PŘEKRAČUJEME HRANICE
PRZEKRACZAMY GRANICE
2014—2020

EVROPSKÁ UNIE / UNIA EUROPEJSKA
EVROPSKÝ FOND PRO REGIONÁLNÍ ROZVOJ
EUROPEJSKI FUNDUSZ ROZWOJU REGIONALNEGO

VSB TECHNICAL UNIVERSITY OF OSTRAVA | FACULTY OF ECONOMICS | DEPARTMENT OF PUBLIC ECONOMICS

DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND

SUPPORT FOR SUSTAINABLE DEVELOPMENT

RASPO

2021

Ostrava, Czech Republic

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics

DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND

SUPPORT FOR SUSTAINABLE DEVELOPMENT

Conference Proceedings of RASPO 2021

Editor

Eva Ardielli
Eva Molnárová

Conference Proceedings of the 4th ONLINE International Scientific Conference
June 17 - 18, 2021
https://www.ekf.vsb.cz/raspo/en

DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND - SUPPORT FOR SUSTAINABLE DEVELOPMENT

Conference Proceedings of RASPO 2021

Author:	Collective of authors
Department, Faculty:	Department of Public Economics, Faculty of Economics, VŠB – Technical University of Ostrava
Title:	DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND - SUPPORT FOR SUSTAINABLE DEVELOPMENT. Conference Proceedings of RASPO 2021.
Editor:	Ing. Eva Ardielli, Ph.D. Ing. Eva Molnárová
Place, year, edition:	Ostrava, 2021, 1st edition
Pages:	288
Published:	VŠB – Technical University of Ostrava, 17. listopadu 15/2172, 708 33 Ostrava-Poruba
Printed:	ZEMAN ART s.r.o., Samaritánská 3192/12, 700 30 Ostrava-Zábřeh
Number of copies:	80

NOT FOR SALE
ISBN 978-80-248-4526-5
ISBN 978-80-248-4527-2
On-line

Program Committee

Ing. Bc. Jiří Bečica, Ph.D.
VŠB - TU Ostrava, Faculty of Economics, Czech Republic

Dr. Agnieszka Bobrowska
University of Opole, Faculty of Economics, Poland

Doc. Ing. Renata Halásková, Ph.D.
University of Ostrava, Faculty of Education, Czech Republic

Prof. Ing. Kamila Janovská, Ph.D.
VŠB - TU Ostrava, Faculty of Metallurgy and Materials Engineering, Czech Republic

Prof. dr hab. Sabina Kauf
University of Opole, Faculty of Economics, Poland

Dr. Grażyna Kozuń-Cieślak
University of Technology and Humanities in Radom, Faculty of Economics, Poland

Dr. Maja Krasucka
University of Opole, Faculty of Economics, Poland

Prof. dr hab. Marta Meciejasz-Świątkiewicz
University of Opole, Faculty of Economics, Poland

Dr. Laura Płatkowska-Prokopczyk
University of Opole, Faculty of Economics, Poland

Prof. dr hab. Janusz Słodczyk
University of Opole, Faculty of Economics, Poland

Prof. dr hab. Stanisława Sokołowska
University of Opole, Faculty of Economics, Poland

Prof. dr hab. Wojciech Sońta
University of Technology and Humanities in Radom, Faculty of Economics, Poland

Doc. Mgr. Pavel Šaradín, Ph.D.
Palacky University, Philosophical Faculty, Czech Republic

Doc. Ing. Petr Tománek, CSc.
VŠB - TU Ostrava, Faculty of Economics, Czech Republic

Prof. PhDr. František Varadzin, CSc.
Silesian University in Opava, School of Business Administration, Czech Republic

Doc. Ing. Iveta Vozňáková, Ph.D.
VŠB - TU Ostrava, Faculty of Metallurgy and Materials Engineering, Czech Republic

Suggested Citation

AUTHOR, A. Title of paper. In: ARDIELLI, E. and E. MOLNÁROVÁ (eds.). *Proceedings of the 4th International Scientific Conference Development and Administration of Border Areas of the Czech Republic and Poland – Support for Sustainable Development, RASPO 2021.* Ostrava: VŠB – Technical University of Ostrava, 2021, pp. xxx-xxx. ISBN 978-80-248-4526-5. ISBN 978-80-248-4527-2 (On-line.)

Publication is not a subject of language check. Papers are sorted by author´s names in alphabetical order. All papers passed a double-blind review process.

Prologue

Dear readers,

this is the Proceedings of papers that were presented at the 4th International Scientific conference “Development and Administration of Border Areas of the Czech Republic and Poland - Support for Sustainable Development” (RASPO) organized by the Department of Public Economics, Faculty of Economics of the VŠB - Technical University of Ostrava. The Scientific Conference RASPO was organized on June 17-18, 2021. Due to the COVID-19 pandemic, this year's conference took place virtually. This year's RASPO conference was funded by project No. CZ.11.3.119 / 0.0 / 0.0 / 16_013 / 0001981 "Development of competencies and improvement of the employability of university students in the labor market in the field of public sector services" (Program Interreg V-A Czech Republic-Poland).

The conference RASPO traditionally responds to common issues of the Czech-Polish border and the most discussed topics usually include Economic and social challenges of sustainable development, Economics and public services at the local level, Sustainable public administration and cross-border cooperation, Culture and Tourism, Public ans bussiness transport and Ecology and efficient waste management.

Academics and students from Czech and Polish universities shared their professional experience and scientific research in real time. Many topics included the COVID-19 pandemic problem. This Proceedings of the RASPO 2021 conference include the peer-reviewed papers that have been successful in the review procedure and were approved by the Scientific Committee for publication.

Ostrava, June 2021

Iveta Vrabková
Head of the Department of Public Economics
Faculty of Economics
VŠB – TUO

Prologue in Czech

Vážení čtenáři,

máte v rukou sborník příspěvků, které byly prezentovány na 4. mezinárodní vědecké konferenci „Rozvoj a správa příhraničních oblastí České republiky a Polska - podpora udržitelného rozvoje“ (RASPO) pořádané Katedrou veřejné ekonomiky, Ekonomické fakulty VŠB - Technické univerzity Ostrava.

Vědecká konference RASPO se konala 17.-18. června 2021. Z důvodů pandemie COVID-19 proběhla letošní konference virtuálně (online). Konference RASPO byla financována z projektu č. CZ.11.3.119 / 0.0 / 0.0 / 16_013 / 0001981 "Rozvoj kompetencí a zlepšení uplatnitelnosti vysokoškolských studentů na trhu práce v oblasti služeb veřejného sektoru“ (Program Interreg V-A Česká republika-Polsko).

Konference RASPO tradičně reaguje na specifické problémy česko-polského pohraničí týkající se ekonomického a sociálního rozvoje příhraničních regiónů. Letošní témata konference RASPO řešily ekonomiku a veřejné služby na místní úrovni, udržitelnou veřejnou správu, přeshraniční spolupráci, kulturu a cestovní ruch, veřejnost a podnikání, dopravu a ekologii či efektivní nakládání s odpady. Nutno podtrhnout, že mnoho témat zahrnovalo pandemickou problematiku týkající se COVID-19. Své odborné názory sdíleli a diskutovali nejen akademici, ale také studenti, z českých a polských univerzit.

Závěrem je potřebné zdůraznit, že tento sborník z konference RASPO 2021 obsahuje recenzované příspěvky úspěšné z hlediska recenzního řízení a následně schváleny vědeckým výborem ke zveřejnění.

Ostrava, červen 2021

Iveta Vrabková
vedoucí Katedry veřejné ekonomiky
Ekonomická fakulta
VŠB – TUO

Prologue in Polish

Szanowni Czytelnicy,

macie w swoich rękach zbiór artykułów, które zostały zaprezentowane na IV Międzynarodowej Konferencji Naukowej „Rozwój i administracja obszarów przygranicznych Republiki Czeskiej i Polski – wspieranie zrównoważonego rozwoju" (RASPO) organizowanej przez: Katedra veřejné ekonomiky, Ekonomická fakulta VŠB – TU Ostrava.

Konferencja naukowa RASPO odbyła się od 17 do 18 czerwca 2021 roku. W związku z pandemią COVID-19 tegoroczna konferencja odbyła się wirtualnie (online). Konferencja RASPO została sfinansowana z projektu nr CZ.11.3.119/0.0/0.0/16_013/0001981 „Rozwój kompetencji i podnoszenie szans studentów uczelni wyższych na rynku pracy w zakresie usług sektora publicznego" (Program Interreg VA Republika Czeska-Polska).

Konferencja RASPO tradycyjnie odpowiada na specyficzne problemy pogranicza czesko-polskiego dotyczące rozwoju gospodarczego i społecznego regionów przygranicznych. Tegoroczny temat konferencji RASPO dotyczył gospodarki i usług publicznych na poziomie lokalnym, zrównoważonej administracji publicznej, współpracy transgranicznej, kultury i turystyki, społeczeństwa i biznesu, transportu i ekologii oraz efektywnej gospodarki odpadami. Należy podkreślić, że wiele tematów obejmowało kwestie pandemii COVID-19. Swoimi opiniami zawodowymi dzielili się i dyskutowali nie tylko naukowcy, ale także studenci z czeskich i polskich uczelni.

Podsumowując, należy podkreślić, że w niniejszym materiale z konferencji RASPO 2021 znajdują się artykuły, który zostały pozytywnie rozpatrzone w procesie recenzowania, a następnie zatwierdzone do publikacji przez konferencyjny komitet naukowy.

Ostrawa, czerwiec 2021

Iveta Vrabková
Kierownik Katedry Gospodarki Publicznej
Wydział Ekonomii
VŠB – TUO

Content

International Evaluation of Technical Efficiency of Hospital Care

Eva Ardielli[1], Sabrina Lee[1], Ivana Vaňková[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
eva.ardielli@vsb.cz, sabrina.lee.st@vsb.cz, ivana.vankova@vsb.cz

Abstract

Evaluating the efficiency of hospitals is one of the important areas of public economics and public policy. The paper is focused on the international evaluation of the technical efficiency of hospital care in the Czech Republic and the chosen federal state of Germany, Baden-Württemberg, in the years 2010-2019 according to input-oriented DEA models. Two models were calculated in the research. Model M1 is based on assumptions of constant returns to scale, and model M2 assuming variable returns to scale. It was confirmed, in case of both models, that the average technical efficiency rate of the Czech Republic for the years 2010-2019 is lower than the average value of the technical efficiency rate of the federal state of Baden-Württemberg. It was also confirmed, that the reduction of hospital beds is possible in both Czech Republic and Baden-Württemberg.

Keywords: *Baden-Württemberg, Czech Republic, DEA, efficiency, healthcare, hospitals, Germany*

JEL Classification: *C10, D24, I10*

1 Introduction

The public economy and public policy of each developed country addresses the issue of possible efficiency gains in health care. The aim of health policy is primarily to increase efficiency on the part of health care providers, such as hospitals (Dlouhý, Jablonský and Novosádová, 2007). An important aspect is the evaluation of the technical efficiency of health care.

The OECD Economic Surveys (2018) point to the fact that health care in the Czech Republic achieves good health results that are getting close to the average of OECD member states. However, a comparison of the Czech healthcare system with countries of the comparable institutional environment points to the potential for increasing efficiency. It is typical for the Czech healthcare system that the state has there a strong control through price and volume regulation. The efficiency and quality of the entire system is influenced by asymmetric information in the relationship among the various actors in the health care system, namely health insurance companies, health care providers and patients. On the other hand, it is necessary to state that each system or the healthcare model has its strengths and weaknesses.

Incentives are created in all systems to encourage both healthcare payers and providers to provide, in particular, cost-effective yet high-quality health services or to prevent the overuse of health services, while regulation should guarantee fair competition and the right price signals (MZČR, 2021).

The health care system is influenced by a number of factors, especially historical development, socio-demographic conditions, the level of maturity of the country, etc. According to the OECD Economic Surveys, the Czech Republic inherited from the communist era a health care system focused on hospital care, which still contributes to inefficiency.

The paper is focused on the evaluation of the technical efficiency of hospital care in the Czech Republic and the federal state of Baden-Württemberg. The modeling of technical efficiency was carried out according to the aggregated input and output parameters, which were selected with the intention of fulfilling the objectives of the

paper. Research data were collected from the statistical health yearbooks of the Czech Republic and the federal state of Baden-Württemberg for the years 2010-2019. Selected parameters are based on uniform terminology, which is the basis of good data comparability.

The aim of the paper is an international evaluation of the technical efficiency of hospital care (inpatient and outpatient hospital care) in the Czech Republic and Baden-Württemberg in the years 2010-2019 according to input-oriented DEA models.

In the research, there were identified two research questions:

- RQ1: The average technical efficiency rate of the Czech Republic for the years 2010-2019 is lower than the average value of the technical efficiency rate of the federal state of Baden-Württemberg.
- RQ2: Although the number of beds is decreasing in the monitored years, it is still possible to reduce the number of hospital beds.

2 Territorial Division of the Czech Republic, Germany and Baden-Württemberg

The Czech Republic is divided into 14 self-governing regions and 6,254 municipalities. Of these, 205 municipalities are municipalities with extended powers, which, like the regions, perform state administration in their districts with delegated powers. The territory outside Prague is divided into 76 districts (the capital city of Prague is not a de jure district, but had similar powers) which serve primarily for statistical purposes and the territorial division of some state administration offices. For the administration of European subsidies, the regions are grouped into a total of eight NUTS2 regions.

Beginning on January 1, 2021, a conceptually uniform administrative division of the state came into force. The new Act on the Territorial Administrative Division of the State (Collection of Laws, 2020) simplifies and clarifies the entire territorial structure of public administration. The old legislation from 1960 is being replaced, the boundaries of smaller subdivision units can no longer exceed the boundaries of larger units, and the entire structure is laid out from below, from the level of municipalities.

The Federal Republic of Germany consists of 16 independent federal states and, taken together, represents a federal state or federation of states. According to their form of government, the states are parliamentary republics. The three states of Berlin, Bremen and Hamburg are city states, which means that each of them is a state and a city at the same time and are therefore not further subdivided into municipalities. The other 13 federal states are subdivided in descending order into government districts, regions, districts, associations of municipalities and municipalities. Municipalities are the smallest territorial units. Germany consists of a total of 12,320 municipalities. The municipalities are also legally independent territorial entities with directly elected governing councils.

Baden-Württemberg is a parliamentary republic and a partially sovereign federal state in the southwest of the Federal Republic of Germany. As in other large German territorial states, the administration in the state has a three-tier structure: At the top are the ministries. Below them are the four government districts of Stuttgart, Karlsruhe, Tübingen and Freiburg as central authorities. In addition, Baden-Württemberg is divided into 35 administrative districts and 1,101 municipalities, which form the lower administrative level. In terms of population and area, Baden-Württemberg is the third-largest state in Germany, with the highest exports, the second-lowest unemployment rate and the fourth-highest gross domestic product (GDP) per capita.

Table 1 – Territorial division of the Czech Republic and Baden-Württemberg

Territorial Division	Czech Republic	Germany	Baden-Württemberg
Number of cohesion regions	8	16	1
Number of (government) districts	-	19	4
Number of regions	14	105	12
Number of districts	76	294	35
Number of municipalities	6,254	12,320	1,101

Source: (ČSÚ, 2021; State statistical office, 2021; TU Berlin, 2008), own processing

3 Healthcare in the Czech Republic and Germany

Healthcare is one of the branches of the public sector. Healthcare in the Czech Republic and also in Germany belongs to the most important sectors of the national economy (Rektořík, 2007). Central body of the Czech

healthcare is Ministry of Health of the Czech Republic. The basic strategic document of Czech health policy is the Strategic Framework for the Development of Health Care in the Czech Republic until 2030 (MZČR, 2021). The basic legal norms regulating the field of health care in the Czech Republic are the Constitution of the Czech Republic, the Charter of Fundamental Rights and Freedoms, Act No. 258/2000 Coll., On the protection of public health and Act No. 48/1997 Coll., On public health insurance (Lochmanová, 2020).

Health care systems can be divided into two basic models according to the method of payment for the provided health care (Hamplová, 2019):

- state health care – health care is paid from public funds and taxes (Beveridge's model, Semašek's model),
- insurance-based health systems - public (compulsory) health insurance (Bismarckian model) or private (voluntary) market health insurance (liberal model).

The Bismarckian model is applied in the Czech Republic and Germany. This model represents a health system based on general health insurance. This is based on the idea of universal access to health care. Health care is then covered by public (compulsory) health insurance. Every citizen usually contributes to the basic fund of the health insurance company (Collection of Laws, 1992; Augurzky and Penter, 2014).

Likewise in Germany, the Bismarck model exists as a social insurance system in which contributions are financed by insurance holders and employers. In this system, there are both public and private providers of health care services. The central political authority for the German health sector is the Federal Ministry of Health, which is one of the highest federal authorities. The main task of this authority is to maintain, secure and further develop the efficiency of the statutory health insurance and the long-term care insurance. The task of providing services of general interest is established by law in the German Basic Law (Grundgesetz). The right to life and physical integrity from Article 2 (2) sentence 1 of the Basic Law and the principle of the welfare state from Article 20 (1) of the Basic Law come into question for a claim to health care to be derived from the Basic Law itself (German Parliament, 2015).

3.1 Hospital Facilities in the Czech Republic and Baden-Württemberg

In the Czech Republic brings together data on health care the Institute of Health Information and Statistics (ÚZIS). According to the published data concerning the provided inpatient care in 2018, a total of 32,065 medical facilities were registered in the Czech Republic (ÚZIS, 2019). The network of institutional care facilities consisted of 194 hospitals (acute and follow-up care) with a total number of 60,328 beds and 120 specialized medical institutions (including health resorts and hospices, without spa hospitals) with a total of 17,412 beds. Beds in psychiatric hospitals accounted for 51.1% of the total inpatient fund of specialized medical institutions, and beds in long-term care hospitals accounted for 19.9% (3,457 beds). In 2018, there were in the Czech Republic registered a total of 154 acute care hospitals, of which 10 were university hospitals and 144 were general hospitals (ÚZIS, 2019), see Table 2. University hospitals are managed and financed centrally by the state through the Ministry of Health of the Czech Republic. University hospitals have a bed capacity of almost 14,000 beds, general hospitals have almost 44,000 beds. The vast majority of bed capacity is therefore in general hospitals, which have a non-state owner as region, municipality or private entity (Lochmanová, 2020).

Table 2 – Number of hospital facilities in the Czech Republic and Baden-Württemberg

Type of health care provider	**Czech Republic**	**Baden-Württemberg**
University hospital	10	6
General hospital	144	250
Acute care hospital (university and general hospital)	**154**	**256**
Aftercare hospital and preventive or rehabilitation institutions	160	198
Total number of facilities	**314**	**454**

Source: (ÚZIS, 2019; State statistical office, 2018; Joint federal committee, 2021), own processing

The "Baden-Württemberg statistical office" is responsible for collecting hospital data in Baden-Württemberg. In accordance with the "regulation on the federal statistics for hospitals", the state office has been obliged to issue the hospital statistics annually since 1990. It is an annual total survey of hospitals and prevention or rehabilitation facilities, their organizational units, staffing and equipment, and the services they provide. In 2018, a total of 250 hospitals (acute and aftercare) with a total of 55 570 established beds are reported. Of these, six are university hospitals with a total of 8 228 beds, which are owned by the state of Baden-Württemberg. With 46 571 beds, general hospitals account for the majority of hospital care compared to university hospitals. Thus,

just as in the Czech Republic, the vast majority of bed capacity is located in general hospitals that have a non-state sponsor as a region, municipality or private entity. In addition, 198 preventive care or rehabilitation facilities with a total of 25 911 beds are reported in this reporting year. These are not explicitly defined as "aftercare hospitals" in Germany, but the facilities named here are, on the one hand, for rehabilitation in the sense of curing an illness, preventing its worsening, easing the symptoms of illness, after a hospital stay or even before admission to a hospital, for preventive care or to improve a weakened health condition (definition of preventive care or rehabilitation facilities see paragraph 107 of the German Social Code V).

4 Methods

The methods of multiple-criteria decision-making (MCDM) are among the most frequently used methods in health care economics today. The models are based on applied efficiency formation and evaluation. Efficiency is generally achieved when the expenditure/costs of ensuring certain processes (inputs) do not exceed the profits achieved at the end of the process (outputs). With regard to the majority of studies on hospital care and other health services, the DEA method is also used predominantly, which was introduced by Charnes, Cooper and Rhodes in 1978 (Charnes et al., 1978; Vrabková and Vaňková, 2015). Against this background, the DEA method is also the comparably most adequate means for this work to evaluate and compare the technical efficiency of hospitals in the Czech Republic and Baden-Württemberg.

The starting point of the evaluation performed in presented paper was a search of professional publications. Authors using multicriteria decision-making methods in the healthcare sector focus mainly on the micro level, ie evaluating the efficiency of healthcare facilities (e.g. Ahmed et al., 2019; Blatnik et al., 2017; Ghahremanloo, M. et al., 2020; Varabyova, et al., 2017). Many articles are also aimed at modeling efficiency at the meso or macro level (e.g. Stefko, Gavurová and Kocisová, 2018; Ravangard et al., 2014).

Based on these analyzes and evaluations, recommendations are made for the given production units with regard to the results of the examined input and output parameters and to the selected DEA model. The resulting recommendations to support the efficiency of hospital care relate mainly to shortening the time of inpatient care, optimizing the continuity of outpatient and inpatient care, optimizing the inpatient fund, increasing the use of working hours of operating rooms, etc.

Table 3 - Overall statistical characteristics of input and output parameters 2010-2019 (n=20)

n=20		Minimum	Maximum	Mean	Median	SD
CZ_2010-2019	x1 number of beds	56 586	62 219	59 328	60 275	1834.2
BW_2010-2019		55 462	58 045	56 383	56 363	774.6
CZ_2010-2019	x2 number of doctors	18 948	22 574	20 602	20 329	1163.1
BW_2010-2019		18 832	24 695	21 545	21 492	1902.4
CZ_2010-2019	x3 number of nurses	57 250	62 748	59 129	58 060	2069.3
BW_2010-2019		49 564	53 474	51 701	51 535	1084.54
CZ_2010-2019	y1 number of hospitalizations	2 132 135	2 260 239	2 189 951	2 182 367	40 025.3
BW_2010-2019		2 022 271	2 165 422	2 113 393	2 134 099	48 849.3
CZ_2010-2019	y2 bed occupancy in days	242.8	263.60	251.78	251.95	7.24
BW_2010-2019		276.31	282.15	280.17	280.32	1.69

Note: SD=standard deviation.
Source: own processing

The subject of the article is the evaluation of technical efficiency according to the selected input and output parameters in the years 2010-2019. Selected input and output parameters were statistically tested and the correlation relationship of the Spearman correlation coefficient was analyzed among the selected parameters, so that the evaluations correspond to the principles for modeling DEA models (Klieštik, 2009; Cooper, Seiford and Zhu, 2011).

The number of beds, the number of doctors and the number of general nurses and midwives were chosen as input parameters. Personnel data related to selected categories of health care workers are based on recalculated average annual numbers of registered and contract staff. The key output parameters that affect the performance

of the hospital sector were chosen the number of hospitalized cases and the use of beds in days. Statistical characteristics of selected input and output parameters for the Czech Republic and Baden-Württemberg are given in Table 3.

For the needs of hospital care evaluation were chosen: an input-oriented CCR model with constant scale returns, i.e. the M1 model, and an input-oriented BCC model with variable scale returns, i.e. the M2 model. Input-oriented DEA models are based on the minimization assumption, when the value of inputs is reduced while maintaining the value of outputs. If the production unit reaches the value 1, the given unit lies on the effective limit and is therefore an effective unit. The resulting value lower than 1 determines inefficient units (Dlouhý, Jablonský, Zýková, 2018).

The evaluation of the technical efficiency of hospital care is verified for CR_2010-CR_2019 and BW_2010-BW_2019, which represent the analyzed DMUs. The calculation of technical efficiency was performed according to the input-oriented CCR DEA model (Model M1), whose mathematical formulation (1) is as follows:

$$\max z = \sum_{r=1}^{s} \mu_r \gamma_{ro} \tag{1}$$

subject to

$$\sum_{r=1}^{s} \mu_r \gamma_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0$$

$$\sum_{I=1}^{m} v_i x_{io} = 1$$

$$\mu_r, v_i \geq \varepsilon > 0$$

The calculation of efficiency according to the M2 model, i.e. the input-oriented model with the assumption of variable scale returns is formulated according to the formula (2):

$$\max z = \sum_{r=1}^{s} u_r \gamma_{ro} - u_o, \tag{2}$$

subject to

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} - u_o \leq 0, \quad j = 1, \ldots, n,$$

$$\sum_{i=1}^{m} v_i x_{io} = 1,$$

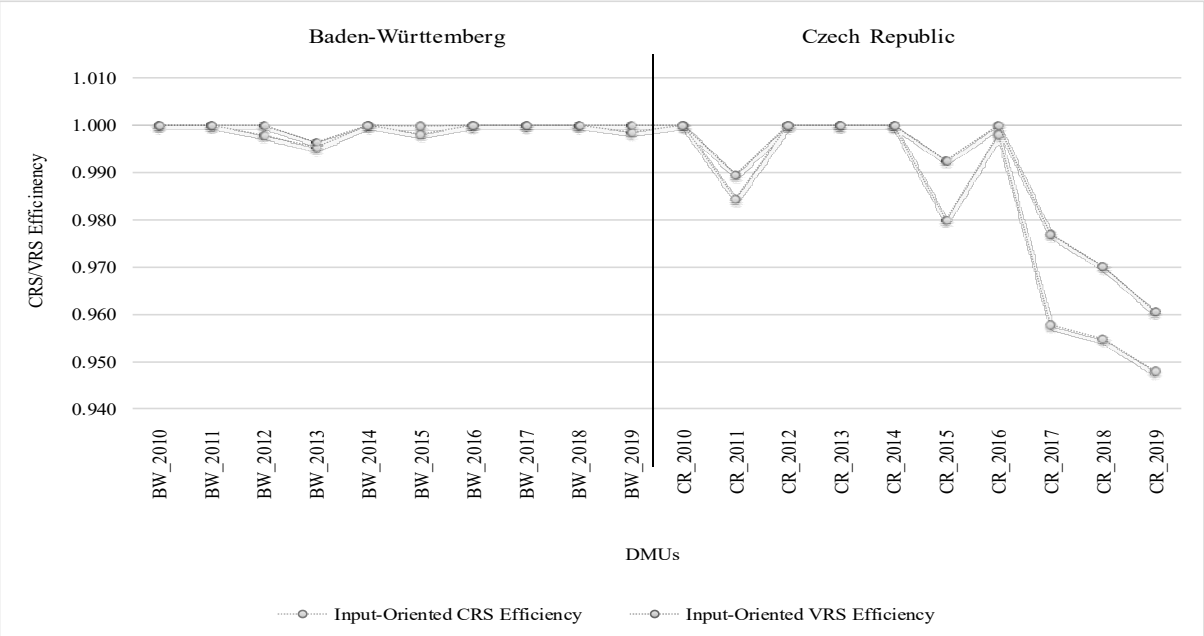
$$v_i \geq \varepsilon,\ u_r \geq \varepsilon, u_o \text{ free}$$

5 Results and Discussion

The essence of technical efficiency modeling of primary DEA models is based on the division of the investigated homogeneous DMUs into efficient and inefficient according to the consumed resources and the amount of production. Model M1 is based on assumptions of constant returns to scale, and model M2 is also an input-oriented model, but assuming variable returns to scale. As stated by Dlouhý, Jablonský, Zýková (2018), assuming variable returns to scale, the efficiency rate of the evaluated units is higher than assuming constant returns to scale.

The summary results of technical efficiency are documented in Figure 1 and Table 4. It is obvious that the levels of technical efficiency are not significantly different. The federal state of Baden-Württemberg was effective in the M1 model in 2010, 2011, 2014, 2016-2018. The average efficiency rate reached 99% over a ten-year period. The Czech Republic was effective in four years, in 2010, 2012, 2013 and 2014. The lowest efficiency rate was achieved in 2019, namely 94.8%. In the M2 model, the federal state of Baden-Württemberg was effective in nine years, specifically in 2010-2012, 2014-2019. The Czech Republic was effective in 2010, 2012-2014 and in 2016.

Figure 1 - Results of M1 (CRS) and M2 model (VRS) for the Baden-Württemberg and the Czech Republic



Source: own processing

The average technical efficiency rate of the Czech Republic for the years 2010-2019 is lower than the average value of the technical efficiency rate of the federal state of Baden-Württemberg. In the case of M1 model the average technical efficiency rate of the Czech Republic reaches the value of 0.98229, while in the case of Baden-Württemberg the value is 0.99896. Similarly in the case of M2 model the average technical efficiency rate of the Czech Republic reaches the value of 0.98895, while in the case of Baden-Württemberg the value is 0.99961. This confirms the research question RQ1, see Table 4.

Table 4 - Aggregated results of input-oriented DEA models

		M1 model	M2 model
CZ_2010-2019	Mean	0.98229	0.98895
	Median	0.99116	1.00000
	SD	0.02009	0.00114
	R	0.05203	0.00363
ZBW_2010-2019	Mean	0.99896	0.99961
	Median	1.00000	0.99621
	SD	0.00156	0.01463
	R	0.00469	0.03942
Total	Mean	0.99063	0.99428
	Median	0.99919	1.00000
	SD	0.01693	0.01149
	R	0.05203	0.03942

Note: R = variation range.
Source: own processing

Given that the technical efficiency is evaluated according to input-oriented DEA models, the evaluation is focused on reducing the values of input parameters while maintaining the values of output parameters. Based on the modeling results, the changes in the input parameters were aimed at changes in the number of beds, not the

number of professional medical staff. Authors such as Vrabková and Vaňková (2021) also point out this fact, stating that reducing the number of professional staff in the field of hospital care would lead to improved technical efficiency, but would also have a significant impact on the deterioration of the quality of health care.

It is also necessary to state that the number of professional staff is legislatively determined according to individual specialties and is related to the number of beds in hospital wards. The results show that in the federal state of Baden-Württemberg the bed fund decreased by 2,583 beds in 2010-2019, the number of hospitalized patients increased, but the use of beds was almost unchanged and in 2019 it reached 76.3%. Within the Czech Republic, the number of beds was reduced by 1,719, but in terms of data on the number of hospitalizations and the use of the bed fund, it can be stated that the number of hospital beds can be further reduced. In 2019, the use of bed fund reached 66%. The evaluation of the number of beds is also influenced by the use of beds for long-term care, as acute care hospitals also provide follow-up care to a various extent.

It can be stated, that although the number of beds is decreasing in the monitored years, it is still possible to reduce the number of hospital beds in both countries. This confirms the research question RQ2.

6 Conclusion

The presented paper was aimed on the international evaluation of the technical efficiency of hospital care in the Czech Republic and Baden-Württemberg in the years 2010-2019 according to input-oriented DEA models. Two models were calculated - model M1 is based on assumptions of constant returns to scale, and model M2 assuming variable returns to scale. It was confirmed, that the levels of technical efficiency are not significantly different. The federal state of Baden-Württemberg was effective in the M1 model in 2010, 2011, 2014, 2016-2018. The Czech Republic was effective in four years, in 2010, 2012, 2013 and 2014. In the M2 model, the federal state of Baden-Württemberg was effective in the periods 2010-2012 and 2014-2019. The Czech Republic was effective in 2010, 2012-2014 and in 2016.

In the research, there were verified two research questions RQ1 and RQ2. RQ1 was confirmed, the average technical efficiency rate of the Czech Republic for the years 2010-2019 is lower than the average value of the technical efficiency rate of the federal state of Baden-Württemberg. RQ2 was also confirmed, although the number of beds is decreasing in the monitored years, it is still possible to reduce the number of hospital beds.

Within the healthcare system as a whole, there is an infinite set of interconnected processes that can be individually evaluated from many points of view. This makes it possible to outline certain suggestions of efficiency or inefficiency, but rarely offer a comprehensive view. However, the evaluation of partial links also provides significant incentives for health policy implementers or management of medical facilities to further ensure affordable, effective and high-quality healthcare for patients. Although these are at first sight mutually exclusive goals, the effort of systemic changes is primarily to ensure optimal and appropriate treatment and rational use of hospital resources.

The number of beds is a performance parameter that discusses the capacity of the facility. This indicator is also linked to professional medical staff, whose role is exceptional and reflects the quality of care provided. The efficiency results of the Czech Republic and the federal state of Baden-Württemberg have shown that although the differences are not significant, there are reserves for increasing efficiency.

Acknowledgements

This paper was supported within the project SGS No. SP2021/67, International Evaluation of the Performance of Health and Social Services with a Focus on the Application of Multicriteria Methods, Faculty of Economics, VŠB - Technical University of Ostrava.

References

[1] AHMED, S., HASAN, M.Z. and LAOKRI, S., et al. (2019). Technical efficiency of public district hospitals in Bangladesh: a data envelopment analysis. *Cost Eff Resour Alloc.* Vol. 17, No. 15. DOI: https:10.1186/s12962-019-0183-6.

[2] AUGZRZKY, B. and PENTER, V. (2014). *Gesundheitswesen für Praktiker: System, Akteure, Perspektiven.* Deutschland: Springer Fachmedien Wiesbaden.

[3] BLATNIK, P., BOJNEC, S. and TUŠAK, M. (2017). Measuring Efficiency of Secondary Healthcare Providers in Slovenia. *Open Medicine*. Vol. 12. DOI: 10.1515/med-2017-0031.

[4] CHARNES, A., COOPER, W.W. and RHODES, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, Vol. 2 No. 6, pp. 429–444.

[5] COOPER, WW. SEIFORD, ML. and ZHU, J. (2011). *Handbook on Data Envelopment Analysis.* Vol. 164. NEW York: Spinger.

[6] ČSÚ (2021). *Analýza zdravotnických účtů ČR - 2000 - 2003 ze dne 28.února 2005* [online]. 2005 [cit. 2021-05-04]. Available from https://www.czso.cz/documents/10180/20554863/152405u1.pdf/1f82e55d-d3e2-4e29-8674-1ad2bb4beea4?version=1.0

[7] DLOUHÝ, M., JABLONSKÝ, J. and NOVOSÁDOVÁ, I. (2007). Use of data envelopment analysis for efficiency evaluation of Czech hospitals. *Politická ekonomie*. Vol.55, No. 1, pp. 60-71.

[8] DLOUHÝ, M., JABLONSKÝ, J. and ZÝKOVÁ P. (2018). *Analýza obalu dat.* Praha: Professional Publishing.

[9] GERMAN PARLIAMENT (2015). *Grundgesetzlicher Anspruch auf gesundheitliche Versorgung* [online]. 2015 [cit. 2021-05-25]. Available from https://www.bundestag.de/resource/blob/405508/4dd5bf6452b5b3b824d8de6efdad39dd/wd-3-089-15-pdf-data.pdf

[10] GHAHREMANLOO, M., HASANI, A., AMIRI, M., HASHEMI-TABATABAEI, M., KESHAVARZ-GHORABAEE, M. and USTINOVIČIUS, L. (2020). A novel DEA model for hospital performance evaluation based on the measurement of efficiency, effectiveness, and productivity. *Engineering Management in Production and Services.* Vol. 12, No. 1, pp. 7-19. DOI: 10.2478/emj-2020-000.

[11] HAMPLOVÁ, L. (2019). *Veřejné zdravotnictví a výchova ke zdraví: pro zdravotnické obory.* Praha: Grada Publishing.

[12] JOINT FEDERAL COMMITTEE (2021*). Gemeinsamer Bundesausschuss: Die Qualitätsberichte der Krankenhäuser* [online]. 2021 [cit. 2021-05-24]. Available from https://www.g-ba-qualitaetsberichte.de/#/search

[13] KLIEŠTIK, T. (2009). Kvantifikácia efektivity činností dopravných podnikov pomocou data envelopment analysis. *E+M Ekonomie a Management.* pp. 133-145.

[14] LOCHMANOVÁ, A. (2020). *Veřejná správa: základy veřejné správy.* Prostějov: Computer media.

[15] MZČR (2021). *Strategický rámec rozvoje péče o zdraví v České republice do roku 2030 ze dne 18. listopadu 2020* [online]. 2020 [cit. 2021-04-02]. Available from https://www.dataplan.info/img_upload/7bdb1584e3b8a53d337518d988763f8d/revokace-zdravi2030_final.pdf

[16] OECD (2018). *OECD Economic Surveys. Czech Republic.* [online]. 2018 [cit. 2021-05-05]. Available from https://www.oecd.org/economy/surveys/Czech-Republic-2018-OECD-economic-survey-overview.pdf

[17] RAVANGARD, R., HATAM, N., TEIMOURIZAD, A. and JAFARI, A. (2014). Factors affecting the technical efficiency of health systems: A case study of Economic Cooperation Organization (ECO) countries (2004–10). Int *J Health Policy Manag*, Vol.3, pp: 63–69. DOI: 10.15171/ijhpm.2014.60.

[18] REKTOŘÍK, J. et al. (2007). *Ekonomika a řízení odvětví veřejného sektoru*. Praha: Ekospress, 2007.

[19] STATE STATISTICAL OFFICE (2021). *Statistisches Landesamt Baden-Württemberg* [online]. 2021 [cit. 2021-05-24]. Available from https://www.destatis.de/DE/Themen/Laender-Regionen/Regionales/Gemeindeverzeichnis/ Administrativ/03-regierungsbezirke.html

[20] STATE STATISTICAL OFFICE (2018). *Statistisches Landesamt Baden-Württemberg: Krankenhausstatistiken Baden-Württemberg* [online]. 2018 [cit. 2021-05-24]. Available from https://www.statistik-bw.de/Suche-und-Bestellung/statBerPage.xhtml?thema=A4

[21] STEFKO, R., GAVUROVA, B. and KOCISOVA, K. (2018). Healthcare efficiency assessment using DEA analysis in the Slovak Republic. *Health Econ Rev*. Vol. 8, No.6. DOI: 10.1186/s13561-018-0191-9.

[22] TU Berlin (2008). [online]. 2008 [cit. 2021-05-24]. Available from http://www.planung-tu-berlin.de/Profil/Regionalplanung.htm

[23] ÚZIS (2019). *Zdravotnická ročenka České republiky 2018* [online]. 2019 [cit. 2021-04-14]. Available from https://www.uzis.cz/res/f/008280/zdrroccz-2018.pdf

[24] VARABYOVA, Y., BLANKART, C.R., TORBICA A. and SCHREYÖGG, J. (2017). Comparing the Efficiency of Hospitals in Italy and Germany: Nonparametric Conditional Approach Based on Partial

Frontier. *Health Care Management Science.* Vol. 20, No. 3, pp: 379-394. DOI: 10.1007/s10729-016-9359-1.

[25] VRABKOVÁ, I. and VAŇKOVÁ, I. (2015). *Evaluation models of efficiency and quality of bed care in hospitals,* Series on advanced economic issues. Ostrava: VŠB-TU Ostrava.

[26] VRABKOVÁ, I. and VAŇKOVÁ, I. (2021). Efficiency of Human Resources in Public Hospitals: An Example from the Czech Republic. *International Journal of Enviromental Research and Public Health.* Vol. 18, No. 9. DOI: 10.3390/ijerph18094711.

[27] Zákon č. 592/1992 Sb., o pojistném na všeobecném zdravotním pojištění. In: *Sbírka zákonů České republiky.* 1992. Available from https://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=592/1992%20&typeLaw=zakon&what=Cislo_zakona_smlouvy.

[28] Zákon č. 51/2020 Sb., o územně správním členění státu a o změně souvisejících zákonů. In: *Sbírka zákonů České republiky.* 2020. Available from https://www.zakonyprolidi.cz/cs/2020-51

eHealth Tools´ Availability in Outpatient Clinics at NUTS 3 Level of Czechia

Eva Ardielli

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00, Ostrava 1, Czech Republic
eva.ardielli@vsb.cz

Abstract

The electronization of outpatient health care is an irreversible consequence of the penetration of information and communication technologies into most fields of human activity, including healthcare. New technologies and applications in healthcare open up a number of new possibilities. Today, most types of medical practices are increasingly using ICT equipment in their practice. The use of ICT usually means the use of a computer, internet connection, online services (online consultations and ordering), keeping electronic medical records (acquisition, management, storage in digital form), the possibility of electronic prescription of drugs or the usage of electronic health records. The paper is focused on the evaluation of the availability of eHealth tools used at outpatient clinics in the Czech Republic. The research results are presented according to the jurisdiction of the territory within the NUTS 3 administrative units in the Czech Republic. Based on the calculation using the ELECTRE III method, it can be stated that the greatest availability of eHealth tools is in Moravian-Silesian Region, Hradec Kralove Region and Pardubice Region. On the contrary, the lowest availability is in Pilsen Region, Capital City of Prague and in Karlovy Vary Region.

Keywords: *Czech Republic, eHealth, ICT, MCDM methods, outpatient health care*

JEL Classification: *H75, I11, I18*

1 Introduction

With the development of information and communication technologies (ICTs), the demand for electronic or digital forms of services offered in many fields is growing. The same is true for healthcare (Oh et. al, 2005). By connecting computer technology with medicine, a young branch of eHealth was created, which is a designation for the electronization of the entire healthcare system (Jung and Loira, 2010). The main goal is to streamline the provided health care by expanding existing or using new ICTs not only for treatment, but also for sharing medical procedures and improving communication with patients, see Ahad et.al (2019) or Chaudhry et. al (2006). During the COVID-19 pandemic, the importance of using these services, especially those provided remotely, without the need for personal contact between the doctor and the patient, is obvious.

A significant part of medical facilities in the Czech Republic consists of facilities providing outpatient care, especially independent outpatient facilities, in which over 50 % of all physicians in the Czech Republic perform their activities (ÚZIS, 2019). The application of new technologies, especially ICT, in these facilities contributes to easier access, to improving the quality and availability of services offered within the Czech Republic or within the EU (MZČR, 2016a).

The aim of the paper is to evaluate the availability of eHealth tools used at outpatient clinics in the Czech Republic at NUTS 3 administration level in the year 2018 by usage of the multi-criteria decision-making methods.

2 Healthcare and eHealth in the Czech Republic

Healthcare in the Czech Republic is one of the most important sectors of the public sector which is financed mainly from public budgets (Rektořík, 2007). The central body for this area is the Ministry of Health of the Czech Republic. The main key objectives in this area are the quality of health care, prolongation of human life, health care of the population and other aspects (MZČR, 2021). Health is mentioned in the Constitution of the Czech Republic as one of the human rights, but it is difficult to define and measure it (Hamplová, 2019). According to the World Health Organization (WHO), health is a state of complete physical, mental and social well-being, not just the absence of disease or infirmity (WHO, 2020). The basic overarching document in the field of health policy in the Czech Republic is the Strategic Framework for the Development of Health Care in the Czech Republic until 2030 (MZČR, 2021). The basic legal norms regulating the field of health care in the Czech Republic are the Constitution of the Czech Republic, the Charter of Fundamental Rights and Freedoms, Act No. 258/2000 Coll., On the protection of public health and Act No. 48/1997 Coll., On public health insurance (Lochmanová, 2020). The health care system in the Czech Republic is based on general health insurance, which is based on the idea of universal access to health care. Health care is then covered by public (compulsory) health insurance. Each citizen usually contributes to the basic fund of the health insurance company, as stated in Act No. 592 on general health insurance premiums (1992).

2.1 Medical Facilities in the Czech Republic

From the point of view of legal regulation, it is possible to distinguish between state and non-state health care facilities providing health care. State health care facilities are established by ministries, especially by the Ministry of Health. Non-state health care facilities are established by municipalities or regions in independent competence or by natural and legal persons (Lochmanová, 2020). According to the forms of care provided, it is possible to distinguish medical facilities into outpatient, inpatient facilities, special facilities, emergency medical service facilities, pharmacy care facilities and public health protection facilities.

A significant part of medical facilities in the Czech Republic consists of facilities providing outpatient care. Outpatient care is a form of health care in which hospitalization or admission of a patient to a bed in a medical facility that provides one-day care is not necessary. Outpatient care is provided by a primary care physician (general medicine, dentistry, gynecology), outpatient specialists who provide health care within individual fields (allergology, dermatology, ophthalmology, urology, cardiology, surgery, etc.). Another form of outpatient health care is care provided to patients whose medical condition requires repeated daily provision of outpatient care, in this case it is the care of special outpatient or patient care (home health care, inpatient health care). In the case of an illness, the patient usually first turns to the primary care physician with whom he is registered. Outpatient care is provided both in hospitals and by general practitioners and specialists in private medical facilities (Hamplová, 2019).

According to Act No. 372/2011 Coll., On health services and conditions of their provision (the Health Services Act), outpatient care is provided as (NZIP, 2021):

- Primary outpatient care, the purpose of which is to provide preventive, diagnostic, therapeutic and assessment care and consultations, as well as coordination and continuity of provided health services by other providers. This health care is provided to the patient by the registering provider.
- Specialized outpatient care, which is provided within individual branches of health care
    - dentistry, pharmacy, fields of specialized education or fields of certified courses of doctors, dentists or pharmacists according to another legal regulation,
    - expertise of non-medical health professionals or fields of specialization education or fields of certified courses of non-medical health professionals according to another legal regulation.
- Patient care, the purpose of which is to provide health care to patients whose medical condition requires repeated daily provision of outpatient care.

2.2 eHealth in the Czech Republic

The term eHealth originated at the turn of the millennium in connection with the development of computer technology and the expansion of the Internet (Bruthans, 2020). eHealth can be described as electronic and computerized healthcare. eHealth technology is then a technological tool through which health or healthcare is supported, often ICTs (van Gemert-Pijnen et al., 2018). A necessary condition for the effective functioning of eHealth is not only the appropriate hardware and software, but also the computer literacy of the users of the system themselves.

Telemedicine is one of the basic elements of eHealth. Telemedicine is the provision of healthcare through remote access using ICT (van Gemert-Pijnen, 2016). Středa and Hána (2016) describe it as a combination of medical informatics and telecommunications, which enable remote data transmission, consulting services or the provision of medical services at a distance. The term telehealth can be confused with telemedicine, it is only a broader term. Telehealth is the provision of care by any healthcare professional, telemedicine by a specific doctor (Bruthans, 2020).

Records of the patient's health condition and procedures are an integral part of the treatment process. As part of the electronic patient documentation, handwritten records are now being abandoned and the transition to computer-assisted data recording is being switched to. Medical documentation can be kept in both forms. Electronic Medical Record (EMR) is a system that stores both the necessary patient data and the procedures performed, orders or results of laboratory tests. Already in 2004, there was a system of IZIP patient health records in the Czech Republic. The electronic medical record contained all information about the patient's state of health. During the following years, however, the operation was interrupted due to its alleged malfunction, see more (Janasová and Ardielli, 2010).

Another specific category of eHealth is electronic imaging data. There is no uniform standard in the field of EMR, therefore a number of EMR systems can be found. There is only one standard in the field of medical imaging data - DICOM (Bruthans, 2020). DICOM (Digital Imagining and Communications in Medicine) is a standard for the distribution, imaging or storage of data acquired by imaging methods such as magnetic resonance imaging, computed tomography or ultrasound. In addition to its own image data, DICOM contains other related information about patients or data sources. The advantage of this standard is the support of communication between devices regardless of the manufacturer and applicability not only in the Internet network, but also on offline media (Středa and Hána, 2016).

Another important element is the issue of reporting incapacity for work. On January 1, 2020, the CSSA launched a sharp operation of the mandatory eNeschopenka system. The main goal of eNeschopenka is to simplify the flow of information between insured persons, doctors, employers and the CSSA (ČSSZ, 2021). This system was widely used in 2020 in connection with the Covid 19 pandemic and compulsory quarantine of persons. At this time, incapacity for work was solved mainly by distance.

Electronic prescription (eRecept) is a medical prescription issued in electronic form, which is stored in the Central Repository of Electronic Prescriptions (CÚER). Each eRecept is assigned its own unique identifier, which is then retrieved by pharmacists. Based on this, the relevant medicinal product is then dispensed, the dispensing is registered in the CÚER. The eRecept identifier can be obtained in paper or electronic form, for example in e-mail, SMS or via a special application in a mobile phone (eRecept, 2021). From 1 January 2018, the obligation to prescribe prescriptions arises only electronically, which applies to all prescribing physicians.

mHealth is a specific form of eHeatlh using mobile technology and special applications (van Gemert-Pijnen, 2018). For the most part, smartphones with an advanced operating system and an application interface that allow to install other programs are used for this purpose. mHealth helps prevent health problems, participates in the creation of more effective health care systems (Středa and Hana, 2016). Today, for example, there are mobile applications for measuring blood pressure, special applications for diabetics or offering improvements in physical condition and overall health. Health insurance companies in the Czech Republic offer applications such as Vitakarta, Health Card and others similar to them, only with a different name. These applications offer an overview of funds spent on the insured's health care, determination of health risks on the basis of recorded data, an overview of doctor's fees. They can also include features that support health care and a healthy lifestyle, comprehensive records of vaccinations, surgeries, injuries, or reminders of doctor visits. In 2020, in connection with the Covid 19 pandemic, the eRouška mobile application was created, which is part of the Smart Quarantine system of the Ministry of Health of the Czech Republic. The application records data about meetings between users of the application. In case of a possible risk of infection, the application displays an anonymous warning (erouska.cz, 2021).

In 2016, the National e-Health Strategy for the period 2016 - 2020 was approved (MZČR, 2016a). The global goal of this strategy is the development of support in the provision of health care using information technology, which will result in better availability, efficiency, quality and safety of health care in the Czech Republic. The priority intention is the greatest possible use of existing information systems that meet the quality and security requirements, as well as the requirements for e-health systems that will be able to transfer data thanks to their predefined structure (MZČR, 2016b).

2.3 Research Backgrounds

There are applied various eHealth tools in outpatient clinics in the Czech Republic. Computer and the possibility of connecting to the Internet is now standard equipment of most medical facilities in the Czech Republic. Many

physicians need this equipment to perform their daily work duties arising from some of the regulations (reporting to the register of providers and the register of health professionals), as well as to obtain important information for their practice (ČSÚ, 2021). Surgeries can use ICT to keep electronic documentation, online consultation and ordering through their own websites and other services provided remotely.

The online eHealth services are not very widespread in the Czech Republic, they mainly include the website of the clinic or surgery with basic information, online ordering to a primary care doctor or outpatient specialist from the website of the surgery or online consultation of the patient with the doctor through the doctors' websites, they can also be carried out in a video call.

Other mean of electronization is the medical record in electronic form or in a combination of paper and electronic form. Medical documentation must be kept conclusively, truthfully, legibly and must be continuously updated (NZIP, 2021).

The doctors use also electronic health information systems (e-systems). Using e-systems, they can gain access to laboratory results, medical records or information about administered drugs. Physician warning of drug interactions is one example of the use of medical e-systems.

From 2018 electronic prescribing of medicines, simply eRecept, is used in the Czech Republic. This prescription is issued in electronic form (eRecept, 2021).

3 Material and Methods

The aim of the paper is to evaluate the availability of eHealth tools used at outpatient clinics in the Czech Republic at NUTS 3 administration level in the year 2018 by usage of the multi-criteria decision-making methods.

3.1 Territorial Division of Czechia

In order to achieve comparability of statistical data within the European Union, a uniform system of classification of territorial statistical units was created (NUTS - Nomenclature of Units for Territorial Statistics - Nomenclature of territorial statistical units). The NUTS classification is intended primarily for: collection, compilation and harmonization of EU regional statistics, socio-economic analysis of regions, definition of EU regional policy. The individual levels of territorial units of the CZ-NUTS classification are:

- NUTS 0 - Czech Republic (administrative unit),
- NUTS 1 - the territory of the whole Czech Republic (non-administrative unit),
- NUTS 2 - associated regions, so-called cohesion regions (non-administrative units),
- NUTS 3 - regions (administrative units).

The regions in the Czech Republic represent the NUTS 3 level. There is a total of 13 regions and the capital city of Prague is a separate unit, but in fact with the status of a region. In the presented research 14 regions of the NUTS 3 level are analyzed by usage of the ELECTRE III method. The availability of eHealth tools used at outpatient clinics in the Czech Republic is evaluated based on 13 indicators. The research shows the state of electronization in 2018. The data were obtained from the database of the Czech Statistical Office (ČSÚ, 2021).

3.2 ELECTRE III Method

In this paper 14 Czech regions of NUTS 3 level (variants) were analysed according to 13 eHealth indicators (criteria). The analyze is made by usage of selected MCDM method – ELECTRE III method. ELECTRE III method belongs to the operations research methods and is based on the evaluation of preference relations. The basis is the examining of the relationships between pairs of variants (Šubrt, 2015). ELECTRE III allows sorting the set of variants from best to worst option.

The basis of the ELECTRE method (Election et Choix Traduisant la Réalité) is to divide the variants into effective and inefficient. In the research was used the method ELECTRE III. ELECTRE III method provides the arrangement of variants into indifferent classes in which the variants are rated equally, but there is a preference relationship between indifferent classes.

Degrees of preference are defined according to the formula 1:

$$s_{ij} = \sum_{h \in c_{ij}} v_h \tag{1}$$

These are entered in the matrix S. The highest degree of preference c^0 is the maximum element of the matrix S and is defined by the formula 2:

$$c^0 = max_{a_i, a_j \in A}(s_{ij}) \quad (2)$$

where A is the set of all variants.

The first preference threshold is determined, which is the second largest value of the matrix S, see formula 3:

$$c^1 = max_{a_i, a_j \in A}(s_{ij}, s_{ij} < c^0) \quad (3)$$

Subsequently, the indicators d_i^s, p_i^s and q_i^s are defined. p_i^s means number of variants for which the relationship $s_{ij} > c^s$ applies. For q_i^s the relation $s_{ij} > c^s$ holds, d_i^s is their difference and s denotes the index of the calculation step. A subset of variants A^1 is determined, which is composed of variants with a maximum d_i^1. If this set is one-element, it can be considered as the first indifferent class. This variant is then removed from the original set of variants, for which the procedure from selection c^0 is repeated.

If the set A^1 is not one-element, it is necessary to find such c^2, where see formula 4:

$$c^2 = max_{a_i, a_j \in A^1}(s_{ij}, s_{ij} < c^1) \quad (4)$$

It is also necessary to define the values of d_i^2, p_i^2 and q_i^2. A subset of A^2 is obtained. If it is not a one-element, the procedure is repeated until a one-element class is found or c^s is zero, see Tzeng and Huang (2011).

The ELECTRE III method does not require the user to put preference thresholds, but the threshold values are gradually automatically generated. The variants are categorized into indifferent classes according to the indicator, which shows the difference between the number of variants before which the variant is preferred and the number of variants that are preferred before the given variant (Yoon and Hwang, 1995).

4 Results and Interpretations

The availability of outpatient eHealth tools in the Czech Republic is analyzed on the basis of the following selected indicators, see Table 1. Indicators I_1 – I_{13} describe the level of eHealth tools used in primary care doctors' surgeries.

Table 1 – Weights of individual indicators

Indicator I_1 – I_{13}	**Weight of indicator**
Equipment of medical facilities with selected ICT	**25%**
- PC (I_1)	0.0833
- Internet (I_2)	0.0833
- Website (I_3)	0.0833
Use of functions of medical e-systems	**25%**
- ordering for preventive examinations, tests (I_4)	0.05
- diagnosis (I_5)	0.05
- results of laboratory tests (I_6)	0.05
- prescribing drugs (I_7)	0.05
- warnings about drug interactions (I_8)	0.05
Method of keeping medical records	**25%**
- in a combination of paper and electronic forms (I_9)	0.125
- in a fully electronic form (I_{10})	0.125
Offered services on website	**25%**
- online ordering (I_{11})	0.0833
- online consultation (I_{12})	0.0833
- online recipe (I_{13})	0.0833

Source: (ČSÚ, 2021), own processing

They cover the area of:

- equipment of medical facilities with selected ICT,
- use of functions of medical e-systems,
- method of keeping medical records and
- offered services on website.

In calculations using ELECTRE III, there are considered also the weights of individual criteria. All criteria are maximizing nature. The weights were determined by scoring method. The results of the research are summarized as the ranking of Czech regions according to the availability of eHealth tools in Czech outpatient clinics in 2018. Based on the results, it is possible to determine the order of the Czech NUTS 3 regions in terms of the eHealth tools availability in outpatient clinics. The results are ordered from the best to the worst, as summarized in Tab.2.

Table 2 – Evaluation of Czech NUTS 3 regions by usage of ELECTRE III (2018)

Order	Variant
1	Moravian-Silesian Region
2	Hradec Kralove Region
3	Pardubice Region
4	Olomouc Region
5	Ústí nad Labem Region
6	Liberec Region
7	South-Moravian Region
8	Central Bohemian Region
9	Highlands Region
10	Zlín Region
11	South Bohemian Region
12	Pilsen Region
13	Capital City of Prague
14	Karlovy Vary Region

Source: (ČSÚ, 2021), own processing

Based on the calculation using the ELECTRE III method, it can be stated that the greatest availability of eHealth tools is in the following three regions: Moravian-Silesian Region, Hradec Kralove Region and Pardubice Region. On the contrary, the lowest availability is in Pilsen Region, Capital City of Prague and in Karlovy Vary Region.

5 Discussion

According to the study of European Commission (European Commission, 2018), eHealth adoption in primary healthcare is a very important task in the European Union member states. The analyzes showed that the eHealth adoption increased from 2013 to 2018 in the EU member states, but there are large differences between the countries surveyed. The Czech Republic has an average position among the EU countries, according to the research, see Ardielli (2020), it is ranked at the 14th position among the all EU countries.

eHealth is an important part of the digital transformation of society. In the Czech Republic, more progress has been made in this area since 2018. The digitizing of the Czech healthcare system has begun by introducing of mandatory electronic prescriptions “e-Prescriptions” since January 1, 2018, when they became mandatory and electronic sick notes “e-Sick Notes” since January 1, 2020. Now in the Czech Republic, there is prepared the introduction of an electronic medications record. Unfortunately, there has been little progress on other fronts. Moreover, the Ministry of Health has yet to complete its draft law setting common standards and rules for eHealth, and it is unlikely to meet its current goal of having the law go into effect in 2021 (Ceelegalmatters, 2021). However the evaluation of electronization and use of ICT in doctors' surgeries is an important element of evaluation of primary care in the Czech Republic. At the level of regions and districts, a survey on the ICT equipment at the doctors ‘surgeries and the survey on the use of eHealth tools is carried out every year. The evaluation is focused on ICT equipment according to the type of surgery, see (ČSÚ, 2021). In the presented research, attention was focused on the evaluation of ICT equipment and the use of eHealth tools according to individual regions of the NUTS 3 level. Individual regions were divided into indifference classes according to the level of use of ICT and the eHealth tools in doctors' surgeries by usage of ELECTRE III method.

Apart from the fact that there are differences in the level of availability of eHealth tools between individual regions of the Czech Republic, barriers to the implementation of ICT in doctors' clinics are also a frequent problem. Klocek et al. (2019) identified the predictors and barriers of eHealth and ICT usage in a sample of GPs in the Czech Republic. Age is an important factor influencing the use of ICT and eHealth tools in GP surgeries, see also Brooks and Menachemi (2006) as found when examined the use of email as a means of communication between patients and physicians. Also Torrent-Selles et al. (2018) examined the predictors that explain favorable eHealth usage outcomes. They found out that the self-employed physicians tend more towards eHealth usage. However the results highlighted also the need to develop more specific policies for eHealth usage to address different realities.

6 Conclusion

Improving the health status of the population and optimizing the health care system is part of today's Czech health policy. An integral part of this development is the electronic health care in general and the closely related electronic health care through modern ICT. In order to be able to implement new elements or develop existing ones, it is first necessary to analyze the current state of this equipment. The paper is focused on the evaluation of the availability of eHealth tools used at outpatient clinics in the Czech Republic. The research results were presented according to the jurisdiction of the territory within the NUTS 3 administrative units in the Czech Republic.

In the research was found that the greatest availability of eHealth tools used at outpatient clinics is in the Moravian-Silesian Region, Hradec Kralove Region, Pardubice Region, Olomouc Regio and Ústí nad Labem Region. The intermediate level of eHealth tools availability was found in Liberec Region, South-Moravian Region, Central Bohemian Region and Highlands Region. The lowest level was found in Zlín Region, South Bohemian Region, Pilsen Region, Capital City of Prague and Karlovy Vary Region.

A very important role in the implementation of ICT and eHealth tools in doctors' surgeries is represented by the abilities and possibilities of mastering electronic tools by doctors as well as patients who must have the appropriate equipment (internet, mobile phone, PC). The age of the doctor and the patient play an important role in this respect.

However, the most important step for the implementation of eHealth in the Czech Republic is the implementation of the Electronic Health Care (EZ) Act. The aim of the law is to set the basic legal framework for secure data sharing in healthcare through the so-called Integrated Secure Dated Interface.

The presented paper is a part of a more extensive research, which is going to include the application of various multi-criteria methods and a longer time period.

Acknowledgements

This paper was supported within the project SGS No. SP2021/67, International Evaluation of the Performance of Health and Social Services with a Focus on the Application of Multicriteria Methods, Faculty of Economics, VŠB - Technical University of Ostrava.

References

[1] AHAD, A. et al. (2019). 5G-Based Smart Healthcare Network: Architecture, Taxonomy, Challenges and Future Research Directions. *IEEE*, 7 (1): 100747–100762. 10.1109/ACCESS.2019.2930628

[2] ARDIELLI, E. (2020). Evaluation of eHealth Deployment at Primary Care in the EU Member States by Usage of Selected MCDM Methods. Review of Economic Perspectives. 20(3):337-359. 10.2478/revecp-2020-0016

[3] BROOKS, R.G. and MENACHEMI, N. (2006) Physicians' use of email with patients: factors influencing electronic communication and adherence to best practices. *J. Med. Internet. Res.* 8(1): e2. https:// doi. org/ 10. 2196/ jmir. 8. 1. e2

[4] BRUTHANS, J. (2020). *Elektronická preskripce v České republice a v evropském kontextu.* Olomouc: Anag.

[5] CEELEGALMATTERS (2021). *eHealth in the Czech Republic.* [online]. 2021 [cit. 2021-04-04]. Available from https://www.ceelegalmatters.com/czech-republic/13705-czech-republic-first-steps-on-the-journey-to-ehealth

[6] CHAUDHRY, B, et al. (2006). Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. *Ann Intern Med.* 144 (1): 742–752.

[7] ČSSZ (2021). *eNeschopenka* [online]. 2020 [cit. 2021-05-04]. Available from https://www.cssz.cz/web/eneschopenka

[8] ČSÚ (2021). *Analýza zdravotnických účtů ČR - 2000 - 2003 ze dne 28.února 2005* [online]. ČSÚ [2005-02-28.]. 2005 [cit. 2021-05-04]. Available from https://www.czso.cz/documents/10180/20554863/152405u1.pdf/1f82e55d-d3e2-4e29-8674-1ad2bb4beea4?version=1.0

[9] ERECEPT (2021). *Statistika elektronické preskripce* [online]. 2021 [cit. 2021-04-20]. Available from https://www.epreskripce.cz/statistika-elektronicke-preskripce

[10] EROUŠKA (2021). *Chráním sebe, chráním tebe!* [online]. 2020 [cit. 2021-05-05]. Available from https://erouska.cz/

[11] EUROPEAN COMMISSION (2018). *Benchmarking Deployment of eHealth among General Practitioners (2018)*, Publications Office of the European Union, Luxembourg.

[12] HAMPLOVÁ, L. (2019). *Veřejné zdravotnictví a výchova ke zdraví: pro zdravotnické obory.* Praha: Grada Publishing.

[13] JANASOVÁ, E. and ARDIELLI, J. (2010). The Usage of Public Information Systems in the Czech Health Service. In *Technologie wiedzy w zarzadzaniu publicznym '10*, 191-200.

[14] JUNG, M.-L., LOIRA, K. (2010). Acceptance of Swedish e-Health services. *Journal of Multidisciplinary Healthcare.* 3(1): 55–63.

[15] KLOCEK, A, et al. (2019). GPs' perspectives on eHealth use in the Czech Republic: a cross-sectional mixed-design survey study. *BJGP Open* 2019; 3 (3): 1-12. DOI: 10.3399/bjgpopen19X101655

[16] LOCHMANOVÁ, A. (2020). *Veřejná správa: základy veřejné správy.* Prostějov: Computer media.

[17] MZČR (2021). *Strategický rámec rozvoje péče o zdraví v České republice do roku 2030 ze dne 18. listopadu 2020* [online]. MZČR [18. 11. 2020]. 2020 [cit. 2021-04-02]. Available from https://ncez.mzcr.cz/sites/default/files/media-https://www.dataplan.info/img_upload/7bdb1584e3b8a53d337518d988763f8d/revokace-zdravi2030_final.pdf

[18] MZČR (2016a). *Národní strategie elektronického zdravotnictví České republiky 2016-2020 ze dne 28. listopadu 2016* [online]. MZČR [28. 11. 2016]. 2016 [cit. 2021-02-15]. Available from https://ncez.mzcr.cz/sites/default/files/media-documents/Narodni_strategie_elektronickeho_zdravotnictvi_v1.0.pdf

[19] MZČR (2016b). *Enterprise Architektura resortu Ministerstva zdravotnictví ČR: MZCR_EA_T05_ePreskripce* [online]. 2016 [cit. 2020-12-15]. Available from https://ncez.mzcr.cz/sites/default/files/media-documents/MZCR_EA_T05_ePreskripce.pdf

[20] NZIP (2021). *Ambulantní péče* [online]. 2021 [cit. 2021-04-15]. Available from https://www.nzip.cz/rejstrikovy-pojem/4

[21] OH, H. et al (2005) What Is eHealth (3): A Systematic Review of Published Definitions, *Journal of Medical Internet Research.* 7(1)

[22] REKTOŘÍK, J. et al. (2007). *Ekonomika a řízení odvětví veřejného sektoru*. Praha: Ekospress, 2007.

[23] STŘEDA, L. and HÁNA, K. (2016). *eHealth a telemedicína: učebnice pro vysoké školy*. Praha: Grada Publishing.

[24] ŠUBRT, T. et al. (2015). *Ekonomicko-matematické metody.* Plzeň: Aleš Čeněk, s.r.o.

[25] TORRENT-SELLENS, J. et al. (2018). Modeling and predicting outcomes of eHealth usage by European physicians: multidimensional approach from a survey of 9196 general practitioners. *J. Med. Internet. Res.* 20(10): e279. https:// doi. org/ 10. 2196/ jmir. 9253

[26] TZENG, G. and HUANG J. (2011). *Multiple Attribute Decision Making*. Boca Raton, USA: CRC Press.

[27] ÚZIS (2019). *Zdravotnická ročenka České republiky 2018* [online]. 2019 [cit. 2021-04-14]. Available from https://www.uzis.cz/index.php?pg=vystupy--knihovna&id=275

[28] VAN GEMERT-PIJNEN, L. et al. (2018). *eHealth research, theory and development: a multidisciplinary approach.* London and New York: Routledge,.

[29] WHO (2020). *What is the WHO definition of health?* [online]. 2020 [cit. 2021-01-04]. Available from https://www.who.int/about/who-we-are/frequently-asked-questions

[30] YOON, K. P. and HWANG, CH. (1995). *Multiple Attribute Decision Making: An Introduction*. California: Sage.

[31] Zákon č. 592 ze dne 20. listopadu 1992 o pojistném na všeobecném zdravotním pojištění. In: *Sbírka zákonů České republiky.* 1992, částka 119, s. 3558-3565. Available from https://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=592/1992%20&typeLaw=zakon&what=Cislo_zakona_smlouvy. ISSN 1211-1244.

Evaluation of Expenditures on Culture from the Budgets of the Regions of the Czech Republic

Jiří Bečica[1], Richard Cicák[1]

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
jiri.becica@vsb.cz, richard.cicak.st@vsb.cz

Abstract

Publicly funded institutions at the regional level provide public services in culture not only for direct external users (visitors), but also for other activities. They fulfil, for example, society-wide goals in the areas of science and research, education, public property management and ensure the preservation of the nation's cultural heritage. The aim of the paper is to evaluate the expenditures from the budget of the regions of the Czech Republic in the field of culture in the period 2014-2018. The results show the expenditures of individual regions of the Czech Republic in relative terms and to selected areas of culture (librarianship, theatre, museology) per capita. The results show that the average value of the ratio of total cultural expenditures of regions in relation to total actual expenditures increases over time. In 2018, regional expenditures reached 2.35% of the total budget, which in absolute terms represents an average of CZK 341.40 million, which each region of the Czech Republic invests in culture. The average amount of expenditure on culture per capita in 2018 was CZK 540.68 per capita and is growing over time. The growing trend of these values is undoubtedly a good signal for users of cultural services and the institutions themselves in the regions that provide services in the field of culture. The most comparable are the expenditures of regions per capita spent in the field of museology, followed by the field of librarianship, and the least comparable are the expenditures spent in the field of theatre. It is thus possible to state differences in the approach of regions in financing individual areas of culture.

Keywords: *culture, Czechia, libraries, museums, public expenditures, regions, theatres*

JEL Classification: *H44, H59, L33, R51, Z19*

1 Introduction

The right to self-realization of every citizen of the Czech Republic in the field of culture is guaranteed by the Charter of Fundamental Rights and Freedoms. The fact that culture is an important factor in the life of society is unquestionable. It helps to develop in the emotional, intellectual, but also moral field, and thus fulfils its educational function. Culture connects the Czech Republic with the outside world, but at the same time sets it apart and characterizes it with its uniqueness. From the economic point of view, the field of culture is an important area in the conditions of the Czech Republic, the financing of this sphere of public life is covered by public resources, ie from the state budget and from the budgets of self-governing units, both higher and lower. The preamble of the Constitution of the Czech Republic states that the citizens of the Czech Republic are the homeland of equal citizens. The purpose of the paper is to find out whether this statement is fulfilled in the specific area of public expenditure in the field of culture, ie whether there is a comparability of expenditure per capita from the budgets of higher territorial units, ie individual regions of the Czech Republic.

The evaluation of cultural organizations has been addressed by a number of authors, such as Hansmann (1981); Throsby (2001; 2004; 2010); Glowacki, Hausner and Jakobik (2009); Turbide, Laurin (2009); Unesco (2009); Dooren, Bouckaert and Halligan (2010); work of DCA (2014); Chiarvalotti (2014); Ilczuk (2015); Nogare and

Bertacchini (2015); Borg (2017); Ardielli (2017a; 2017b), Bečica (2018), Vrabková (2018, 2019) or Galecka a Smolny (2017a, 2017b, 2019). Most of the above work is based on the Value for Money concept. Within this concept, it is a matter of measuring the performance of variously chosen technical and economic indicators in a homogeneous sample of providers. Within the paper, this homogeneous sample will be higher territorial administrative units (regions) in the Czech Republic, following the example of Vavrek, Papcunová, Tej (2020). The purpose of evaluation through the VFM is to obtain information on the economy, efficiency and effectiveness of publicly provided funds, which should ensure the fulfilment of predetermined goals. Cultural goods are characterized by the fact that they are rare and have utility value. These two characteristics form the basis of economic value. Determining the utility value of cultural goods is difficult because the utility value of a good varies for different consumers. In practice, the VFM concept does not necessarily have to be about achieving the lowest price of the good, but about the optimal combination of costs and the obtained quality of the provided public good. Expenditures spent on securing cultural goods from the budgets of the regions of the Czech Republic can be measured from various angles. According to Kalubang and Kakwezi (2013), the VFM concept of publicly established organizations should be based on making the best use of public funds to achieve the intended results, while management should be responsible for cost-effective, efficient and effective management. The contribution will be based on the assumption that all regions follow the same legislative regulations and strive to ensure a comparable level of public goods for the population in their territory. As part of the contribution, the financial comparability per capita of the region will be measured for the regions while securing cultural goods.

2 Research Methodology

The aim of the paper is to evaluate the public expenditure of regions in the Czech Republic (excluding the capital city of Prague and the Central Bohemian Region) in the field of culture in 2014-2018. The paper will verify hypothesis H1 as amended: "Public expenditure of regions of the Czech Republic in selected areas of culture is comparable per capita." The value of the determined average of the evaluated period of expenditure on culture per capita within a tolerance of ± 10 % of the observed value of the average expenditure per capita. The evaluation is performed in all regions of the Czech Republic, with the exception of the Central Bohemian Region and the capital city of Prague, which, due to their geographical location within the Czech Republic, represent a certain extreme that would distort the results of other regions.

The results presented below express the share of the total actual expenditures of Section 33 - Culture, Churches and Religious Societies in the total actual expenditures of the region in the period from 2014 to 2018, which are further elaborated in Annex Number One. The analysis of expenditure under section 33 by sectoral breakdown of the budget structure includes subsections 331 - Culture, 332 - Preservation of monuments and preservation of cultural heritage and national and historical awareness, 334 - Media, 339 - Other cultural, church and media activities. For individual regions, the development of public expenditures directed to selected areas of culture (librarianship, theatre, museums) in terms of per capita of the region is further described and analysed.

Data on budgets for individual periods were obtained from the MONITOR portal of the Ministry of Finance according to the sectoral classification of the budget structure and data on the number of permanent residents from the presented information of the Czech Statistical Office according to individual regions of the Czech Republic.

3 Results

The results are presented in this chapter. The chapter is divided into two parts, where section 3.1 first presents the results of the share of total financial expenditures on culture to the total actual expenditures of regions in the observed period 2014 – 2018. In chapter 3.2 the expenditures of individual regions are given per capita culture (librarianship, theatre, museology). The mentioned areas of culture represent in all evaluated regions more than 75% of all expenditures realized in the field of culture.

3.1 Results of the Share of Expenditures on Culture in the Total Actual Expenditures of Regions in the Years 2014 to 2018

The results shown in table number one show the development of the share of total financial expenditures on culture in the total actual expenditures of individual regions, for the period between 2014 and 2018. The presented values are based on the data given in the table in Annex number one.

Table 1 - Relative representation of total expenditures in the field of culture in the total expenditures of regions in % in 2014–2018

Region	2014	2015	2016	2017	2018	$\bar{x}$
JHC	2,44	2,22	2,42	2,50	2,42	2,40
PLK	2,53	3,01	3,11	3,21	3,64	3,10
KVK	2,68	2,60	3,60	2,61	2,42	2,78
ULK	1,70	1,71	1,83	2,21	2,49	1,99
LBK	1,91	1,94	1,99	1,87	2,12	1,97
HKK	2,67	2,57	2,14	1,80	1,65	2,17
PAK	1,72	1,74	1,68	1,74	2,33	1,84
VYS	1,99	1,75	1,85	1,90	2,01	1,90
JHM	1,32	1,78	1,79	1,62	1,75	1,65
OLK	2,07	2,20	2,36	2,38	3,00	2,40
ZLK	2,22	2,20	2,40	2,35	2,48	2,33
MSK	1,48	1,50	1,72	1,80	1,84	1,67
$\bar{x}$	2,06	2,10	2,24	2,17	2,35	

Source: Own processing, MONITOR.

The total amount of financial resources that individual regions allocate to the field of culture is influenced by several factors, such as the number of cultural institutions that the region itself establishes or supports, which is in its administration, or finally the political representation, which was changed in 2016 in all regions due to regular elections. Each council has different priorities and goals, including in the field of providing public services for the population. Thanks to all the described factors, the volume of funds going from regions to culture is not the same over time.

The first region listed in the table is the South Bohemian region (JHC). The percentage of regional expenditures in the field of culture in total expenditures in 2015 decreased compared to 2014, increased in 2016 and 2017 and in the last monitored period 2018 returned to 2.42% as in 2016. From a first look at the data of the Plzeň Region (PLK) there is a visible emphasis on the field of culture. In four of the five monitored periods, the ratio of expenditures on culture to total expenditures exceeds 3%, which is unparalleled in other regions. Year-on-year, this ratio grew in all periods, as did the absolute volume of funds spent on culture in all periods. The values show an interest in developing the field of culture. The Karlovy Vary region is the smallest population in the sample of regions, area and volume of funds invested in culture. The actual expenditures of the Karlovy Vary Region (KVK) grew year-on-year outside 2016. The highest percentage of total actual expenditures in culture in 2016 reached a total of 3.60%, in this period the highest amount of funds was spent on culture across periods. The total amount of funds spent in the Ústí nad Labem Region (ULK) is growing in all periods, as is the ratio of expenditures in the field of culture to the total expenditures of the region. Expenditures in the field of culture in each of the monitored periods also increased year-on-year, to a maximum value in 2018. This development may indicate the interest of the Ústí nad Labem Region in supporting the development of culture in its territory. In the Liberec Region (LBK), there was a jump in the volume of total actual expenditures between 2014 and 2015. The year 2016 then brought a decline, and since 2017, the region's actual expenditures have been increasing year-on-year. In the first four monitored periods, the percentage of expenditures on culture in the total actual expenditures of the region is relatively balanced; in the last period of 2018, the share of expenditures on culture increased by 0.25%. The relative expenditures of the Hradec Králové Region (HKK) in the field of culture are constantly declining. Expenditures in the field of culture in 2014 had the highest share, 2.67 %. None of the other monitored periods exceeded this value. In 2016 and 2017, the total funds spent on culture decreased, in 2017 even to an overall lower absolute value than in 2014. In the Pardubice Region (PAK), between 2014 and 2015, there was a significant increase in total actual funds spent and funds spent on culture. In the following period of 2016, there was a decrease, both in the percentage of expenditures on culture in total expenditures and in the absolute amount of funds spent on culture. The following years 2017 and 2018 were then marked by growth. In the last monitored period, expenditures on culture in the Pardubice Region amounted to 2.33 % of the budget. In the Vysočina region (VYS), a declining trend is evident between 2014 and 2015 in the ratio of expenditures on culture to the volume of total expenditures. Even in the actual volume of funds invested in culture in 2015 and 2016, there is a significant decrease. The years 2017 and 2018 then brought a gradual increase, both in the total volume of invested funds and in the percentage of cultural expenditures to total expenditures. The South Moravian Region (JMK) achieved a year-on-year increase in budgeted actual expenditures in all monitored periods. In the total volume of funds that went to culture, there was a decrease only between 2016 and 2017, which corresponds to a reduction in the ratio of expenditures on culture to the total expenditures of the region. Due to the large number of cultural institutions established by the South Moravian Region, the volume of real funds that the region invests in culture is also considerable. The Olomouc Region (OLK) is then one of the

regions which in each monitored period managed to maintain a growing percentage of expenditures in the field of culture in the total expenditures of the region from the total expenditures. At the same time, it was able to maintain the growing year-on-year volume of funds spent on culture in all monitored periods. The results of the Zlín Region (ZLK) in the monitored periods show an effort to maintain a relatively balanced percentage of expenditures on culture in relation to total expenditures. Such an approach can be considered positive. The approach of the Moravian-Silesian Region (MSK) can also be assessed in the same way, as it was able to increase the ratio of expenditures on culture to the total actual expenditures of the region in each of the monitored periods. The total volumes of funds spent on culture, except for 2016, when they decreased slightly in absolute terms, are growing over time. Across periods, there is a balanced increase in spending in the field of culture with a maximum in the last monitored year 2018.

3.2 Results of Regional Expenditure According to Selected Areas of Culture in Terms of per Capita

The following part of the results of the work follows the results of recalculation indicators of public expenditure of regions per capita according to selected areas of culture (librarianship, theatre, museums), which are available in Annex number two. These results are used as a basis for analyse comparability between individual regions in the selection. Finding out whether the individual regions in the sample are comparable in individual areas and in individual periods in terms of the volume of expenditures per capita will help to verify the test of the established hypothesis H1. The output tables of hypothesis H1 for each region in the periods 2014–2018 show the resulting values of recalculation of public expenditure per capita, then the average value of this indicator in each of the regions for all monitored periods is subjected to the test condition, ie distance from the average value found in throughout the selection for all periods. The distance in regions where the average for the observed period met the conditions imposed by the hypothesis, ie the distance ± 10% from the value of the determined average, is marked in grey.

Table number two represents the results of testing the H1 hypothesis in the field of librarianship within the observed period.

Table 2 - Values of conversion of expenditures in the field of librarianship per inhabitant of the region and test of hypothesis H1

Region	2014	2015	2016	2017	2018	$\bar{x}$ region in CZK	Distance in %
JHC	87,33	85,66	92,73	106,16	112,60	96,90	20,37
PLK	91,05	98,06	107,91	110,61	128,03	107,13	33,08
KVK	91,20	97,17	96,23	115,55	121,22	104,27	29,53
ULK	60,91	64,35	63,93	75,68	129,44	78,86	**-2,03**
LBK	98,29	99,95	103,08	110,17	126,12	107,52	33,57
HKK	98,57	102,08	104,14	116,09	142,58	112,69	39,99
PAK	50,64	56,31	57,77	67,51	96,46	65,74	-18,34
VYS	57,06	57,73	61,18	62,72	84,36	64,61	-19,74
JHM	11,38	11,70	11,54	15,24	15,29	13,03	-83,81
OLK	71,64	75,43	80,73	118,41	257,47	120,74	49,99
ZLK	43,87	44,29	45,91	49,03	67,55	50,13	-37,73
MSK	39,58	41,43	43,24	46,22	51,36	44,36	-44,89
$\bar{x}$ in CZK	66,79	69,51	72,37	82,78	111,04	80,50	

Source: Own processing, MONITOR, ČSÚ.

Right after the first look at the results, the field of librarianship cannot be considered comparable. After testing the average value of recalculation of regional expenditures per capita against the average value of the sample for the observed period, which amounted to CZK 80.50 per capita, only the Ústí nad Labem region met the condition of hypothesis H1, which is marked in grey colour in the last column of table number two. Among the regions that were located at a positive distance by more than 10 % above the average value are the regions of South-bohemian, Plzeň, Karlovy Vary, Liberec, Hradec Králové and Olomouc. In the latter, the value of the average recalculation is the highest among all monitored regions. The Pardubice, Vysočina, South-Moravia, Zlín and Moravian-Silesian regions were in the negative area, more than 10 % below the sample average. It can therefore be stated that half of the evaluated regions are below the determined average value and half above it. The most negative distance is reached by the South Moravian Region, where the recalculation of expenditures per capita in the field of librarianship is on average only CZK 13.03 per capita and in comparison, with the Olomouc Region the value of average expenditures per capita is nine times lower.

Table number three shows the values of expenditures per inhabitant of the region in the field of theater. The table shows all selected regions except the Zlín Region, which did not realize any expenditures in this area within the monitored period.

Table 3 - Values of recalculation of expenditures in the field of theatre per capita in the region and test of hypothesis H1

Region	2014	2015	2016	2017	2018	x̄ region in CZK	Distance in %
JHC	19,15	19,94	19,66	20,92	25,50	21,03	**-0,91**
PLK	20,01	26,04	23,77	27,01	30,50	25,47	19,97
KVK	8,81	9,83	6,56	10,24	13,53	9,80	-53,85
ULK	3,35	5,69	19,88	45,95	49,89	24,96	17,56
LBK	5,19	5,49	10,86	6,87	7,24	7,13	-66,41
HKK	8,70	8,66	9,00	10,14	12,96	9,89	-53,40
PAK	7,39	7,70	8,26	11,20	11,51	9,21	-56,60
VYS	60,02	60,69	68,43	97,98	83,27	74,08	248,96
JHM	5,00	4,36	7,26	30,60	31,84	15,81	-25,51
OLK	6,27	7,22	8,78	10,63	9,43	8,47	-60,12
MSK	41,91	43,18	46,75	53,82	58,80	48,89	130,32
x̄ in CZK	15,48	16,57	19,10	27,11	27,87	21,23	

Source: Own processing, MONITOR, ČSÚ.

If the situation in the field of librarianship can be considered incomparable, the differences in the field of theatre are much more marked. After testing the determined average value of recalculation of regional expenditures in the field of theatre per capita against the average value of selection in the monitored period, which amounted to CZK 21.23 per capita, only the South Bohemian region met the conditions of hypothesis H1. Among other things, it is possible to trace that within the monitored period, a total of four regions are more than 10 % above the average. These are the Plzeň, Ústí and Labem, Vysočina and Moravian-Silesian regions, which are themselves the founders of their own theatre institutions. Furthermore, it can be concluded that the six regions, namely Karlovy Vary, Liberec, Hradec Králové, Pardubice, South Moravia, and Olomouc, are more than 10 % below the average per capita. It is therefore clear that several regions are extremely increasing the average in the selection with their expenditures, which makes the structure incomparable. From the resulting values it is quite clear that the field of theatre cannot be considered comparable. Regions that are the founders of their own theatre, either of the seasonal type (Plzeň Region) or theatres with a professional ensemble (Ústí and Labem, Vysočina and Moravian-Silesian regions), stay above the sample average and logically have higher expenditures per capita in the theatre area than other regions, which only financially supported by theatre institutions established in the region by another entity (most often by individual cities).

Table number four shows the situation in museums and galleries. This area is the most financially supported in all regions, which may indicate its greatest comparability.

Table 4 - Values of recalculation of expenditures in museums and galleries per inhabitant of the region and test of hypothesis H1

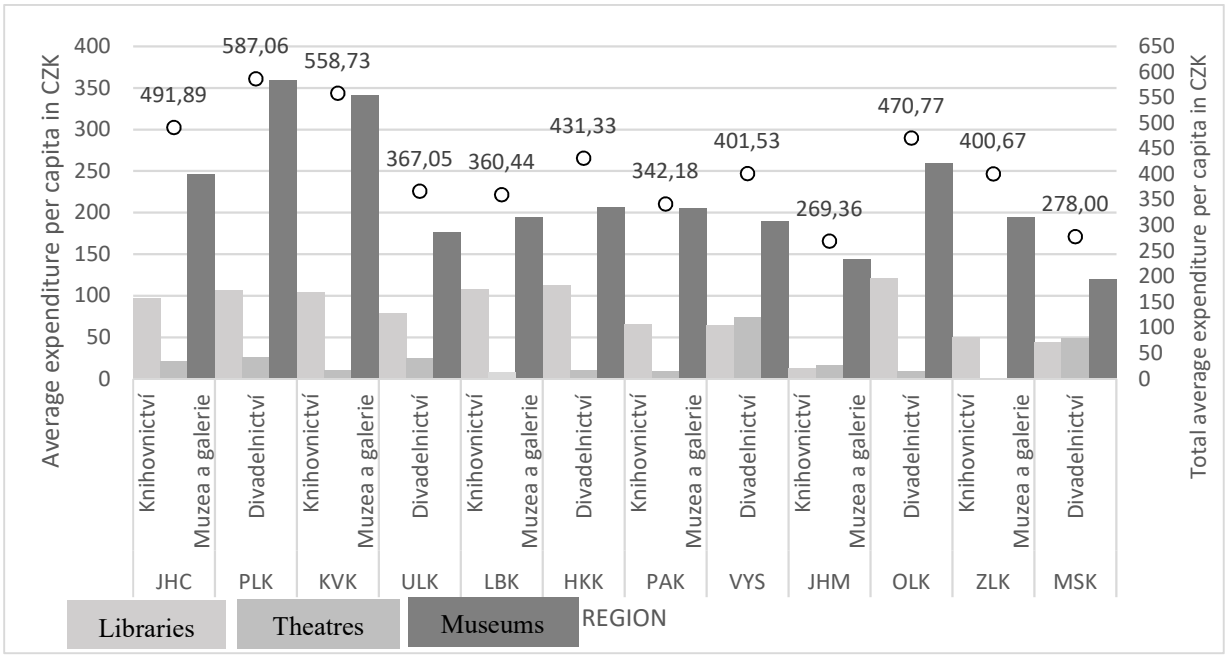
Region	2014	2015	2016	2017	2018	x̄ region in CZK	Distance in %
JHC	198,82	212,88	214,59	281,92	324,65	246,57	12,27
PLK	270,63	311,89	341,38	357,17	511,28	358,47	63,23
KVK	292,39	351,18	457,99	282,34	320,49	340,88	55,22
ULK	145,30	145,76	169,76	178,63	243,99	176,69	-19,55
LBK	153,61	188,65	170,08	189,37	271,96	194,73	-11,33
HKK	165,09	285,76	199,63	170,56	209,49	206,11	**-6,15**
PAK	182,14	187,95	149,68	170,04	337,07	205,38	**-6,48**
VYS	188,41	189,66	170,93	170,55	225,71	189,05	-13,92
JHM	101,98	174,34	153,09	127,39	160,54	143,47	-34,67
OLK	185,14	248,13	248,70	258,46	358,22	259,73	18,27
ZLK	161,98	186,63	159,29	202,34	260,54	194,15	-11,59
MSK	99,60	97,42	118,46	137,47	147,85	120,16	-45,29
x̄ in CZK	178,76	215,02	212,80	210,52	280,98	219,62	

Source: Own processing, MONITOR, ČSÚ.

From table number four it is clear at first glance that expenditures in museums and galleries can be considered the most comparable. Compared to theatre, there are not extremely high and low values that would distort the average. Two regions, Hradec Králové and Pardubice, passed the test of recalculation of average expenditures of regions in museums and galleries per capita against the average value for the observed period, which amounted to CZK 219.62 per capita. The regions in which the average value of the conversion indicator exceeded the determined average by more than 10 % include the South-bohemia, Plzeň, Karlovy Vary and Olomouc regions. In the Plzeň Region, the value per capita is on average the highest among all. The Ústí nad Labem, Liberec, Vysočina, South Moravian, Zlín and Moravian-Silesian regions are more than 10 % below the observed average. In the last-mentioned region, the average value of conversion per capita is the lowest, only CZK 120.16 and thus accounts for about a third of the funds per capita compared to the Pilsen region.

To identify and understand the structure of expenditures in the field of culture in individual regions, it is appropriate to visualize the values found, as shown in graph number one. The graph shows the average values in conversion indicators per capita in individual areas for all monitored periods, at the same time it shows the total average value of cultural expenditures per capita in the region. Thus, after adding up the achieved average values, it is possible to identify the structure and distribution of cultural expenditures among the individual selected areas, which have been subjected to a detailed examination. It is therefore possible to trace which regions, based on the average of the values found in the period 2014–2018, focus on the field of librarianship, the field of theatre or the field of museology. Across the selection, it can be stated that the most supported regional culture from the regional budgets has long been the area of museums and galleries, in all monitored regions. Subsequently, the second place is usually the area of librarianship and the last is always, with a few exceptions, the area of theatre. Furthermore, it is worth recalling that these three selected areas make up from the total average recalculated expenditures on culture per capita in most regions over 75 % of the total expenditures on culture, which was the reason for choosing these three areas. The remaining part most often consists of regional expenditures in the field of monument care.

Figure 1 - Average value of recalculation of public expenditures of regions per capita in individual areas of culture in the period 2014 - 2018



Source: Own processing.

From graph number one it is possible to evaluate the obvious dominance of expenditures per capita in museums and galleries, which is in the first place in all regions, always several times, compared to other monitored cultural areas. The regions in which the field of librarianship is in second place in terms of the volume of expenditures per capita include the South-bohemian, Plzeň, Karlovy-Vary, Ústí and Labem, Liberec, Hradec Králové, Pardubice, Olomouc and Zlín regions. On the other hand, the Vysočina, South Moravian and Moravian-Silesian regions are among the regions where expenditures per capita in the field of theatre exceed the expenditures in the field of librarianship.

4 Conclusion

From the above results as well as the values given in Annex number one, it is evident that the average value of the ratio of the total cultural expenditures of the regions in relation to the total actual expenditures has increased over time. In 2018, it reached a value of 2.35% in the selection, which absolutely represents an average of CZK 341.40 million, which each region invests in culture. The growing trend is undoubtedly a good signal for the field of culture. The average indicator of the conversion of actual expenditures on culture per capita of the region is also growing over time. Between 2014 and 2018, it increased on average by CZK 205.25 per person, in the last monitored period in 2018 its value in the sample was CZK 540.68 per capita.

The results of testing hypothesis H1 show that within the field of librarianship, the average of the indicator of conversion of expenditures into the field of librarianship per inhabitant of the region in 2014-2018 was tested against the value of CZK 80.50 per inhabitant. Only one region met the hypothesis condition, namely the Ústí nad Labem region. The result really presents the long-term imbalance of expenditures of the evaluated regions in the field of librarianship. In the field of theatre, the average of the indicator of conversion of expenditures in the field of theatre per capita in the region in 2014-2018 was tested against the value of the ascertained average of the sample, CZK 21.23 per capita. In this case, one region also met the hypothesis condition, namely the South-bohemian region. It is worth noting here that the divergence of individual regions in the field of theatre is the highest. Within the field of museology, the average of the indicator of conversion of expenditures into the area of museums and galleries per inhabitant of the region in 2014-2018 was tested against the value of the ascertained average of the sample, CZK 219.62 per inhabitant. In this case, a total of two regions met the conditions of the hypothesis, namely the Hradec Králové and Pardubice regions.

The results presented in the paper show that the expenditures of individual regions differ from each other and for most of them it is not possible to state comparability per capita in the evaluated areas. Of the evaluated cultural areas, the largest volume of regional expenditures is spent on museums, which is followed by expenditures on librarianship and theatre. It can also be stated that the approved cultural policy of the Czech Republic for the period 2015-2020 with a view to 2025 emphasizes various types of cultural services; declares their public support and diversity, however, it also expects increasing economic efficiency of publicly spent funds (Ministry of Culture of the Czech Republic, 2015), which fully corresponds to the above theory of the VFM. This means that organizations supported from public funds, not only the regional level, should perform their mission not only economically and efficiently, but also effectively, especially when the above-mentioned Cultural Policy of the Czech Republic plans further gradual increase in public spending in individual areas of the cultural sector.

Acknowledgements

The paper was created within the financial support of the student grant project SGS No. SP2021/18 on Faculty of Economics, Technical University of Ostrava.

References

[1] ARDIELLI, E. (2017a). Evaluation of Electronic Cultural Participation in EU Member Countries. In Proceedings of the 2017 *12th International Scientific Conference Public Economics and Administration*, 2017. pp. 2-9.

[2] ARDIELLI, E. (2017b). Performance Evaluation of Cultural Sector in the Czech Republic and EU-Member Countries. In Proceedings of the 2017 *22nd International Scientific Conference Theoretical and Practical Aspects of Public Finance,* 2017. pp. 92-98.

[3] BEČICA, J. (2018). Technická efektivita a produktivita muzeí v ČR. In: *Economics Management Innovation*. 2018, 2: pp. 48-58. ISSN 1805-353X. Available at: http://www.emijournal.cz/

[4] BORG, R. P. (2017). A methodology for the quality assessment of the theatre. In V. A. Cremona (ed.), Capitalising on culture? Malta and the European capital of culture. pp. 77-96. Msida: Malta University Publishing.

[5] ČESKÝ STATISTICKÝ ÚŘAD. *Veřejná databáze.* [online]. [cit. 2020-03-17]. Dostupné z: https://vdb.czso.cz/vdbvo2/faces/cs/index.jsf?page=statistiky

[6] DCA (2014). *Public Value Measurement Framework. Measuring the Quality of the Arts.* [online]. [cit. 2021-05-02]. Available from http://www.dca.wa.gov.au/Documents/New%20Research%20Hub/Research%20Documents/Public%20Value/PVMF_Measuring_Quality_Arts_Research_Hub_08_14.pdf.

[7] DOOREN, W., BOUCKAERT, G.. HALLIGAN, J. (2010). *Performance management in the Public Sector*.

New York: Routledge.

[8] GALECKA, M., SMOLNY, K. (2019). Criteria for the optimal financing model of public theatres. *Review of Economic Perspectives.* Vol. 19 (2), pp. 119–136. DOI: https://doi.org/10.2478/revecp-2019-0007.

[9] GALECKA, M., SMOLNY, K. (2017a). Financial Stability of Cultural Institutions Based on the Example of Voivodeship Theaters and Music Institutions. *PROBLEMY ZARZADZANIA-MANAGEMENT ISSUES*. Vol. 15 (2), pp. 196-213.

[10] GALECKA, M., SMOLNY, K. (2017b). Finanancing rules of the activity of cultural institutions in the context of economic efficiency. *EKONOMIA I PRAWO-ECONOMICS AND LAW.* Vol. 16 (4), pp. 387-399.

[11] GLOWACKI, J., HAUSNER, J., JAKOBIK, K., et al. (2009). *Finansowanie Kultury i Zarzadzanie Instytucjami Kultury.* Availabel from http://h.p://www.kongreskultury.pl/library/File/RoSK%20finansowanie/

[12] HANSMANN, H. (1981). Nonprofit Enterprise in the Performing Arts. *Bell Journal of Economics.* Vol. 12 (2), pp. 341-361. DOI: 10.2307/3003560.

[13] CHIARVALLOTI, F. (2014). Performance Evaluation in the Arts and Cultural Sector: A Story of Accounting at Its Margins. *The Journal of Arts Management, Law, and Society,* Vol. 44 (2), pp. 61-89.

[14] ILCZUK, D. (2015). *Ekonomika Kultury.* Warszawa: PWN.

[15] KALUBANGA, M., KAKWEZI, P. (2013). Value for money auditing and audit evidence from a procurement perspective - A conceptual paper. *International Journal of Advances in Management and Economics.* Vol. 2 (5), pp. 115-124.

[16] MKČR. (2015). *Státní kulturní politika na léta 2015 – 2020.* [online]. [cit. 2021-06-04]. Available from https://www.mkcr.cz/statni-kulturni-politika-69.html.

[17] MONITOR. Informační portál Ministerstva financí ČR. Územní samospráva. [online]. [cit. 2020-02-07]. Dostupné z: https://monitor.statnipokladna.cz/uzemni-samosprava/kraje-a-rrrs

[18] NIPOS. Centrum informací a statistik kultury. Divadla 2018 výběr ze základních statistických údajů o kultuře v České republice. [cit. 2020-02-01]. [online]. Dostupné z: https://statistikakultury.cz/wp-content/uploads/2019/10/Statistika_2018_DIVADLA.pdf

[19] NIPOS. Centrum informací a statistik kultury. Knihovny 2018 výběr ze základních statistických údajů o kultuře v České republice. [cit. 2020-02-01]. [online]. Dostupné z: https://statistikakultury.cz/wp-content/uploads/2019/10/Statistika_2018_KNIHOVNY.pdf

[20] NIPOS. *Kultura České republiky v číslech: vybrané údaje ze statistických šetření.* Prague: Národní informační a poradenské středisko pro kulturu.

[21] NOGARE, CH. D., BERTACCHINI, E. (2015). Emerging modes of public cultural spending: Direct support through production delegation. *POETICS.* 49 (SI), 5-19. DOI: 10.1016/j.poetic.2015.02.005.

[22] Statistika kultury České republiky. Poskytovatelé kulturních služeb [online]. [cit. 2020-01-30]. Dostupné z: https://statistikakultury.cz/poskytovatele-kulturnich-sluzeb/

[23] Statistika kultury České republiky. Respondenti – zpravodajské jednotky. [online]. [cit. 2020-02-04]. Dostupné z: https://statistikakultury.cz/respondenti/

[24] THROSBY, D. (2001). *Economics and culture.* Cambridge: Cambridge University Press.

[25] THROSBY, D. (2004). Assessing the impacts of a cultural industry. *Journal of Arts Management, Law Society.* Vol. 34 (3), pp. 188–204.

[26] THROSBY, D. (2010). *The economics of cultural policy.* Cambridge: Cambridge University Press.

[27] TURBIDE, J., LAURIN, C. (2009). Performance Measurement in the Arts Sector: The Case of the Performing Arts. *International Journal of Arts Management.* Vol. 11 (2), pp. 56–70.

[28] UNESCO. (2009). *Measuring the economic contributionof cultural industries. A review and assessment of current methodological approaches.* [online]. 2009 [cit. 2021-05-20]. Available from http://uis.unesco.org/sites/default/files/documents/measuring-the-economic-contribution-of-cultural-industries-a-review-and-assessment-of-current-methodological-approaches-en_1.pdf.

[29] VAVREK, R., PAPCUNOVÁ, V., TEJ, J. (2020). Evaluation of Financial Management of Towns in relation to Political Cycles using CV-TOPSIS. *Lex Localis – Journal of Local Self-Government.* Vol. 18(2), pp. 231-252. DOI: 10.4335/18.2.231-252(2020).

[30] VRABKOVÁ, I. (2018). Technical Efficiency of Public Libraries of Small Municipalities. In Proceedings of the 2018 *2nd International Scientific Conference Development and Administration of Border Areas of the Czech Republic and Poland: Support for Sustainable Development.* 2018. pp. 284-291.

[31] VRABKOVÁ, I. (2019). Models of static and dynamic technical efficiency of municipal libraries in the Czech Republic. *SOCIO-ECONOMIC PLANNING SCIENCES.* Vol 68. Article Number: 100646. DOI: 10.1016/j.seps.2018.09.001.

Appendix 1 - Total expenditure and expenditure on culture of regions in Czechia (mil. CZK)

Expenditure / Year	**2014**	**2015**	**2016**	**2017**	**2018**	**Region**
Total expenditure	9 215	10 338	10 193	11 496	15 305	HKK
Expenditure on culture	246	265	218	207	253	
Relatively in %	2,67	2,57	2,14	1,8	1,65	
Total expenditure	10 988	12 823	11 638	13 501	16 418	JHC
Expenditure on culture	268	285	282	338	397	
Relatively in %	2,44	2,22	2,42	2,5	2,42	
Total expenditure	16 778	18 061	18 649	19 328	22 550	JHM
Expenditure on culture	221	322	334	314	394	
Relatively in %	1,32	1,78	1,79	1,62	1,75	
Total expenditure	5 162	6 345	5 588	5 953	7 123	KVK
Expenditure on culture	138	165	201	155	172	
Relatively in %	2,68	2,6	3,6	2,61	2,42	
Total expenditure	6 996	7 909	7 332	8 261	9 674	LBK
Expenditure on culture	133	154	146	155	205	
Relatively in %	1,91	1,94	1,99	1,87	2,12	
Total expenditure	17 438	20 767	18 082	19 998	24 147	MSK
Expenditure on culture	258	311	312	359	445	
Relatively in %	1,48	1,5	1,72	1,8	1,84	
Total expenditure	10 226	11 558	11 300	12 565	15 398	OLK
Expenditure on culture	212	254	266	299	462	
Relatively in %	2,07	2,2	2,36	2,38	3	
Total expenditure	8 251	9 347	8 724	9 496	11 474	PAK
Expenditure on culture	142	163	147	165	268	
Relatively in %	1,72	1,74	1,68	1,74	2,33	
Total expenditure	9 536	9 903	10 213	11 179	13 160	PLK
Expenditure on culture	241	298	318	359	479	
Relatively in %	2,53	3,01	3,11	3,21	3,64	
Total expenditure	12 697	13 484	14 215	15 500	18 478	ULK
Expenditure on culture	216	230	261	342	460	
Relatively in %	1,7	1,71	1,83	2,21	2,49	
Total expenditure	9 380	10 469	9 819	11 026	12 996	VYS
Expenditure on culture	186	183	182	210	262	
Relatively in %	1,99	1,75	1,85	1,9	2,01	
Total expenditure	8 904	9 680	9 225	10 204	12 080	ZLK
Expenditure on culture	198	213	221	240	299	
Relatively in %	2,22	2,2	2,4	2,35	2,48	
Average expenditures on culture (mil. CZK)	**204,92**	**236,92**	**240,67**	**261,92**	**341,33**	
Average % representation	*2,06*	*2,10*	*2,24*	*2,17*	*2,35*	
Median expenditure on culture (mil. CZK)	**214,00**	**242,00**	**241,00**	**269,50**	**346,50**	
Standard deviation of expenditure on culture	**44,94**	**58,37**	**62,04**	**78,31**	**105,17**	
Standard deviation % representation	*0,44*	*0,43*	*0,57*	*0,45*	*0,53*	

Source: Own processing.

Appendix 2

Table - Ranking of the indicator of expenditure on librarianship per capita in the region in 2014–2018

	2014		2015		2016		2017		2018	
1.	HKK	99	HKK	102	PLK	108	OLK	118	OLK	257
2.	LBK	98	LBK	100	HKK	104	HKK	116	HKK	143
3.	KVK	91	PLK	98	LBK	103	KVK	116	ULK	129
4.	PLK	91	KVK	97	KVK	96	PLK	111	PLK	128
5.	JHC	87	JHC	86	JHC	93	LBK	110	LBK	126
6.	OLK	72	OLK	75	OLK	81	JHC	106	KVK	121
7.	ULK	61	ULK	64	ULK	64	ULK	76	JHC	113
8.	VYS	57	VYS	58	VYS	61	PAK	68	PAK	96
9.	PAK	51	PAK	56	PAK	58	VYS	63	VYS	84
10.	ZLK	44	ZLK	44	ZLK	46	ZLK	49	ZLK	68
11.	MSK	40	MSK	41	MSK	43	MSK	46	MSK	51
12.	JHM	11	JHM	12	JHM	12	JHM	15	JHM	15
	$\bar{x}$	67	$\bar{x}$	70	$\bar{x}$	72	$\bar{x}$	83	$\bar{x}$	111
	$\tilde{x}$	66	$\tilde{x}$	70	$\tilde{x}$	72	$\tilde{x}$	91	$\tilde{x}$	117
	s	26,39	s	27,34	s	28,76	s	33,23	s	56,97

Source: Own processing.

Table - Ranking of the indicator of expenditures in the field of theatre per capita in the region in 2014–2018

	2014		2015		2016		2017		2018	
1.	VYS	60	VYS	61	VYS	68	VYS	98	VYS	83
2.	MSK	42	MSK	43	MSK	47	MSK	54	MSK	59
3.	PLK	20	PLK	26	PLK	24	ULK	46	ULK	50
4.	JHC	19	JHC	20	ULK	20	JHM	31	JHM	32
5.	KVK	9	KVK	10	JHC	20	PLK	27	PLK	31
6.	HKK	9	HKK	9	LBK	11	JHC	21	JHC	26
7.	PAK	7	PAK	8	HKK	9	PAK	11	KVK	14
8.	OLK	6	OLK	7	OLK	9	OLK	11	HKK	13
9.	LBK	5	ULK	6	PAK	8	KVK	10	PAK	12
10.	JHM	5	LBK	5	JHM	7	HKK	10	OLK	9
11.	ULK	3	JHM	4	KVK	7	LBK	7	LBK	7
12.	ZLK	0	ZLK	0	ZLK	0	ZLK	0	ZLK	0
	$\bar{x}$	15	$\bar{x}$	17	$\bar{x}$	19	$\bar{x}$	27	$\bar{x}$	28
	$\tilde{x}$	8	$\tilde{x}$	8	$\tilde{x}$	10	$\tilde{x}$	16	$\tilde{x}$	20
	s	17,22	s	17,55	s	18,88	s	26,43	s	23,76

Source: Own processing.

Table - Ranking of the indicator of expenditure on museums and galleries per capita in the region in 2014–2018

	2014		2015		2016		2017		2018	
1.	KVK	292	KVK	351	KVK	458	PLK	357	PLK	511
2.	PLK	271	PLK	312	PLK	341	KVK	282	OLK	358
3.	JHC	199	HKK	286	OLK	249	JHC	282	PAK	337
4.	VYS	188	OLK	248	JHC	215	OLK	258	JHC	325
5.	OLK	185	JHC	213	HKK	200	ZLK	202	KVK	320
6.	PAK	182	VYS	190	VYS	171	LBK	189	LBK	272
7.	HKK	165	LBK	189	LBK	170	ULK	179	ZLK	261
8.	ZLK	162	PAK	188	ULK	170	HKK	171	ULK	244
9.	LBK	154	ZLK	187	ZLK	159	VYS	171	VYS	226
10.	ULK	145	JHM	174	JHM	153	PAK	170	HKK	209
11.	JHM	102	ULK	146	PAK	150	MSK	137	JHM	161
12.	MSK	100	MSK	97	MSK	118	JHM	127	MSK	148
	$\bar{x}$	179	$\bar{x}$	215	$\bar{x}$	213	$\bar{x}$	211	$\bar{x}$	281
	$\tilde{x}$	174	$\tilde{x}$	189	$\tilde{x}$	171	$\tilde{x}$	184	$\tilde{x}$	266
	s	54,99	s	69,03	s	92,58	s	66,25	s	94,82

Source: Own processing.

Evaluation of efficiency of the publicly established theatres in Poland and Czechia

Jiří Bečica

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
jiri.becica@vsb.cz

Abstract

Culture is a mean of transferring information between generations. We include a field of interpretive culture into a cultural branch that is usually non-profit in democratic states with a market-driven economy. Institutions (theatres) evaluated in this paper are mediators of an unrepeatable interpretive art and they need funds of public resources of different government levels to ensure their activities. The aim of the present paper is to evaluate the efficiency of theatres' management of 93 evaluated public theatres in the Czech Republic and Poland through 11 indicators chosen from available technical and economical indicators. The evaluated weights of chosen indicators were determined by Technique for Order of Preference by Similarity to Ideal solution (TOPSIS) in combination with a chosen objective method for determining indicators' importance. Within the paper, the theatres of Poland were evaluated first and then theatres of the Czechia. This was followed by an evaluation of all theatres in one file. According to the results, it is evident that the worst results in both states were stated in the big theatres. These theatres producing more genres of interpretive art (puppets, drama, ballet, operas or musicals), needs much more art employees and financial resources for their activity. There were not proved fundamental differences in the functioning of public established theatres in Poland and Czechia in the evaluation.

Keywords: *culture, Czechia, Poland, public goods, theatre, TOPSIS technique*

JEL Classification: *H44, H59, L33, R51, Z19*

1 Introduction

This paper is focused on an evaluation of efficiency of public established institutions providing services of interpretive art field (theatres) within the Poland and Czechia. For an evaluation, there were chosen 93 public established theatres, that create a backbone network of public established institutions providing services of interpretative art in both countries. Selected theatres are established by a public entity in the field of dramatic art and cannot do without subsidies or contributions from public budgets or funds. Not only in the Czechia and Poland but in other developed democratically controlled states as well only a small part of cultural entities can gain sufficient amount of funds by their main activity, i.e. entrance fee or additional selling of services. This leads founders, respectively top management of government level (states, regions or municipalities) to political agreement on ensuring of certain kind of public goods from public budgets. In the market, the institution providing public goods (net or mixed) would not be able to ensure public goods without funds of public resources, that is found as unacceptable in the long term by non-expert and expert public and elected politicians. Since non-profit organization is not possible to evaluate according their profit, there is a question of their efficiency in many countries, respectively efficiency of provided public resources when realizing public goods for inhabitants.

Many authors deal with an evaluation of non-profit organizations, e.g. Vrabková and Vaňková (2021); Vavrek, Papcunová, Tej (2020); Kovářová (2019; 2018); Vaňková (2018); Badia and Borin (2012); Cai and Wang

(2012); Dooren et al. (2010); Turbide and Laurin (2009) or Kaplan and Northon (2001). In terms of evaluation of culture services can be state Hansmann (1981); Throsby (2001; 2010); Glowacki, Hausner and Jakobik (2009); DCA thesis (2014); Chiarvalotti (2014); Ilczuk (2015); Nogare and Bertacchini (2015); Borg (2017), Ardielli (2017a, 2017b); Vrabková (2018, 2019) or Galecka and Smolny (2017a, 2017b, 2019). Every the above mentioned theses come out from an evaluation of non-profit organizations usually from Value for Money. Within this concept it is a measuring of efficiency of different chosen technical and economical indexes by homogeny organizations. The aim of such an evaluation is to gain information through economy and efficiency of public provided funds, that should ensure fulfil of predetermined goals of organizations. It does not have to be achieving of the lowest price in practice but optimal combination of cost and gained quality of provided public good, most of cultural goods may be included there. According to Cardy (1999) connection between economy and efficiency shows an organization must solve all three parameters of performance when measuring performance. Smith (2009) states to VFM application of "3E" principles led to dramatic changes in management of public established organizations, including cultural organizations. According to Kalubanga and Kakwezi (2013) the base of VFM should be, by public established organizations, best use of public resources for achieving results, when management of organizations should be responsible for economy and effective organization management.

The aim of this paper is to evaluate public established professional theatres in Poland and Czechia according to chosen economical and performance indicator. To fulfil the aim of this paper, the contribution is divided into several chapters. First, there is a characterization of public goods in culture area, then follows comparison between theatre art of the Poland and Czechia in the paper. The part of description of methodology, it is focused on introduction of examined sample of theatres, used indicators and a way of their processing by TOPSIS and MW method. Then there is a chapter focusing on the assessment of the functioning of total 93 theatres in the Poland and Czechia, first every country individually and then together within one file of data. The results found are summarized and discussed in a context of public funding in the conclusion, respectively there is evaluated the functioning of theatres within public economy.

2 Public Goods in Culture Area

Among public goods we also include some goods in the field of culture. The cultural goods are characterized by their scarcity and value in use. These two characteristics form the basis of economical value. It is difficult to set the value in use of cultural goods because a value of use is different for different users. Since this problem leads extremes when financing production of competent cultural goods. The result can be that some goods are underestimated and some overestimated. A sector of national economies provides cultural goods to inhabitants in democratically managed states. According to Pestoff (1992) can the breakdown of national economy be acceded: 1) from the point of view of primary focus of organizations to their activity (profit/nonprofit); 2) From the point of view of organization establisher (public or private) or 3) from the point of view of organization anchor (working formal or informal) according to legislations. This breakdown of national economy allows some combinations how to ensure different goods and services for inhabitants.

A profit sector should be fund by resources gained from selling goods of the profit sector entities for a market price, created by supply and demand on the market. If it is not possible to ensure market price by some services, then a non-profit sector takes ensuring of the services, where the aim is not to gain a profit but benefits. Funds needed for organizations´ activities is necessary to ensure through redistribution processes from national, regional or local public budgets. The issue of public goods was already mentioned in economy literature in the thesis of Pareto and Schwier (1927), in a context of a neo-classical theory and Paret´s optimum. However, the first definition of public goods is attributed to P. A. Samuelson (1954), extended by Musgrave (1998) and discussed by Arrow (1963), Niskanen (1971), Pollit (1993), Buchanan (1998), Samuelson, Nordhaus (2010) or Stiplitz and Rosengard (2015). According to Stilitz (1997) the imbalance in the market is the result of private companies´ failure, that follow their interests and usual only try maximizing profits for their owners and not to create benefits for whole society.

In many developed countries, providing cultural goods is insured on the basis of a binding document on the government level, so called "cultural policy" of a state. The document usually relates to other cultural documents of national level (e.g. UNESCO) and contains main global goals of the country, regions or municipalities in the field of directing the culture. Activities in culture most often focus on a development and conservation of cultural heritage, increasing efficiency in culture field and increasing cultural awareness of inhabitants. According to Dostál (2012) cultural policy has developed for many years not only in the Czech Republic but in Poland as well and the right to accede to cultural assets itself is guaranteed in The Charter of Fundamental Rights and Freedoms. The Ministries of Culture, guarantee of cultural policy define basic functions of cultural policy. Within the guarantee of protection of freedom creation of artists and art-makers, guarantee of equality to access to cultural assets or making conditions for realization of cultural activities of inhabitants.

There is no strict definition for the notion of theatre, there are many interpretations in specialized literature. Theatre is most often described as art form gathering different kinds of art (recitation, singing, music, dancing etc.). Theatre plays have had trend to approximate a man to society and working society to a man since the Ancient age. Blahník (1923) provides to this, it has never happened soma age is without a play and on top of that without such synthetic play as theatre is. Bernard (1983) states theatre has transferred importance and it may be understood as a place of wonders creating fiction and performs it as a reality. Černý (1982, p.18) explains theatre as an artistic activity of a man performed through certain intuition. If the theatre is understood as a social institution, it can be defined as organization that creates conditions for theatrical process and within it is operated theatrical activity, that is also state by Krejčí (2009, p. 12).

Theatrical art, according to Kazdy (1998), focuses on performing arts, where actors perform a play and spectators sit and watch scenes in the auditorium. Some theatres have long-term tradition within individual states of Europe and, in some genres (e.g. opera), they are interesting not only for domestic but for foreign visitors (tourists) as well who do not admire only art performance on stages but very worthy historic rooms of theatre houses mentioned in tourist guides. As an example of known theatre house in Europe can be noted at least one well-known theatre in each country e.g. Teatro alla Scala in Milan, Italy, Wiener Staatsoper in Austria, The Royal opera House (Covent Garden) in London, Great Britain, Opera national de Paris in France, Mariinsky Theathre in Sankt Peterburg in Russian, Semperoper Dresden in Germany or within evaluated countries Národní divadlo in Prague or Teatr Wielki – Oper Narodowa in Warsaw, Poland.

3 The Characteristic of the Theatrical Art in Poland and Czechia

Polish cultural policy and theatrical art had been connected to censorship, centralistic policy of ruling party, lack of freedom of speech and limited art creation till 1989 as vell as in Czechia. Theatres had gained independence after 1989 after social-economic transformation in both countries. A system of culture following the pattern of west-oriented economies has been preferred, when system of public funding of cultural institution gained characteristics of both French model, that grants cultural freedoms to inhabitants in the Constitution and German model, where most cultural institutions were transferred into hands of local authorities (regions, municipalities), they are founders of most non-profit cultural institutions and they ensure them financially.

Theatres in Poland operate on the basis of the law on organizing and operating of cultural activities (UOK) that was adopted in 1991. This law created a legislative framework for culture funding in democratically controlled Polish economy. The law introduced a concept of “cultural institutions” (theatres, museums, libraries etc.) and allowed their free establishment by different subject. Nowadays, public cultural institutions are founded by Ministry of Culture or other central or local authority (regions, municipalities) in Poland. Public founder of theatre provides necessary property to an institution and the institution gains legal personality when registering on public register. There are more cultural institutions fund mostly by local authorities (JST) in Poland. Since 1999, only three national theatres have been funded from national budget: Teatr Wielki . Opera Narodowa and two dramatic theatres: Teatr Narodowy in Warsaw and Narodowy Teatr Stary in Krakow. Since 2005, the Ministry of Culture and National Heritage has co-financed chosen theatres as cultural institution falling within local authorities. Most of the Poland theatres is established “non-profit” way in public hands and geographically allocated more within urban centres. The theatres are fund from about 70 % of total volume of resources from founder budget, i.e. public budget of state and budgets regions and municipalities. The inhabitants ´expenditure into cultural field are relatively low and they create only about 3,7 % of total expenditure of Polish households. Nevertheless it can be state, that theatres are, in comparison with other cultural institutions, less dependent on founders funds then museums, galleries, libraries or other cultural centres, where income self-sufficiency of institutions involves in 20 % of total volume necessary for operating of given institution. The establishment of a theater in the Czech Republic is not regulated by a special law. Funding of the theatres in the Czech Republic differ according to a legal form of founder. If a public sector establishes a theatre (states, regions, municipalities), the amount of funds depends mainly on elected representatives on the level (municipal or regional council, Ministry of Culture of the Czech Republic thus government of the Czech Republic).

The base of activity of all art institutions is a (artistic) season, i.e. from September 1 to August 31 following year. It is set a plan of repertoire for the season. A management of a theatre (director) is usually appointed on the basis of founder competitive selection. The term of office of a director is usually a few seasons. From the view of provided genre, drama and puppets theatres with a permanent (professional) ensemble operated on the base of repertoire formula predominate among public theatres. A similar organization is by less numerous theatres focused on popular musical or operatic and ballet creation (genre). There are different size of the theatres in Poland as well as in the Czechia, there are big theatres with their own scene and professional ensemble (sometime with a bigger number), and also relatively small theatres focused on certain genre and a specific audience. Most of smaller private established theatres on non-profit principle (associations and foundations) produce mainly comedies and small musical concerts.

Cultural activities of public established theatres in Poland are fund from public system of subsidies for allocated users (purposes subsidies) and allocated subsidies. The main difference between a legal grant and allocated subsidies is a process ensuring contracting for the purpose of allocated subsidies. A legal grant for a current activity of theatres is allocated for finance year that is equivalent of a year, and in nature, partly always funds two theatrical seasons. Finance management of public theatres in Poland and Czechia comes from finance plan set by director depending on amount of grants of operator (founder). It is a direct funding of cultural institutions from a public budget same as in the Czech Republic. The institution gains their own funds only by selling tickets or from rental. The self-sufficiency of theatres in Poland and Czechia is about from 15 – 50 % that is dependent on many factors. Including e.g. legal form, founder, finance policy apply by theatre management, location of theatre, size of auditorium, produced genres or selection of repertoire.

Cultural creation in the Poland and Czechia in the period before Covid-19 (according to a statistical survey) overcomes one record after the other (NIPOS, 2020). Number of subjects that operate theatrical activity is stable over a long time. The theatres attendance gradually grew over time and kept quality European standard, i.e. 6,2 millions of visitors per year. A percentage of audience was different according to a number of factors, however, it was about 80 % in average. The highest number of visitors is long recorded by dramatic or puppets performances realized the most in Poland, as vell as in Czechia. The average wage of theatre employees were at a level of 1000 Euro. From a total number of theatre employees, there are 40 % of employees recognized in statistics as unknown character of profession, which are independent actors and others that are not typically classified into field of professional employees. Other 30 % of employees figure in theatres as volunteer and only 30 % of employees are either professional actors or are recognized in a different profession of cultural character.

4 Research Methodology

The paper evaluates publicly established CZ and PL theaters through technical-performance and economical-finance indicators as well. A selection of economical-finance indicators connects with cost side of production and operation of the theatre when it is evaluated the amount of total costs, energy costs, wage costs and amount of provided subsidies from public resources. The technical and performance indicators include the number of theater seats, the number of scenes (stages), the number of shows (performances), the number of premieres and the total number of theater attendance (visitors). Concrete selection of evaluated indicators shows table number one. Basically, it is a complex evaluation, within this paper, of theatre management abilities to success in cultural and economic field too, that puts very high demands on operating, respectively theatre management. According to Krejčí (2009) the management of theatre is understood as sum of approaches, knowledge, personal opinions and processes used by theatre managers for successful master of manager functions. Functions such as planning, organizing, Management of Human Resource, supervising and control of activities realized in a theatre are focused on achieving of target goals of a founder and fulfill of theatre´s fulfillment.

Table 1 - Evaluated indicators

Indicator		Group
IT1	Number of seats	technical indicators
IT2	Number of scenes (stages)	
IT3	Number of shows	
IT4	Number of premiers	
IT5	Number of viewers (in thousands)	
IF1	Total revenues (in mil. EUR)	financial indicators
IF2	Total costs (in mil. EUR)	
IF3	Own revenues (in mil. EUR)	
IF4	Subsidies all (in mil. EUR)	
IF5	Labor costs (in mil. EUR)	
IF6	Energy consumption of the main activity (in mil. EUR)	

Source: Own processing.

Primary data for comparison of evaluated theatres within Czech Republic and Poland were obtained from official sources of different levels, most often annual reports. Statistical data for the Czech Republic were drawn from summary characteristics of Czech theatres from the National Information and Advisory Centre for Culture (hereinafter NIPOS) and from data of Czech Statistical Office (hereinafter ČSÚ). Economical indicators were drawn from Informative portal of Ministry of Finance of the Czech Republic – IISSP – Monitor and from profit and loss account of the evaluated theatres. There are evaluated 26 public established Czech theatres in a legal form of contributory organization or public Service Company within the file. The theatres are evenly distributed throughout the Czech Republic and they produce dramatic, music (musical and operetta), opera, ballet or puppet performances. Their common creature is also the fact they are members of Association of professional theatres in the Czech Republic, establishers of at least one professional ensemble and operate minimum on theatrical scene. Their founders are municipalities with more than 30 thousands inhabitants (LAU 2), then self-governing regions (NUTS 3) the founders of theatre and state (Ministry of Culture of the Czech Republic).

Evaluated Polish public theatres (drama, music, puppet) are also municipalities public founders (LAU 2) with more than 100 thousands of inhabitants and voivodship (NUTS 3) according to classification of territorial units for statistic (NUTS). Data for evaluation were gained throughout individual questions focusing on financial accounts and factual reports of cultural institutions. An examined sample is composed of 67 public theatres, of which 46 is operated by municipalities and 21 by regions. A common feature is also the fact they are founders of one professional ensemble at least and operate one theatrical scene minimum. Since it was not possible to precise diagnose all theatre institutions at the level of economical-finance and technical-performance indicators (e.g. availability of basic information as a number of visitors, number of seats in auditorium, etc.) there are not, as well as in the Czechia, taken into account all public established theatres in the paper. Their selection is evenly represented through whole territory of Poland according to stated indicators.

Publicly established theatres should follow certain rules of financial discipline. These are reflected in the law when working with public funds that should be incurred economically, efficient and effectively. For this reason were ranked e.g. own incomes or wage (personal) costs among observed indicators. On the other hand, a theatre provides a public good that is possible measure technically. Within a complex evaluation of such subjects it is therefore appropriate to adhere also a quantity of a provided goods, so it was used e.g. a number of sets or a number of realized performances. Chosen finance-economical indicators were converted from Czech crowns and Polish zloty by a rate of Central Polish bank and a unit was selected, due to position of the Czech Republic and Poland in Europe, Euro that servers to a reader for a better international comparison.

The TOPSIS method was used for evaluation, which belongs to the MCDM (multi-criteria decision making) methods. TOPSIS is an MCDM method with high utilization rate by solving decision making problems of different characteristics. Zavadskas et al. (2016) classified it as the second most used and alternatives include analytical hierarchy process (AHP), analytic network process (ANP), preference ranking organization method for enrichment evaluation (PROMETHEE), and elimination and choice expressing the reality (ELECTRE) Tramarico et al. (2015) deals with their frequency of use. The results can be described simply as values calculated base on the shortest distance to a positive ideal solution (i.e. variants that can be real but fictitious as well) and the longest distance to a negative ideal solution. This method is dealt more deeply in Shih et al. (2017), Seyedmohammadi et al. (2018) or Kravčáková Vozarová et al (2020) and is calculate as follows:

$$D = \begin{pmatrix} & X_1 & X_2 \ldots & X_j \ldots & X_n \\ A_1 & x_{11} & x_{12} \ldots & x_{1j} \ldots & x_{1n} \\ A_2 & x_{21} & x_{22} \ldots & x_{2j} \ldots & x_{2n} \\ : & : & : & : & : \\ A_i & x_{i1} & x_{i2} \ldots & x_{ij} \ldots & x_{in} \\ : & : & : & : & : \\ A_m & x_{m1} & x_{m2} \ldots & x_{mj} \ldots & x_{mn} \end{pmatrix}$$

where: A_i = i(th) alternative,

x_{ij} = value of the j(th) criteria, which was achieved by the i(th) alternative

In the next step this matrix is standardised using the formula

$$r_{ij} = x_{ij} / \sqrt{\sum_{j=1}^{j} x_{ij}^2}$$

where: r_{ij} = standardised value of the j(th) criterion

x_{ij} = value of the j(th) criterion, which was achieved by the i(th) alternative

The acquired data matrix is multiplied by the weights of the relevant criteria using the formula:

$$v_{ij} = w_{ij} . r_{ij}$$

where: v_{ij} = weighted standardised value

w_{ij} = weight of the criterion

$$H_j = \max(w_{ij}), D_j = \min(w_{ij})$$

where: H_j = Positive Ideal Solution (PIS), D_j = Negative Ideal Solution (NIS)

The distance from the PIS and NIS acquired in this manner is calculated according to:

$$d_i^+ = \left[\sum_{j=1}^{k}(w_{ij} - H_j)^2\right]^{1/2}, \; d_i^- = \left[\sum_{j=1}^{k}(w_{ij} - D_j)^2\right]^{1/2}$$

where: d^+ = distance from PIS

d^- = distance from NIS

The key criterion according to which the order of alternatives is arranged represents the relative distance from (nearness to) PIS, which takes both identified distances from the previous step into consideration by mean of the formula given below.

$$c_i = \frac{d_i^-}{d_i^- + d_i^+}$$

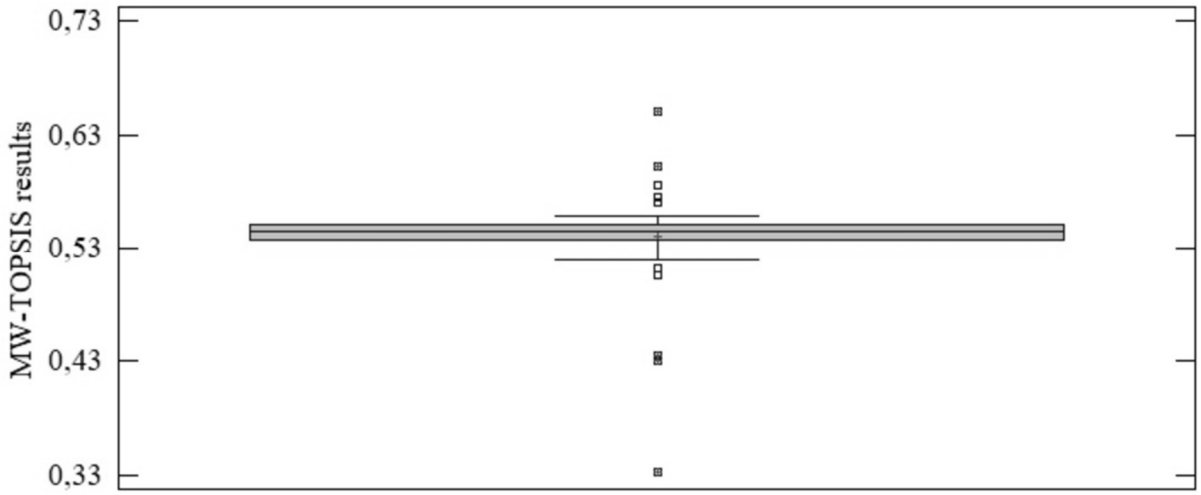
where: c_i = relative distance from PIS.

An important aspect of evaluation is setting of importance, respectively weight of selected indicators. There are more approaches to determining them while Keršuliene at al (2010) divides these approaches into four basic groups: subjective, professional, objective and integrated (a combination of previous approaches). For the purposes of evaluation, the MW method (Mean Weight method) was selected within the objective methods, which is the simplest in its procedure and the weight of each indicator is the same (see e.g. Vavrek et al. 2017). An evaluation of result is realized using more mathematical-statistical methods, where is possible to classify Mann-Whitney test, Leven test and Krusla-Wallis test. All calculations and analysis are realized in MS Excel, Statisrica 13.4 and Statgrphics XVIII.

5 Detected Results

The evaluation of theater performance in Poland is shown in figure number one, from which it is clear, that the variation range of results of multicriteria evaluation of theaters shows higher variability of overall results (R = 0.317), which is due to the number of remote and extreme values of some Polish theaters. on both sides of the created fence box (Chart 2). Confirmation of this statement is, for example, the high degree of sharpness of the results and also their concentration around the mean value (γ = 15,754).

Figure 1 - Results of multi-criteria evaluation of the theatres in Poland

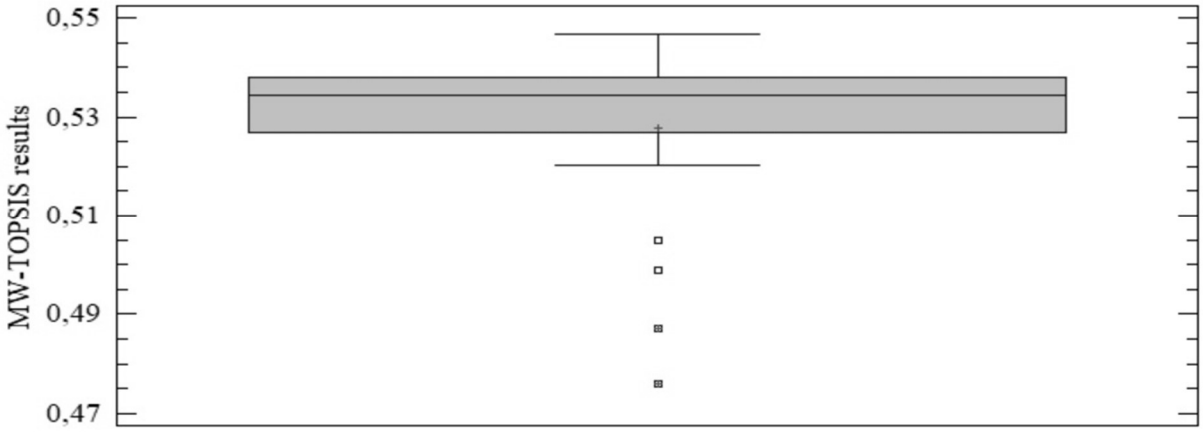


Source: Own processing.

Figure number one shows that significant differences in ratings can be observed both in the group of the best rated Polish theaters and in the group of the worst rated theaters. The best rated are Teatr Muzyczny Roma and Północne Centrum Sztuki Teatr Komedia and Teatr Kwadrat. On the opposite side of the evaluation, with a value of 0.333 (relative distance to the PIS alternative, ie evaluation by the MW-TOPSIS method), the Capitol Theater ranked last. The Syrena Theater and the Wielki Theater in Łódzi were only slightly better. In the case of Polish theaters, it can be stated that a better overall rating is associated with a lower level of subsidies (IF4), personnel expenditure (IF5) or energy consumption (IF6), but to a lesser extent than in the case of Czechia. The better-rated theaters were able to appeal to a larger number of visitors (attendance), which may be due to the size of the theater auditorium and the size of the Polish market, which is about four times larger in population than in the Czech Republic.

The evaluation of theater performance in the Czechia is shown in figure number two, which shows that the variability of the overall results of the multicriteria evaluation is low with a minimum variable range of 0.071 and a relative distance to the PIS alternative (Figure 2). This significant homogeneity of the results is also supported by selected moment characteristics (sX = 0.017; vX = 3.278%) and a high degree of concentration of the results around the mean values (β = 3,080).

Figure 2 - Results of multi-criteria evaluation of the theatres of the Czechia



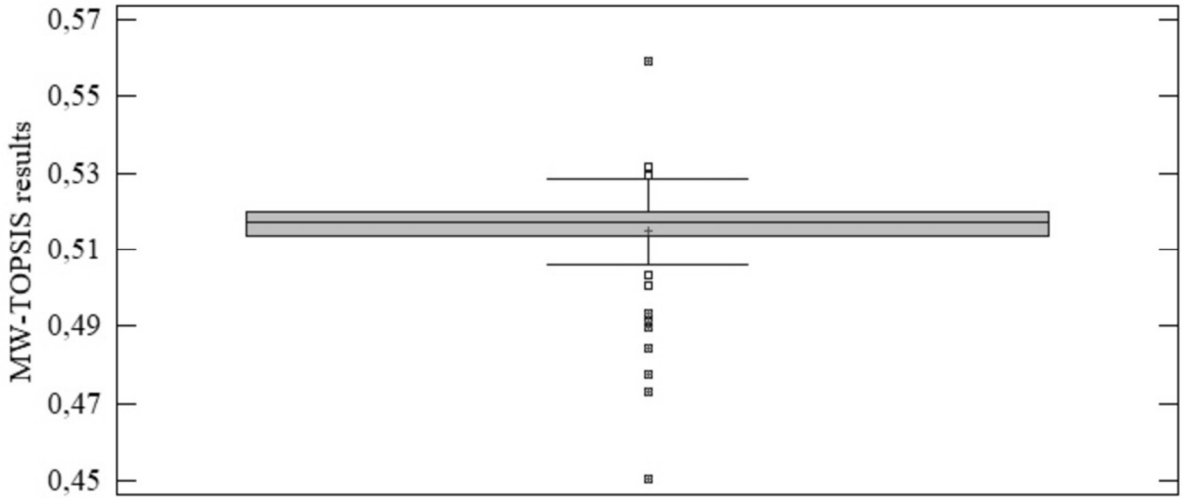
Source: Own processing.

Within the evaluation it can be seen significant differences in evaluating individual theatres, especially the ones placed at the end of ranking. The difference between the best evaluated couple of theatres (Divadlo Příbram and Městská divadla pražská) is more than ten time smaller then the difference among the four worst evaluated theatres in the file, which are characterized by their multi-genre compared to other theaters in the ensemble (Theater J. K. Tyl in Plzeň, National Moravian-silesian theatre in Ostrava, National theatre Brno and National theatre Prague). The basic impact on the evaluation had finance indicators (IF4 – IF6), where the last four theatres were ranked always the last from total file. The ranking of these theatres at the end of evaluated file can be given by the nature of scope of produced art, where all mentioned theatres are founders of larger number of

art ensembles producing different genre forms (drama, opera, ballet, musical), operate more buildings (scenes) in comparison to other theatres and produce more new performances (premieres). A larger number of employees (not only actors, but operating employees too) connects all these matters and it negatively influences volume of realized wages from total volume of the theatres budgets. Within evaluated file of Czech theatres, there are better total results connected to lower values of total costs (IF2), provided subsidy (IF4), personal costs (IF5) and energy consumption (IF6). We can also mark better evaluated theatres as theatres with lower number of premiers (IT4), usually focused on one interpretative genre and does not requires such finance resources for realization. Most often it is production of drama performances or puppet performances. Mentioned theatres also supports fact of operating usually only one building (scene) with lower number of seats, it means realizing performances with lower number of personnel, i.e. lower volume of wages.

The summary results for the group of Czech and Polish publicly established theaters are shown in figure number three, from which the reduction of absolute differences is evident. These small differences were again reflected in the high concentration around the mean value, specifically around the average at the level of 0.514, resp. median at 0.517.

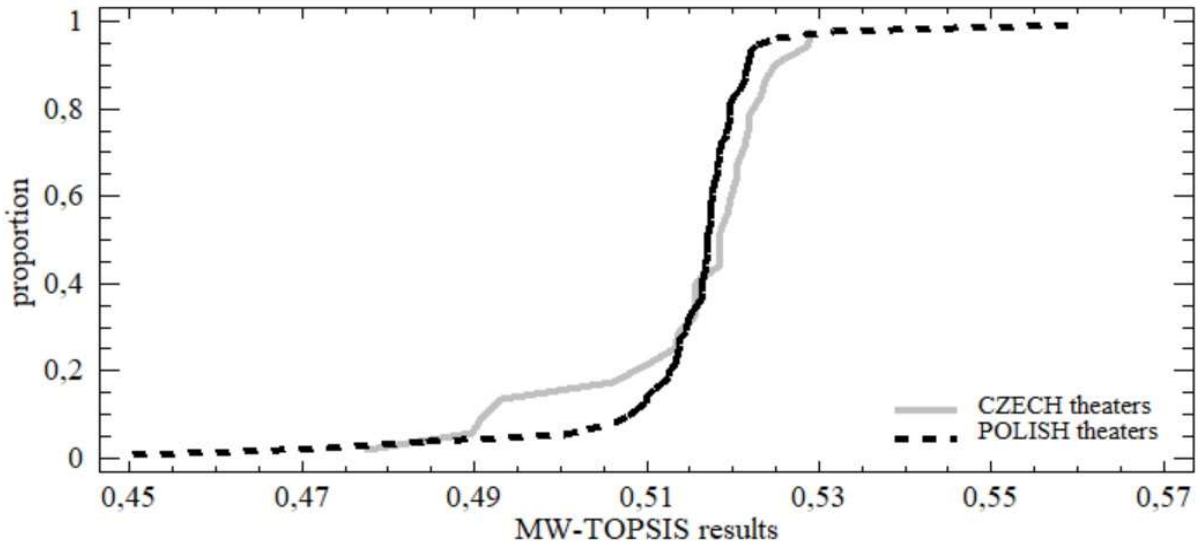
Figure 3 - Results of multi-criteria evaluation of theatres in the Czechia and Poland in a one common file



Source: Own processing.

The theatres in Poland placed, within total evaluated file, both first – Teatr Muzyczny Roma and the last – Capitol. Overall, there were evaluated 93 theatres while twelve of them can be marked as different. Majority representative have Polish theatres in this group. It can be partly attributed to their larger number within evaluated file.

Figure 4 - Multi-criteria evaluations of public theatres in the Czechia and Poland



Source: Own processing.

Most of public established theatres are left in local authorities (municipalities and regions) in both states. Neither in the Czech Republic nor in Poland does exist optimal and uniform rules for funds redistribution between different theatres from public resources and within professional public, it is still discussed whether a culture should be funds and founded by local government or from centre, i.e. at the level of states. From a statistical view, the differences between groups of Czech Polish theatres did not prove. We can state the conformity by the mean ($W = 758$; $p = 0{,}335$), distribution function (K-S = 0,263; $p = 0{,}148$) and also variance (LE = 1,356; $p = 0{,}247$). Possible differences can be attributed only to results of individual theatres and not to conditions at level of evaluated state, i.e. the Czechia and Poland.

Despite the division of cultural institutions operated by state or local authorities (regions, municipalities), did not prove better results from state founders.

6 Discussion and Conclusion

A total number of theatres is rather above standards in both states due to a number of inhabitants and in comparison with other European countries and theatre subjects are deployed quite equally. Theatrical production is developed in both states as is evidence by e.g. large number of operated scenes and above European standard of theatre visitors. However, genre offer is rather uneven in both evaluated states. Specification of Czech theatre infrastructure is so called metropolitan aspects of theatres which is a high concentration of theatres of different genres in metropolis (Prague). Within the Czechia and theatrical production can be noted excluded position of the capital city Prague and other large cities, such as Brno, Ostrava and Plzeň. Within Polish municipalities, is not metropolitan aspect alert as in the Czechia which is caused by eight times larger number of municipalities over a hundred thousand inhabitants, around 40 in Poland.

In both countries can be found some difficulties within the framework of publicly established theatres. Among these, we can name e.g. increasing claims at a number of realized cultural occasions provided from public resources, a persistent unsatisfactory finance situation of most public established institutions reflected in buildings becoming obsolete and deterioration of technical parameters of evaluated theatres. The theatres are large dependent on a distributed fund from public resources when making an art in both evaluated countries. They are divided according to fragmented and often also non-transparent criteria. Further, it is possible to note disunity of observed indicators among institutions, a significant role of government institutions and general lack of resources from the point of economical capability of inhabitants when ensuring goods of cultural value (accepted price of entrance fee). The problem of quality ensuring of productions can be a low number of employees employed in theatrical industry as professional actors, or singers for permanent employment.

The management of every professional theatre in current Czechia and Poland is in unenviable situation for a longer time. On one hand, there is an effort to operate theatre professionally usually based on long-term declared art plans, on the other it is necessary to come up with budget resources. In addition, given the general government deficit due to the Covid-19 pandemic, the financial situation of theater institutions cannot be expected to improve. The first indications show that the financial resources of the budgets of individual theaters will stagnate or rather deteriorate in the optimistic variant in the medium term, which is due to a decrease in the selection of resources for public budgets and reflects the performance of the economy. The financial resources necessary for operating of evaluated theaters usually come from public sources of various levels of government (state, region, municipality) and reflect the willingness of the theater founder and donor to maintain and finance such cultural goods that are sought after by as many visitors as possible. The funding of cultural activity is an obligation of a founder (i.e. local authorities). The Ministry of Culture may provide additional funds for operating but there is no legal regime to them. Neither in Poland, nor in the Czechia, there are not uniform rules and clear definition of criteria for allocation of finance from public and other resources. A role of private sponsoring is marginal. It is a responsibility of local governments to hold theatres through a number of purpose grants or statutory grants. A grant of public founder covers usually 70 % of costs for theatre activity in average, while a volume of sponsors´ funds is between 1 to 3 %. Own theatres incomes from entrance fee and rent of rooms make about 25 % in average of budget and rest, about 2 %, of funds is gained by other resources. From the view of management approach to operated theatre genre of institution it can be state that it is more difficult financially secure operating of multi-ensemble theatres. These are usually multi-genre oriented (drama, opera, ballet, musical) their budget is several times higher than by one-ensemble, narrowly focused theatres prevailing in both states. One-genre theatres most often offer drama or puppet performances.

It is necessary ensure substantial amount of funds to theatrical art is independent. In a market, it is not possible to ensure these funds only by private sector, with some minor exceptions. If we wanted to ensure real cost of theatres only through real price of entrance fee in the market (from current total cost of evaluated institutions and an offer of number of seats) the produced service would have been a very luxury good and demand of inhabitants would have been (because of objective economical situation of most inhabitants of evaluated countries)

minimum. Not in vain, a realization of goods of interpretative art (theatre or music production) could afford only a ruler, noble families or high ranking church dignitaries in the past.

Acknowledgements

The paper was created within the financial support of the student grant project SGS No. SP2021/18 on Faculty of Economics, Technical University of Ostrava.

References

[1] Act on organizing and running (1991). *Journal of Laws 1991.* No. 114 item 493, Elaborated based on: i.e. form 2012 item 406, form 2014 item 423, form 2015 item 337, 1505. [Online]. Available from http://prawo.sejm.gov.pl/isap.nsf/doload.xsp/WDU20180001983/O/D20181983.pdf. [Accessed: 2021-04-30].

[2] ARDIELLI, E. (2017a). Evaluation of Electronic Cultural Participation in EU Member Countries. In Proceedings of the 2017 *12th International Scientific Conference Public Economics and Administration*, 2017. pp. 2-9.

[3] ARDIELLI, E. (2017b). Performance Evaluation of Cultural Sector in the Czech Republic and EU-Member Countries. In Proceedings of the 2017 *22nd International Scientific Conference Theoretical and Practical Aspects of Public Finance,* 2017. pp. 92-98.

[1] ARROW, K. (1963). *Social Choice and Individual Values.* New York: J. Wiley and Sons.

[2] BADIA, F., BORIN, E. (2012). Opportunities and Critical Points for the Introduction of Performance Measurement Systems in Theatres - A Comparison between Theoretical Assumptions and Empirical Realities. *Journal of Cultural Management and Policy.* Vol. 2, No. 2, pp. 45-59.

[3] BERNARD, J. (1983). *Co je divadlo.* Prague: SPN.

[4] BLAHNIK, V. K. (1923). *Smysl a podstata divadelního umění.* Prague: Fr. Borový.

[5] BORG, R. P. (2017). A methodology for the quality assessment of the theatre. In V. A. Cremona (ed.), Capitalising on culture? Malta and the European capital of culture. pp. 77-96. Msida: Malta University Publishing.

[6] BUCHANAN, J. (1998). *Veřejné finance v demokratickém systému*. Prague: Computer Press.

[7] CARDY, CH. (1999). *Rozvoj služieb pre verejnosť.* Všeobecná časť výstupu riešenia úlohy projektu EÚ/Phare – Technická pomoc reforme verejnej správy v SR 9409/01/02.

[8] ČERNÝ, F. (1982). *Metodologie výzkumu dějin divadla: skriptum pro posluchače filozofické fakulty Univerzity Karlovy.* Prague: UK.

[9] CAI, Z., WANG, Y. (2012). Research Frontiers in Public Sector Performance Measurement. Physics *Procedia.* Vol. 25, pp. 793-799.

[10] Český statistický úřad. (2019). Kultura v ČR. Availabel from https://www.czso.cz/csu/czso/kultura

[11] DCA (2014). *Public Value Measurement Framework. Measuring the Quality of the Arts.* [online]. [cit. 2021-05-02]. Available from http://www.dca.wa.gov.au/Documents/New%20Research%20Hub/Research%20Documents/Public%20Value/PVMF_Measuring_Quality_Arts_Research_Hub_08_14.pdf.

[12] DOOREN, W., BOUCKAERT, G.. HALLIGAN, J. (2010). *Performance management in the Public Sector*. New York: Routledge.

[13] DOSTÁL, P., KISLINGEROVÁ, E. (2012). *Ekonomika kultury: efektivní metody a nástroje podnikání v sektoru kultury.* Prague: Oeconomica.

[14] GALECKA, M., SMOLNY, K. (2019). Criteria for the optimal financing model of public theatres. *Review of Economic Perspectives.* Vol. 19 (2), pp. 119–136. DOI: https://doi.org/10.2478/revecp-2019-0007.

[15] GALECKA, M., SMOLNY, K. (2017a). Financial Stability of Cultural Institutions Based on the Example of Voivodeship Theaters and Music Institutions. *PROBLEMY ZARZADZANIA-MANAGEMENT ISSUES*. Vol. 15 (2), pp. 196-213.

[16] GALECKA, M., SMOLNY, K. (2017b). Finanancing rules of the activity of cultural institutions in the context of economic efficiency. *EKONOMIA I PRAWO-ECONOMICS AND LAW.* Vol. 16 (4), pp. 387-399.

[17] GLOWACKI, J., HAUSNER, J., JAKOBIK, K., et al. (2009). *Finansowanie Kultury i Zarzadzanie Instytucjami Kultury.* Availabel from http://h.p://www.kongreskultury.pl/library/File/RoSK%20finansowanie/

[18] HANSMANN, H. (1981). Nonprofit Enterprise in the Performing Arts. *Bell Journal of Economics.* Vol. 12 (2), pp. 341-361. DOI: 10.2307/3003560.

[19] CHIARVALLOTI, F. (2014). Performance Evaluation in the Arts and Cultural Sector: A Story of Accounting at Its Margins. *The Journal of Arts Management, Law, and Society,* Vol. 44 (2), pp. 61-89.

[20] ILCZUK, D. (2015). *Ekonomika Kultury.* Warszawa: PWN.

[21] KALUBANGA, M., KAKWEZI, P. (2013). Value for money auditing and audit evidence from a procurement perspective - A conceptual paper. *International Journal of Advances in Management and Economics.* Vol. 2 (5), pp. 115-124.

[22] KAPLAN, R. S., NORTON, D. P. (2001). Transforming the Balanced Scorecard from Performance Measurement to Strategic Management: Part I. *Accounting Horizons.* Vol. 15 (1), pp.87−104.

[23] KAZDA, J. (1998). *Kapitoly z dějin divadla.* Prague: H & H.

[24] KERŠULIENE, V., ZAVADSKAS, E. K., TURSKIS, Z. (2010). Selection of rational dispute resolution method by applying new step-wise weight assessment ratio analysis (SWARA). *Journal of Business Economics and Management.* Vol. 11 (2), pp. 243-258. DOI: 10.3846/jbem.2010.12.

[25] KOVÁŘOVÁ, E. (2018). Analysis of the Size of Nonprofit Sector in Czech Regions. In Proceedings of the 2018 *2nd International Scientific Conference Development and Administration of Border Areas of the Czech Republic and Poland: Support for Sustainable Development.* 2018. pp. 98-106 .

[26] KOVÁŘOVÁ, E. (2019). Expenditures on Social Services from Regions Budgets in the Czech Republic Within the Period 2015-2018. In Proceedings of the 2019 *13th International Scientific Conference Public Economics and Administration.* 2019. pp. 212-221.

[27] KRAVČÁKOVÁ VOZÁROVÁ, I., KOTULIČ, R., VAVREK, R. (2020). Assessing Impacts of CAP Subsidies on Financial Performance of Enterprises in Slovak Republic. *Sustainability.* Vol. 12, 948. DOI: https://doi.org/10.3390/su12030948.

[28] KREJČÍ, H. (2009). *Základní typy právních forem profesionálních divadel v České republice a jejich vliv na proces řízení.* Brno: Janáčkova akademie múzických umění.

[29] MUSGRAVE, R. A. (1959). *The Theory of Public Finance*. New Yourk: McGraw-Hill.

[30] MKČR. (2015). *Státní kulturní politika na léta 2015 – 2020.* [online]. [cit. 2021-06-04]. Available from https://www.mkcr.cz/statni-kulturni-politika-69.html.

[31] NIPOS. *Kultura České republiky v číslech: vybrané údaje ze statistických šetření.* Prague: Národní informační a poradenské středisko pro kulturu.

[32] NISKANEN, W. A. (1971). *Bureaucracy and Representative Government*. Chicago: Aldine-Atherton.

[33] NOGARE, CH. D., BERTACCHINI, E. (2015). Emerging modes of public cultural spending: Direct support through production delegation. *POETICS.* 49 (SI), 5-19. DOI: 10.1016/j.poetic.2015.02.005.

[34] PARETO, V., SCHWIER, A. S. (1927). *Manual of Political Economy.* New York: August M Kelley Pubs.

[35] PESTOFF, V. A. (1992). Third sector and co-operative services – An alternative to privatization. *Journal of Consumer Policy*, 15, pp. 21-45.

[36] POLLITT, C. (1993). *Managerialism and the Public Services: Cult for Cultural Change in the 1990s?* Oxford: Blackwell.

[37] SAMUELSON, P. A. (1954). The Pure Theory of Public Expenditure. *The Review of Economics and Statistics.* Vol. 36 (4), pp. 387–389.

[38] SAMUELSON, P. A., NORDHAUS, W. D. (2010). *Economics.* New Your: McGraw Hill.

[39] SEYEDMOHAMMADI, J., SARMADIAN, F., JAFARZADEH, A. A., GHORBANI, M. A.; SHAHBAZI, F. (2018). Application of SAW, TOPSIS and fuzzy TOPSIS models in cultivation priority planning for maize, rapeseed and soybean crops. *Geodermam.* Vol. 310, pp. 178-190. DOI: 10.1016/j.geoderma.2017.09.012.

[40] SHIH, H. S., SHYUR, H. J., LEE, E. S. (2007). An extension of TOPSIS for group decision making, *Mathematical and computer modelling*. Vol. 45 (7-8), pp. 801-813. DOI: https://doi.org/10.1016/j.mcm.2006.03.023.

[41] SMITH, P. C. (2009). *Measuring value for money in healthcare: concepts and tools.* University of York: Centre for Health Economics. Available from https://www.lampdevelopment.org/wp-content/uploads/2017/01/MeasuringValueForMoneyInHealthcareConceptsAndTools.pdf>

[42] STIGLITZ, J. E.; ROSENGARD, J. K. (2015). *Economics of the Public Sector*. New York: W. W. Norton Company.

[43] STIGLITZ, J. E. (1997). *Ekonomie veřejného sektoru*. Prague: Grada Publishing.

[44] TRAMARICO, C. L., MIZUNO, D., ANTONIO, V., SALOMON, P., AUGUSTO, F., MARINS, S. (2015). Analytic Hierarchy Process and Supply Chain Management: A Bibliometric Study. *Procedia Computer Science.* Vol. 55, pp. 441–450. DOI: 10.1016/j.procs.2015.07.005.

[45] THROSBY, D. (2001). *Economics and culture.* Cambridge: Cambridge University Press.

[46] THROSBY, D. (2004). Assessing the impacts of a cultural industry. *Journal of Arts Management, Law Society.* Vol. 34 (3), pp. 188–204.

[47] THROSBY, D. (2010). *The economics of cultural policy.* Cambridge: Cambridge University Press.

[48] TURBIDE, J., LAURIN, C. (2009). Performance Measurement in the Arts Sector: The Case of the Performing Arts. *International Journal of Arts Management.* Vol. 11 (2), pp. 56–70.

[49] UNESCO. (2009). *Measuring the economic contributionof cultural industries. A review and assessment of current methodological approaches.* [online]. 2009 [cit. 2021-05-20]. Available from http://uis.unesco.org/sites/default/files/documents/measuring-the-economic-contribution-of-cultural-industries-a-review-and-assessment-of-current-methodological-approaches-en_1.pdf.

[50] VAŇKOVÁ, I. (2018). Technical Efficiency of Retirement Homes Aggregated in Particular Districts of the Czech Republic. In Proceedings of the 2019 *13th International Scientific Conference Public Economics and Administration.* pp. 384-393.

[51] VAVREK, R., ADMIŠIN, P., KOTULIĆ, R. (2017). Multi-Criteria Evaluation of Municipalities in Slovakia - Case Study in Selected Districts. *Polish Journal of Management Studies.* Vol. 16 (2), pp. 290-301. DOI: 10.17512/pjms.2017.16.2.25.

[52] VAVREK, R.. PAPCUNOVÁ, V.. TEJ, J. (2020). Evaluation of Financial Management of Towns in relation to Political Cycles using CV-TOPSIS. *Lex Localis – Journal of Local Self-Government.* Vol. 18 (2), pp. 231-252. DOI: 10.4335/18.2.231-252(2020).

[53] VRABKOVÁ, I., VAŇKOVÁ, I. (2021). Efficiency of Human Resources in Public Hospitals: An Example from the Czech Republic. *International Journal of Environmental Research and Public Health.* Vol. 18 (9). Article number: 4711. DOI: 10.3390/ijerph18094711.

[54] VRABKOVÁ, I. (2018). Technical Efficiency of Public Libraries of Small Municipalities. In Proceedings of the 2018 *2nd International Scientific Conference Development and Administration of Border Areas of the Czech Republic and Poland: Support for Sustainable Development.* 2018. pp. 284-291.

[55] VRABKOVÁ, I. (2019). Models of static and dynamic technical efficiency of municipal libraries in the Czech Republic. *SOCIO-ECONOMIC PLANNING SCIENCES.* Vol 68. Article Number: 100646. DOI: 10.1016/j.seps.2018.09.001.

[56] ZAVADSKAS, E. K., MARDANI, A., TURSKIS, Z., JUSOH, A., NOR, K. (2016). Development of TOPSIS Method to Solve Complicated Decision-Making Problems: An Overview on Developments from 2000 to 2015. *International Journal of Information Technology & Decision Making,* Vol. 15, pp. 1-38. DOI: 10.1142/S0219622016300019.

Family-Run Agricultural Holdings and the Environmental Challenges of Sustainable Development of Rural Areas – a Case Study of Research Conducted in Opole Province

Anna Bisaga[1], Stanisława Sokołowska[2]

[1]University of Opole
Institute of Economics and Finance
Department of Econometrics and Quantitative Methods
Ozimska 46a, 45-058 Opole, Poland
abisaga@uni.opole.pl

[2]University of Opole
Institute of Management and Quality
Department of Organization and Management
Ozimska 46a, 45-058 Opole, Poland
stanislawa.sokolowska@uni.opole.pl

Abstract

An important aspect of modernization of the Common Agricultural Policy (CAP) after 2020 will be its ecological modification connected with the new institutional environment which is constituted jointly by the European Commission and individual states' governments. The new regulations are supposed to encourage farmers to more effectively respect the requirements of the Good Agricultural and Environmental Conditions (GAEC) and Statutory Management Requirements (SMR), but also to take on individual environmental commitments within the scope of eco-programs. This study aims to evaluate farmers' readiness to introduce changes into their agricultural holdings, which result from the new system of conditionality, as well as from their own experience to date in implementing environmental requirements. The empirical material comes from the questionnaire-based research conducted in 2014 and 2018 among the population of 100 agricultural holdings, with intensive and medium-intensive agricultural production, located in communes that are representative of the agricultural space of Opole Province. The studies confirm that in the case of farmers operating in this region, the proposed alterations in managing the environmental function were necessary and can offer a new impulse for sustainable management of land and services of ecosystems. These changes may significantly contribute to the improvement of the quality of "green infrastructure" in the border areas of the Czech Republic and Poland.

Keywords: *CAP, conditionality principle, ecological modernization of agricultural holdings*

JEL Classification: *Q18, Q15, Q01*

1 Introduction

European agriculture is being faced with a series of challenges connected with the economic condition of the agricultural sector, care for environment, actions intended to alleviate climatic changes and also the need for establishing strong social and economic structures in rural areas. The condition to successfully meet the challenges is to secure stability of the natural capital. In the theory of sustainable development it is said about four principles (models) of stability of natural capital: careful, sensitive, strong and restrictive [1, 9, 10]. These principles concern the degree of substitution of the natural capital by the anthropogenic capital. The restrictive principle of sustainable development indeed excludes such a possibility. It is also accepted that these principles form a "ladder of sustainable development" and logic of its implementation. Experiences connected with

implementing sustainable development into agriculture show that their effectiveness is dependent on features of natural environment and its ecosystem services which should be preserved or reproduced. Securing stability of the natural capital and the choice of right principle (model) of its sustainability possesses thus a territorial dimension. Moreover, stability of the natural capital, with the inclusion of challenges posed to European agriculture can be achieved thanks to nature [11] with the use of its biodynamical strength, or thanks to implementation of innovations and new technologies that provide sustainable intensification of production and its effectiveness [4], as well as to tying them to new chains of values such as bioeconomy or economy of closed circuit. Consolidating Europe's natural capital will favor building green infrastructure which – in opposition to "grey infrastructure" – will reciprocally influence its further proliferation [8].

The above-mentioned principles of securing stability of the natural capital in the process of their implementation require new institutional solutions in both the institutional environment (the regulative sphere) and the management structure. They also necessitate arranging for a supply of innovations substituting production methods and the regulative system of industrial agriculture by new systems of agricultural production (ecological, organic, precision farming) and by a network-based organization of value chains. Taking into account both premises, modernization of the Common Agricultural Policy (CAP) became indispensable in order to continue the process of ecological modernization of agriculture. Regarding this process, the significance of the national management of the CAP increases respectively. National strategic CAP plans require systemic actions: changes in the institutional environment, supply of innovations for agriculture and rural areas, inclusion of agricultural counselling into the system of knowledge and innovation [2], as well as alterations in the system of managing agricultural holdings. The process of preparing the national strategic CAP plans and the principles behind evaluation of their realization are regulated in the Directive of European Parliament and the Council COM (2018) 392. These plans will also have to take into account the strategy called "from field onto the table", which is a part of the European Green Order accepted by the European Council in December 2019. The CAP structure directed at the environment consists of many elements: the above-mentioned strategy from field on the table, requirements of new conditionality, national regulations and national strategic plans, voluntary eco-programs and farmers' individual environmental commitments. The system of new conditionality regulates the agricultural activity, including the following areas:

- climate and environment;
- public health, animals' health, health of plants;
- well-being of animals.

The system is based on administrative punishments for not abiding by the Good Agricultural and Environmental Conditions (GAEC) and Statutory Management Requirements (SMR), as well as on rewards (extra-normative/additional ecological commitments).

A novelty among the requirements of the Good Agricultural Culture is the obligatory requirement to prepare by farmers plans of management of resources: soil, water, air. Member-states are obligated to render available an electronic tool facilitating preparation of such plans and monitoring their realization. Will this structure be a strong stimulus for further transformation of agriculture in Opole Region? The studies presented here make an attempt at answering the above-asked question.

2 Material and Methods

This study essays to assess farmers' readiness to introduce changes into agricultural holdings, ones that result from the new system of conditionality and their experience to date concerning implementation of environmental requirements. The empirical material was collected during a questionnaire-based survey carried out in 2014 and 2018 among 100 agricultural holdings with intensive and medium-intensive agricultural production. The holdings are based in communes which are representative of the agricultural space of Opole Province. The material presented in the study includes the questions concerning effects of the environmental agricultural activity, evaluation of the environmental principle of cross compliance, as well as changes in agricultural production introduced in accordance with the new institutional environment. In the study, induction and deduction methods and an institutional analysis were used.

3 Results and Discussion

3.1 Impact of Agricultural Production on the Environment in Farmers' Opinions

Since Poland's accession to the European Union in 2004, the agricultural production has been going on in a new institutional environment (in the literature on the subject it is even said about a renaissance of the agricultural law), which – on the one hand – strengthens environmental functions of agricultural holdings, yet – on the other one – facilitates intensification of the production and pursuance of its specialization. As a result of the impulses

directed at agriculture by the institutional environment, there follow both positive and negative external effects of the agricultural production. Securing an effective influence exerted by the new institutional environment demanded alterations in the system of diffusion of knowledge and information (AKIS) thanks to which the agricultural production became more reflective. It needs observing that the farmers' assessment of effects of their activity is also influenced by the experience to date of implementation of different agro-environmental instruments.

Intensification of agricultural production, according to the examined, has a negative influence on the state of natural environment. Negative external effects lead mainly to deterioration in the quality of soils, losing biodiversity, worsening of the air quality, climatic changes and changes in landscape. The presented ranking of agriculture impacting ecosystems shows, at the same time, hierarchies of environmental targets which farmers are capable of realizing within the conditionality system and voluntary agro-environmental commitments (see Table 1).

Table 1– Ranking list of the negative effects of farming on environment (2018)

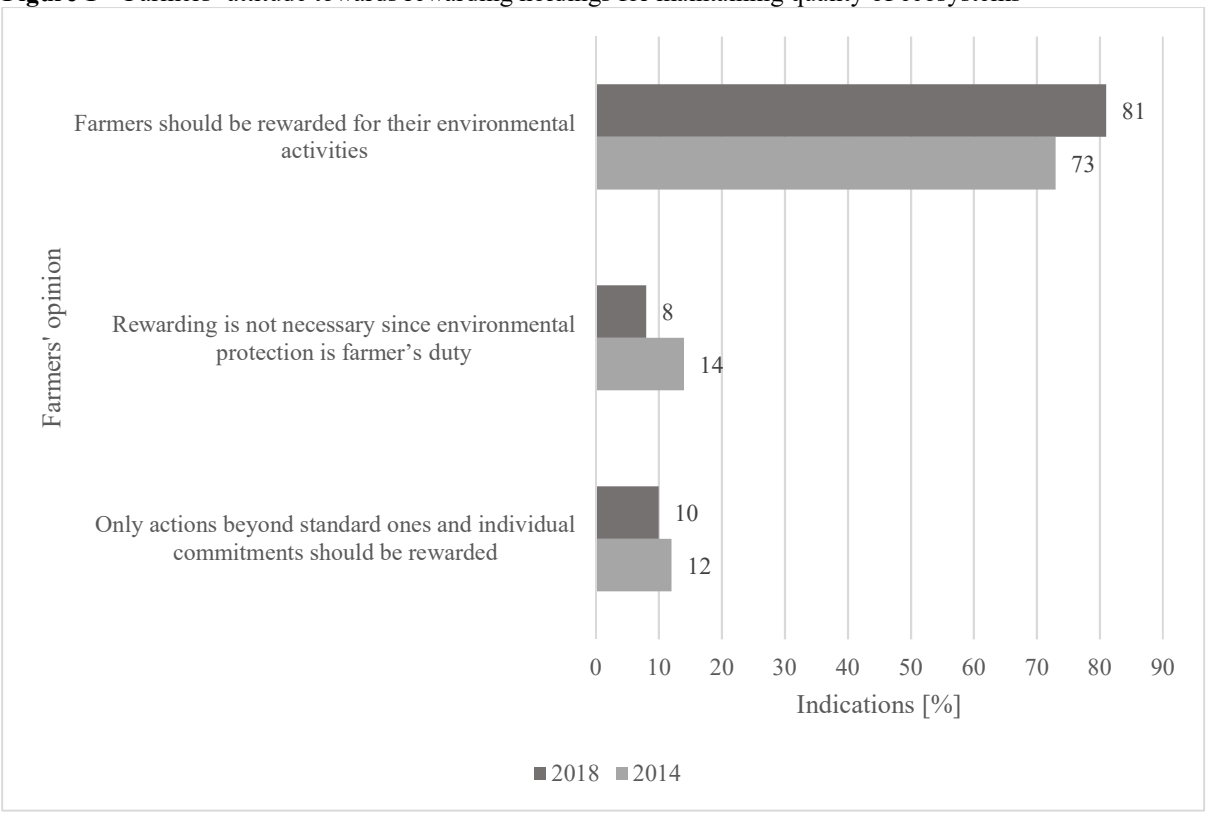
Type of ecosystem	Place in the ranking
Quality of soils	1
Quality of the air	3
Biodiversity	2
Landscape	5
Changes in climate	4

Source: Authors' own study based on the survey.

In the opinions of farmers, it is of primary importance to preserve the quality of soils and services rendered by ecosystems (biodiversity). On the other hand, climatic effects and value of the agricultural landscape are of lesser importance to them. In the examined population, there dominate holdings cultivating crops which have a rather beneficial impact on the climate and thanks to a large checkboard of fields they contribute to caring for the rural landscape.

It follows from the conducted research that the number of farmers who believe that agro-environmental activities should be rewarded is growing systematically (see Figure 1).

Figure 1 – Farmers' attitude towards rewarding holdings for maintaining quality of ecosystems



Source: Authors' own study based on the survey

On the other hand, the number of respondents who declare that securing services of ecosystems is written into farmer's profession and that only voluntary farming-environmental commitments which result from the specifics of the given place should be rewarded, is growing lower. Such opinions confirm the fact that there is a necessity of introducing changes into the management system of agricultural holdings.

3.2 The Cross Compliance Principle as a Source of Changes in the Agriculture of Opole Province

As far agriculture is concerned, preservation and reproduction of environmental services is closely connected with the system of agricultural production. This dependence was revealed in the effect of simple industrialization of farming in the EU 15 states, but also through those of collectivization of agriculture according to the schemata created as a consequence of socialist industrialization of agriculture. No wonder experimenting on universalization of the CAP has already supplied, and provided that the research tools are perfected – will continue to supply – relevant empirical material for analysis of the conditionings behind the ecological transformation of European agriculture. Recalling experts' opinions and original research on the CAP reform of 2003 [7, 4 5], their major directions can be indicated as follows:

- alterations in the agrarian structure, organization of holdings and technologies of production,
- institutional effects of implemented changes,
- environmental effects connected with preservation of historical landscape of rural areas and biodiversity,
- impact of agriculture on climatic changes.

The research confirms that in all of the above-mentioned spheres under analysis, the CAP reform of 2003 has contributed to a rise in the divergence in the EU agriculture in its regional (territorial) treatment, although the premise of "European green integration" has lain at the foundations of that reform.

The CAP reforms of 2003 and 2004 required relevant institutional environment (GAEC, SMR) as well as new structures of co-management of agriculture. In Poland, their implementation filled in the "institutional gap" that appeared as a result of the system transformation which commenced in 1989. The presented research concerning Opole Region showed that in the farmers' decision-taking process it is not only the market, but also institutional surrounding, whose attributes impact to a significant extent the competitiveness of agricultural produce, which are of importance. The institutional conditions that result from decoupling and the cross compliance principle have strengthened primarily the institutional capital of the Opole countryside. The normative solutions which were introduced agreed with the traditional values such as: respect for autonomous productivity of the land and care for its appropriate usage, ethos of work. The farmers in Opole Region displayed the largest interest of all the farmers in Poland in GAEC and SMR trainings [3], irrespective of their education. In the successive years, though, the wish to hold broad competences in the field of knowledge of environmental requirements relating to agricultural production weakened (see Table 2).

Table 2 – Farmers' self-evaluation concerning their knowledge of GAEC and SMR

Knowledge of the GAEC and SMR requirements	Indications [%]	
	2014	2018
I hold a full knowledge.	21	15
I am still going to get familiar.	10	16
I hold knowledge to the extent which is necessary to run my activity.	68	58
I am not interested.	1	11

Source: Authors' own study based on the survey.

One can point to two causes behind the weakening of the impulses generated by the new institutional surrounding:

- There were changes introduced into the organization and technology of agricultural holdings, which are compliant with the requirements of normative environment;
- There is a lack of systemic solutions to facilitate management of agricultural holdings – such elements of it as agricultural counseling, organization of support for agriculture, Internet platforms – have not been integrated.

Until 2019, in Poland, obtaining direct payments was dependent on respecting "the common farming culture". The GAEC and SMR requirements were binding exclusively in the case of beneficiaries of operational programs of rural areas development. Despite this, the knowledge of the requirements of the cross compliance principle, which was acquired, resulted in that the direct payments became the instrument of managing income risk in

agriculture. Like in all of the European regions where intensive (productive) agriculture has developed, they contributed to a more sustainable land management. Thanks to neighbor's tenancy agreements and buying out land from farmers abandoning agricultural production, the process of enlarging agricultural holdings in Opole Region [3], which had already been identified since 1990, accelerated. Holdings which have a larger area of land at their disposal were able to simplify the production structure, introduce new technologies and pursue narrower specializations [2]. Those changes, however, were dependent on the institutional environment included in the cross compliance principle.

Holdings specializing in growing crops are dominant in Opole Region. A full implementation of the SMR requirements and the integrated plant protection necessitate making constant changes in agrotechnology and perfection of decision-making process. The decisions which are taken serve endogenization of agriculture development in Opole Region and adjusting the crops structure to the habitat-related requirements (see Table 3).

Table 3 – Factors conditioning selection of crops for sowing

Criterion	Indications [%]	
	2014	2018
- habitat-related conditions – quality of land at the disposal	64	49
- interest in a variety on the part of receivers of farm produce	15	27
- popularity of a variety with other farmers	17	8
- resistance of a variety to diseases and pests	73	68
- suggestions from counsellors on farming	9	15
- price of seeds	31	26

Source: Authors' own study based on the survey.

The instance of the criteria which direct the farmers' decisions relating to selection of plants for sowing points to a growing significance of the market in this respect, as well as following agricultural counsellors' advice to a greater and greater extent.

3.3 The CAP-Promoted "Greening" as an Incubator of New Farming Practices in Environmental Protection

"Greening" has become synonymous with the CAP reform of 2017 [6]. The right to obtain direct payments was conditioned not only by abiding by the GAEC and SMR requirements, but also was made dependent on substitutive farming practices in the sphere of environmental protection, whose selection relied on the individual farmer's decision. The institutional change consisted in implementing the "provider gets" principle.

The requirements of "greening" dependent of the farmer's decision have been in force since 2015 and extend over farmers cultivating an area of at least 10 hectares of arable land. Greening introduces the requirement of diversification of crops in holdings of 10 hectares and more of arable land and maintenance of pro-ecological areas (the so-called ecological focus areas /EFA/) over at least 5% of the arable land which is at the disposal of the holdings whose total area exceeds 15 hectares. 30% of the domestic financial envelope is allotted to financing greening. The examined farmers based in Opole Region were asked how their incomes had changed in relation to the new formula of direct payments (see Table 4).

Table 4 – Assessment of the influence of changes in direct payments on holdings' incomes

Impact on the income	Indications [%]
- very substantial	10
- substantial	34
- insubstantial	33
- does not impact the income	14
- hard to assess	9

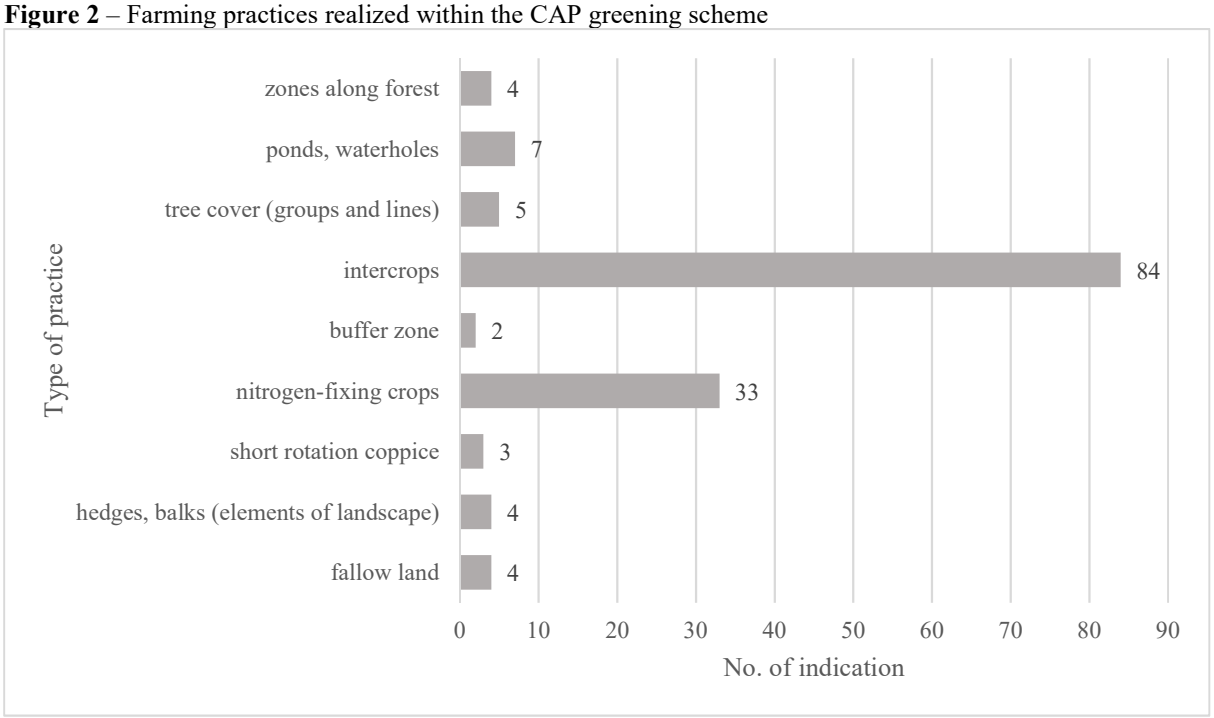
Source: Authors' own study based on the survey.

It follows from the data contained in Table 4 that according to 44% of the respondents, their incomes rose to a very substantial or substantial extent; however, answering another question, as many as 43% of the examined considered "greening" to be disadvantageous to farming.

The effects of the CAP "greening" in Polish agriculture made the object of studies by Wioletta Wrzaszcz [12], conducted among FADN holdings. Comparing the results of the research with those presented in this study, it

can be noticed that the practices of "greening" concern mainly diversification of crops. Among these practices, differently from other regions in Poland, there dominated aftercrops (plants binding nitrogen) and legumes in Opole Region (see: Figure 2).

Figure 2 – Farming practices realized within the CAP greening scheme



Source: Authors' own study based on the survey

Greening has also popularized growing soya, the European varieties of which are selected and propagated by the Experimental Station of Evaluation of Varieties in Głubczyce and the Agricultural Complex in Kietrz. Thanks to "greening" cultivation of soya can become an intelligent specialization of agricultural holdings in Opole Province. A greater interest in structure-forming plants in Opole Region is the effect of having covered modernization paths already in the past.

3.4 Farmers' Attitude Towards Voluntary Environmental Commitments

In the practice of environmental protection in agriculture to date, the only possibility of taking on individual commitments with regard to management of holdings' environmental function was farmers' participation in realization of various packets of agro-environmental and climatic programs. In schemes of rural areas development, which were realized in Poland beginning with 2006, their number was limited – 9 packets, only two of which were addressed to holdings of intensive production system: "Sustainable farming" and "Protection of soils and waters". It was already in the edition of research of 2014 that growing participation of farmers in realization of different packets of environmental programs was observed. In the case of the "Sustainable farming" packet it was 44% of the respondents in 2014. However, in 2018, the research conducted among the same population revealed a significant drop in the farmers' participation in realizing different agro-environmental packets. In the case of the above-mentioned one ("Sustainable farming"), it amounted to only 26% of the examined. In this situation, it is vital to get to know the sources of the dislike taken to such programs (see Table 5).

Table 5 – Main factors impacting the lack of farmers' interest in participating in realization of agro-environmental programs

Factor	Indications in 2018 [%]
- lack of interest in goals and requirements of programs	16
- dislike towards filling up successive applications	25
- conviction that obtained payments do not compensate the lost income	21
- doubts as to their environmental effectiveness	15
- construction of a program ought to be based on individual commitments	3

Source: Authors' own study based on the survey.

Bureaucratic impediments which the questioned pointed to as the major barrier to participation in agro-environmental programs, confirm the need for simplification of the CAP, but also prove that farmers expect not only financial support in the process of ecological modernization of agricultural holdings, but support in taking management-related decisions on changes introduced into their holdings, as well. The farmers are also interested in keeping documentation in the electronic form (48% of the indications), passing it to an integrated management system with the aim to obtain, in this way, some advice and suggestions from agricultural counselors and other experts.

Farmers from Opole Region do not like, either, the universal character of the requirements concerning realization of agro-environmental and climatic programs which do not take account of regional and local conditions. They, in their majority (66%), expect the requirements of the conditionality principle to be complemented with national, regional and local norms. In the opinion of 36% of the questioned, additional norms should be legislated by national governments, 31% believe that the proper level of their legislating is the region, whereas 21% want the norms to be introduced on the local level, together with the use of local programs of environmental protection as well as plans of spatial management.

4 Conclusions

- Strategic programming of environmental protection in agriculture and defining environmental norms in the EU require making thorough changes. The new model of managing the CAP introduces the national, regional and local levels into realization of its environmental functions, thanks to the strategic CAP plans prepared by member states. The need for such a transformation is confirmed also by farmers based in Opole Province.
- Agro-environmental programs have contributed to the ecological modernization of agricultural holdings to a considerable degree. The experience connected with their realization can be used in creating regional strategies of environmental protection in agriculture. The market does not reward farmers for managing the environmental function. Farmers' ecological commitments must offer the foundation of institutional contracts.
- Environmental regulations in agriculture are a source of expenses which can partially be compensated through implementing eco-innovations. Putting into practice the requirements of the cross compliance principle in agricultural holdings which operate in Opole Province has raised a need for new technological and organizational solutions. It can be supposed that the new conditionality system will strengthen processes of ecological modernization of agricultural holdings, chiefly by means of "feeding plans" and alterations made in the AKIS system.
- Securing stability of the natural capital, in particular – services of ecosystems – poses a challenge to regions with the intensive production system. As part of the strategy of sustainable intensification, each territory should search for its own developmental path which will look after the local, specific resources found within its space. Thanks to this, their value (rarity) can be transferred in products and commercialized in a variety of services.
- The conditionality system can make a source of endogenous institutional motivation which strengthens the effectiveness of processes of ecological modernization of agricultural holdings and sustainable development of rural areas.

References

[1] BAKER, S. (2006). *Sustainable development*, London-New York: Routledge.

[2] BISAGA, A., SOKOŁOWSKA, S. (2018). The role of instruments of the Common Agricultural Policy in securing sustainable development of rural areas a case study of Opole Province. *Ekonomia i Środowisko – Economics and Environment.* No. 1 (64), pp. 110-120.

[3] BISAGA, A., SOKOŁOWSKA, S., SZWIEC P. (2010). *Endogenne i egzogenne warunki trwałego rozwoju towarowych gospodarstw rolnych regionu opolskiego*, Wydawnictwo: Uniwersytet Opolski.

[4] BUCKWELL, A., UHRE, A.N., WILLIAMS, A., POLÁKOVÁ, J., BLUM, W.E.H., SCHIEFER, J., LAIR, G.K,. HEISSENHUBER, A., SCHIESSL, P., KRÄMER, C., HABER W., (2014). *Sustainable Intensification of European Agriculture* RISE Foundation, Brussels.

[5] CZUDEC, A., MIŚ, T., ZAJĄC, D. (2018). *Zrównoważony rozwój obszarów wiejskich w wymiarze regionalnym.* Poznań: Bogucki Wydawnictwo Naukowe.

[6] GOŹDZIEWICZ-BIECHOŃSKA, J. (2017). Zielona infrastruktura na obszarach wiejskich jako instrument polityki ochrony środowiska UE, *Studia Iuridica Lubinesia*, vol. XXVI, No. 1, pp. 211-226.

[7] HART, K., BALDOOCK, D., BUCKWELL, A., (2016). *Learning the Lessons of the Greening of the CAP.* A Report for the UK Land Use Policy Group in Collaboration with the European Nature Conservation Agencies Network, Institute for European Environmental Policy, London.

[8] EUROPEAN COMMISSION Brussels, 18.12.2013 SWD(2013) 532 final COMMISSION STAFF WORKING DOCUMENT EXECUTIVE SUMMARY OF THE IMPACT ASSESSMENT

[9] KOCISZEWSKI, K. (2013*). Ekologizacja polskiego rolnictwa a jego zrównoważony rozwój w warunkach członkostwa w Unii Europejskiej*, Wyd. UE we Wrocławiu, Wrocław.

[10] MENSAH, J. (2019). Sustainable development: Meaning, history,principles, pillars, and implications for human action: Literature review, https://doi.org/10.1080/23311886.2019.1653531 *Cogent Social Sciences*,5:1, 1653531, DOI: 10.1080/23311886.2019.1653531

[11] SIEKIERSKI, C. (2020). *Uwarunkowania rozwoju polskiego rolnictwa w kontekście zmian ustro-jowych, integracji z UE oraz ewolucji wspólnej polityki rolnej.* „Zagadnienia Ekonomiki Rolnej/Problems of Agriculture Economics", No.1(362), s. 122-137.

[12] TITTONEL, P. (2014). Ecological intensification of agriculture – sustainable by nature. *Current Opinion in Environmental Sustainability*. No. 8, pp. 53-61, http://dx.doi.org/10.1016/j.cosust.2014.08.006.

[13] WRZASZCZ, W. (2017). Skutki zazielenienia Wspólnej Polityki Rolnej na przykładzie gospodarstw prowadzących rachunkowość rolną, *„Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu"* t. XIX, z. 4, pp. 231-237.

[14] WRZASZCZ, W., PRANDECKI, K. (2020). Rolnictwo a europejski zielony ład, *„Zagadnienia Ekonomiki Rolnej Problems of Agricultural Economics*" t. 365 z. 4, pp. 156-179.

Evaluation of the Impact of the COVID-19 Pandemic on Cross-Border Cooperation of SMEs in the Field of Implementation of Open Innovations

Katarzyna Czerná[1], Hana Štverková[1]

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Business Administration
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
katarzyna.czerna@vsb.cz, hana.stverkova@vsb.cz

Abstract

Within a vibrant business ecosystem, innovations are constantly metamorphosing into a determinant for survival and generating a competitive advantage in the market. This course is frequently becoming apparent in a pandemic as especially SMEs have been obliged to change the business model to survive. One of these models is the open innovation model. This is welcome, especially in cross-border areas, where the cooperation with external partners, spreads beyond national borders. The aim of this paper is to evaluate the impact of the COVID-19 pandemic on cross-border cooperation of innovative SMEs in the field of implementation of open innovations, focusing on small and medium-sized enterprises in the border regions Cieszyn Silesia and Beskydy in Poland and the Czech Republic. The surveyed innovative SMEs understand and implement the idea of open innovations to create innovative projects, especially of a process nature (because they cooperate with external entities in the process of creating innovations). Concerning the geographic positions of regions, the range of the geographic impact of innovations arising in the open model of innovations is transnational. The main common feature is that even though both parties display signs of open innovation, the open innovation model is not part of their innovation strategy.

Keywords: *innovative SMEs, open innovation, pandemic COVID-19*

JEL Classification: *M10, O31, O36*

1 Introduction

The process of growing intensification, globalization and modifications of the widely known manners of competition in the forms of digitalization, the increasing influence of knowledge flexibility of a corporate organization based on a well-developed structure belongs among the most significant determinants for changes not only the range but also forms itself of cooperation between enterprises, including those with innovative character. This trend is becoming even more crucial, especially now, during the COVID-19 pandemic, when due to the slowdown in the growth of national economies, companies were forced to face unknown pitfalls and fight for bare survival. This situation led them to change quickly and adapt to the situation. Therefore, innovations are now considered a fundamental factor and the key to success in the extension and development of the organization and its survival itself. It can be stated that, consequently, the capacity to learn, improve business competencies, gain new skills constantly and its transformation into an innovation becomes the driving force behind the development of every organization, especially in the case of small and medium-sized enterprises, whose organizational structure and flexibility allow for a rapid response to change.

SMEs represent a determinant part of most countries' national economies due to their capability of creating a healthy business environment and growth support not only of the national economy but also in cities and separate regions. Their importance is also evidenced by the fact that SMEs represent 99% of all companies in the European Union. In this paper, SMEs are understood according to the EU Recommendation 2003/361; see Table 1.

Table 1 –Typology of SMEs

Company category	Staff	Turnover or	Balance Sheet Total
Medium-sized	<250	≤ € 50 m	≤ € 43 m
Small	< 50	≤ € 10 m	≤ € 10 m

Source: EU Recommendation 2003/361

Nowadays, also due to pandemic challenges, in particular the speed of shifts in the business environment, increasing costs, and the risk of failure, the implementation of complex, innovative projects without cooperation with the other companies and other groups of interest is nearly impossible. Such a development means the possibility of implementing the concept of the open innovations by Lichtenthaler (2011), understood as systematic invention, acquisition, preservation, and use of knowledge inside and outside the organization as a result of innovative processes implemented in cooperation with various actors of the environment (Chesbrough 2003).

A company implementing innovation projects requires specialist knowledge obtained from numerous sources due to operating with supply chain partners, competitors, institutional partners, universities, and academic partners (Chesbrough, Wanhaverbeke and West, 2006). Process of use knowledge can have non-financial implications, such as implementing innovative projects with co-operators, as part of strategic alliances and also financial implications (commercialization of knowledge, sales of knowledge licenses). The advantage for SMEs operating in border areas is the possibility of cross-border cooperation and the use of other markets and functioning solutions and best practices of a foreign partner.

For this reason, this paper aims to evaluate the impact of the COVID-19 pandemic on cross-border cooperation of SMEs in the field of implementation of open innovations, focusing on small and medium-sized enterprises in the border regions Cieszyn Silesia and Beskydy in Poland and the Czech Republic. Attention was paid to innovative SMEs because, according to the Oslo Manual (2018), an innovative enterprise implements one or more innovations during the observation period. Furthermore, in the case of such enterprises, it is possible to assess aspects of open innovation. This description refers equally to companies engaged in specific innovation independently or collectively with other entities. From this point of view, innovative activity may be sustained, discontinued, performed, or abandoned. At the same time, this research will provide some guidance for other companies from other cross-border areas on how to translate closed innovations into a model of open innovation and thus reap the benefits of localization and membership of the European Union.

2 Literature Review

The open innovation concept originated to modify the common and well-known in the environment of innovative companies, innovation process invented and implemented inside the company and exclusively with the use of its internal resources, from a process based on the application of ideas originating from both inside and outside the company, i.e., internal, as well as external ways of introducing a new product (Muška et al., 2009).

This idea of connecting both types of resources through the formulation of inter-organizational bonds and various types of innovation networks is not original; it has been highlighted many times in the empirical and theoretical works existing in the literature in this area (Hung and Chou, 2013; Van de Vrande et al, 2009). On the other hand, new is the association of seemingly radically different directions of knowledge and technology transfer, the processes of external exploration and use of knowledge (exploitation). Cheesbrough (2003) first described this topic and referred to the thought of open innovation for use the deliberate entrance and outflow of knowledge. The external knowledge acquisition explains how corporations secure entrance to shallow roots of technical and technological knowledge to supplement their resources and improve contemporary technological solutions. The transformation of the innovation model from closed to open necessitates unavoidable consequences, particularly in the field of cooperation management in innovation, as well as increasing the risk of losing control of resources, where the need to protect the intellectual property of the parties involved in it increases (Procházka, 2009, Guertler and Sick, 2021).

The main reasons for diverging from a closed to an open model of innovation are globalization, development of intellectual property protection, increasing mobility on the labour market, or the development of new technologies, especially ICT, which have an impact on innovative activity (Hilmersson and Hilmersson, 2021). Other crucial factors are the development of new forms of organization and cooperation of enterprises, reducing the life cycle of innovation, products, and technologies, high costs of research and development activities, diffusion of knowledge resources, or the necessity to combine different technologies in order to take the intended enterprise (Kozarkiewicz, 2010). Implementation of the open innovations assumes a certain level of involvement of external participants at all stages of the innovative process, starting from inventing an idea and ending with

the stage of product implementation. The use of external participants in innovative processes makes it possible to reduce costs and risks in research activity or achieving economies of scale. It becomes possible also the phenomenon of technological convergence and resource synergy. The opening of the innovative model in a company may take place according to three patterns: centrally (the inward), where dominates the flow of innovation from the environment to the enterprise, the outside where the innovation flow process commands from the enterprise to the environment; and mixed, where the flow of innovation takes place through the cooperation of enterprises within business networks or strategic alliances (Grimaldi, Greco and Cricelli, 2021). The degree of openness of the innovation process should be individually defined by each enterprise, depending on on the specifics of the conducted activity and the implemented business model.

The COVID-19 pandemic whirled the market conditions and forced many SMEs to handle the subject of continuing and stimulating their activities. On the other hand, the pandemic time can positively affect SMEs' willingness to implement or even start innovation activities (Urbaniková et al., 2020), even in the field of cross-border cooperation. Although the closure of borders as part of anti-epidemic measures posed a particular obstacle, digitization and operation in the online space helped establish and maintain cooperation.

3 Material and Methods

The authors focused their research on the area of Cieszyn Silesia, with an overlap to the Beskydy region on the Czech and Polish sides. Cieszyn Silesia signifies one of the euroregions with transnational co-operation arrangements between Poland and the Czech Republic and consists of:

- Twelve municipalities of the Cieszyn County, two municipalities of the Bielsko County, one municipality in Wodzisław County, and Jastrzębie Zdrój in Poland.
- Sixteen municipalities of the Karviná District and 27 municipalities in the eastern part of the Frýdek-Místek District in the Czech Republic.

Part of the historical area of Cieszyn Silesia, particularly Bielsko-Biała, Czechowice-Dziedzice and Frýdek-Místek fall under the Beskydy region.

The SMEs were selected from a database of innovative enterprises created during previous research also concerning innovation activities. Thirty companies on each side of the border were contacted; 25 companies from Poland and 20 companies from the Czech Republic replied. Therefore, the sample was unified into 40 companies (20 from each side of the examined region), all domestically owned. In the sample, the majority were manufacturing companies (46 % CZ, 53 % PL), followed by software companies (37 % CZ, 29 % PL). Only a minority of the sample creates service companies (17 % CZ, 16 % PL).

The questionnaire contained three primary parts. In the identification part (9 items), attention was paid to the classification of the surveyed companies concerning their field of operating and critical features of innovation activities. The second part contained ten closed questions regarding various choice questions related to pandemic challenges for monitored companies in the field of innovative cooperation. Finally, the last part dealt with seven crucial features of SMEs innovation indicators, where respondents indicated the level of their approval concerning those involved in the questionnaire statements on the 5-point numerical Likert attitude scale (from 1 - *I strongly disagree* to 5 - *I strongly agree* with a presented statement). Seven essential characteristics related to the openness of innovation in the monitored companies understood as:

- innovative efficiency of the enterprise
- creating innovation groups,
- the level of absorption of knowledge of the enterprise (understood in the sense of the degree of assessment of the importance of the company's internal resources for innovative activities),
- use of external sources of knowledge,
- standardization of different types of innovation activities
- continuous management of researchers,
- intellectual-property measures.

Then, a correlation analysis was performed using Spearman's rank correlation coefficient (significance level of 5 %) to determine the relationships between the external knowledge gaining, its transmission to the transboundary environment and indicators that reflect the level of innovation of SMEs. Spearman's ρ is a nonparametric measure of rank correlation (statistical relation between the rankings of two variables), which estimates how strong the relationship between two variables can be described using a monotonic function.

4 Results and Discussion

Before the pandemic in the Czech part of the surveyed area, only 35% of the addressed companies implemented open innovations within their business. Following the outbreak of the pandemic and the initial six-month phase of the reorientation and anchoring effort, up to 57% of these organizations have joined the open innovation model in the new reality. Cross-border cooperation became more pronounced after the onset of the pandemic, as up to 42% of the original 26% of companies turned to foreign partners. Within the Czech research area, relations between the buyer and the supplier prevail to secure reliable supplies (68%), followed by strategic alliances between entities that do not compete (23%). Before the pandemic onset, the Czech side most often involved the partners until the last step of the innovation process, i.e., the launch and market penetration itself (83%). The first three steps of the innovation process appeared in the answers only in lines of percent. The pandemic caused monitored SMEs on the Czech side to involve partners in the initial phase, i.e., the generation of ideas (34%) and product development (31%). In this respect, the concept development phase lags (15%), see Table 2.

Table 2 – Challenges during a pandemic - Czech researched companies.

Aspects	**Before COVID-19**	**During COVID-19**
Implementation of OI	35 %	57 %
Cross-border cooperation	26 %	42 %
Relation Buyer-Supplier	56 %	68 %
Strategic alliances	18 %	23 %
Idea generation phase	2 %	34 %
Concept phase	3 %	15 %
Product phase	6 %	31 %
Market phase	83 %	89 %
OI as a part of the strategy	NO	NO

Source: own research

The results of the Polish side of the study area were utterly different in many respects. Even before the pandemic, the open innovation model was more robust, as in 59% of the organizations surveyed. At the same time, this trend intensified in the pandemic period, when this share rose to 71%. Cross-border cooperation, i.e., the use of localization and EU membership benefits, was already evident before the pandemic in 34% of the surveyed companies and with the onset of the pandemic in as many as 51%. On the Polish side of the surveyed area, innovative SMEs preferred cooperation within strategic alliances between non-competitors (46%), followed by cooperation with the academic environment (35%). Even before the pandemic, there is an apparent effort to involve partners at all levels of the innovation process: 26% in the generation idea phase, 29% in the concept development phase, 17% in the product development phase, finally 42% in the launch and market penetration. With the pandemic onset, the concept development phase, in particular, comes to the fore in 48% of cases, and the idea generation phase lags (18%), see Table 3.

Table 3 – Challenges during a pandemic - Polish researched companies.

Aspects	Before COVID-19	During COVID-19
Implementation of OI	59 %	71%
Cross-border cooperation	34 %	51 %
Strategic alliances	39 %	46 %
Academic cooperation	27 %	35 %
Idea generation phase	26 %	18 %
Concept phase	29 %	48 %
Product phase	17 %	26 %
Market phase	42 %	42 %
OI as a part of the strategy	NO	NO

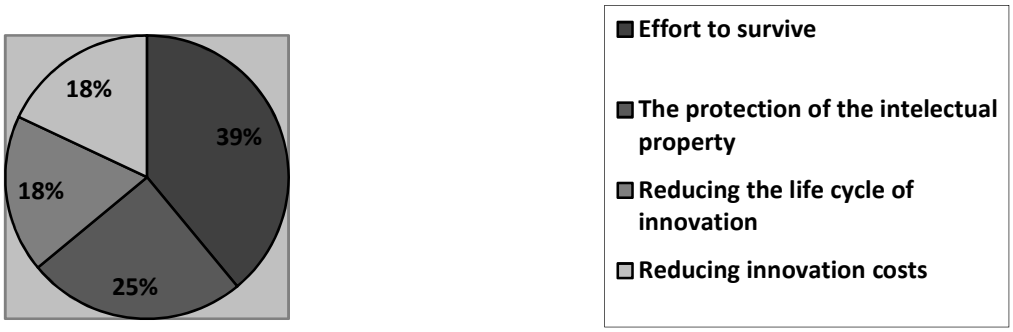
Source: own research

In the monitored region (on both sides of the border), the most common reason for transforming the closed innovation model into an open innovation model was the effort to increase mobility in the labour market, reducing the life cycle of innovation or reducing innovation costs. After the pandemic outbreak, the most common reason monitored by SMEs was the effort to survive, the protection of intellectual property, see Figure 1 and Figure 2.

Figure 1 – Problems before COVID-19

Source: own research

Figure 2 – Problems after COVID-19



Source: own research

The last part of the research was focused on finding the relationships between the critical parts of the open innovation process (i.e., external acquisition of knowledge and technology and its external use) and factors

determining the level of innovation of individual companies, where Spearman's rank correlation coefficient was used for their quantification. The results of this analysis are shown in Table 4.

Table 4 – Correlation analysis of relationships between OI processes and aspects of innovativeness of SMEs.

Aspects of innovation of SMEs	External acquisition of knowledge	External transition of knowledge
Innovative efficiency of the enterprise	0,835**	0,874**
Creating innovation groups	0,476**	0,205**
The level of absorption of knowledge	0,821**	0,436**
Use of external sources of knowledge	0,354**	0,786**
Standardization of different types of innovation activities	0,768**	0,342**
Continuous management of researchers	0,777**	0,703**
Intellectual-property measures	0,234**	0,870**

Source: own research

The research revealed clear and robust relations between the external acquisition of knowledge and the level of absorption of knowledge, standardization of different types of innovation activities, continuous management of researchers. These factors condition successful acquisition and absorption of knowledge from the external environment. On the contrary, the transition of knowledge to the external environment has very strong correlations with use of external sources of knowledge, continuous management of researchers, and intellectual-property measures. A unique and, to some extent, the separate item is the innovative efficiency of the enterprise, as it affects both parts of the open innovation process.

5 Conclusion

Innovation in recent turbulent and uncertain crises caused by the COVID 19 can be seen as a way for the durability of companies, especially SMEs, which do not have economic and infrastructural comfort comparable to large companies but are more adaptable in reacting to potential developments and courses in the markets. Therefore, SMEs can also apply the principles of open innovation in their business, where they can obtain sufficient resources and support. This is possible, especially in border areas, where this cooperation goes beyond national borders. The research showed that although the addressed innovative SMEs operated in the neighbouring territory of the Euroregions, where the region is somewhat understood as one cooperating unit with similar developments, both historical and economic, national differences exist, even in terms of the changes brought about by the COVID-19 pandemic.

The Polish SMEs surveyed were characterized by a higher level of openness to cooperation with external partners, i.e., in applying the open innovation model, even before the pandemic. This trend was further strengthened after the pandemic outbreak, when after the initial, to some extent incubation phase, when companies tried to orient themselves in the conditions of the new normality, the surveyed Polish SMEs placed more emphasis on open innovations. The research also showed an effort to involve external partners in all phases of the innovation process. On the other hand, at least often, the Polish SMEs surveyed decided to cooperate in the production phase of the innovation process. There are also concerns about the loss of know-how and sensitive innovative data. At the same time, the authors proved involvement in the model of open innovations and foreign partners (in the case of Czech research). This fact supports the thesis of the specificity of border areas, where border areas are often perceived by the population and society as a whole, so the foreign partner is also perceived as an opportunity to expand markets rather than a threat.

On the Czech side of the studied area, in the case of SMEs, they are less willing to introduce the model of open innovations than on the Polish side, although the concept of transnational cooperation is not foreign to them. The problem is trust in partners, where external collaborators are more involved in the final phase of the innovation process, i.e., launches and marketing activities. So there is still an evident concern about sensitive know-how. Although the pandemic has paradoxically improved this situation, as companies have been forced to look for

other sources for innovative projects and thus for market survival, the results in the conceptual phase are not yet sufficient. One way to solve this problem is to introduce adequate protection of intellectual property.

The surveyed innovative entities operating on the Polish and Czech side of the studied region know and apply the idea of open innovations to create innovations (because they cooperate with external entities in the process of creating innovations) and concerning the geographic conditions of regions, the scope of the geographic impact of innovations arising in the open model of innovations is over local and also national. The main common feature is that even though both parties show signs of open innovation, specifically, the open innovation model is not part of their innovation strategy.

The research indicated the exact integration of the external acquisition of technology and external use of this technology beyond the borders of a particular company as two sides of the open innovation system. This aspect significantly influences the innovation management processes in present SMEs due to the potential interdependencies. It also confirmed the influence of factors determining the level of innovation of individual companies on these two critical processes of open innovation.

The research was limited by the amount of data, as innovative cross-border SMEs are not very common in the examined border region, but can mean a deeper analysis of other border regions, at the same time, analysis of measurable results stemming from open innovations during a pandemic. This research also provides some guidance for other SMEs in the researched area into an open model of innovation, but also how to start innovating. It can be prognosticated that SMEs, thanks to an adequately established open innovation process incorporating into an innovation strategy, can improve their performance and strengthened their market position. Even a pandemic can positively transform the competitiveness of small and medium-sized enterprises and empower them to function effectively in times of crisis.

Acknowledgements

Support of the Student Grant Competition – project “SP2020/107".

References

[1] European Commission (2021). *Entrepreneurship and Small and medium-sized enterprises (SMEs).* [online]. [cited 2021-04-10]. Available from: https://ec.europa.eu/growth/smes/sme-definition>

[2] CHESBROUGH, H. W. (2003). Open Innovation: The New Imperative for Creating and Profiting from Technology. Boston: Harvard Business School Press.

[3] CHESBROUGH, H. W., WANHAVERBEKE, W., WEST, J. (2006). *Open Innovation: Researching a New Paradigm.* Oxford: Oxford University Press.

[4] GRIMALDI, M., GRECO, M., CRICELLI, L. (2021). A framework of intellectual property protection strategies and open innovation. *Journal of Business Research.* Vol. 123, pp. 156-164.

[5] GUERTLER, M. R., SICK, N. (2021). Exploring the enabling effects of project management for SMEs in adopting open innovation – A framework for partner search and selection in open innovation projects. *International Journal of Project Management.* Vol. 39, No. 2, pp. 102-114.

[6] HILMERSSON, F. P., HILMERSSON, M. (2021). Networking to accelerate the pace of SME innovations. *Journal of Innovation & Knowledge.* Vol. 6, No. 1, pp. 43-49.

[7] HUNG, K-P., CHOU, Ch. (2013). The Impact of Open Innovation on Firm Performance: The Moderating Effects of Internal R&D and Environmental Turbulence. *Technovation.* Vol. 33, No. 10-11, pp. 368-380.

[8] KOZARKIEWICZ, A. (2010). Współczesne trendy w innowacyjności – w kierunku otwartych innowacji. *Przegląd Organizacji*. Vol. 5, pp. 20-23.

[9] LICHTENTHALER, U. (2009). Outbound open innovation and its effect on firm performance: examining environmental influences, *R&D Management.* Vol. 39, No. 4, pp. 317-330.

[10] MUŠKA, M., KRÁLÍK, J., HÁLEK, V. (2009). *Otevřená inovace - Přístup překračující známé meze*. Bratislava: DonauMedia.

[11] OECD (2018). *Oslo Manual 2018*. [online]. [cited 2021-04-10]. Available at: https://www.oecd.org/sti/oslo-manual-2018-9789264304604-en.htm>

[12] PROCHÁZKA, L. (2010). Inovace obchodních modelů v prostředí otevřených inovací - Aplikace Business Model Canvas. In: *Jak se zastavil a změnil svět*. Praha: Oeconomica, 2010.

[13] URBANÍKOVÁ, M. et al. (2020). Analysis of Innovation Activities of Slovak Small and Medium-Sized Family Businesses. *Administrative Sciences*. Vol. 10, No. 4, pp. 80.

[14] VAN DE VRANDE, V., DE JONG, J. P. J., VANHAVERBEKE, W., DE ROCHEMONT, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*. Vol. 29, No. 6-7, pp. 423-437.

Evaluation of the Use of Selected Residential Social Services for the Elderly: The Position of the Moravian-Silesian Region with regard to the other Regions of the Czech Republic

Izabela Ertingerová

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
izabela.ertingerova@seznam.cz

Abstract
The growing demand for social services is closely related to the issue of demographic aging of the population, not only in the residential, ambulatory but also in field areas. Not only the Czech Republic, but also other European countries are facing a growing demand for placement in residential social facilities. According to valid Czech legislation, residential social services are part of social care services and serve to ensure dignified treatment and self-sufficiency of persons in the least restrictive environment. The scope and availability of residential social services is not the same in al the regions of the Czech Republic, which is reflected in the total number of users of these services. The aim of the paper is to define, describe and evaluate the intensity of the use of selected residential social services for seniors in the regions of the Czech Republic, also with regard to defining the position of the Moravian-Silesian region among the other regions. The analysis is performed for the defined reference period 2011-2019. Among the selected residential social services, homes for the elderly and homes with a special regime were chosen, the target group of which consists of persons aged 65+. Since 2011, the analysis has shown a growing number of users of the homes with special regime service across all regions of the Czech Republic and, conversely, a slightly declining number of users of the homes for the elderly service. The findings confirm the growing need for residential social services for people diagnosed with dementia. Selected residential social services were used mainly by women rather than men.

Keywords: *elderly people, Moravian-Silesian region, regions, residential social services*

JEL Classification: *H55, J11, J14*

1 Introduction

In recent years, not only the Czech Republic but also foreign countries have been struggling with demographic aging. Demographic forecasts of the Czech Statistical Office (2004, 2019) assume that in 2050 changes in the age structure of the population will have a significant effect, especially in the case of seniors (persons aged 65+). It is expected that in 2030 the proportion of older people will increase to such an extent that every fourth person in the total population will represent a person over 65+, and in 2050 it will be every third person. These large changes in the structure of the population will also be reflected in the average age, which in 2050 will be in the range of 48 to 50 years, which is 10 years more than at present.

According to Vágnerová (2007), the process of old age is accompanied by a change in the way of life, especially within the framework of physical and social skills. Certain changes can also be seen in the economic, health,

social and personal spheres. The changes are also confirmed by the United Nations (2013), which states that aging is an unprecedented and lasting process leading to profound global socioeconomic consequences.

The quality of life in old age is able to be positively influenced to a certain extent by long-term readiness for old age. Thanks to general knowledge and advances in modern medicine, the level of quality of life and mental well-being of the population is increasing (Havelsrud et al., 2014). However, it is essential to lead the population to old age preparedness. Since 2003, the Ministry of Labor and Social Affairs of the Czech Republic has been regularly preparing and publishing strategic documents: The National Program for Preparation for Aging, The National Action Plan Supporting Positive Aging and The Strategy for Preparation for Aging, which comprehensively deal with the issue of preparing the population for aging and improving the position of seniors in society. As reported by Průša et al. (2015), Xavier et al. (2003) and Walsh et al. (2017), seniors are among one of the most vulnerable groups of the population, not only in terms of their position in society but also due to the threat of social exclusion. The main reasons include a combination of various factors, such as health status, standard of living, marital status, low level of education, unavailability of care and services, social or age discrimination, etc.

Kane (2015) emphasizes that the aging of the population is closely related to the area of social services, which is gaining increasing interest in this context. Specifically, it is possible to talk about the increased demand for long-term social and health care services. Long-term social and health care is most often provided as part of a residential form, i.e. in social and health care facilities. The most frequently requested social services include homes for the elderly, special regime homes, week care centers, protected housing, or residential respite care, etc. These are services whose care includes, among other things, the provision of accommodation, personal and health care. Users of residential social services are characterized by a grade of dependence on the assistance of another physical person (they are not able to manage basic daily living needs on their own).

The paper focuses on selected types of residential social services, specifically homes for the elderly and special regime homes. These are residential social services, the users of which are mainly persons over the age of 65. Due to the different territorial and settlement structure, it can be said that the offer of selected residential social services for seniors and the number of their users differs at the level of higher territorial self-governing units - regions - of the Czech Republic. The aim of the paper is to define, describe and evaluate the intensity of the use of selected residential social services for the elderly in the regions of the Czech Republic, also with regard to the position of the Moravian-Silesian Region among the other regions. The analysis is performed for a defined reference period 2011-2019.

2 Theoretical Background

Currently valid Czech legislation and professional literature are not uniform in defining the term senior. These people are generally referred to as elderly people or old-age pensioners. In this context, Šerák (2009) points out that the age limit for the definition of an elderly person (senior) was originally at the level of 60 years, but in recent years the limit has been moved to the age of 65 years. The Ministry of Labor and Social Affairs (2021) distinguishes according to age two categories of seniors - younger seniors (65-80 years) and older seniors (over 80 years).

Prior to the change of regime until 1989, social services were provided to a limited extent in accordance with Act No. 100/1988 Coll., On Social Security. The provision of care for the elderly was provided only within the form of institutional care, namely state retirement homes, whose activities were financed by the state. A significant gap in the legislation was seen in the absence of the quality of social services provided and the protection of the rights of service users. Since 1989, there has been a gradual change in the concept of social services, mainly due to non-profit organizations that have focused intensively on service users, their rights and protection. In the field of social services, concepts such as social inclusion, prevention of social exclusion and the effort to define parameters leading to the provision of social services in a certain quality began to be used (Malíková, 2020).

In the Czech Republic, residential social services are regulated by Act No. 108/2006 Coll., The Social Services Act, as amended. This law defines residential services as services that are associated with accommodation in social services facilities. Selected residential social services (homes for the elderly, special regime homes) fall into the group of social care services and are intended for persons who are characterized by reduced self-sufficiency due to age, health or chronic mental illness and therefore require on the assistance of another physical person. Most residential facilities are managed within regional and municipal founders, or other (non-state) founders.

The demand for placement in residential social facilities occurs most often when seniors are no longer able to stay in their natural social environment and take care of themselves due to old age or health status. As stated by Vágnerová (2008), placement in a residential facility represents a fundamental lifestyle change for seniors, which is associated with more difficult and long-term adaptation. However, Glass and Plaats (2014) state that

aging in a community of people of a similar age category provides seniors with mutual support, a sense of security and eliminates social isolation. According to Železná (2018), it is necessary to pay increased attention to the connection and openness of residential facilities with local communities, families and intergenerations. Dvořáčková (2012) confirms the statement and states that this eliminates social isolation and creates new relationships.

The approach of the regions of the Czech Republic to the issue of providing social services for the elderly can be considered very similar. According to the strategic documents of individual regions - Medium-term plans for the development of social services - it can be stated that the goal of all regions is to provide seniors with access to long-term social care, in all forms (outpatient, field, residential) with emphasis on the appropriate level of quality. The priority of the regions is to keep seniors in their natural social environment as long as possible and thus preserve their social and societal ties. The availability of residential services should be primarily aimed at people with a high degree of dependence on the assistance of another physical person. Also due to the growing number of people diagnosed with dementia, the regions support the gradual transformation of bed capacities from homes for the elderly to the service of special regime homes.

The Moravian-Silesian Region, similarly to other regions, has long been conceptually focused on the support and development of social services in its territory. The Medium-Term Plans for the Development of Social Services issued so far respond to the changing realities in the field of social services since 2007, including the ongoing identification of needs by local people. The target group of seniors is also the subject of increased interest of the region. The priority of the region is to focus on the quality of services provided in order to support their increase with system tools, and also to ensure the availability of field and outpatient services in sufficient capacity to prevent the use of residential services. However, it is clear that the current availability and pace of increasing the capacity of residential social services is not able to respond effectively enough to the growing number of seniors, especially due to the demographic aging of the population (MSR, 2020).

3 Material and Methodology

The paper focuses on the analysis and evaluation of the use of selected residential social services, the target group of which is mainly people over 65 (seniors). The analysis is carried out at the level of the regions of the Czech Republic. The subject of interest is a selected group of residential social services, namely homes for the elderly and special regime homes. The aim of the paper is to define, describe and evaluate the intensity of the use of selected residential social services for the elderly in the regions of the Czech Republic, also with regard to the position of the Moravian-Silesian Region among the other regions. The research is carried out for the reference period 2011-2019, i.e. from the year when the last Census of Population, Households and Dwellings was carried out.

The research is focused on the analysis of i.) the total number of users of selected residential social services, ii.) the structure of users of selected residential social services by gender (male, female), iii.) the relationship between the number of users of selected residential social services and the total number of seniors, iv.) the relationship between the number of users of selected residential social services and the number of recipients of care allowance in senior age. Users of residential social services are defined as persons who were officially registered in the monitored years that they used the given services in the regions. For the purpose of analyzing the relationship between the monitored parameters, the Spearman and Pearson correlation coefficient was used for all monitored years. The Bootstrap method was used to determine the reliability of the resulting values of correlation coefficients.

The database was created from data taken from public statistical databases, specifically from the Statistical Yearbooks of the Ministry of Labor and Social Affairs, from basic statistics of the Ministry of Labor and Social Affairs and from the public Register of Social Service Providers. Data on the development of the number of seniors in individual regions of the Czech Republic were taken from the statistical yearbooks of the Czech Social Security Administration. The data are processed using standard methods of explanatory statistics within a graphical and tabular display.

To fulfill the defined goal, three research questions (RQ) were formulated, which will be answered with regard to the achieved results from the performed analyzes:

RQ1 *What is the difference in the use of selected residential social services in the observed period 2011-2019?*

As stated by Horecký, Průša (2019), the demand for social services affects not only the demographic aging of the population, but also the health status of the population, i.e. the number of people diagnosed with dementia. These are factories that have a significant impact on the requirements for the availability and scope of social services in individual regions of the country. The findings are in accordance with the outputs of the analyzes of the authors Kubalčíková, Havlíková (2016), Kašparová, Křupka, Jirava (2016) or Langhamrová, Šimková, Sixta (2018).

RQ2 *Do selected residential social services for the elderly use mainly women than men?*

The use of residential social services depends on the age, health status of the senior and the grade of dependence on the assistance of another physical person. According to the results of the 2011 Census of Population, Households and Dwellings, the structure of seniors in households changes with age. It has been identified that seniors under the age of about 74 live in the same household. However, the increasing intensity of deaths in older age leads to more frequent living of an individual alone in the household. In general, the proportion of older people is higher for women than for men. This is due, among other things, to the fact that the average life expectancy of women is longer than that of men, but also of the lower retirement age.

RQ3 *Is the Moravian-Silesian Region one of the regions with the highest number of users of selected residential social services in relation to the total number of seniors?*

According to data from the Czech Statistical Office (2019), it follows that the age structure of the population in all regions has developed relatively uniformly since 2011. The age group of the population 65+ increased the most. Until 2017, certain deviations in the share of seniors in the total population in the capital city of Prague and in the Central Bohemian and Karlovy Vary regions were detected. When examining the number of service users, it is also necessary to consider the number of registered providers of selected residential social services for the elderly.

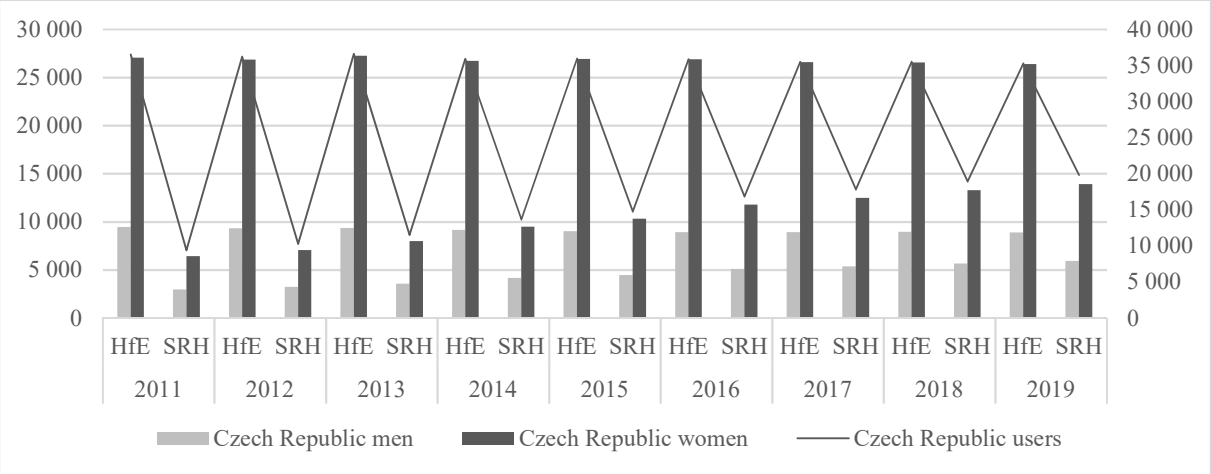
4 Research Results

The Ministry of Labor and Social Affairs, as the creator of social and preparation policies for aging, is based primarily on projections of demographic aging of the population, the health status of seniors, which is significantly improving thanks to modern medicine, and analyzes of current population needs. Their financing also plays an important role in the area of residential social services. In particular, funds from public budgets represent a significant part of the total revenues of individual providers, so their annual dependence on their recognition and payment is obvious.

4.1 Number of Users of Selected Residential Social Services

Every year, the Ministry of Labor and Social Affairs registers the total number of users of social services within the individual regions of the Czech Republic. Figure 1 shows the development of the number of users of selected residential social services for the elderly (HfE - Homes for the Elderly, SRH - Special Regime Homes) for the period 2011-2019. From Figure 1 it is clear that in terms of the number of users, the dominant residential service is the home for the elderly (HfE). The total number of users of this service was the highest especially in the years 2011 to 2013, when the service was used by approximately 36,500 seniors. Since 2014, a slight decrease in users by 2% was recorded, in the following years, year-on-year decreases of 0.5-1 % were evident. A significant shift in the number of users has been evident since 2011 in the service of special regime homes (SRH). Significant year-on-year increases were detected between 2012 and 2013 - an increase of 12.3 %, then between 2013-2014 - an increase of 18.2 % and between 2015-2016 - an increase of 14.0%. Since 2016, there has been an increase in the number of users of the service by an average of 5 %. It is thus clear that the growing number of users of the service of special regime homes is accompanied by a decreasing number of users of the service of homes for the elderly.

Figure 1 – Total number of users of selected residential social services by type and gender



Source: Ministry of Labour and Social Affairs (2011-2019), own data processing

From the point of view of interregional comparison, it can be stated that the highest number of users of selected residential social services was detected in the Moravian-Silesian region (approximately 5,951 users in 2011, approximately 6,877 users in 2019), Central Bohemia (approximately 5,788 users in 2011, in 2019 approximately 7,624 users) and further in the Usti nad Labem and South Moravian regions (more than 5,000 users). There are a significant number of registered providers of residential services in the given regions. On the contrary, the lowest number of users was found in the Karlovy Vary and Liberec regions (up to 2,000 annual users).

Figure 1 also shows the structure of users of selected residential social services for the elderly by gender - men and women. It can be stated that the most frequent users of residential services are women, across all services. In the case of the service of homes for the elderly, women make up more than 75% of the total number of users of the service, in the case of the service of special regime homes, this is more than 50% of the total number. The interregional comparison of results confirms the predominance of women in individual years.

The predominance of women as users of both residential social services for seniors can also be expressed by conversion to one man, see Table 2, which shows the given conversion according to individual types of services and regions of the Czech Republic. Results greater than 3 are highlighted in light blue.

Table 2 – Recalculation of users of selected residential social services by gender: number of women per one man

Number of women per one man	2011		2012		2013		2014		2015		2016		2017		2018		2019	
	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH	HfE	SRH
Capital City of Prague	3,80	3,23	3,79	3,77	3,79	3,74	3,77	3,05	3,84	3,10	3,71	2,69	3,65	2,76	3,81	2,86	3,82	3,03
Central Bohemian Region	2,74	2,27	2,80	2,45	2,88	2,61	2,78	2,51	2,92	2,63	3,02	2,56	2,98	2,68	2,86	2,84	2,89	2,90
South Bohemian Region	2,68	2,15	2,85	2,08	2,79	2,01	2,84	1,95	2,87	2,06	2,89	2,23	2,95	2,28	2,75	2,23	2,94	1,34
Plzen Region	2,48	2,21	2,50	2,14	2,42	1,93	2,29	1,87	2,36	1,85	2,54	1,78	2,52	1,82	2,47	2,05	2,05	1,96
Karlovy Vary Region	2,51	2,83	2,75	2,84	2,38	2,23	2,23	2,71	2,61	2,94	2,69	3,43	2,77	3,52	2,80	3,43	2,81	3,43
Usti nad Labem Region	2,65	1,66	2,68	1,61	2,66	1,89	2,71	2,07	2,73	2,06	2,77	2,10	2,74	2,04	2,63	2,05	2,78	2,18
Liberec Region	2,53	2,75	2,55	2,55	2,69	2,76	2,76	2,80	2,95	3,03	2,75	2,71	2,80	2,73	2,93	2,68	3,02	2,64
Hradec Kralove Region	2,87	2,76	2,98	2,67	3,15	2,93	3,11	2,79	3,10	2,98	3,11	2,88	3,04	2,85	3,04	2,80	3,09	2,86
Pardubice Region	2,91	2,24	3,05	2,31	3,02	2,07	2,98	1,74	3,10	1,66	3,27	1,70	3,20	1,74	3,22	1,80	3,03	1,83
Region Vysocina	2,65	1,67	2,68	1,90	2,67	1,99	2,59	2,09	2,76	2,14	2,76	2,26	2,72	2,24	2,85	2,50	2,75	2,54
South Moravian Region	3,34	2,55	3,18	2,53	3,41	2,49	3,35	2,82	3,29	2,81	3,30	2,83	3,23	2,92	3,39	2,65	3,42	2,86
Olomouc Region	2,51	4,79	2,44	4,46	2,53	2,76	2,68	2,57	2,63	2,56	2,57	2,54	2,46	2,40	2,58	2,33	2,65	2,54
Zlin Region	2,98	1,51	2,87	1,68	2,91	1,64	3,04	1,76	3,22	1,67	3,39	1,72	3,22	1,75	3,31	1,86	3,26	1,89
Moravian-Silesian Region	3,14	1,81	3,09	1,79	3,21	1,98	3,30	1,99	3,28	2,14	3,19	2,13	3,26	1,94	3,09	1,99	3,05	1,95
Czech Republic	2,86	2,17	2,88	2,19	2,92	2,23	2,91	2,28	2,99	2,31	3,01	2,31	2,98	2,32	2,97	2,35	2,97	2,35

Source: Ministry of Labour and Social Affairs (2011-2019), own data processing.

Table 2 shows that the number of women per man was steadily higher in the observed period 2011-2019 in the capital city of Prague (except for the years 2016-2018 for special regime homes), in the Moravian-Silesian (except the special regime homes) and South Moravian regions. In the Olomouc Region, the highest values (more than 4.46) were found in 2011 and 2012 in the case of the service of special regime homes. In some regions it is possible to observe almost identical results of recalculations - for example in the capital city of Prague in 2012 and 2013, in the Central Bohemian Region in 2018 and 2019 or in the Karlovy Vary Region in 2018 and 2019. Average data for the whole of the Czech Republic point to slight differences between the monitored residential services (the number of users of homes for the elderly per man slightly predominates than in the case of homes with a special regime) - except in 2016, values remained below 3 women per man.

The relationship between selected residential social services - women and men - is monitored using the Spearman and Pearson correlation coefficient to express the degree of intensity of dependence between the genders, see Table 3. Verification of the reliability of the resulting values of Spearman's correlation coefficient was performed by using Bootstrap methods, see Table 4.

Table 3 – Spearman and Pearson correlation coefficient: women and men using residential social services

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Spearman correlation coefficient	0,976	0,975	0,975	0,972	0,970	0,965	0,959	0,958	0,947
Pearson correlation coefficient	0,964	0,963	0,956	0,966	0,961	0,953	0,941	0,943	0,928

Source: Ministry of Labour and Social Affairs (2011-2019), own data processing.

Table 4 – Verification of the reliability of the resulting values of the Spearman correlation coefficient

Bootstrap CI 95 %	2011	2012	2013	2014	2015	2016	2017	2018	2019
Lower	0,890	0,885	0,877	0,891	0,856	0,854	0,815	0,830	0,805
Upper	0,992	0,989	0,983	0,987	0,989	0,990	0,982	0,984	0,979

Source: Own data processing.

The values of the Spearman and Pearson correlation coefficient confirm a very strong relationship between the observed variables (number of women and men using selected residential social services). However, this relationship is declining year on year (with some exceptions). The decrease in statistical dependence is also confirmed by the lower and upper confidence intervals of the correlation coefficient according to the Bootstrap method. The resulting values of correlation coefficients were mainly influenced by low values in the Karlovy Vary and Liberec regions, where the numbers of service users were the lowest compared to other regions.

4.2 The Relationship between the Number of Users of Selected Residential Social Services and the Total Number of Seniors in the Regions of the Czech Republic

As already mentioned in the Introduction, users of selected residential social services are mainly seniors (persons aged 65+). The paper is therefore also focused on how a large part of seniors use selected residential social services in individual regions. It is also necessary to consider the fact that the users of the residential services are characterized by a certain grade of dependence on the assistance of another physical person (which is the most common reason for demand for placement in social facilities) and can therefore be assumed that they are paid a social benefit – the care allowance. For this reason, the relationship between service users and the number of care allowances aged 65+ will also be analyzed.

Table 5 shows the conversion of users of selected residential social services (U) to the total number of seniors (ST) and to the number of recipients of social benefits aged 65+ - care allowance (RoSB). The results are recalculated per 1,000 inhabitants 65+. The achieved highest values according to individual parameters are highlighted in bold, while the light blue coloring shows the lowest level of results. The results for the conversion of the number of users to the number of care allowance recipients for 2011-2013 are shown in italics, due to the fact that the Ministry of Labor and Social Affairs did not publish data on the number of care allowance recipients in those years - for analysis for individual regions are determined on the basis of the average development from 2014 to 2019.

Table 5 – Users of residential social services vs. total number of seniors and recipients of the care allowance aged 65+

	2011		2012		2013		2014		2015		2016		2017		2018		2019	
	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB	U/ST	U/RoSB
Capital City of Prague	9,5	*135,7*	9,5	*132,9*	10,2	*139,2*	9,7	129,9	10,7	140,6	11,1	140,1	12,3	158,1	13,2	164,5	14,0	170,6
Central Bohemian Region	21,5	*305,7*	21,6	*294,1*	23,3	*304,0*	24,0	303,0	25,0	**303,8**	25,3	**296,5**	25,8	**298,5**	26,5	**300,3**	26,4	**288,4**
South Bohemian Region	23,6	*233,7*	23,6	*231,4*	23,5	*228,0*	24,3	236,3	25,0	243,3	25,3	243,7	25,0	244,2	24,9	241,4	24,8	240,3
Plzen Region	17,8	*213,5*	18,2	*209,5*	19,0	*211,6*	18,8	204,3	19,0	202,9	20,1	208,8	19,4	196,7	20,0	197,5	20,8	199,6
Karlovy Vary Region	15,6	*229,3*	16,4	*230,5*	17,6	*236,1*	17,9	232,2	18,8	237,2	18,4	219,7	18,2	209,3	18,4	206,1	18,9	207,5
Usti nad Labem Region	**27,9**	***313,3***	**27,9**	***310,8***	**29,1**	***314,1***	**29,1**	**306,5**	**28,2**	280,3	**29,1**	290,4	**29,0**	289,7	**29,2**	282,3	**29,7**	276,2
Liberec Region	12,7	*141,3*	13,7	*149,1*	12,7	*136,5*	13,6	143,9	12,9	134,0	15,4	159,9	15,6	163,1	16,0	157,8	16,9	167,5
Hradec Kralove Region	20,4	*236,5*	20,4	*228,3*	20,6	*223,0*	21,1	223,6	21,3	220,8	21,1	211,7	21,9	217,7	22,7	220,3	22,7	214,4
Pardubice Region	21,0	*215,6*	21,6	*216,1*	21,7	*213,0*	24,8	239,7	24,9	242,8	25,9	249,7	25,5	233,7	25,3	229,4	25,2	227,7
Region Vysocina	21,0	*205,4*	22,0	*211,7*	22,6	*213,9*	22,5	210,9	22,6	211,2	23,1	210,0	23,1	211,7	23,0	208,1	23,7	214,9
South Moravian Region	19,0	*188,2*	19,1	*183,9*	20,6	*194,2*	21,5	198,8	21,7	197,2	22,1	192,2	21,9	191,6	21,6	189,4	20,9	177,1
Olomouc Region	19,5	*202,9*	19,6	*199,7*	20,3	*202,2*	21,0	207,4	21,5	208,2	22,7	211,5	23,1	214,4	23,7	220,8	23,8	221,1
Zlin Region	24,3	*221,1*	24,8	*221,2*	25,2	*220,3*	25,2	217,1	25,8	221,7	26,2	219,4	25,7	215,0	26,3	217,9	26,2	213,7
Moravian-Silesian Region	21,4	*230,5*	21,3	*223,1*	21,6	*220,6*	21,9	218,6	21,7	212,3	22,4	215,4	23,3	219,1	23,7	220,9	24,3	222,2
Czech Republic	19,6	*220,6*	19,9	*217,6*	20,6	*219,9*	21,0	220,8	21,3	219,8	22,0	220,2	22,2	221,3	22,6	221,5	22,8	219,3

Source: Ministry of Labour and Social Affairs (2011-2019), Czech Social Security Administration (2011-2019), own data processing.

Table 5 shows that a strong relationship between the number of users of residential services and the total number of seniors was detected in the Usti Region, in all monitored years. On the contrary, a weak relationship between the monitored parameters was detected in the capital city of Prague, also across all monitored years. This fact is given by the high number of seniors and the relatively low number of service users. As for other regions, the overall results were similar, with some exceptions (for example, the Liberec and Karlovy Vary regions). Assuming that all users of services would be recipients of the care allowance, it can be stated that a strong relationship was also detected in the Usti nad Labem and Central Bohemian regions. On the contrary, lower

values were detected in the Liberec Region in 2013, 2015, 2018, 2019 and in the capital city of Prague in years 2011, 2012, 2014, 2016 and 2017. It is evident that in the capital city of Prague and in the Moravian-Silesian, Olomouc and Liberec regions there has been an increase in the relationship between the number of service users and recipients of social benefits since 2015.

The Spearman and Pears correlation coefficient was used to evaluate the relationship between the number of residential service users and the number of seniors living in individual regions. The analysis was performed for all monitored years, see Table 6. To verify the reliability of the resulting values of the Spearman correlation coefficient, the Bootstrap method was used here, see Table 7.

Table 6 – Spearman and Pearson correlation coefficient: users of social services and total number of seniors

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Spearman correlation coefficient	0,851	0,837	0,899	0,785	0,846	0,851	0,890	0,912	0,952
Pearson correlation coefficient	0,802	0,800	0,817	0,804	0,826	0,834	0,861	0,876	0,885

Source: Ministry of Labour and Social Affairs (2011-2019), own data processing.

Table 7 – Verification of the reliability of the resulting values of the Spearman correlation coefficient

Bootstrap CI 95 %	2011	2012	2013	2014	2015	2016	2017	2018	2019
Lower	0,461	0,386	0,598	0,311	0,462	0,464	0,609	0,651	0,776
Upper	0,996	0,987	0,995	0,987	0,987	0,995	0,995	0,996	1,000

Source: Own data processing.

The values of Spearman's and Pearson's correlation coefficient confirm a very strong relationship between the observed variables. It is evident that this relationship has been increasing year-on-year since 2015. The growth of statistical dependence is also confirmed by the lower and upper confidence intervals of the correlation coefficient according to the Bootstrap method. Among the monitored parameters, there has been a noticeable increase since 2015, i.e. a growing number of seniors and the number of users of selected residential social services caused by the establishment of new social facilities and thus an increase in bed capacity. As can be seen from Table 5, differences in the results were detected mainly in the Usti nad Labem and Zlin regions (strong positive relationship) and in the capital city of Prague (low relationship).

5 Conclusion

Demographic aging of the population represents a significant problem of economic policy in relation to the provision of the necessary long-term health and social care to a sufficient extent, or pension provision, especially in relation to the social system. Population aging is currently one of the most binding and discussed topics not only in the Czech Republic. Addressing this issue is one of the key priorities of social policy makers. Social services, which are defined by Act No. 108/2006 Coll., On social services, play an important role in providing long-term social care services for the elderly. The social services sector offers several types of social services that serve to provide long-term care for people with low self-sufficiency caused by old age or unfavorable health status.

Residential social services (homes for the elderly and special regime homes) are among the most demand social services among the elderly. These services are mainly demanded by people with a high grade of dependence on the assistance of another physical person and therefore need all-day social and health care, which could not always be provided to the necessary extent in the natural social environment. According to the statistical yearbooks of the Ministry of Labor and Social Affairs, it is possible to identify the main trends in the use of social services in terms of territorial scope and structure of service users.

Findings regarding the extent of use of selected residential social services and the structure of users by gender showed that the analysis for the period 2011-2019 can identify differences between the number of users of services, even within the interregional comparison. The highest number of users of selected residential social services was detected within the Moravian-Silesian, Central Bohemian, Usti nad Labem and South Moravian regions within the time period. These are the regions in which most providers of given residential social services operate. During the monitored period, a gradual increase in the number of users of the special regime homes service was found; in the case of the homes for the elderly service, on the other hand, a gradual slight decrease was recorded since 2014. The results of the analysis of the structure of users by sex showed that in both residential services, women predominate among users (the number of women is 60 % more than men). This fact was found identically in all regions.

The analysis of the strength of the relationship between the number of service users and the number of seniors (as well as the number of care allowance recipients) was confirmed to be very strong. In the monitored years, the strength of the relationship was evident especially in the Usti nad Labem Region, on the contrary, a very low strength was detected in the capital city of Prague. As for other regions, the overall results were similar in most regions (19-24 users of services per number of seniors per 1,000 persons). In the Moravian-Silesian, Olomouc, and Liberec regions and in the capital city of Prague, there has been an increase in the positive relationship between the number of service users and care allowance recipients since 2015.

Based on the findings, it can be stated that the Moravian-Silesian Region is one of the regions with a high number of users of selected residential social services, which is mainly due to a higher number of providers operating in the area and extensive availability of bed capacity. In terms of the analysis of the relationship between the monitored variables (number of users versus number of seniors and number of recipients of care allowance), the Moravian-Silesian Region does not differ significantly (positively or negatively) from other regions. However, as stated in the chapter Theoretical Background, the priority of the region is to keep seniors as long as possible in their natural social environment, to which the territorial social policy is adapted.

Acknowledgements

This paper was created within the project TJ04000315 *"Nové výzvy na trhu sociálních služeb pro seniory v Moravskoslezském kraji".* The project was supported by the Technology Agency of the Czech Republic.

References

[1] CZECH STATISTICAL OFFICE (2004). *Populační prognóza ČR do r. 2050*. [online]. [cit. 2021-04-15]. Available from: https://www.czso.cz/csu/czso/populacni-prognoza-cr-do-r2050-n-g9kah2fe2x.

[2] CZECH STATISTICAL OFFICE (2004). *Domácnosti seniorů*. [online]. [cit. 2021-04-15]. Available from: https://www.czso.cz/csu/czso/6b004993af.

[3] CZECH STATISTICAL OFFICE (2019). *Proměny věkového složení obyvatelstva ČR 2001-2050*. [online]. [cit. 2021-04-15]. Available from:https://www.czso.cz/csu/czso/promeny-vekoveho-slozeni-obyvatelstva-cr-2001-2050.

[4] CZECH SOCIAL SECIRUTY ADMINISTRATION (2011-2019). *Důchodová statistika*. [online]. [cit. 2021-04-10]. Available from: https://www.cssz.cz/web/cz/duchodova-statistika.

[5] DVOŘÁČKOVÁ, D. (2012). *Kvalita života seniorů v domovech pro seniory*. Praha: Grada Publishing.

[6] GLASS, A. P., PLAATS V. R. S. (2014). A Conceptual Model for Aging Better Together Intentionally. *Journal of Aging Studies*. Vol. 27, Issue 4, p. 428-442.

[7] HAVELSRUD, K., DAHM, K. T., SLETSJOE, H., REINAR, L. M. (2014). *The Effect of Activity in the Elderly.* Oslo: Knowledge Centre for the Health Services at the Norwegian Institute of Public Health.

[8] HORECKÝ, J., PRŮŠA L. (2019). *Současná struktura služeb dlouhodobé péče a prognóza potřebnosti sociálních služeb 2019-2050.* Tábor: Asociace poskytovatelů sociálních služeb ČR.

[9] KANE, R. L. (2015). A New Long-Term Care Manifesto. *The Gerontologist*. Vol. 55, Issue 2, p. 296-301.

[10] KAŠPAROVÁ, M., KŘUPKA, J., JIRAVA, P. (2016). Region to Region Comparasion of Selected Social Services for Senior Citizens. *The 20th International Conference Current Trends in Public Sector Research 2016, Brno*. p. 275-283.

[11] KUBALČÍKOVÁ, K., HAVLÍKOVÁ J. (2016). Current Developments in Social Care Services for Older Adults in the Czech Republic: Trends Towards Deinstitutionalization and Marketization. *Journal of Social Service Research*. Vol. 42, No. 2, p. 180-198.

[12] LANGHAMROVÁ, J., ŠIMKOVÁ, M., SIXTA, J. (2018). Macroeconomic Impacts of the Expansion of Social Services for Ageing Population of the Czech Republic. *Politická ekonomie*. Vol. 66, Issue 2, p. 240-259.

[13] MALÍKOVÁ, E. (2020). *Péče o seniory v pobytových zařízeních sociálních služeb.* Praha: Grada Publishing.

[14] MINISTRY OF LABOUR AN SOCIAL AFFAIRS (MLSA). (2021). *Registr poskytovatelů sociálních služeb. Vyhledávání služby.* [online]. [cit. 2021-04-15]. Available: http://iregistr.mpsv.cz/socreg/rozsirene_hledani_sluzby.fw.do?SUBSESSION_ID=1618566656723_10.

[15] MORAVIAN-SILESIAN REGION. (2020). *Střednědobý plán rozvoje sociálních služeb v Moravskoslezském kraji na léta 2021-2023*. [online]. [cit. 2021-04-15]. Available from: https://www.msk.cz/assets/temata/strategicke_dokumenty/strednedoby-plan-rozvoje-msk-21-23.pdf.

[16] PRŮŠA, L., BAREŠ, P., HOLUB, M., ŠLAPÁK, M. (2015). *Vybrané aspekty péče o seniory z hlediska sociálního začleňování*. Praha: VÚPSV, v.v.i.

[17] ŠERÁK, M. *Zájmové vzdělávání dospělých*. (2009). Praha: Portál.

[18] UNITED NATIONS (2013). *World Ageing Population.* New York: Department of Economic and Social Affairs. 114 p. ST/ESA/SER.A/348.

[19] VÁGNEROVÁ, M. (2007). *Vývojová psychologie*. Praha: Grada Publishing.

[20] VÁGNEROVÁ, M. (2008). *Vývojová psychologie II. Dospělost a stáří*. Praha: Karolinum.

[21] WALCH, K., SCHARF, T., KEATING, N. (2017). Social Exclusion of Older Persons: A Scoping Review and Conceptual Framework. *European Journal of Ageing*. Vol. 14, p. 81-98.

[22] XAVIER F. M. et al. (2003). Elderly people´s definition of quality of life. *Brazilian Journal of Psychiatry*, 2003. Vol. 25, No. 1, p. 31-39.

[23] ŽELEZNÁ, L. (2018). Care-giving to grandchildren and elderly parents: role conflict or family solidarity? *Ageing & Society*. Vol. 38, Issue 5, p. 974-994.

Research and Development in the Czech and Polish Context: Case Study of the Czechia's Regions

Martina Halásková[1], Eva Kovářová[1], Eliška Krömerová[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
martina.halaskova@vsb.cz, eva.kovarova@vsb.cz, eliska.kromerova.st.@vsb.cz

Abstract

Paper evaluates intensity of research and development, resp. research and innovation potential of Czechia and its regions. The aim of the paper is to compare the trend in intensity of research and development in the Czech-Polish context and to assess the research and innovation potential of the Czechia's regions. The first part of the analysis confirmed the higher intensity of research and development in Czechia in comparison with Poland. The second part of the analysis, focused on research and innovation potential of Czechia's regions, confirmed the dominance of Prague region and the worst position of the Karlovy Vary region, when the fundamental indicators for the period of years 2010–2019 were considered. However, the results of multi-criterial assessment of the regions' research and innovation potential, based on key performance indicators, revealed the best position of the Karlovy Vary region. Results of the correlation analysis showed strong and positive relationships between fundamental indicators of research and innovation potential of Czechia's regions. Case study, comparing research and innovation potential of the Pardubice and South Bohemian regions, confirmed their position within the overall assessment of their intensity in research and development (total expenditures on research and development), but the stronger position of Pardubice region was identified with respect to other indicators (research and development workplaces, researchers and patents).

Keywords: *Czech regions, development, indicators, research, R&D expenditure*

JEL Classification: *O32, R58, C10*

1 Introduction

Science, research, development and innovations belong to the important resources of economic growth and social welfare. Research and development contribute vitally to the creation of new knowledge, products and technological processes. The European Research Area (ERA) gathers European resources related to science, research and innovations with the aim to ensure better coordination of these activities at the level of the European Union Member States, the European Union level, resp. at the level of the regions within the Member States. Standardly, the basic, applied research and experimental research are recognized with respect to the research and development activity (OECD, 2015). The strong cooperation among institutions accompanied with the high level of public sector's participation seems to be a key factor for the successful progress of the innovation and research-development environment (Klimová et al., 2020; Graf and Menter, 2021). These institutions include universities, research institutes and other institutions having the characteristics of synthetic knowledge basis with business enterprises (Soukalová, 2016). The tightest relationships exist especially with the educational sector, resp. with the institutions of tertiary education, within the framework of other forms of cooperation (Schwarzová and Litschmannova, 2019). In relation to the research and innovation progress, it is necessary to examine wider consequences, as well as research and development capacities of the public and business sphere (Gardocka-Jalowiec, 2012; Hunady et al., 2018; Adamowicz, 2021). In Czechia, the National Research, Development and Innovation Policy contributes to the progress in the key areas of research and

development (R&D). These key areas include especially management and financing of the R&D system; development of human resources; quality and international excellence in R&D; collaboration between the research and application sphere; and the innovation potential as well **(**RVVI, 2021a).

1.1 Research and Innovation Potential in European Dimension - Literature Review

Intensity of research and development, as well as the development of the innovation capacity at the national and regional level was thematized in the studies of Rodríguez-Pose and Crescenzi (2008); Szarowska and Žurkova (2017).

Innovation potential and innovation environment, relationship between economic performance and for-innovation factors, or the evaluation of the expenditures on research and development as the preconditions for the innovation performance of the European Union Member States and regions were identified by Capello and Lenzi (2013); Bednář and Halásková (2018), or Kraftova and Kraft (2018). Their findings confirmed that the efficiency of the use of innovations was not related only to the strength of local knowledge basis. The importance of R&D activities for regional growth and the focus on intelligent growth, based on knowledge and innovations with the emphasis placed on regional environment, was recognized. Other researches showed that the contribution of the expenditures on research and development to economic performance was not unchanging, and increasing expenditures could be in some cases accompanied with lower growth of economic performance in a country or in a region.

The innovation and research potential has already been examined within the Czech dimension too (Klímová, 2013; Kovacsova, 2014; Srholec and Zizalova, 2014; Soukalová, 2016; Klímová et al., 2020), or it has been presented in wider consequences in the context of the Visegrad Group countries (V4 countries), including Poland, Czechia, Hungary, Slovakia (Šipikal et al., 2010; Melecky and Stanickova (2011); Hunady et al., 2018). The trend of the expenditures on research and development in the V4 countries between the years 2004–2018, demonstrated by Jablonska (2020), showed that the structure and dynamics of the expenditures on research differed among them. However, the innovation potential of the V4 countries was still low in comparison with the European Union level. Šipikal et al. (2010) compared activities of the innovation strategies in the V4 countries' regions and they identified the key differences and higher similarities between the regions of the same country. They revealed that lower similarities in the innovation potential existed between regions with similar level of development. Halaskova and Halaskova (2018) compared research potential of the Czech and Polish NUTS2 regions with respect to the selected indicators of the R&D using the correlation analysis. Zdrazil and Mateja (2013) evaluated the science, research, development and science-research potential index focusing on disparities and dynamics of the changes in the Czech and Slovak NUTS2 regions between years 2001 and 2011. Roszko-Wojtowicz et al. (2019) or Adamowicz (2021) examined research and innovation potential in the Polish context. Adamowicz (2021) proved lowering disproportions in the innovation potential of three Eastern Poland regions and consequence between the innovation level and regions' economic growth. Roszko-Wojtowicz et al. (2019) identified the intensity of research and development in so-called high-tech sectors with high level of total factor productivity, which was affected by the expenditures on research and development of the business enterprises.

2 Material and Methods

The analysis presented further uses the data taken from the Eurostat (science, technology, digital society) as well as from the Czech Statistical Office (regional data for Czechia). In the first part of the analysis, an attention is given to the total expenditures on research and development (R&D) as the fundamental financial indicator, and the indicator of the innovation performance and competitiveness. The comparison of the trend in research and development, resp. innovation potential, in Czech-Polish context and the regional context of Czechia is done for the period of years 2010–2019. The year 2010 represents the initial year of the Strategy Europe 2020, and the year 2019 is the last year with available statistical data for all selected indicators. Regions of South-Bohemia and Pardubice are presented in the case study covering the period of years 2013–2018.

The analysis focuses in its second part on the relationships between selected R&D indicators, when the attention is given especially to expenditures on R&D in private sector (*BERD*), public sector (*PERD*) including government sector (*GOVERD*) and higher education sector (*HERD*), research and development personnel (*RDP*) and patent applications submitted by domestic applicants (*PAS*). The strength and tightness of these relationships is examined with the use of the method of correlation analysis – the *Pearson's bivariate correlation* (*PC*) processed in SPSS. Abu-Bader (2021) considers Pearson's correlation one of the most common parametric techniques of the inferential statistics. The Pearson bivariate correlation is based on the method of covariance and it gives information about the magnitude of the association, or correlation, as well as about the direction of the relationship between two considered variables. The correlation between them can be assessed using the *PC* as positive (direct) or negative (inverse), or no relationship between two variables can be identified. The Pearson's correlation coefficient is computed as follows:

$$PC = \frac{cov(x,y)}{\sqrt{var(x)} \cdot \sqrt{var(y)}} \quad (1)$$

Where *cov (x, y)* is the covariance of *x* and y, *var (x)* is variance of variable *x*, and *var (y)* is the variance of *y*. *PC* is calculated for the relationships between variables *BERD*, *PERD*, *RDP* and *PAS*. When the correlation is assessed between the R&D resources' variables (expenditures and personnel) and R&D outcome's variable (patent applications), the delay between resources' variables and outcome's variable is expected in the length of one year. It means that *PAS* as the outcome's variable is considered in the year *t* and resources' variables *BERD*, *PERD* and *RDP* are considered in the year *t-1*. The correlation analysis is done for the period of years 2010–2019 when the relationships between the resources' variables are considered. Therefore, *PC* is calculated for *n* observations and *n* = 140 (10 years and 14 regions, 10 x 14). However, when the relationships between the resources' variables and the outcome's variable are assessed, the period covered by analysis is shorter because of the delay. Thus, the analysis covers nine years and 14 regions of Czechia, and *PC* is calculated for *n* = 126 (9 x 14). The relationships between variables are demonstrated with the use of scatter plots processed in SPSS as well.

Relative performance of the Czechia's regions in terms of the use of resources for their research and innovation potential with respect to the outcome is assessed with the use of standard benchmarking method. Bogetoft and Otto (2011) consider benchmarking a systematic comparison of the performance of one entity (e.g. region) against other entities (e.g. regions). The idea is that the compared entities transform the same types of resources to the same types of outcomes/outputs. The simple benchmarking method deals with the cost functions or with so-called *Key performance indicators* (*KPIs*). *KPIs* are expressed commonly as the ratio between an output and input and they can create the basis for the multi-criterial assessment of the entities' performance (Goncalves et al., 2015). The multi-criterial assessment of the research and innovation potential of the Czechia's regions deals with three *KPIs* that are defined for individual regions and years as follows:

$$KPI_1 = \frac{PAS}{BERD}; KPI_2 = \frac{PAS}{PERD}; \; KPI_3 = \frac{PAS}{RDP} \quad (2)$$

All indicators are then considered the criteria, which maximum value is required. The multi-criterial assessment is done for the period of years 2010–2018, when again the one-year delay between resources' variables and outcome variable is assumed. Assessment deals with normalized values of three *KPIs* and considers them as the criteria with the equal weights (1/3). The multi-criterial assessment is done with the use of *Weighted sum method*. This approach enables to obtain the *Composite indicator* (*CI*) assessing the research and innovation potential of the Czechia's regions, when *CI* is calculated as the weighted sum of three criteria's values. The values of *CI* range from 0 to 1 and they are calculated for each year and region.

3 Results and Discussion

This section of the paper deals with the topic of research and development in the Czech-Polish context and with the analysis of research and innovation potential in the conditions of the Czechia's regions. As a part of the overall analysis, the case study comparing selected indicators of research and development in two Czechia's regions (regions of Pardubice and South Bohemia) is presented as well.

3.1 Research and Development in Czech-Polish Context

Simple and composite indicators are commonly used to measure the innovation performance in the international context. Simple indicators, based on financial data, are easy to calculate and understand. However, their information value is limited, when the research and innovation potential is considered (RVVI, 20201b). Further analysis introduces comparison based on one of the simple indicators – gross expenditures on research and development (*GERD*). *GERD* belongs to the core indicators related to objectives and targets defined by the Strategy Europe 2020. *GERD* includes all investment and non-investment expenditures on research and development regardless their sources, and the expenditures are counted for one country and one year. If the *GERD* is expressed as the percentage of GDP, it defines so-called R&D intensity. Trends in development of the *GERD* values for Czechia and Poland are documented for the period of years 2010–2019 in Table 1.

Table 1 – R&D Intensity – Total R&D expenditure (% of GDP)

R&D intensity	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Czechia	1.33	1.54	1.77	1.88	1.96	1.92	1.67	1.77	1.90	1.94
Poland	0.72	0.75	0.88	0.88	0.94	1.00	0.96	1.03	1.21	1.32
EU (EU28)	1.92	1.96	2.00	2.02	2.03	2.04	2.04	2.08	2.11	2.14

Source: Authors according to Eurostat (2021)

Results presented in Table 1 demonstrate increasing intensity of research and development (increasing total expenditures on research and development as the percentage of GDP) in Czechia and Poland. The higher are these expenditures, the better are the preconditions for the growth and strengthening of the innovation potential in both countries. Results reveal that Czechia was nearly twice as intensive as Poland. The R&D intensity was the highest one in Czechia in the years 2014 and 2019, and in Poland in the years 2018 and 2019. However, when Czechia and Poland are compared with the mean value calculated for all European Union Member States (EU28), it is obvious that their intensity was lower than these mean values for the whole period of years 2010–2019. Besides the R&D intensity, which is affected not only with the *GERD* but also with the growth of GDP, other simple indicators can be used. An indicator expressing the gross expenditures on research and development in PPP per one inhabitant is one of the most commonly used in the international comparison. This standardized indicator eliminates not only different sizes of compared countries but also their different price levels (RVVI, 2021b).

Total expenditures on research and development can be further decomposed with respect to the sectors where the research and development is performed. Then, expenditures can be classified as being spent in public sector, including government's expenditures on research and development (*GOVERD*) and expenditures of the higher education institutions on research and development *(HERD*), and expenditures on research and development spent in business sector (*BERD*). Decomposed expenditures for Czechia and Poland are presented in Table 2. In Czechia, higher expenditures, expressed as the percentage of GDP, were spent in business sector, and their annual growth is evident. The lowest expenditures were spent on research and development in the governmental sector. Poland had lower R&D intensity than Czechia (see the Table 1) and this lower intensity was also reflected in the structure of the Polish expenditures on research and development. However, higher expenditures were spent in business sector in Poland, similarly to Czechia. By the year 2015, expenditures of Polish public sector were relatively equally distributed between governmental and higher education sectors, but in the year 2016, position of the Polish higher education sector was strengthened and at the same time, the role of governmental sector was weakened (see Table 2).

Table 2 – R&D expenditure by sector performance in Czechia and Poland (% of GDP)

Sector performance R&D	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
R&D expenditure on Business enterprise sector (*BERD*)										
Czechia	0.77	0.85	0.95	1.02	1.10	1.04	1.02	1.11	1.18	1.20
Poland	0.19	0.23	0.33	0.38	0.44	0.47	0.63	0.67	0.8	0.83
R&D expenditure on Government sector (*GOVERD*)										
Czechia	0.29	0.31	0.33	0.34	0.36	0.39	0.30	0.30	0.31	0.32
Poland	0.26	0.26	0.25	0.24	0.23	0.24	0.02	0.02	0.02	0.02
R&D expenditure on Higher education sector (*HERD*)										
Czechia	0.27	0.38	0.49	0.51	0.5	0.48	0.34	0.35	0.41	0.42
Poland	0.27	0.26	0.30	0.26	0.28	0.29	0,30	0.34	0.38	0.47

Source: Authors according to Eurostat (2021)

3.2 Research and Innovation Potential of the Regions of Czechia

The resources and outcomes of research and development at the national and also at the regional level of Czechia are assessed with the use of selected indicators concerning research, development and innovations. In presented analysis, an attention is paid to the research and innovation potential of the Czechia's regions during the period of years 2010–2019 (see Table 3). Comparison of total R&D expenditures revealed the dominant position of Prague in comparison with other regions. Prague had got the best-assessed research and innovation potential of all regions with respect to other indicators of research and development as well, when these indicators include the R&D personnel (recalculated to the full-time devoted to R&D), number of workplaces and number of submitted patent applications. On the contrary, Karlovy Vary region reached the lowest values of all selected indicators. However, the trend of increasing R&D expenditures was observed for all Czechia's regions, which reflects improving preconditions for the growth of their innovation performance.

Table 3 – Total expenditures on research and development in Czechia's regions, years 2010–2019 (mil. CZK)

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Prague	20 882	22 941	24 689	26 165	29 443	32 999	27 632	32 034	36 868	40 115
Central Bohemia	6 017	6 350	6 677	9 718	9 879	9 991	11 175	14 357	16 343	16 761
South Bohemia	2 114	2 193	2 537	2 534	2 488	2 665	2 846	2 928	3 442	3 768
Plzen	2 295	3 142	3 779	4 133	4 737	4 607	3 447	3 614	4 362	5 098
Karlovy Vary	106	124	204	115	151	203	173	211	246	325
Usti nad Labem	731	843	1 125	1 084	1 216	1 097	862	902	1 054	1 328
Liberec	1 452	1 861	2 860	2 366	2 614	2 520	2 654	2 895	3 426	3 681
Hradec Kralove	1 479	1 679	1 680	1 890	2 054	1 987	1 808	2 151	2 515	2 873
Pardubice	2 136	2 472	2 783	2 687	2 727	2 650	2 532	2 775	3 146	3 187
Vysocina	743	780	922	1 160	1 502	1 536	1 408	1 384	1 594	1 667
South Moravia	8 519	11 192	14 645	16 185	17 012	17 699	14 968	15 486	16 475	18 750
Olomouc	1 613	2 133	3 558	3 061	3 377	2 983	2 833	3 367	4 156	4 738
Zlin	1 787	2 118	2 317	2 254	2 749	2 533	2 622	3 356	3 530	3 787
Moravia-Silesia	3 100	4 924	4 584	4 500	5 155	5 194	5 149	4 927	5 598	5 546

Source: Authors according to Czech Statistical Office (2021)

3.2.1 Correlations between R&D Variables in the Regions of Czechia

If the regions are considered as the performance units in the field of research and development, the relationships between the resources of their research and innovational potential and the outcomes of their use can be assessed. These relationships or correlations can be examined with the use of Pearson correlation analysis. First, attention should be payed to the relationships between the resources' variables, which are defined as business and public expenditures on research and development (*BERD*, resp. *PERD*) and personnel involved in research and development (*RDP*). Table 4 shows the strength and direction of the correlations between the pairs of resources' variables. The Pearson correlation coefficients are calculated with the use of data observed for the period of years 2010–2019, thus results reflect 140 observations (10 years and 14 regions).

Table 4 – Correlation between resources' variables for Czechia' regions, panel data for the period 2010–2019

BERD and PERD	BERD and RDP	PERD and RDP
0.805**	0.896**	0.983**

** Correlation is significant at the 0.01 level

Source: Authors according to Czech Statistical Office (2021)

The values of *PC* confirmed strong and positive relationships between the resources' variables that express resources (inputs) for the research and innovation potential of Czechia's regions. The strongest relationship is identified between the public expenditures on research and development (*PERD*) and the size of personnel involved in research and development (*RDP*).

Then, an attention has to be paid to the relationships between the resources' variables and the outcome's variable. Here, the one-year delay is assumed between the resources' variables and outcome's variable, thus the analysis deals with nine years. The direction and the strength of relationships between three resources' variables (*BERD*, *PERD*, *RDP*) and the outcome's variable (*PAS*), with the use data observed for the period of years 2010–2019, is presented in Table 5. *PC* was calculated for 126 observations (9 years and 14 regions) and its values confirm strong positive relationships between the resources and outcomes of the research and innovation potential of the Czechia' regions. The values of *PC* reveal the strongest relationship between number of patent applications (*PAS*) and the size of personnel involved in research and development (*RDP*).

Table 5 – Correlation between resources' variables and outcome's variable for Czechia's regions, panel data for the period 2010–2019 (one-year delay)

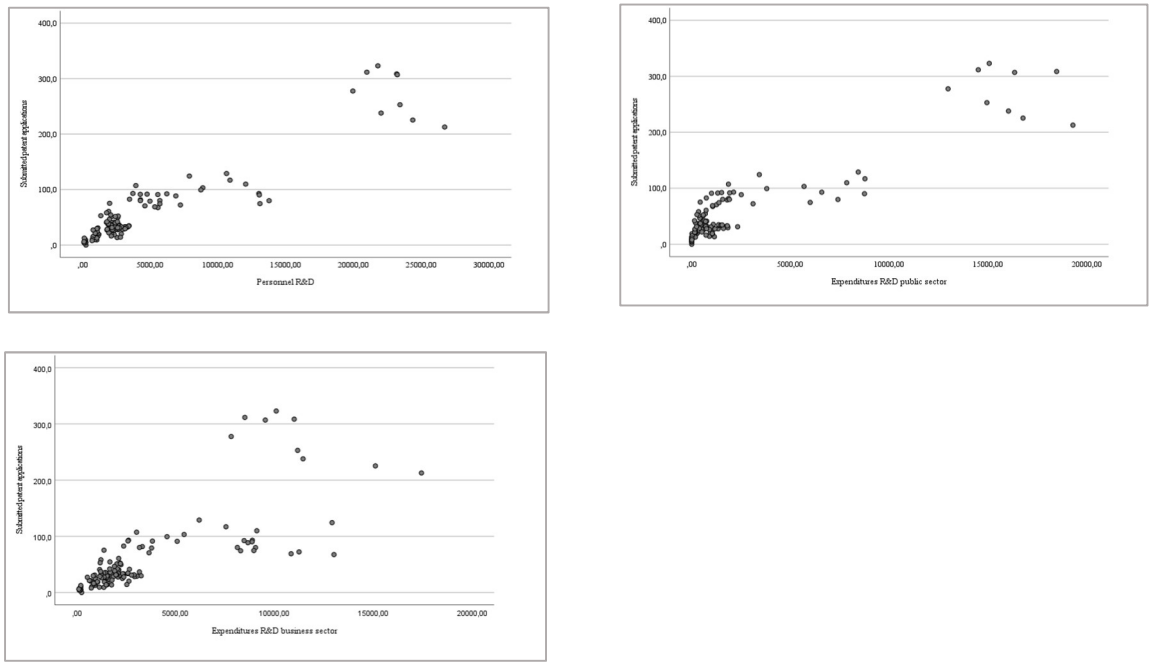
Variables	BERD	PERD	RDP
PAS	0.764**	0.920**	0.932**

** Correlation is significant at the 0.01 level

Source: Authors according to Czech Statistical Office (2021)

The relationships assessed in Table 5 with the use of *PC* are demonstrated also with the use of Figure 1.

Figure 1 – Relationships between resources' varaibles and the outcome's variable, Czechia' regions, panel data for the period 2010–2019 (one-year delay)



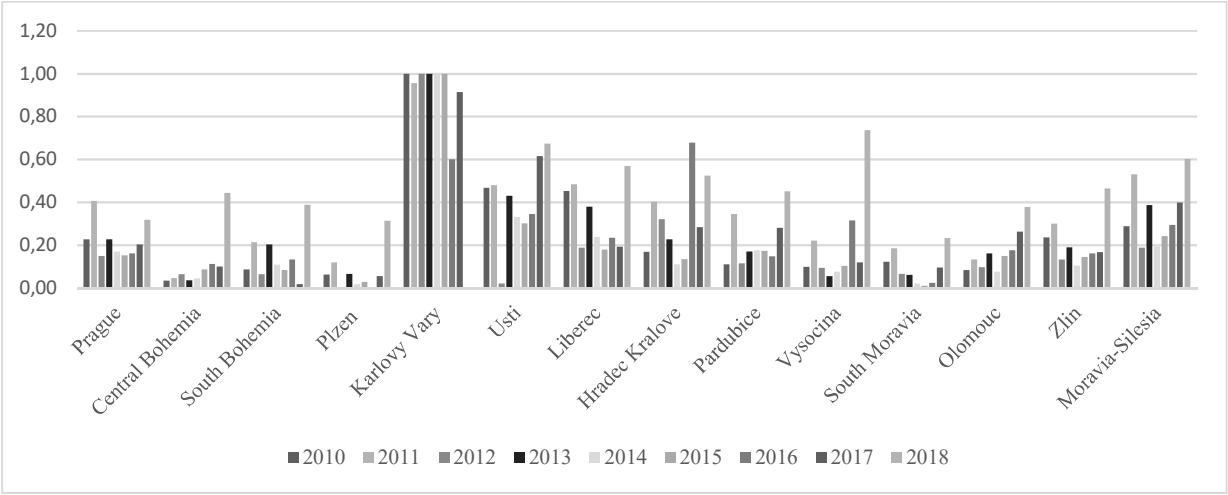
Source: Authors according to Czech Statistical Office (2021)

Figure 1 presents relationships between 126 observations for the resources' variables and outcome variable (9 years and 14 regions) as the one-year delay is assumed. Figure 1 contains three scatter plots, where the submitted patent applications (*PAS*) are considered to be dependent variable, as they express the outcomes of the research and innovation performance of the Czechia's regions.

3.2.2 Multi-Criterial Assessment of the Research and Innovation Potential of the Czechia's Regions

The research and innovation potential of 14 Czechia's regions is assessed as well with respect to three above-defined *KPIs*, which are defined as the ratio of the outcomes (*PAS*) and the resources (*BERD*, *PERD* and *RDP*). Assessment is done with the use of data observed for the period of years 2010–2019 when the one-year delay between resources' variables and outcome's variable is assumed. It means that assessment is done for 9 years. Criteria (*KPIs*) are considered to have the equal weights because they are regarded as having the same importance for the research and innovation potential of the Czechia's regions. Values of composite indicator (*CI*) assessing the research and innovation potential of all regions and years are presented in Appendix 1.

Figure 2 – Multi-criterial assessment of the research and innovation potential of Czechia's regions, values of *CI* for the period of years 2010–2019 (one-year delay)



Source: Authors according to Czech Statistical Office (2021)

Multi-criterial assessment of regions' research and innovation potential presented in Figure 2 differs from that one presented in Table 3 as the Figure 2 deals with the key performance indicators defined as the ratio of outcomes and resources. If the performance of Czechia's regions is based on weighted *KPI*s, the best position has to be assigned to the Karlovy Vary region, which fundamental indicators had the lowest values in comparison with other regions. The dominance of Prague, demonstrated in Table 3, is not confirmed from the perspective of multi-criterial assessment dealing the three *KPIs*.

3.2.3 Resources for the Research and Innovation Potential of Public Sector: Case Study for the South Bohemia and Pardubice Region between Years 2013–2018

Research and innovation potential is further demonstrated in the case study dealing with two selected regions – South Bohemia and Pardubice. South Bohemian region can be described as a region with relative important participation of the public research-development capacity and diversified manufacturing industry located in the whole territory of the region. Several universities and other institutions of higher education, as well as institutes of the Czech Academy of Science, research and development workplaces and teams operate in South Bohemian region. The purpose of newly established innovation infrastructure (science-technology parks, centres for the technology transfers) is to constitute the quality of supportive services that should be helpful for current innovation firms in the successful realization of their business plans and innovation activities. However, the research and innovation system of Pardubice region can be assessed as an average one with respect to its R&D parameters. Applied research has got the dominant position within the research activities in the Pardubice region. The R&D activities can be assigned especially to the large industrial firms located in the city of Pardubice, and a key role in the regional system of research, development and innovations belongs to the University of Pardubice. The University of Pardubice has got extensive infrastructural and expert basis in wide range of fields and specializations (MPO, 2021). The University of Pardubice is the only one university operating in the field of natural and technical sciences in the region, and thus the University is the most important actor in research and development in the Pardubice region.

The research and innovation potential of the South Bohemia and Pardubice region, with the emphasis placed on public sector, is summarized for the period of years 2013–2018 in Tables 6 – 9.

Table 6 – Total R&D expenditures and R&D expenditures in public sector, South Bohemia and Pardubice region compared

Year	South Bohemian region		Pardubice region	
	Total expenditures on R&D	Expenditures on R&D in public sector (%)	Total expenditures on R&D	Expenditures on R&D in public sector (%)
2013	2 534.18	43.13	2 687.40	23.79
2014	2 488.45	42.25	2 727.04	17.89
2015	2 664.73	39.19	2 649.91	20.48
2016	2 846.19	34.73	2 532.06	14.42
2017	2 927.47	39.22	2 775.25	14.88
2018	3 441.60	39.04	3 146.31	17.85
Mean value 2013–2018	2 817.10	39.59	2 753.00	18.22

Source: Authors according to Czech Statistical Office (2021)

Total expenditures on research and development in both regions reached the comparable values (see Table 6). However, the structure of expenditures significantly differed. In the South Bohemian region, higher expenditures were spent in public sector than in Pardubice region, which is also reflected in next Tables 7 and 8. Table 7 shows numbers of workplaces in both regions and the share of public sector in these workplaces, and Table 8 presents the sizes of personnel involved in research and development in both regions.

Table 7 – Number of R&D workplaces, South Bohemia and Pardubice region compared

Year	South Bohemian region		Pardubice region	
	R&D workplaces total number	R&D workplaces in public sector (%)	R&D workplaces total number	R&D workplaces in public sector (%)
2013	108	19.44	139	8.63
2014	113	18.58	135	8.89
2015	114	19.30	145	8.28
2016	123	17.89	137	8.76
2017	137	16.79	145	7.59
2018	141	16.31	140	7.86
Mean value 2013–2018	123	18.05	140	8.34

Source: Authors according to Czech Statistical Office (2021)

Year	South Bohemian region		Pardubice region	
	RDP (number)	RDP in public sector (%)	RDP (number)	RDP in public sector (%)
2013	818	71.15	977	34.29
2014	918	71.46	1 055	33.08
2015	920	69.46	1 105	27.42
2016	965	70.67	1 013	30.21
2017	1048	68.42	1 014	31.76
2018	966	68.74	998	33.27
Mean value 2013–2018	939	70.00	1 027	31.70

Table 8 – Size of R&D personnel, South Bohemia and Pardubice region compared

Source: Authors according to Czech Statistical Office (2021)

In both regions, growing total expenditures on research and development, as well as the increasing number of workplaces are observed. When the sizes of personnel are compared, it can be seen that the size of personnel increased in South Bohemia. The proportion of personnel involved in R&D in public sector in South Bohemia is then twice as large as in Pardubice region. Table 9 shows the patent activity in both regions when the emphasis is again placed on the patent activity in the public sector. Findings confirm higher involvement of public sector in R&D in South Bohemia in comparison with the Pardubice region. However, during the observed period of years 2013–2018, the patent activity was higher in Pardubice region with higher involvement of business sector in R&D.

Table 9 – Patent activities, South Bohemia and Pardubice region compared

Year	South Bohemian region		Pardubice region	
	Patents granted for the territory (total number)	Patents granted for public subjects in the territory (%)	Patents granted for the territory (total number)	Patents granted for public subjects in the territory (%)
2013	17	57.14	34	12.50
2014	20	44.44	46	6.82
2015	9	45.45	33	29.41
2016	26	34,62	34	5.71
2017	18	42.86	31	15.15
2018	29	48.00	25	15.38
Mean value 2013–2018	20	45.42	34	14.16

Source: Authors according to Czech Statistical Office (2021)

4 Conclusion

When the competitiveness of states or regions is assessed, a key importance can be assigned to many factors, including also the factors concerning the research and innovation environment. In the field of research and development, indictors measuring resources, defined especially as the financial and human resources, as well as indicators measuring outcomes, defined as a production of new knowledge and expressed for example in the

form of patents, have to be considered. Results of comparative analysis presented above revealed increasing intensity of research and development, respectively increasing total expenditures on research and development as the percentage of GDP, of Czechia and Poland. Results showed as well that Czechia was nearly twice as intensive as Poland during the period of years 2010–2019. Results of the comparison of the research and innovation potential of the Czechia's regions done for the period of years 2010–2019 confirmed the dominance of the Prague region and the worst position of Karlovy Vary region, when the fundamental indicators of research and innovation potential were considered. However, when the assessment was based on three performance indicators, the Karlovy Vary region received one of the best positions. Relationships between the resources' variables (*BERD*, *PERD*, *RDP*) of the research and innovation potential of the Czechia's regions as well as relationships between the resources' variables and the outcome's variable (*PAS*) were assessed as strong and positive. Special attention was paid as well to two selected regions – South Bohemia and Pardubice, when the presented case study confirmed positions of South Bohemia and Pardubice region in previous overall assessment of regions' research and innovation potential. However, deeper comparison of these two regions revealed higher potential of Pardubice region with respect to the selected indicators defining the research and innovation potential of both regions (number of workplaces, size of the personal involved in research and development, patent applications).

Acknowledgements

This paper was created within the project SGS SP2021/51 „Complex use of quantitative methods in economic disciplines".

References

[1] ABU-BADER, S. H. (2021). *Using Statistical Methods in Social Science Research: With a Complete SPSS Guide*. Oxford University Press.

[2] ADAMOWICZ, M. (2021). The Potential for Innovative and Smart Rural Development in the Peripheral Regions of Eastern Poland. *Agriculture-Basel.* Vol. 11, 188.

[3] BEDNÁŘ, P., HALÁSKOVÁ, M. (2018). Innovation Performance and R&D Expenditures in Western European Regions: Divergence or Convergence? *Journal of International Studies.* Vol. 11, pp. 2010-2024.

[4] BOGETOFT, OTTO, L. (2011). *Benchmarking with DEA, SFA, and R*. Springer Science+Business Media.

[5] CAPELLO, R.; LENZI, C. (2013). Territorial Patterns of Innovation and Economic Growth in European Regions. *Growth and Change.* Vol. 44, pp. 195-227.

[6] CSO (2021). *Comparison of Regions in the Czech Republic* (*Science and Research*)**.** [online]. [cit.2021-04-15]. Available from https://www.czso.cz/csu/czso/19-science-and-research-knt51coktq

[7] EUROSTAT (2021). *Research and development expenditure, by sectors of performance.* [online]. [cit.2015-04-15]. Available from https://ec.europa.eu/eurostat/databrowser/view/tsc00001/default/table?lang=en

[8] GARDOCKA-JALOWIEC, A. (2012). R&D expenditure and the Innovativeness of the Polish Economy, *Ekonomista.* No. 1, pp. 79-99.

[9] GONCALVES, C. D. F., MANDONCA DIAS, J. A., CRUZ MACHANDO V. A. (2015). Multi-criteria decision methodology for selecting maintenance key performance indicators, *International Journal of Management Science and Engineering Management.* Vol. 10, pp. 215-223.

[10] GRAF, H., MENTER, M. (2021). Public research and the quality of inventions: the role and impact of entrepreneurial universities and regional network embeddedness. *Small Business Economics.* Early Access.

[11] HALASKOVA, M., HALASKOVA, R. (2018). Research Potential of Czech and Polish NUTS2 Regions. In Proceedings of the 2018 *2th International Conference Development and Administration of Border Areas of the Czech Republic and Poland. Support for Sustainable Development*. pp. 73-81.

[12] HUNADY, J., L'APINOVA, E., PISAR, P. (2018). Evaluation of selected determinants of innovation potential at NUTS 2 level in V4 countries. In Proceedings of the 2018 *5th Academy-of-International-Business-Central-and-Eastern-Europe (AIB-CEE Chapter Annual Conference on International Entrepreneurship as the Bridge between International Economics and International Business.* pp. 217-230.

[13] JABLONSKA, M. (2020). Comparative Analysis of R&D in the Visegrad Group Countries in the Years 2004-2018. *Comparative Economic Research-Central and Eastern Europe.* Vol. 23, pp. 31-44.

[14] KLIMOVA, V., ZITEK, V., KRALOVA, M. (2020). How Public R&D Support Affects Research Activity of Enterprises: Evidence from the Czech Republic. *Journal of the Knowledge Economy*, Vol. 11, pp. 888-907.

[15] KLÍMOVÁ, V. (2013). Innovation Infrastructure in Moravian Regions. In *Proceedings* of the 2013 *16th International Colloquium on Regional Sciences.* pp. 198-204.

[16] KOVACSOVA, L. (2014). Research Potential of the Czech Regions. In *Proceedings* of the 2014 *17th International Colloquium on Regional Sciences.* pp. 186-193.

[17] KRAFTOVA, I., KRAFT, J. (2018). The Relationship between Pro-Innovation Factors and the Performance of the European Union Member States and their Regions. *Inzinerine Ekonomika-Engineering Economics.* Vol. 29, pp. 424-433.

[18] MELECKY, L., STANICKOVA, M. (2011). The Competitiveness of Visegrad Four NUTS2 Regions and its Evaluation by DEA Method Application. In Proceedings of the 2011 *29th International Conference on Mathematical Methods* in *Economics.* pp. 474-479.

[19] MPO (2021). *Národní výzkumná a inovační strategie pro inteligentní specializaci České republiky 2021–2027. Příloha 2. Karty krajských RIS3 strategií*. [online]. [cit.2021-04-30]. Available from http://www.risjk.cz/files/risjk/uploads/files/161304599463-132-c-priloha-2-krajske-karty-1.pdf

[20] OECD (2015). *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities,* Paris: OECD Publishing.

[21] ROSZKO-WOJTOWICZ, E., GRZELAK, M.M., LASKOWSKA, I. (2019). The impact of research and development activity on the TFP level in manufacturing in Poland. *Equilibrium-Quarterly Journal of Economics and Economic Policy.* Vol. 14, pp. 711-737.

[22] RODRÍGUEZ-POSE, A., CRESCENZI, R. (2008). Research and Development, Spillovers, Innovation Systems, and the Genesis of Regional Growth in Europe. *Regional Studies.* Vol.42 (1), pp. 51–67.

[23] RVVI (2021a). *Národní politika výzkumu, vývoje a inovací České republiky 2021+*. [online]. [cit.2021-04-19]. Available from https://www.vyzkum.cz/FrontClanek.aspx?idsekce=913172.

[24] RVVI (2021b). *Innovation Strategy of the Czech Republic 2019 – 2030.* [online]. [cit.2021-04-20]. Available from https://www.vyzkum.cz/FrontClanek.aspx?idsekce=867922.

[25] SOUKALOVA, R. (2016). The Role of Universities in the Transfer of Innovations in the Creative Industry in the Czech Republic. In Proceedings of the 2016 *27th International Business Information Management Association Conference. Innovation Management and Education Excellence Vision 2020: From Regional Development Sustainability to Global Economic Growth, VOL S I - VI,* pp. 3166-3174.

[26] SRHOLEC, M., ZIZALOVA, P. (2014). Mapping the Geography of R&D: What Can We Learn for Regional Innovation Policy in the Czech Republic and Beyond? *European Planning Studies.* Vol. 22, pp. 1862-1878.

[27] SCHWARZOVA, P., LITSCHMANNOVA, M. (2019). The Evaluation of Alternative Financial Resources of Secondary Education in the Moravian-Silesian Region**.** In Proceedings of the 2019 *22nd International Colloquium on Regional Sciences.* pp. 200-2008.

[28] SZAROWSKA, I., ŽURKOVA, D. (2017). Public Expenditure on Research and Development and its Relationship with Economic Growth in the Czechia, Denmark and Slovakia. *Scientific Papers of the University of Pardubice – Series D.* Vol. 24 (39/1/2017), pp. 211-222.

[29] ŠIPIKAL, M., PISÁR, P., URAMOVÁ, M. (2010). Support of innovation at regional level. *E+M Ekonomika a Management.* Vol.13, pp. 74-85.

[30] ZDRAZIL, P., MATEJA, Z. (2013). Science-Research Potential Index and Dynamics of its Development in Czech and Slovak Regions. In Proceedings of the 2013 *International Scientific Conference on Hradec Economic Days 2013 - Economic Development and Management Region.* pp. 353-359.

Appendix

Values of CI assessing multi-critically the research and innovation potential of Czech regions

Region	2010	2011	2012	2013	2014	2015	2016	2017	2018
Prague	0.23	0.41	0.15	0.23	0.17	0.15	0.16	0.20	0.32
Central Bohemia	0.03	0.05	0.06	0.04	0.04	0.09	0.11	0.10	0.44
South Bohemia	0.09	0.21	0.06	0.20	0.11	0.08	0.13	0.02	0.39
Plzen	0.06	0.12	0.00	0.07	0.02	0.03	0.00	0.06	0.31
Karlovy Vary	1.00	0.96	1.00	1.00	1.00	1.00	0.60	0.91	0.00
Usti	0.47	0.48	0.02	0.43	0.33	0.30	0.35	0.62	0.67
Liberec	0.45	0.48	0.19	0.38	0.24	0.18	0.23	0.19	0.57
Hradec Kralove	0.17	0.40	0.32	0.23	0.11	0.13	0.68	0.28	0.52
Pardubice	0.11	0.34	0.12	0.17	0.18	0.17	0.15	0.28	0.45
Vysocina	0.10	0.22	0.09	0.05	0.08	0.10	0.32	0.12	0.74
South Moravia	0.12	0.18	0.07	0.06	0.02	0.01	0.02	0.10	0.23
Olomouc	0.08	0.13	0.10	0.16	0.08	0.15	0.18	0.26	0.38
Zlin	0.24	0.30	0.13	0.19	0.10	0.15	0.16	0.17	0.47
Moravia-Silesia	0.29	0.53	0.19	0.39	0.19	0.24	0.29	0.40	0.60

Source: Authors according to Czech Statistical Office (2021)

The Public Transport in the Statutory City of Ostrava

Kamila Janovská[1], Lucie Orlíková[2], Iveta Vozňáková[1], Karolina Slamová[3], Hana Tomčíková[1]

[1]VŠB – Technical University of Ostrava
Faculty of Materials Science and Technology
Department of Economics and Management in Industry
17. listopadu 15, 708 33 Ostrava – Poruba, Czech Republic
kamila.janovska@vsb.cz, iveta.voznakova@vsb.cz, hana.tomcikova.st@vsb.cz

[2]VŠB – Technical University of Ostrava
Faculty of Mining and Geology
Department of Geoinformatics
17. listopadu 15, 708 33 Ostrava – Poruba, Czech Republic
lucie.orlikova@vsb.cz

[3]VŠB – Technical University of Ostrava
Institute of Languages
17. listopadu 15, 708 33 Ostrava – Poruba, Czech Republic
karolina.slamova@vsb.cz

Abstract

Transport is one of the key components of every municipality and has long remained an important player in the process of forming not only the municipalities themselves but also higher territorial units. There is a great effort to reduce the burden on the environment, noise and transport costs by restricting the entry of passenger cars and move towards greater use of urban public transport in metropolises. Expenditures on public transport are among the largest items of city budgets in the Czech Republic and are growing with the number of inhabitants and the total area of the city. The article presents the outputs that arose within the solution of the project TL01000145 "Methodological - application tools for efficiency financial management of territorial structured Statutory City". The outputs of the article are focused on the area of transport, as it is one of the key areas of the budget of the Statutory City of Ostrava. As part of this project, a questionnaire survey was conducted in 2020 aimed at the inhabitants of Ostrava. The aim of the research was to find out what opinions and attitudes the inhabitants of Ostrava have about the functioning of public transport in the city.

Keywords: *expenditures, public services, public transport*

JEL Classification: *H72, R42, R12, R53*

1 Introduction

Individual car transport significantly burdens the environment, especially in the centres of large metropolises. There is significant pollution of the environment, traffic jams and an increase in overall noise in cities, which negatively affects the living standards of the inhabitants of these metropolises. Currently, there is a significant tightening of legislation in the area of car operation. However, increasing demands are also placed on public transport operators in the Czech Republic.

Urban public transport can be defined as a system of passenger public transport lines designed to provide transport services in the territory of the city by means of public transport. A specific public transport system can

be ensured by bus, tram or trolleybus transport. In cities with a population of over one million, it is the metro or overhead railways served by trains [1]. The effort of large metropolises, in particular, is to reduce the environmental burden of transport or to minimise its negative impact. The biggest problem in today's large metropolises is individual car transport, which pollutes the air due to CO2 emissions, increases overall noise, and causes a very common phenomenon called congestion, which has many negative economic and environmental impacts [2]. As part of the provision of transport in cities, the optimisation of the transport system in relation to environmental and cost sustainability has been addressed for a long time [3].

Urban public transport is part of every modern metropolis and serves to satisfy the transport requirements of the population, while its function is given by the characteristics in relation to managing the needs of population transport, the environment, and the investment intensity of the transport system. To ensure these needs, a perfect organisation within the integrated transport system and synchronisation of technical development is necessary, as well as all management, organisational, tariff, planning, and investment activities. The current dynamic environment places high demands on the efficiency, speed, safety and quality of the urban transport system, but also on evaluating the efficiency of spending funds.

In the vast majority of cases, the financing of urban public transport currently represents the greatest burden on urban public budgets in the Czech Republic and in the European Union cities. Every year, municipal budgets have to deal with the financing of a demonstrable loss and a reasonable profit for their own transport companies or contract carriers. The scope provided by public transport is subject to the approval of the city council, which is responsible for providing transport on its territory. A common problem of transport companies is their underfunding; due to the regulation of fare prices and the reduction of demands on the city budget, they cannot create sufficient reserves for fleet renewal and modernisation of operations. Thus, cities are forced to increase subsidies for public transport at the expense of other activities or are facing a reduction in the scope of the public service. Therefore, a number of professional works deal with the issue of comparing prices in public transport (e.g., determining the socially optimal price), setting the frequency and subsidies, evaluating the efficiency of road infrastructure, evaluating urban public transport, or evaluating investments in transport infrastructure capacity development [4,5,6].

As already mentioned, the pressure to ensure the maximum efficiency of the services provided and the use of public resources not only at the level of individual countries but also at the level of individual cities is constantly increasing. This need is also very noticeable in statutory cities, which carry out budgeting (solve the budget process) at the city level and at the level of city districts. In the Czech Republic, the regulation of Act No. 194/2010 Coll. Law on public passenger transport services and amending other laws approved in accordance with the European Union on 20 May 2010 fundamentally affects the methods of financing public transport.

Expenditures on public transport are among the largest items of city budgets in the Czech Republic and are growing with the number of inhabitants and the total area of the city. City budgets contribute to the compensation depending on their size. Smaller cities (about 50,000 inhabitants) provide subsidies to transport companies in the amount of about 8-10% of their tax revenues. In contrast, larger cities provide around 16-20%. The traditional financing model in the Czech Republic is a situation where the passenger's contribution to the total operating costs of public transport (PT) represents only a particular part; the rest is paid in the form of subsidies. In the conditions of the Czech Republic, the amount of this contribution is typically only 40% of the cost of a given trip. The city will pay the remaining 60% of the price for the passenger from public funds. [7-12]. he necessary high subsidies for public transport have many negative effects; in the case of a lack of financial resources in the public budget, the main immediate impact is the insufficient flow of investment funds in public transport. The investment parts of the subsidy are limited. As the operator of regulated non-market public transport is forced to cooperate with an ultimately market environment (e.g., with companies supplying fuels and energy), the costs of operating PT (vehicle-kilometre) increase as the market requires, but it is not possible to respond to them adequately as the market requires.

2 Material and Methods

The Statutory City of Ostrava (SCO) differs from other Czech and European cities in its residential structure. Ostrava consists of three natural centres of settlement and thus forms a polycentric residential structure around three core areas - around the historic city centre in Moravian Ostrava, Ostrava-South and Poruba. Ostrava is divided into 23 city districts, the largest of which has about 100 thousand inhabitants and the smallest under 1 thousand residents. Approximately 300 thousand people live in the city of Ostrava, including 10 thousand foreigners. The city has an area of 21,400 ha, which is an area that could accommodate up to 1 million inhabitants. The built-up area with lower building density, a number of gaps, peripheral places and barriers are a major problem in the development of the city and the effective maintenance of its infrastructure. Although the population of Ostrava has been declining since the 1990s, the decline is not large enough to diminish the present and future importance of Ostrava. The inhabitants of Ostrava place new demands on improving the quality of life

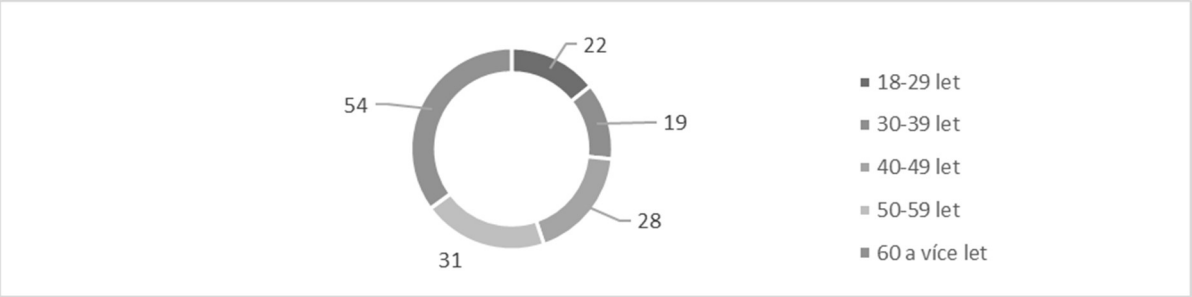
in all city districts. The Statutory City is required to be more efficient in its management, including the application of modern technologies in relation to citizens and city administration and applying a community and participatory approach to its development. The largest city districts require faster connections by public transport [13].

In the period 2018-2020, the project in the Statutory City of Ostrava "Methodological and application tools for the efficiency of financial management of a territorially structured Statutory City" was solved. The project responds to the need to optimise and make available the participation of internal and external stakeholders in the processes of all phases of budgeting, both at the level of the city and city districts. Within the above-mentioned project, data for the year 2017-2019 were analysed and processed.

The economic results of the urban districts and the Municipal Council of the Statutory City of Ostrava for the period 2017- 2019 were analysed [14]. In terms of expenditure sections, the SCO budget, the highest expenditures are those on transport (mostly covered by the city authority), housing, communal services and territorial development (mostly financed by municipal districts), and administration, where the share of municipal expenditures and city districts is almost balanced. In 2017, 21 expenditure sections were identified in the SCO budget, in 2019 only 17 were identified, so the number of expenditure sections was reduced. The division of transport was not affected by any adjustments and reductions. The highest share of municipal expenditures in 2017 is transport expenditures (about 25.1% of all expenditures). In 2019, transport expenditures make up about 25.0% of all expenditures. On average, city districts spent CZK 13,784,000 on transport. CZK, and per capita CZK 1.6 thousand, and in 2017 and in 2019 on average, city districts spent CZK 19,062 thousand, and per capita CZK 1 474.1 thousand. From the above data, a growing trend in transport spending can be traced. The analyses of expenditures of the Statutory City of Ostrava for the monitored period made it possible to monitor expenditures both from the point of view of SCO as a whole, from the point of view of municipal administration, and from the point of view of individual municipal districts. They have shown basic aspects of expenditures of territorially divided Statutory City and clearly demonstrate that expenditures on public transport in the Czech Republic are among the largest items of city budgets, and not otherwise in the city of Ostrava. Therefore, it is necessary to pay increased attention to this area.

In 2020, the research team of the TACR (Technology Agency of the Czech Republic) project, in cooperation with the Respond agency, conducted a questionnaire survey among the inhabitants of Ostrava. The aim of the research was to find out what opinions and attitudes the inhabitants of Ostrava have about the functioning of public transport in the city and other selected issues. The article presents opinions that substantially explain the essence of the research. 154 respondents took part in the research. They were selected based on the quota regulation and also according to their location of residence in Ostrava. No gender distinction was made between the respondents, but similar surveys conducted in the Czech Republic earlier showed that the quality of transport is perceived similarly by both groups. The results of the survey were intended to provide an answer to the question of how satisfied the citizens of Ostrava were with the functioning of Public Transport in Ostrava. The questionnaire contained a total of 9 main questions, where respondents expressed themselves using a rating scale (1 = very satisfied to 10 = very dissatisfied, 99 = I do not know). The questions focused mainly on the satisfaction of citizens with the offer of connections, whether on weekdays or on weekends and on the observance of timetables. The general part of the questions was then focused on the education, age and social status of the respondents. Figure 1 shows the individual groups of respondents in terms of age.

Figure 1 - Age structure of respondents



Source: Elaborated by the authors

Table 1 shows the numbers of respondents in individual age groups and with respect to economic activity.

Table 1 - Numbers of respondents in individual age groups and with respect to economic activity

	18-29 years	30-39 years	40-49 years	50-59 years	60 and more years	In total
economically inactive		2	2	4	48	56
businessman, company owner	1	2	2	5	2	12
student (apprentice)	12					12
employee doing mental work	6	12	21	13	4	56
employee doing manual work	3	3	3	9		18
Total sum	22	19	28	31	54	154

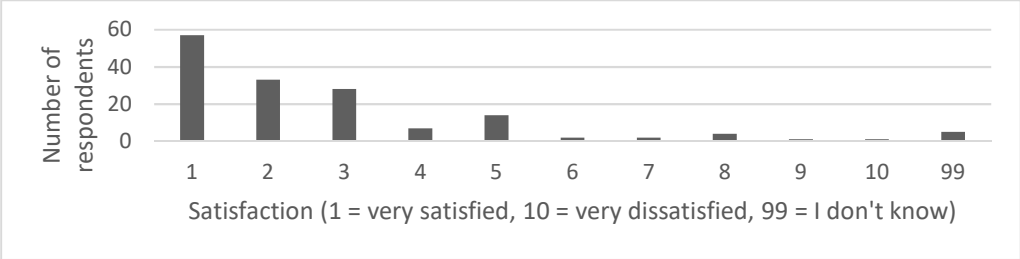
Source: Elaborated by the authors

The most numerous group, which was represented in the survey by 35%, are economically inactive respondents in the age category of 60 and over. Furthermore, a large group consists of the economically active age group 50-59 years (20%).

The respondents' residences were divided according to city districts. The most numerous group were respondents from Poruba (24%) and Silesian Ostrava (21%), while respondents from Krásné Pole, Pustkovec and Lhotka (0.6%) were the least represented. The last data examined by the respondents was their level of education. The group with completed secondary education was the most represented here, followed by groups with university education, especially in the age category 40-49 years.

Almost 77% of respondents are satisfied with the offer of connections on normal working days, see Figure 2. Only 1.3% of respondents stated that they were very dissatisfied with the offer of connections. In general, respondents from larger city districts, such as Poruba, Svinov, Slezská Ostrava, showed greater satisfaction in the range of 10 and 9, where the offer of connections on working days and the availability of public transport stops is greater. On the contrary, satisfaction in peripheral areas such as Polanka nad Odrou, Hošťálkovice or Hrabová ranged from 3 to 5. The age category and economic activity of the respondents did not show any significant differences in the evaluation of satisfaction.

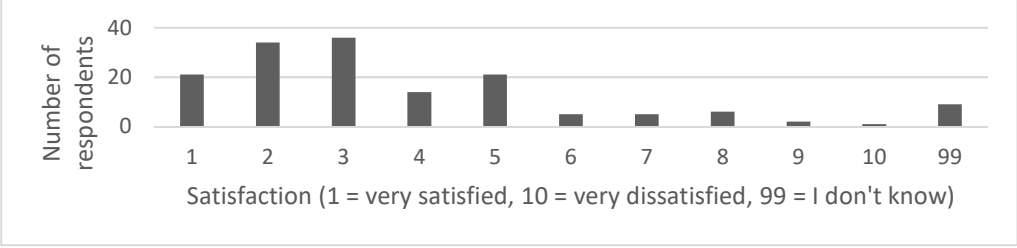
Figure 2 - Satisfaction of respondents with the offer of connections in SCO on working days



Source: Elaborated by the authors

The overall satisfaction with the offer of connections on Saturdays and Sundays decreased. 68.2% of respondents ranged from 2 to 5. The number of respondents who were unable to assess the situation also increased (the age group 50-59 years had the largest representation in this group, over 44%). Unlike normal working days, there was dissatisfaction with the offer of connections in Silesian Ostrava and Polanka nad Odrou.

Figure 3 - Satisfaction of respondents with the offer of connections in the SCO on Saturdays and Sundays

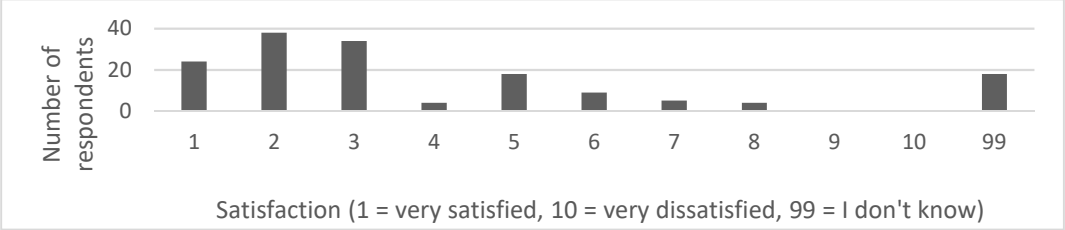


Source: Elaborated by the authors

The question "Satisfaction with transport services (line management)" caused a problem for the respondents (it was not properly formulated), as 11.6% of respondents answered, "I do not know". Most (94%) of these

responses were from the age group of 60 years and older and from economically inactive respondents. 62.3% of respondents were satisfied with the transport service, see Figure 4.

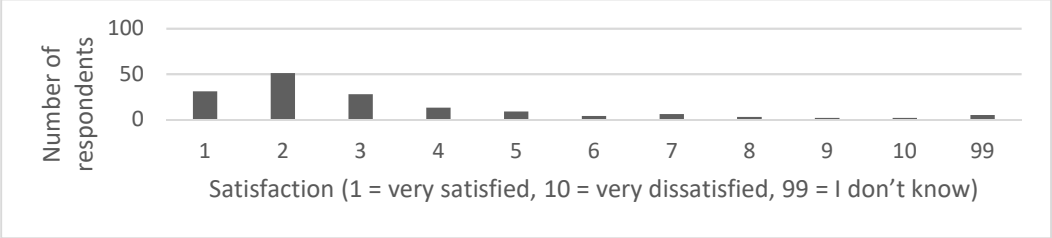
Figure 4 - Satisfaction of respondents with transport services



Source: Elaborated by the authors

71.4% of respondents were satisfied with the connection and observance of timetables, see Figure 5. The least satisfied group was the age category of 50-59 years. And also in the city districts of Ostrava-South and Poruba.

Figure 5 - Satisfaction of respondents with observance of timetables



Source: Elaborated by the authors

Table 2 shows the numbers of respondents in individual age groups and their satisfaction with the continuity of connections and observance of timetables.

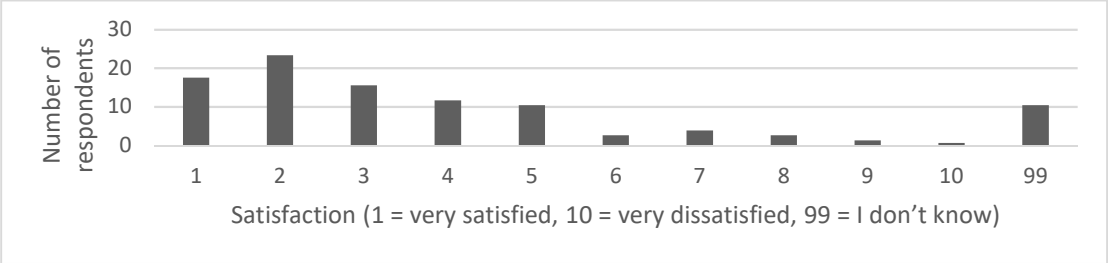
Table 2 - Numbers of respondents in individual age groups and their satisfaction with the continuity of connections and compliance with timetables

Satisfaction/age	18-29 years	30-39 years	40-49 years	50-59 years	60 and more years	In total
1	3	3	7	7	11	31
2	8	2	10	7	24	51
3	5	5	5	2	11	28
4	3	4		2	4	13
5	2	1		5	1	9
6		2	1	1		4
7	1	1	1	1	2	6
8			2	1		3
9			1	1		2
10				2		2
99		1	1	2	1	5
In total	22	19	28	31	54	154

Source: Elaborated by the authors

Over half of the respondents (56.5%) are satisfied with the information about the planned changes in transport, see Figure 6. Education, age and residence did not show any differences in this case.

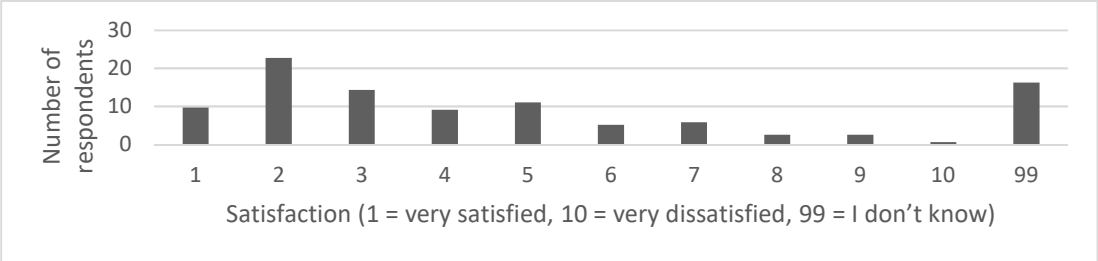
Figure 6 - Satisfaction of respondents with information about planned changes in transport



Source: Elaborated by the authors

In the case of satisfaction with information during emergencies, satisfaction decreased. 36.4% of respondents ranged from 5 to 10, at the same time, the share of answers "I do not know" increased to 16.2% (especially from the age groups 50-59 years and 60 and more years), see Fig. 7. The greatest dissatisfaction here was reported by respondents from the Poruba, Ostrava-Jih and Slezská Ostrava districts.

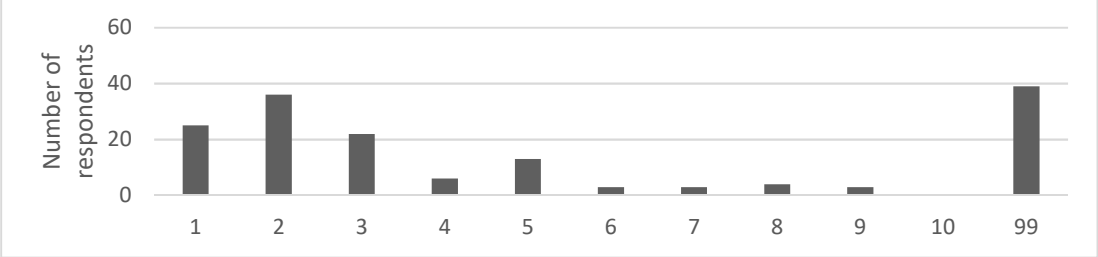
Figure 7 - Satisfaction of respondents with information during emergencies



Source: Elaborated by the authors

Satisfaction with the operation of the website was reported by 53.9% of respondents, but there was a large group of respondents 25.3%, who could not answer this question (see Figure 8). These were the age groups 50-59 years and 60 and over the years. Education did not play a role here.

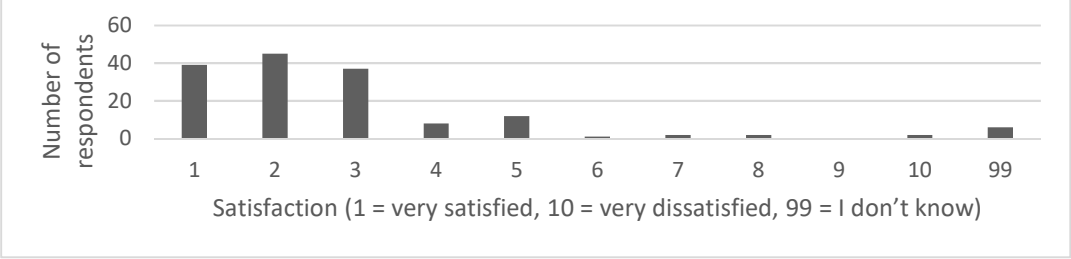
Figure 8 - Satisfaction of respondents with website traffic



Source: Elaborated by the authors

Most respondents 78.9% are satisfied with the information at the stops, see Figure 9. Age, education and residence did not play a role here. The answers were very similar in all the groups mentioned.

Figure 9 - Respondents satisfied with information at the stops



Source: Elaborated by the authors

70.1% of respondents are satisfied with the behaviour of drivers. 11.7% of respondents considered the willingness and behaviour of drivers to be average (rated 5). Residents of peripheral city districts evaluated the behaviour of drivers more positively than respondents from city districts such as Poruba, Ostrava-Jih or Moravská Ostrava and Přívoz.

3 Results and Discussion

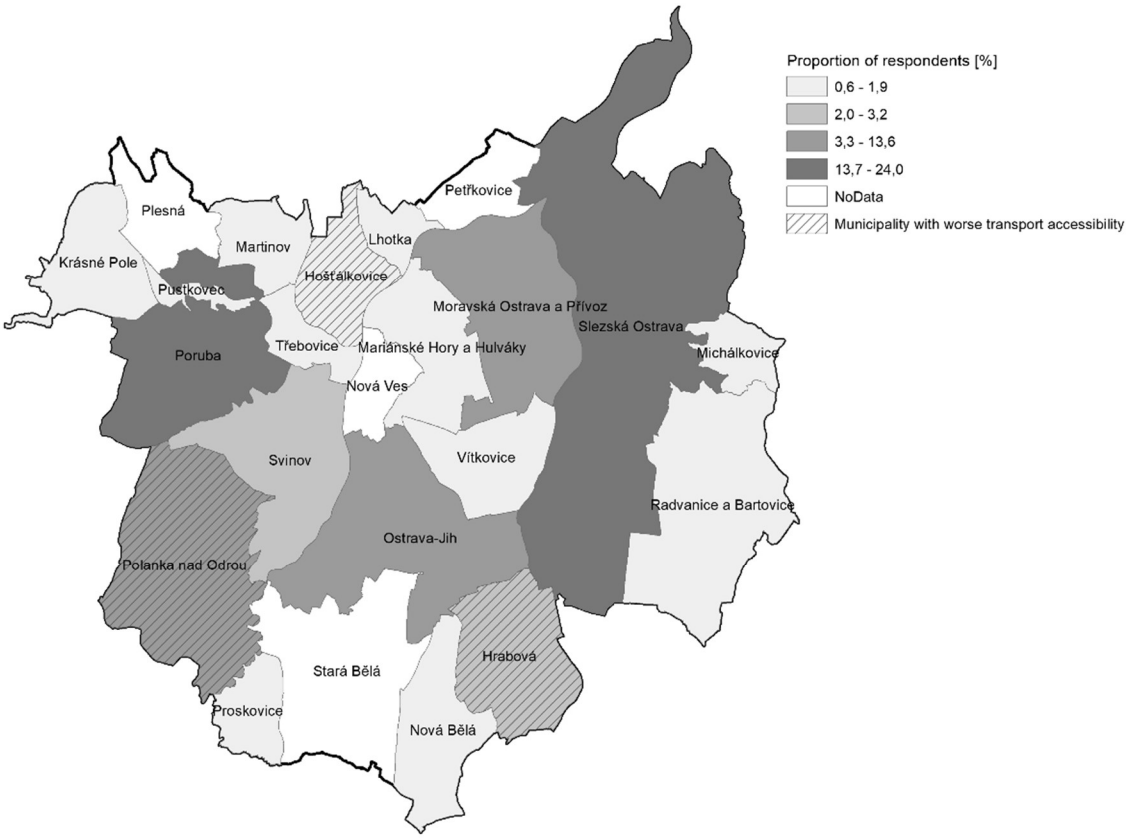
The transport system in the Statutory City of Ostrava is characterised by several specific features:

- transporting a large number of passengers over a relatively large and fragmented area compared to cities with the same population
- significant, spatial and seasonal fluctuations in demand for the services provided,
- high density of the transport network with short distances between the stops and low intervals between individual connections,
- a characteristic technical base adapted to the operation of the city.

Based on the analysis of available data, it can be clearly stated that in the Statutory City of Ostrava, expenditures in the area of transport are constantly increasing, and it can be assumed that this trend will be maintained, as the Statutory City of Ostrava succeeds in persuading residents to use public transport (it is evident from the documents of the Dopravní podnik Ostrava, a.s. In recent years, this trend has been most visible especially in trolleybus transport, where more and more residents prefer trolleybus transport to individual car transport, mainly due to the high density of trolleybus lines in the city centre.

The main task of public transport in the Statutory City of Ostrava is to provide the necessary quality of services for citizens in addition to the connection with the concept of sustainable development. The number of respondents who took part in the survey was 154, the age ranging from 18 to 60+. The questionnaire survey results have led to the following significant conclusions: almost 77% of respondents are satisfied with the offer of connections on standard working days, on weekends, the satisfaction with the offer of connections in SCO decreases slightly. 71.4% of respondents were satisfied with the continuity of connections and observance of timetables, while the least satisfied group was the age category of 50-59 years. The figure 10 shows municipality with worst transport accessibility. It is positive that respondents search for information about public transport on the website of Dopravní podnik Ostrava a.s., but a large group of respondents aged 50 and over do not seem to use the website regularly, as they were unable to answer this question. It will, therefore, be appropriate to focus on promoting the use of the website in this age group. Since the objective of Dopravní podnik Ostrava a.s. is to meet the needs of customers (passengers) and measure their satisfaction, it will be very important to conduct surveys at regular intervals in order to compare the development of respondents' opinions and evaluations with the quality of services provided by Dopravní podnik Ostrava a.s. and to proceed from them when meeting their transport needs. In order to increase the information value of the surveys, it is desirable to increase the number of respondents in all age categories.

Figure 10 - Transport accessibility



Source: Elaborated by the authors

4 Conclusion

Urban public transport is part of every modern city and is necessary to meet the transport requirements of the population, while its function is given by the characteristics in relation to coping with the needs of transporting the inhabitants, the environment, and the investment requirements of the transport system. It requires perfect organisation within the integrated transport system and synchronisation of technical development and all management, organisational, tariff, planning, and investment activities.

Over the last three years, the Ostrava Public Transport Company has invested three billion in purchasing about 170 low-emission buses powered by compressed natural gas (CNG) and several dozen emission-free electric buses and trolleybuses with batteries, which can run outside the overhead network. The Statutory City of Ostrava, like other major world capitals, monitors the development of technology, and its goal is to transform the current transport system into a transport system that will use only ecological, i.e. emission-free means of transport. Therefore, it is assumed that in the future, expenditures on urban public transport will continue to be among the largest items in the city budget, which will increase not only with population and overall city size but also in connection with ever-increasing environmental concerns. However, it can also be assumed that the quality of transport in the Statutory City of Ostrava will increase as a result of the planned investments.

Acknowledgements

This paper was created within the project “Metodicko aplikační nástroje pro efektivní řízení územně členěného statutárního města”. Project registration number TL01000145.

References

[1] JAŚKIEWICZ, J., PARLIŃSKA, M. (2016). Gospodarka cyrkulacyjna w zakresie żywności – konieczność oraz zyski dla sektora i społeczeństwa. *Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Problemy Rolnictwa Światowego*. 16 (3), pp.121–129. [online] [cit. 2019-03-12]. Available: http://sj.wne.sggw.pl/pdf/PRS_2016_T16(31)_n3_s121.pdf.

[2] U. S. DEPARTMENT OF TRANSPORTATION (2015), *Federal Highway Federation, Congestion: A National Issues,* ops.fhwa.dot.gov, [online]. [cit.2016-05-10]. Available: http://www.ops.fhwa.dot.gov/aboutus/opstory.htm

[3] MARTINS V. W. B., ANHOLON R., QUELHAS O. L. G. (2019). Sustainable Transportation Methods. *Encyclopedia of Sustainability in Higher Education. Springer*, Cham. doi.org/10.1007/978-3-319-63951-2_192-1

[4] PAVÓN, N., RIZZI. L., G. ROAD (2019). Road infrastructure and public bus transport service provision under different funding schemes: *A simulation analysis. Transportation Research Part A: Policy and practice*. [online]. [cit. 2020-11-20]. 125, pp 89-105. doi:10.1016/j.tra.2019.05.001

[5] HÖRCHER, D., DE BORGER, B., SEIFU, W., GRAHAM, J.D. (2020). Public transport provision under agglomeration economies. *Regional Science and Urban Economics* [online]. 2020, 81 [cit. 2020-11-20]. doi:10.1016/j.regsciurbeco.2019.103503

[6] BASSO, L. J., SILVA. H.E. (2014). Efficiency and Substitutability of Transit Subsidies and Other Urban Transport Policies. *American Economic Journal: Economic Policy*. 6(4), pp.1-33. doi:10.1257/pol.6.4.1

[7] MELICHAR, V., JEŽEK.J. (2004). *Ekonomika dopravního podniku*. 3. Vyd. Pardubice: Univerzita Pardubice

[8] OCHRANA, F., PAVEL., J., VÍTEK. L. (2010). V*eřejný sektor a veřejné finance: financování nepodnikatelských a podnikatelských aktivit.* 1. vyd. Praha: Grada Publishing.

[9] PROVAZNÍKOVÁ, R., SEDLÁČKOVÁ, O. (2009) Financování měst, obcí a regionů: teorie a praxe. 2. vyd. Praha: Grada

[10] ZELENÝ, L. (2007) Osobní přeprava. 1. vyd. Praha: ASPI.

[11] MINISTERSTVO DOPRAVY ČESKÉ REPUBLIKY MDČR.(2021) Dopravní politika České republiky pro období 2021-2027 s výhledem do roku 2050 [online], 2021. [cit. 2021-05-05]. Available: https://www.komora.cz/legislation/85-20-dopravni-politika-cr-pro-obdobi-2021-2027-s-vyhledem-do-roku-2050-t24-7-2020/

[12] Sdružení dopravních podniků ČR (2021). [online]. 2021[cit. 2021-05-14].Available: http://www.sdp-cr.cz/.

[13] KUTA, V., ENDELA, S. (2015). *Ostrava jako regionální metropole*. Ostrava: Statutární město Ostrava.

[14] Interní materiály Statutárního města Ostrava za období 2017-2019.

Analysis of Evaluation of Financing and Safety of Road Transport in the Czech Republic and Poland Using the WSA Method

Lenka Karnufková[1], Roman Vavrek[1]

VŠB - Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 70121 Ostrava 1, Czech Republic
lenka.fabianova.st@vsb.cz, roman.vavrek@vsb.cz

Abstract

Transport is currently an extremely important topic from the perspective of the environment, the perspective of safety. Transport is also being considered from the perspective of financing, mostly provided by the state. The aim of this paper is to use the WSA (Weight Sum Approach) method to identify the quality of road transport in the Czech Republic and in Poland within the context of selected regions of the European Union for the period 2010–2018. Both of these regions have rather worse ratings within the context of the results obtained and in terms of consideration for indicators such as investment in road transport per 1 km of motorway or the total number of fatalities (meaning that they are found in the second half of the overall order). In the case of the Czech Republic, the result is based on below-average results across the set of criteria monitored. In Poland, meanwhile, the cause is mainly the low level of road traffic safety.

Keywords: *Czech Republic, European Union countries, Poland, road transport*

JEL Classification: *C18, O18, R42*

1 Introduction

Transport is becoming the driving force of each and every economy. Transport is characterised as the intentional and organised relocation of objects and persons by way of different types of means of transport (Vavrek, Bečica, 2020). Transport is also part of the public sector, which can be analysed according to Stiglitz, Rosengard (2015); there are four general stages of analysis when addressing each fundamental economic issue: a description of what the government is doing, an analysis of the consequences of government measures, an assessment of alternative policies, and an interpretation of the political forces that underlie government decisions. First let us focus on a definition of transport itself. Zelený et al. (2017) contend that transport is characterised as an activity linked to the purposeful relocation of persons and physical objects of a variety of volumes, within a variety of temporal and spatial contexts, using different means of transport and technologies. Another view is provided by Surovec et al. (2004), according to which transport means the deliberate activity of relocating persons or goods in space and time. Peková et al. (2012) contend that transport can be defined as an activity linked to the purposeful relocation of persons and physical objects in a variety of contexts - time or volume and spatial. As Holubová (2014) states, transport is any relocation of persons and material assets carried out either by own force or by intermediated force. Transport is part of the transport sector, which is a growth sector. It can be added here that the transport sector as a whole is a growth industry, and that the following are the main factors contributing to its performance growth:

- Changes in the structure of the manufacturing industry leading to the transfer of economic activities from traditional centres to new development areas, the process being reinforced by integrative activities.
- Changes in production methods that lead to the need for fast and flexible, user-focused transport, the positive contribution of which is its influence on accelerating capital turnover: the reduction of stocks, the reduction of storage demands.
- The rising share of the service sector in the economy; undertaking business in this sphere is linked to an increase in demands on professional mobility over short, medium, and long distances.

- The increase in net income and changes in the social and demographic structure of society; the income effect, increasing work activity among women, the desire to secure mobility leads to a higher share of passenger car ownership and to an increase in the number and the length of journeys. Zelený et al. (2017)

Views on the division of transport are different, more complex and simple. In terms of transporting people and goods, Zelený et al (2017) distinguish between the following basic modes of transport: road, rail, air, water, pipeline, combined, urban public transport, special transport, etc.

According to Rektořík et al. (2012), transport can be divided into overland, maritime, and air transport. Overland transport is considered in a separate section below. Maritime transport, at sea or over oceans, uses ships or tankers, which are unfortunately not used in the Czech Republic in light of the conditions here, and air transport, which can be understood as aviation and/or aerospace. Air transport encompasses transport above the surface of the earth, meaning that it includes balloon flying, parachute jumps, bungee jumping, or a flight in a means of transport within the Earth's atmosphere. As far as space transport is concerned, European space activities are mainly conducted by the European Space Agency (ESA). Although ESA is not an EU body, it is strongly supported by the EU, even financially. Eisler et al. (1998) use the division of passenger and freight transport. Here transport is divided into passenger and freight transport, which are further divided into public transport and transport for one's own needs. The fundamental difference between passenger and freight transport is that in the case of passenger transport, we are talking primarily about transport of up to 3.5 tons in weight which should primarily be used for the carriage of persons. In the case of freight transport, vehicles weigh from 3.5 tons upwards and are used to carry goods, material, etc.

It is important to finance transport and, as Peková et al. (2012) argue, the resources which finance transport infrastructure can be divided into public and alternative sources. The following are among such public sources:

- financing from municipal and regional budgets, from which funds are drawn mainly for the construction and maintenance of transport infrastructure;
- the budget of Státní fond dopravní infrastruktury (State Fund for Transport Infrastructure);
- the budget of the Ministry of Transport;
- foreign support funds and European Union programmes - Structural Funds, Operational Programme Transport II, etc.

As Peková et al. (2012) contend, alternative sources include:

- loans from domestic and foreign banks, collecting direct charges for the use of transport infrastructure, and
- funding with the involvement of private capital: Public-Private Partnership (PPP).

Lubomír Zelený et al. (2017) characterise safety as the condition of optimal functioning of the transport system without conflict situations and disruption to the fluidity and organisation of traffic. Szczukowski (2017) states that safety is "a condition without damage or perception of a condition without damage or potential damage". In the Polish dictionary, for example, the term safety is defined as a condition which gives a sense of certainty and guarantees its preservation and the chance to improve and a situation distinguished by a lack of risk of losing something that one particularly appreciates (Pawłowski, 2020). Holubová (2014) further states that road traffic safety concerns all citizens and includes three main components: the road system, the human factor, and the vehicle. These three elements are interconnected by the localisation of traffic incidents and their characteristics provide the basis for analysing road accidents.

2 Material and Methods

As mentioned, the aim of this paper is to use the WSA (Weight Sum Approach) method to identify the quality of road transport in the Czech Republic and in Poland within the context of selected regions of the European Union for the period 2010–2018. The population for processing this analysis is the 28 regions of the European Union during the reference period, i.e. 2010-2018 (including the UK, which left the EU in 2021). The sample is then those countries that have available data for the period 2010-2018. The selected regions are marked in blue in Figure 1, and subsequently evaluated.

Figure 1 – 14 selected EU regions from the population of countries for actual analysis

Source: Own processing

These 14 countries are evaluated using the following indicators in order to achieve the principal objective:

Table 1 – Set of evaluated criteria

Financing	1A – Investment in road infrastructure in EUR
	2A – Investment in road transport per capita
	3A – Investment in road transport per 1 km of motorway
	4A – Number of kilometres of motorway per 1 million inhabitants
	5A – Growth rate
Safety	1B – Total number of fatalities
	2B – Number of fatalities per 1 million inhabitants
	3B – Number of fatalities per 100 km of motorway

Source: Own processing

Indicator 1A covers expenditure on new transport construction and on improving the existing network (OECD 2021). We can use Indicator 2A to see how much investment in road infrastructure there is per capita, so that individual countries can be compared with one another. We use Indicator 3A to determine how much money would be invested in 1 km of motorway if only these routes were extended. The aim of Indicator 4A is to determine how many kilometres of motorway there are per 1 million inhabitants in the sample so that individual countries can be compared with one another. Indicator 5A makes it possible to ascertain the percentage year-on-year change in the total length of motorway in the sample during the reference period. Indicator 1B shows the number of fatalities in the sample during the reference period. Thanks to indicator 2B, we know how many fatalities there are per million inhabitants in each country in the sample so that they are comparable with each other. Indicator 3B aims to determine how many fatalities there are per 100 km of motorway in the selected states during the reference period. The calculations of Indicators 2B and 3B are shown in Table 3.1. The data for these indicators are taken from the Eurostat database (2021).

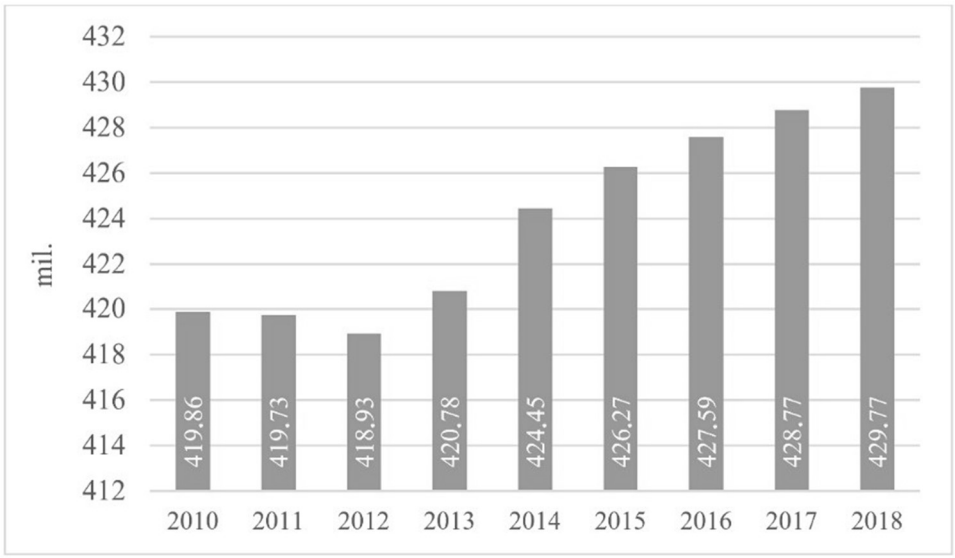
Data to achieve the principal objective are drawn from the Eurostat database (2021a, 2021b, 2021c) and OECD (2021). Analyses are processed in MS Excel.

2.1 Characteristics of the Research Sample

The following part of the chapter is devoted to the sample itself from the perspective of the basic data, by way of which the number of inhabitants and the number of kilometres of motorway are converted per 1 million inhabitants for the purpose of illustrating the current situation.

Figure 2 shows the development of the total number of inhabitants in the selected European Union regions. A decline can be observed from 2010 to 2012, caused by the reduced number of inhabitants in Germany, Romania, and Poland in those years. The trend thereafter is a rising one, despite smaller fluctuations in the number of inhabitants between countries.

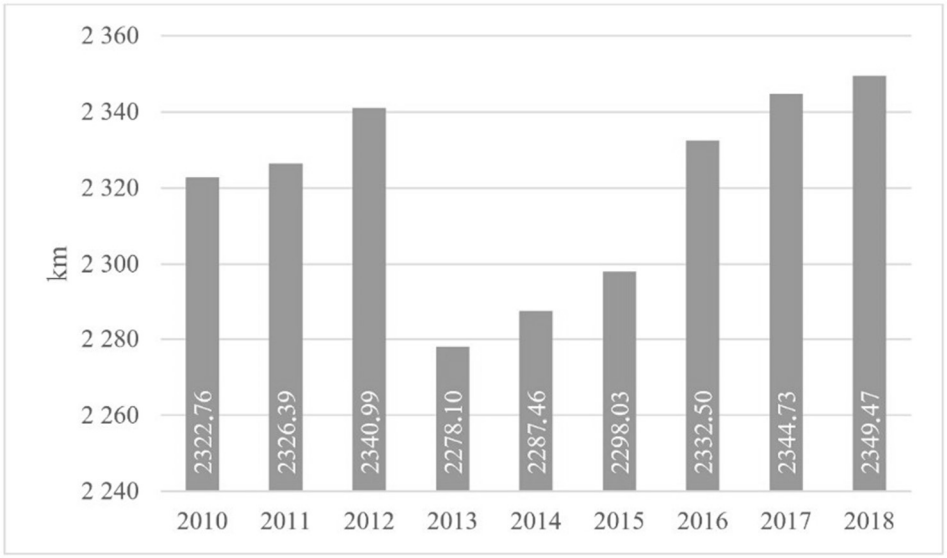
Figure 2 – Total number of inhabitants in the sample of regions of the European Union (million)



Source: Own processing

From Figure 3 we can see the development of the number of motorway kilometres per 1 million inhabitants in the sample. The graph shows that the number of kilometres increased until 2012, but that there was a significant decrease thereafter, due to the reduction in the number of kilometres of motorway in Slovenia between 2012 and 2013, i.e. an administrative reduction. The trend has risen again since. There was a step increase between 2015 and 2016 due to the increase in motorways in the Czech Republic, as mentioned above.

Figure 3 – Number of kilometres of motorway per 1 million inhabitants in selected EU regions (km)



Source: Own processing

We can observe an increase in the number of inhabitants in the 14 selected regions alongside the increase in motorway kilometres. We will now consider the results of multi-criteria evaluation using the 6 indicators.

2.2 The WSA Method

The WSA method, or Weighted Sum Approach, is one of the easier methods of multi-criteria evaluation. Among the more sophisticated are the TOPSIS method (Technique for Order of Preference by Similarity to Ideal

Solution) or the ELECTRE method (ELimination Et Choice Translating Reality); see Vavrek (2019). It is therefore a multi-criteria decision-making method for assessing a number of alternatives from the perspective of the number of decision-making factors. The application of these methods can be found in both the public sector (Ardielli, Bečica 2018; Papcunová et al. 2015) and in the private sector (Pukala, Petrova 2019). The result of this method is "u", from the word utility. Partial evaluation by means of the individual criteria "u_{ij}" would be interpreted as the partial utility of the i-th variant in relation to the j-th criterion,

$$u_{ij} = \frac{y_{ij} - d_j}{|h_j - d_j|}; i = 1,2,..,m; j = 1,2,\dots,n \quad (1)$$

where: y_{ij} - the value in the indicator monitored

d_j - the worst possible value of the selected indicator

hj - the best possible value of the selected indicator

If the value of the indicator is close to the best possible value (hj), then the value in the calculation table will be close to 1. Conversely, if the value of the indicator is close to the worst possible value (dj), then the value in the calculation table will be close to 0. For the purposes of this thesis, Indicators 1A (investment in road infrastructure), 2A (investment in road transport per capita), and 3A (investment in road transport per km of motorway) are characterised as maximisation, and conversely Indicators 1B (total number of fatalities), 2B (fatalities per 1 million inhabitants), and 3B (fatalities per 100 km of motorway) are characterised as minimisation.

The weighting was determined on the basis of the method of equal importance (Vavrek, 2015), because we are unable to objectively determine which of these indicators is of greater importance, or on what basis to determine this information.

3 Results and Discussion

3.1 Multi-Criteria Evaluation Using the WSA Method in 2010

Table 2 – Decision matrix and results of the WSA method in 2010

country/indicator	1A	2A	3A	1B	2B	3B	W
Belgium	348,000,000	32.10	197 390.81	850	78.41	48.21	0.37
Czech Republic	**1,719,545,029**	**164.36**	**2 342 704.40**	**802**	**76.66**	**109.26**	**0.48**
Germany	12,250,000,000	149.75	955 612.76	3 648	44.60	28.46	0.53
Spain	7,851,000,000	168.89	550 483.80	2 444	52.57	17.14	0.52
France	14,497,093,953	224.21	1 272 567.94	3 992	61.74	35.04	0.56
Italy	3,389,000,000	57.26	508 248.35	4 114	69.50	61.70	0.30
Luxembourg	182,571,021	363.64	1 201 125.14	32	63.74	21.05	0.62
Austria	390,000,000	46.70	226 876.09	522	62.50	30.37	0.42
Poland	**6,509,637,046**	**171.20**	**7 595 842.53**	**3 908**	**102.78**	**456.01**	**0.39**
Romania	2,851,137,605	140.49	8 587 763.87	2 377	117.12	715.96	0.32
Slovenia	221,000,000	107.86	287 760.42	138	67.35	17.97	0.46
Finland	890,000,000	166.31	1 142 490.37	272	50.83	34.92	0.54
Sweden	1,666,090,563	178.37	845 302.16	266	28.48	13.50	0.59
United Kingdom	6,482,927,057	103.71	1 765 503.01	1 905	30.48	51.88	0.55

W – results of the WSA method

Source: Own processing based on Eurostat (2021a,b,c), OECD (2021)

Indicator 1A, which shows investment in road infrastructure in EUR in Table 3.4, shows that France, which provided EUR 14.5 billion in 2010, and Germany, which invested EUR 12.2 billion in road infrastructure, provided the largest investment. Conversely, Luxembourg invested the least in road infrastructure, spending EUR 182.5 million during the reference year. When comparing these countries, it is important to note that France is about 249 times larger than Luxembourg. It can therefore be expected that France's expenditure will be higher. The Czech Republic invested EUR 1.7 billion in road infrastructure in 2010. As for Indicator 2A, having the character of maximisation, it can be observed that Luxembourg has the highest per capita investment, in spite of having the lowest total expenditure in the previous indicator. The figure here is EUR 363.6 per capita for 2010. France had the second highest investment, investing EUR 224.2 per capita in the same year. On the contrary, Belgium (EUR 32.1), Austria (EUR 46.7), and Italy (EUR 57.26) had the lowest investment, of less

than EUR 100 per capita, during the reference year. The Czech Republic invested EUR 164.36 per capita in road infrastructure in the reference year, with almost the same level of investment recorded in Spain (EUR 168.9) and Finland (EUR 166.3). Another indicator assessed in this method is Indicator 3A (investment in road transport per 1 km of motorway), where it can be seen that the highest investment in road transport per 1 km of motorway was in Romania (EUR 8.5 billion) and Poland (EUR 7.5 billion). On the contrary, Belgium (EUR 197,000), Austria (EUR 226,000), and Slovenia (EUR 287,000) invested the least in the reference year in terms of this indicator. The Czech Republic invested the converted sum of EUR 2.3 billion, meaning it was third among the evaluated regions. The highest number of fatalities (1B) was in Italy, France, Poland, and Germany. There the number of fatalities was over 3,000. This might also be due to the higher population in these countries in comparison with the others. The fewest fatalities were in Luxembourg (32 persons), Slovenia (138 persons), Sweden (266 persons), and Finland (272 persons), where the figure is below 500 in the reference period. There were 802 deaths in the Czech Republic in 2010, meaning that the Czech Republic is in the middle of the countries monitored in a comparison with other countries. There was a similar number of fatalities in Belgium in that year: 850. This indicator shows that despite the absolute figures for Indicator 1B, where Italy has the highest number of fatalities, this figure stands at 69.5 deaths when converted to 1 million inhabitants (2B), corresponding to most of the countries under observation. On the contrary, Romania and Poland have the highest death rates per 1 million inhabitants, with more than 100 fatalities. The fewest fatalities in 2010 were then in Sweden (28.48 people) and the United Kingdom (30.48 people). 76.66 fatalities per million inhabitants were recorded in the Czech Republic. The final indicator monitored is the number of fatalities per 100 km of motorway (3B). This indicator shows that only Romania (715.96 persons), Poland (456.01 persons), and the Czech Republic (109.26) had more than 100 100 fatalities per 100 km of motorway in 2010. It should also be noted that these countries did not have such an extensive motorway network as other countries during the reference period.. The total motorway network in 2010 in the Czech Republic was 734 km, in Poland 857 km, and in Romania only 332 km.

3.2 Multi-Criteria Evaluation Using the WSA Method in 2018

Table 3 – Decision matrix and results of the WSA method in 2018

country/indicator	1A	2A	3A	1B	2B	3B	W
Belgium	655,906,000	57.54	372 039.71	684	60.01	38.80	0.39
Czech Republic	**1,044,764,479**	**98.47**	**834 476.42**	**656**	**61.83**	**52.40**	**0.44**
Germany	15,630,000,000	188.79	1 189 407.20	3 275	39.56	24.92	0.62
Spain	3,512,000,000	75.27	225 344.88	1 806	38.71	11.59	0.43
France	9,630,130,000	143.91	825 133.24	3 246	48.51	27.81	0.48
Italy	3,409,000,000	56.36	490 998.13	3 334	55.12	48.02	0.29
Luxembourg	180,379,732	299.63	1 093 210.50	36	59.80	21.82	0.64
Austria	463,000,000	52.48	265 633.96	409	46.36	23.47	0.43
Poland	**2,668,638,220**	**70.27**	**1 630 200.50**	**2 862**	**75.36**	**174.83**	**0.25**
Romania	2,181,564,246	111.70	2 650 746.35	1 867	95.59	226.85	0.30
Slovenia	219,000,000	105.96	351 524.88	91	44.03	14.61	0.50
Finland	1,526,000,000	276.79	1 647 948.16	239	43.35	25.81	0.70
Sweden	2,497,001,960	246.73	1 171 201.67	324	32.02	15.20	0.69
United Kingdom	8,697,004,973	131.23	2 266 025.27	1 839	27.75	47.92	0.67

W – results of the WSA method

Source: Own processing based on Eurostat (2021a.b.c). OECD (2021)

Table 3 again shows the same indicators as above, but in the most recent reference year: 2018. For indicator 1A, which represents investment in road transport, we see that Germany had the highest investment (EUR 15.6 billion). We can observe an increase in such investment compared to 2010, when Germany invested EUR 12.2 billion in road infrastructure. France registered a slight fall in investment of less than EUR 5 billion. As in 2010, the lowest investment was in Luxembourg (EUR 180 million). The Czech Republic invested more than EUR 1 billion in road infrastructure, a slight decrease on 2010. Luxembourg (EUR 299.63), Finland (EUR 276.79), and Sweden (EUR 246.73) recorded the highest investment per capita (2A). Investment in these countries exceeded EUR 200 per capita in 2018. By contrast, the lowest investment per capita was seen in Austria (EUR 52.48), with Italy (EUR 56.36) and Belgium (EUR 57.54) also investing less than EUR 60 in 2018. A decrease can be observed in the Czech Republic even after converting to investment per capita; there was a decrease of EUR 65.89 in 2018 in comparison with 2010. Romania (EUR 2.6 billion) and the United Kingdom (EUR 2.2 billion) registered the highest investment in road infrastructure per 1 km of motorway (3A), and were the only two countries observed where investment was higher than EUR 2 billion in the reference year 2018. After those there

were countries that invested more than EUR 1 billion, but less than EUR 2 billion. These were Finland (EUR 1.6 billion), Poland (EUR 1.6 billion), Germany (EUR 1.1 billion), Sweden (EUR 1.1 billion), and Luxembourg (EUR 1 billion). In contrast, the lowest investment in 2018 was seen in Spain (EUR 225,000). The Czech Republic recorded investment of EUR 834,000 in 2018, a reduction of EUR 1.5 billion in comparison with 2010. This decrease might have been caused by the expansion of the motorway network. The number of fatalities (1B) fell slightly on 2010, a decrease that can be seen in almost all countries. The number of fatalities was still the highest in Italy (3,334 people), Germany (3,275 people), France (3,246 people), and Poland (2,862 people). The lowest number of fatalities was in Luxembourg (36 people), the only country, together with Slovenia (91 people), where fewer than 100 people died in 2018. There were 656 fatalities in the Czech Republic in the reference year, down by 164 in comparison with 2010. Looking at Indicator 2B, it can be observed that all countries have a mortality rate of lower than 100 persons a year per 1 million inhabitants. Romania came closest to this boundary with 95.59 fatalities per 1 million inhabitants in 2018, followed by Poland, with 75.36 fatalities. The lowest number of fatalities was in the United Kingdom (27.75 people). There were 61.83 fatalities per 1 million inhabitants in the Czech Republic, slightly above the average. However, here too there was a significant drop on 2010. For Indicator 3B, which represents fatalities per 100 km of motorway, we can see that the most fatalities were in Romania (226.85 persons) and in Poland (174.83 persons). These were the only countries under observation where the number of fatalities was more than 100 people for the year, but even here there is a marked decrease on 2010: by 489.11 people in Romania and 281.2 people in Poland. Spain (11.59 people), Slovenia (14.61 people), and Sweden (15.2 people) had the lowest number of fatalities. The Czech Republic registered 52.4 fatalities per 100 km of motorway, a drop of 56.86 people compared to 2010.

3.3 Comparison of the Results of Multi-Criteria Evaluation Using the WSA Method in 2010 and 2018

Development of the overall results of analysis for the period 2010-2018. Such development is rising, except in Poland, where there was a decline between 2011 and 2014 caused by high levels of Indicators 1B (fatalities) and 2B (fatalities per 1 million inhabitants), where the results of the analysis are zero. A slight decrease in the reference period can be observed in France, which has seen a decrease in values since 2013. Slow growth can be observed in the remaining countries. The three best-placed countries in the analysis during the reference period are Luxembourg, the United Kingdom, and Sweden. Luxembourg was the best rated country in 2010, where 4A (investment per capita) and 1B (total fatalities) are considered the best indicators. The country's worst position during the reference period was fourth. In the final reference year, Luxembourg was ranked fourth in the analysis, that year being the worst for that country in terms of the evaluation. Finland ranked first in 2018, with particular improvements in Indicators 3A (investment in road infrastructure) and 4A (investment per capita). Although it might appear that Poland is the worst in the assessment of the multi-criteria analysis, the worst country is in fact Italy, one reason for this being that it was ranked between 12th and 14th throughout the evaluation period.

Table 4 – Order based on the WSA method for 2010 and 2018

country/results	2010		2018	
	result	rank	result	rank
Belgium	0.366	12.	0.386	11.
Czech Republic	**0.482**	**8.**	**0.436**	**8.**
Germany	0.533	6.	0.622	5.
Spain	0.520	7.	0.435	9.
France	0.555	3.	0.479	7.
Italy	0.301	14.	0.294	13.
Luxembourg	0.619	1.	0.640	4.
Austria	0.422	10.	0.432	10.
Poland	**0.388**	**11.**	**0.249**	**14.**
Romania	0.323	13.	0.302	12.
Slovenia	0.462	9.	0.500	6.
Finland	0.538	5.	0.704	1.
Sweden	0.594	2.	0.693	2.
United Kingdom	0.551	4.	0.666	3.

Source: Own processing

Second and following paragraphs are not indented either. normal text of the paper.

Luxembourg ranked first in 2010, with a resulting utility value of 0.619. By contrast, Italy was last, the result of the analysis being 0.301. The Czech Republic was ranked eighth in the overall assessment. There was a change in the order of countries in 2018, with Finland ranked 1st, achieving a resulting value of 0.704. It came in fifth place in 2010 using this analysis, with a resulting utility value of 0.538. Luxembourg, on the other hand, fell to 4th place, but nevertheless achieved a slight improvement in its result within the context of the results of the other regions. This was also the case for France, which occupied 3rd place in 2010, but fell to 7th in 2018. Poland dropped to 14th place, its resulting utility value only reaching 0.249, with a slight decrease (0.139) visible. Slovenia moved up in the overall assessment, rising from 9th place (2010) to 6th place (2018). Despite a slight decrease in the resulting value, the Czech Republic remained in 8th place among the 14 countries observed.

4 Conclusion

It was found from the overall analysis of safety levels that the most vulnerable age groups include people aged 25-49 and those over 65. There was a visible decline in fatalities in all countries analysed during the reference period. The highest total number of fatalities (1B) was in Italy. Poland. and France throughout the reference period. The worst affected country when converting to the number of fatalities per 1 million inhabitants (2B) was Romania. followed by Poland. For the last indicator monitored. 3B (number of fatalities per 100 km of motorway). the highest number of fatalities was again in Romania and Poland, but we can observe a decrease in the number of fatalities in all countries monitored during the reference period. The final part of the third chapter involved a multi-criteria analysis. which brought together all previous indicators that had been analysed within WSA using the method of equal importance. Based on the results of this analysis, countries were put into order, with Luxembourg faring best and Italy coming last in 14th place in 2010. In the final reference year 2018, Finland was the best ranked country. and by contrast Poland the worst. The Czech Republic was ranked 8th in both 2010 and 2018.

These findings should be seen in the context of the limitations of the WSA method. This method is one of the simplest ones and using other MCDM methods (TOPSIS, ELECTRE, …) the results could be different. Another factor directly influencing our findings is the weights of selected indicators calculated based on the Equal importance method. As our previous research shows (Vavrek, 2019), the choice of an appropriate method also directly determines the overall results.

Acknowledgements

This paper was created within the project “Economic evaluation of public service organizations within the allocation function of public budgets”. Project registration number SP 2020/32.

References

[1] ARDIELLI, E., BEČICA, J. (2018). Multi-criteria Evaluation of the State of Professional Theatres in the Czech Republic in Terms of Mixed Public Goods Provided to the Citizens. *Review of Economic Perspectives*. Vol. 18(2), 155-176.

[2] EISLER et al. (1998). *Úvod do ekonomiky dopravy*. Prague: Codex Bohemia.

[3] EUROSTAT (2021a). *Population on 1 January by age and sex*. [online]. [cit. 2021-04-18]. Available from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjan&lang=en.

[4] EUROSTAT (2021b). *Length of motorways and e-roads*. [online]. [cit. 2021-04-18]. Available from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_if_motorwa&lang=en.

[5] EUROSTAT (2021c). *Persons killed in road accidents by age*. [online]. [cit. 2021-04-22]. Available from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran_sf_roadag&lang=en.

[6] HOLUBOVÁ, V. (2014). *Bezpečnost silniční dopravy a ochrana majetku. I.* Ostrava: VŠB – Technical University of Ostrava.

[7] OECD (2021). *Infrastructure investment (indicator)*. [online]. [cit.2015-05-04]. Available from https://www.oecd-ilibrary.org/transport/infrastructure-investment/indicator/english_b06ce3ad-en.

[8] PAPCUNOVÁ, V., HORNYAK GREGANOVÁ, R., ORSAGHOVÁ, D. (2015). Evaluating of the financial management of the municipalities via parameters of data matrix in the Slovak Republic conditions. In Proceedings of the *IX. International Conference on Applied Business Research. ICABR 2014*. pp. 803-814.

[9] PAWŁOWSKI, J. et al. (2020). Słownik Terminów z Zakresu Bezpieczeństwa. Toruń: Adam Marszałek Publishing.

[10] PEKOVÁ et al. (2012). *Veřejný sektor – řízení a financování*. Prague: Wolters Kluwer ČR.

[11] PUKALA, R., PETROVA, M. (2019). Application of the AHP method to select an optimal source of financing innovation in the mining sector. In Proceedings of the *IVth International Innovative Mining Symposium- E3S Web of Conferences*, 105.

[12] REKTOŘÍK et al. (2012). *Ekonomika a řízení odvětví technické infrastruktury: teoretická část, odvětvová část*. Prague: Ekopress.

[13] STIGLITZ, J. E., E. ROSENGARD. (2015). *Economics of the public sector*. New York: W. W. Norton & Company.

[14] SUROVEC et al. (2004). *Provoz a ekonomika silniční dopravy II: pozemní komunikace, veřejné služby v přepravě cestujících, dráhy: redakční uzávěrka k ...* Ostrava: VŠB – Technical University of Ostrava.

[15] SZCZUKOWSKI, M. (2017). Safety in transportation: a review of the concept, its context, safety preservation and improvement effectiveness. *Scientific Journal of Silesian University of Technology*. Vol. 95. pp. 197-212.

[16] ÚZIS ČR (2015). *Lůžková péče 2013.* [online]. [cit.2015-03-15]. Available from http://www.uzis.cz/category/edice/publikace/kardexy>.

[17] VAVREK, R. (2019). Evaluation of the Impact of Selected Weighting Methods on the Results of the TOPSIS Technique. *International Journal of Information Technology & Decision Making*. Vol. 18(6), 1821-1843.

[18] VAVREK, R., BEČICA, J. (2020). Capital City as a Factor of Multi-Criteria Decision Analysis - Application on Transport Companies in the Czech Republic. *Mathematics*. Vol. 8(10), 1765.

[19] ZELENÝ et al. (2017). *Osobní doprava: pozemní komunikace, veřejné služby v přepravě cestujících, dráhy: redakční uzávěrka k ...*. Prague: C.H. Beck.

Succession in Family Businesses

Andrea Kolková[1], Vendula Fialová[2], Andrea Folvarčná[2]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Sokolská třída 2416/32, 701 00, Ostrava 1, Czech Republic
andrea.kolkova@vsb.cz

[2]University of Entrepreneurship and Law
Institute of Entrepreneurship and Marketing
Vltavská 585/14, 150 00 Praha 5, Czech Republic
vendula.fialova@vspp.cz, andrea.folvarcna@vspp.cz

Abstract

The aim of the article is to present the results of research which was aimed to determine whether and how selected factors of a family business affect the involvement of successors in the family business. Many family business founders want their businesses to survive for future generations within the family, often in the least altered form and with such benefits that will ensure long-term prosperity for the family as well as social stability. And it is this goal that is also the main objective of sustainable development from the perspective of a whole society. The presented research builds on and develops already implemented research in the field of family businesses, focusing on the identification and evaluation of the influence of selected factors such as the age of the entrepreneur, the territorial scope of the company and the size of the family business on succession solution in Czech family businesses. The authors evaluate the conclusions and identify possible directions for further research in the field of succession.

Keywords: *age of the founder of the family business, chi-square ratio, Directional Measures, family business, succession, Symmetric Measures*

JEL Classification: *M21, M14, O31*

1 Introduction

Family businesses and various forms of family entrepreneurial activities form an integral part of all national economies. More and more family business owners are addressing issues related to their family business being taken over by another family member. This phenomenon in the Czech Republic is caused mainly by the fact that in the 1990s, the first generation of entrepreneurs began their business activities; and they are now at an age when it is necessary to deal with the future of their companies very actively.

The goals of family business are very often aimed at future generations, while the effort to preserve "the good" for future generations is also the main goal of sustainable development. There are more pillars on which sustainable development is based, yet in relation to available data as well as research, the environmental and economic aspect of this development still prevails. The social pillar of this development is often underestimated, however, it is this pillar which comes to the fore in family business, where the future plays a significant role in the decision-making of these companies and where the behavior of both founders and their successors predetermines this future.

This article focuses on the topic of succession in a family business. In their research, the authors focused mainly on the question of how selected factors characterizing family businesses affect the involvement of successors in their business. The research was focused on determining the dependence of the successor's involvement in the

family business on selected factors, such as the age of the active entrepreneur (usually the founder), the size of the company, the industry in which the family business operates, the territorial scope of the family business.

This is a current topic that can help find ways to streamline the path of succession in family businesses, analyze the factors that influence the choice and necessity of finding successors. A controlled and high-quality takeover of a family business is a necessary condition for the family business to remain competitive and to be able to develop its full specific potential. The impact of research on further adjustments in the definitions of family businesses is significant in conjunction with wider possibilities for amending legislation regarding takeovers in family businesses. This refers to both: legislation as well as accounting and taxation including better targeting of support, financial and advisory forms of assistance from governmental and non-governmental organizations.

2 Theoretical Background

Succession in family companies is a topic addressed by several domestic and foreign authors. In their research, they addressed various factors and roles that influence family business succession planning, such as economic performance and various ownership structures, but also gender roles (Decker, Heinrichs, Jaskiewicz, Rau 2017). In their study, the authors also address characteristics such as the size of the business, its economic performance, age, education, and the intended date of retirement of the owner, and how the age of the owner affects the planning and implementation of succession. Research, which focused more on the socioemotional wealth (SEW) of family business owners, and how these values affect the continued involvement of family members, was examined by Abu Bakar (2019), who aims to identify factors that lead to building a strong bond and commitment of successors to the family business.

In their study, Gimenez and Novo (2020) synthesize several contributions that addressed succession in family businesses, emphasizing the key role of preparing and educating a potential successor and the need to consider not only the candidate's expertise but also his or her credibility and honesty.

The article by Kubick and Machek (2019) further focuses on the role of women in family businesses and the influence of the gender of the successor in the intergenerational succession. According to the article, women as successors are often underestimated in this area and they recommend that this fact should be considered when choosing a successor.

He, Tang, Ma and Wang (2015) point to four basic dimensions of family relationships that affect intergenerational succession: family cohesion, family spirit of cooperation, relationships between existing entrepreneurs and their successors, and the influence of family councils. The importance of psychological variables in the "retirement" planning process is highlighted in a study by Wrosche, Gagna and De Pontet (2011), when owners who trusted their successors were planning an earlier retirement date.

Other authors dealing with the age of the family business owner were Feltham, T., Feltham G. and Barnett (2005). They conclude that family businesses are often highly dependent on a single owner / individual and this degree of dependence is often related to his or her growing age.

The importance of research into factors influencing succession in family businesses and the development of family businesses is also emphasized in Mury's article (2017), which points to the role of family businesses in the development of business activities in some regions of Slovakia where large companies are lacking.

It is obvious that the succession of family businesses is addressed by many authors and studies, but only few of them deal more deeply with the question of how much the involvement of the successor of a family business depends on selected factors such as age of active entrepreneur - founder, size of the company, industry in which the family business. operates or the place of operation of the family business. The aim of the authors of this article is to present the results of their own research, to define the conclusions and identify possible directions for further research in the field of succession.

3 Material and Methods

The results of data collection carried out in the form of a written questionnaire survey in the period from 2016 to 2020 were used for the research. The basic group consisted of family businesses, whose representation in the total number of all business entities in the Czech Republic is estimated at more than 87% (EFB, 2014) and whose definition is based on the basic five definitions of family business Family Firm Institute from 2016 (FFI, 2016) , which brings together the views of various authors (Miller et al., 2007 according to FFI, 2016 - Sciascia and Mazzola, 2008 according to FFI, 2016) dealing with the issue of family business.

In total, relevant data were obtained from 348 family businesses, which were the subject of further evaluation. Based on previous studies and research, basic research questions and hypotheses had been established.

H1: The need to find and involve a successor increases with the age of the family business owner.

H2: The need to find a successor and their involvement increases with the size of the family business

H3: The need to find a successor and their involvement increases with the size of the market in which the family business operates (local, national, EU, global market).

4 Results and Discussion

The size of the company was divided into 5 groups. The division was based on the division of companies according to the number of employees. Big enterprises consisted of companies with more than 250 employees. Larger medium-sized enterprises included enterprises with 100 to 249 employees. Other groups analyzed were smaller medium-sized enterprises which consisted of companies with 50-99 employees. Enterprises with up to 49 employees were classified as small and enterprises with up to 19 employees were classified as micro. The distribution of these enterprises in the research is shown in Table 1, where it is evident that micro enterprises and small enterprises were the most represented. In contrast, companies with more than 250 employees were included in the research in only 7 cases.

Table 1 - Division of firms by size

	Frequency	%	Valid %	Cumulative %
Big enterprises	7	2,0	2,0	2,0
Bigger-medium-enterprises	10	2,9	2,9	4,9
Micro-enterprises	171	49,1	49,1	54,0
Small enterprises	140	40,2	40,2	94,3
Smaller-medium-enterprises	20	5,7	5,7	100,0
Total	348	100,0	100,0	

Source: own research

Furthermore, the companies were divided according to the place of operation of the organization. From this point of view, the companies were divided into companies operating on the local market, the regional market, the national market, the EU market, and the world market. The distribution of enterprises within these groups can be seen in Table 2. Most enterprises operate in the local market, respectively, at the regional level.

Table 2 - Division of enterprises by activity

	Frequency	%	Valid %	Cumulative %
Local market	70	20,1	20,1	20,1
Regional market	144	41,4	41,4	83,3
National market	76	21,8	21,8	42,0
Union market	51	14,7	14,7	98,0
World market	7	2,0	2,0	100,0
Total	348	100,0	100,0	

Source: own research

The key data that were the starting point of the research was the age of active entrepreneurs, i.e., those who currently own the company, know the science, and decide on its activities and development. Table 3 shows the fact that most entrepreneurs are represented in the age group over 50 (i.e., 51-60) and then over 40 (i.e., 41-50). The fewest respondents are between the ages of 20-30, only 7 in total. The research also showed the activity of entrepreneurs over the age of 60.

Table 3 – Division of age of active entrepreneurs

	Frequency	%	Valid %	Cumulative %
over fifty	127	36,5	36,5	36,5
over forty	122	35,1	35,1	71,6
over sixty	31	8,9	8,9	80,5
over thirty	61	17,5	17,5	98,0
over twenty	7	2,0	2,0	100,0
Total	348	100,0	100,0	

Source: own research

The focus of this research was to evaluate succession according to previous characteristics. In terms of succession 4 answers to the question whether the company had a successor were examined: no - I am not considering a successor / I have no successor, no - not yet / age of successors, yes - successor actively works for

a family business, yes - successor has already taken over the family business. A summary of the responses is documented in Table 4. Most companies have a successor who actively works for a family business. However, the successor, who has taken over a company is represented by the smallest number of respondents.

Table 4 - Succession in the company

		Frequency	%	Valid %	Cumulative %
	No (I am not considering a successor / I have no successor)	52	14,9	14,9	14,9
	No (not yet / age of successors)	108	31,0	31,0	46,0
	Yes (the successor has already taken over the family business)	16	4,6	4,6	50,6
	Yes (the successor is actively working for the family business)	172	49,4	49,4	100,0
	Total	348	100,0	100,0	

Source: own research

The results of the research are sorted according to the research questions that were asked. Thus, three hypotheses concerning succession in family businesses were analyzed.

The first hypothesis was based on a survey of the dependence of succession in the organization and the age of active entrepreneurs. The first hypothesis was "The need to find a successor and his involvement grows with the age of the family business owner." Table 5 shows that at the age of 20-30, and therefore 40, the involvement of successors, already working in the company is negligible. The change occurs after the age of 40, and after the age of 50, most entrepreneurs already cooperate with their successors. Most respondents who handed over the business to their successors handed them over after 40 years of age. However, the total number of entrepreneurs in the research who completely handed over the company to their successors was inconsequential, only 16 out of 348 respondents.

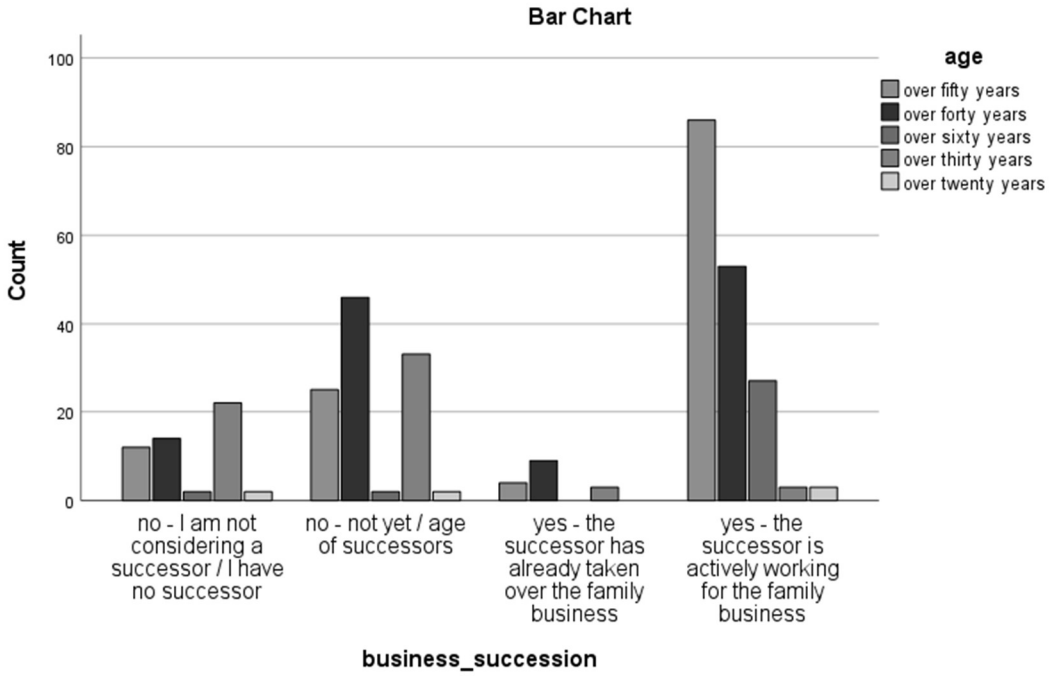
Table 5 - Cross tabulation business succession and age

		age					Total
		over twenty years	over thirty years	over forty years	over fifty years	over sixty years	
business succession	no - I am not considering a successor / I have no successor	2	22	14	12	2	52
	no - not yet / age of successors	2	33	46	25	2	108
	yes - the successor has already taken over the family business	0	3	9	4	0	16
	yes - the successor is actively working for the family business	3	3	53	86	27	172
Total		7	61	122	127	31	348

Source: own research

Graph 1 also declares the given results. The first hypothesis is confirmed. According to the findings, the need to find a successor grows with the age of the active entrepreneur, significantly after 40 years of age of the active entrepreneur.

Figure 1 - Dependence of succession on the age of active entrepreneurs



Source: own research

After evaluating the results, it is also necessary to perform a statistical evaluation of the dependence and statistical verification of the correctness of the hypothesis. Table 6 shows test result $\chi 2$. The above results demonstrate that hypothesis 1 can be confirmed with statistical significance. The tested statistic is 3,9 and the critical value of distribution $\chi 2$ with one degree of freedom for the 5% level of significance is 3,84. It is therefore possible to reject the hypothesis of the independence of the given number and we can consider the dependence between age and succession as confirmed.

Table 6 – Results of $\chi 2$

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square $\chi 2$	27,213[a]	16	0,039
Likelihood Ratio	29,732	16	0,019
N of Valid Cases	347		

a. 15 cells (60,0%) have expected count less than 5. The minimum expected count is 0,14.

Source: own research

Subsequently, the degrees of association of the relationship given by the first hypothesis were quantified. The results are summarized in Tables 7 and 8.

Table 7 - Directional Measures.

			Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Ordinal	Somers' d	Symmetric	0,044	0,049	0,905	0,365
		business succession Dependent	0,048	0,053	0,905	0,365
		age Dependent	0,041	0,045	0,905	0,365

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on chi-square approximation
d. Likelihood ratio chi-square probability.

Based on Sommer's d, association rates of 0,044 were calculated, which is consistent with Kendall's τ_b.
Source: own research

Table 8 - Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Ordinal	Kendall's τ_b	0,044	0,049	0,905	0,365
	Kendall's τ_c	0,036	0,040	0,905	0,365
	Gamma	0,068	0,075	0,905	0,365
	Spearman Correlation	0,049	0,055	0,917	,360[c]
Interval	Pearson's R	0,060	0,058	1,118	,264[c]
N of Valid Cases		347			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.
Source: own research

If we consider the succession rate in the company as an explanatory variable, the asymmetric Sommer's d becomes 0.048, and the age of active entrepreneurs is -0.041. The Kendall's τ_c coefficient is slightly lower than the coefficient of Kendall's τ_b. The relationship between the variables is positive, meaning that we can confirm that the need for succession increases with age.

The second hypothesis tested was "The need to find a successor and their involvement increases with the size of the family business". The size of the company was derived from the number of employees. This hypothesis was "As the size of the company grows, the number of successors in the company grows."

Table 9 - Dependence of company size on succession

		Business size					Total
		Big enterprises	bigger-medium-enterprises	Smaller-medium enterprises	Small enterprises	Micro enterprises	
business succession	no - I am not considering a successor / I have no successor	1	0	0	14	37	52
	no - not yet / age of successors	2	3	3	39	61	108
	yes - the successor has already taken over the family business	0	1	3	8	4	16
	yes - the successor is actively working for the family business	4	6	14	79	69	172
Total		7	10	20	140	171	348

Source: own research

Ambiguous results can be read from Table 9. Most successors are likely to cooperate in small or medium-sized enterprises, both larger medium-sized and smaller medium-sized enterprises. However, for large companies, this cannot be clearly confirmed. Therefore, the hypothesis cannot be considered as unequivocally confirmed. The schematically determined conclusions are also documented in Graph 2.

Table 10 – Results of $\chi 2$

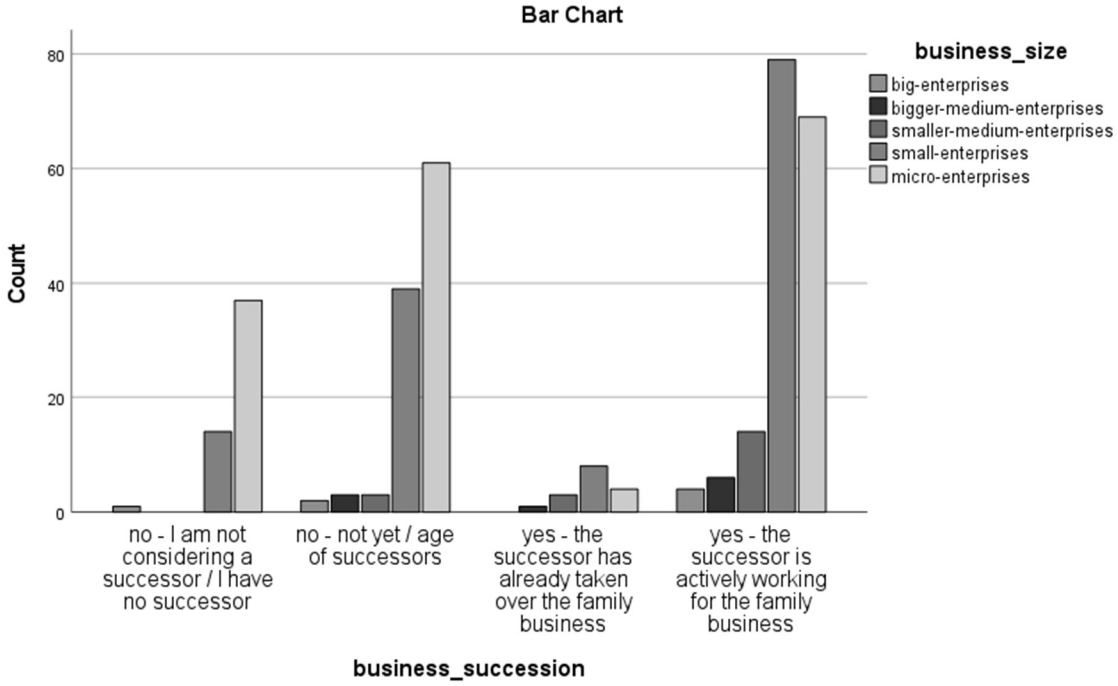
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square $\chi 2$	29,420[a]	12	0,003
Likelihood Ratio	32,629	12	0,001
N of Valid Cases	348		

a. 10 cells (50,0%) have expected count less than 5. The minimum expected count is32.

Source: own research

The results of the $\chi 2$ test given in Table 10 show that the results can be considered relevant. As follows from the result, the statistic $\chi 2$ at the 5% level of significance has confirmed that there is no dependence between the size of the company and the succession.

Figure 2 - Dependence of succession on the size of the company



Source: own research

The third hypothesis was based on the assumption that the need for succession and the involvement of successors increases with the size of the market in which the family business operates (the scope of the company). This relationship was formulated into the hypothesis "As the scope of companies expands, the need for succession increases."

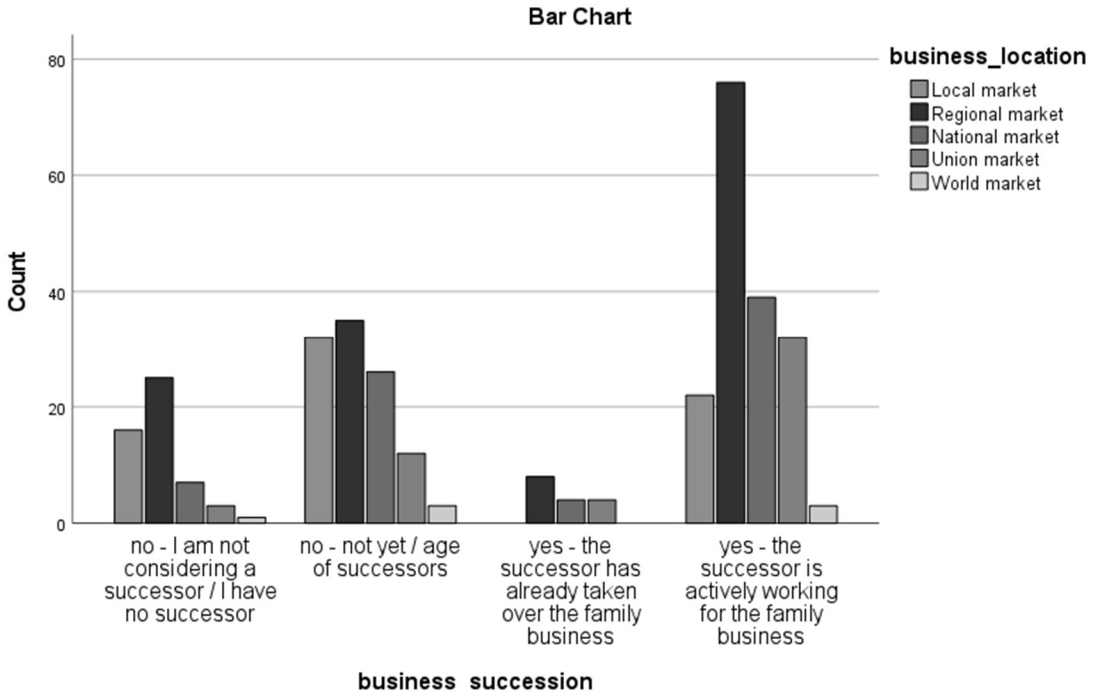
Table 11 - Dependence of market size and succession.

		business location					
		Local market	**Regional market**	**National market**	**Union market**	**World market**	**Total**
business succession	no - I am not considering a successor / I have no successor	16	25	7	3	1	52
	no - not yet / age of successors	32	35	26	12	3	108
	yes - the successor has already taken over the family business	0	8	4	4	0	16
	yes - the successor is actively working for the family business	22	76	39	32	3	172
Total		70	144	76	51	7	348

Source: own research

It is clear from the data in summary Table 11 that even this dependence has not been unambiguously confirmed. Most companies were transferred to companies operating at the level of regional markets (at the regional level) or national markets (at the state level). On the other hand, there were 4 respondents on world markets who do not have a business to hand over and only 3 who cooperate with a successor. This is also illustrated in Graph 3.

Figure 3 - Dependence of market size and succession



Source: own research

Table 12 – Results of $\chi 2$.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square $\chi 2$	28,353[a]	12	0,005
Likelihood Ratio	32,465	12	0,001
N of Valid Cases	348		

a. 7 cells (35,0%) have expected count less than 5. The minimum expected count is 0,32.

Source: own research

The results of the $\chi 2$ test given in Table 12 also showed that these quantities are independent, and the results can be considered relevant. As follows from the result, the statistic $\chi 2$ at the 5% level of significance confirmed that there is no dependence between the scope of the family business (market size) and succession.

6 Conclusion

The following conclusions emerged from the implemented research aimed at determining the dependence of succession and the role of successors in family business in the context of the age of active entrepreneurs (often the founders, potential first generation of entrepreneurs), size and territorial scope of family business. Of the defined hypotheses of the interdependence of the involvement of successors in business and selected factors, only one was confirmed. The need to find a successor and their active involvement in business demonstrably increases with the age of the family business owner (active entrepreneur), and it was found that active involvement of successors occurs to active entrepreneurs who are relatively younger, and it is usually after they have turned 40, which from the point of view of expected years of active entrepreneurship presupposes long-term active cooperation of the persons involved (entrepreneurs and successors). This fact represents a positive prerequisite for quality succession planning and its implementation in Czech family businesses.

On the contrary, hypotheses aimed at verifying the existence of a relationship between the territorial scope of the family business (market size) or the size of this business were not confirmed. No dependence was identified between the issue of succession, the size of the family business (in terms of the number of employees) and the territorial scope of the family business.

The conclusions of the research show that the age of the entrepreneur is an important factor which affects the succession and activity of the successors in business and are an important factor for its planning. For an active entrepreneur, exceeding the age of 40 is a significant milestone in which succession needs to be actively implemented. It may seem too early to start involving a successor in terms of the potential active years of the

entrepreneur, however, it is clear, and the results of the research clearly confirm that this age limit is a condition for the successful planning and implementation of the handover of the family business to the next generation. reached conclusions confirm, supplement, and expand the research and the presented studies of the issue of succession in family companies carried out so far. At the same time, the authors conclude that in terms of optimizing the planning and implementation of succession in family businesses, their training and education in this area, it would be appropriate to focus in further research on the extent and manner of the gradual involvement of successors in business (property rights, scope of decision-making, position, and role of successors in business, etc.), which would allow the identification of regularities or specifics in this process.

The age of the entrepreneur, when they ought to actively address succession not only in terms of content (what I want to pass on), but also process (how and when) was identified as a significant milestone that can affect succession and shape the future of family business and the sustainable development of family business in general.

The research also shows that the issue of succession and the future of their businesses is already a well-known topic among family business owners and is given considerable attention. There is a need for more in-depth research into this trend, focusing on the needs of transferring businesses, so that relevant legislation and support from governmental and non-governmental institutions can be developed and adapted, and family businesses can continue to develop and grow as an important segment of the economy.

References

[1] ABU BAKAR, R. (2019). Socioemotional wealth and family commitment. *Journal of Family Business Management*, Vol. 9, pp. 393-415.

[2] DECKER, C., HEINRICHS, K., JASKIEWICZ, P., RAU, S. B. (2017). What do we know about succession in family businesses? Mapping current knowledge and unexplored territory. In: *Kellermanns, Franz and Hoy, Frank eds. The Routledge Companion to Family Business. Routledge*. pp. 15–44.

[3] EUROPEAN FAMILY BUSINESSES. (2014). *Families in business for the long term*. Available at: http://www.europeanfamilybusinesses.eu/

[4] FAMILY FIRM INSTITUTE. (2016). *Defining Family Enterprise*. Available at: http://www.ffi.org/?page=definitions.

[5] FELTHAM, T., FELTHAM, G., BARNETT, JJ. (2005). The Dependence of Family Businesses on a Single Decision-Maker. *Journal of Small Business Management*, Vol. 43, pp. 1-15.

[6] GIMENEZ, E., NOVO, J. A. (2020). A Theory of Succession in Family Firms. *Journal of family and economic issues,* Vol. 41, pp. 96-120.

[7] HE, B., TANG, X., MA, CH-Z., WANG, Q-CH. (2015). Impact Mechanism of Family Relationships on Intergenerational Succession for Family Businesses.: In Proceedings of the *International conference on information science and management engineering,* ICISME 2015, pp. 307-312.

[8] KUBICEK, A., MACHEK, O. (2019). Gender-related factors in family business succession: a systematic literature review. *Review of managerial science,* Vol. 13, pp. 963-1002.

[9] MILLER, D. ET AL. (2007). Are Family Firms Really Superior Performers? *Journal of Corporate Finance,* Vol. 13, pp. 829-858.

[10] MURA, L. (2017) Current situation in Family Businesses. In Proceedings of the 7th International Scientific Conference on Managerial Trends in the Development of Enterprises in Globalization Era, ICOM 2017, pp. 178-185 .

[11] SCIASCIA, S., MAZZOLA, P. (2008). Family Involvement in Ownership and Management: Exploring Nonlinear Effects on Performance. *Family Business Review*, Vol. 21, pp. 331-345.

[12] WROSCH, C., GAGNE, M., DE PONTET, S. B. (2011). Retiring From the Family Business. *Family business review*, Vol. 24, pp. 292-304.

Assessment of Selected Performance and Operational Criteria in Transport Companies in the Czech Republic

Natálie Konečná[1], David Lenert[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
natalie.konecna@vsb.cz, david.lenert@vsb.cz

Abstract

Everyone knows transport and not many people can imagine life without it nowadays. It has its importance in economics, culture, politics and security. The issue of transport security and the related transport service is relevant in view of the growing trend in the number of private cars, where the increasing number of cars in families is putting pressure on public transport. The aim of this article is to evaluate the functioning of transport companies in selected cities of the Czech Republic on the basis of selected performance and operational criteria. In this case, the number of passengers carried in relation to the density of the transport network is chosen as the operational criterion. The assessment is based on data from nineteen, respectively twenty transport companies operating on the territory of the Czech Republic, which are also active members of the Association of Transport Companies of the Czech Republic (Sdružení dopravních podniků České republiky). The number of passengers carried by individual transport companies in the public transport network was monitored over a nine-year period. It was found on the basis of the analysis that the largest number of passengers per capita is attributed to the Prague transport company, while the transport companies from Chomutov and Jirkov show the lowest number. Within the analysis of the operational criterion - density of the transport network - the cities are relatively balanced. The highest density of the transport network is shown by the city of Teplice, where buses and trolleybuses serve the city, while the lowest density is shown by the city of Děčín.

Keywords: *density of transport network, number of passengers carried, transport companies, urban public transport*

JEL Classification: *C21, C67, R48*

1 Introduction - Transport and Transport Infrastructure

Many authors in their articles deal with the public transport system, its efficiency and quality. Among the foreign authors, for example, a group of authors consisting of Stiglic Mitja, Agatz Niels, Savelsbergh Martin and Mirko Gradisar deal with the issue of transport integration which would increase the efficiency of public transport, with studies showing that bicycle sharing combined with public transport can achieve higher usage of public transport. Ivan Igor in his article also considers integration, but from the perspective of urban and suburban transport. Pawlasová Pavlína, on the other hand, discusses the factors that influence satisfaction with public transport. Passenger satisfaction with public transport is also addressed by Olivková Ivana in her article.

Transport has been, is and always will be the driving force of development in the life of all nations. Nowadays, people cannot imagine life without transportation, using various means of transport and sufficient transport infrastructure. Transport is an activity that everyone is familiar with. The oldest form of transport is walking. Even today, for people in less developed countries, walking long distances is usually the only possible way of transport. People there still carry heavy loads, e.g. as mountain Sherpas. In developed countries, walking as a

way of moving from place to place is used rather for shorter distances. Walking for longer distances in more developed countries is mainly a way to spend leisure time e.g. hiking.

Rektořík (2012) states that transport is an activity providing intentional movement of people and things. It has its strategic importance in the economic, political, cultural and also security sector. In order to move people or things, there must be sufficient transport infrastructure that is suitable for the movement of vehicles (Eisler, Kunst and Orava, 2011).

Eisler, Kunst and Orava (2011) classify transport as a sector of the national economy that forms the overall infrastructure of the economy. Ochrana (2007) believes that there is no straightforward definition of the term public service. Public service can be described as a concept that has economic, social and legal content. In economic terms, a public service is an economic or public estate. For this reason, a public service can be a pure public estate or a mixed public estate. From the perspective of the theory of estates, according to Rektořík (2012), a pure market estate has become a mixed estate over time. The form of state intervention varies from one transport sector to another.

The aim of this article is to evaluate the functionality of transport companies on the basis of operational and performance criteria, supported by a hypothesis:

In the period under review, there is an increase in the number of passengers carried within the monitored transport companies.

1.1 Urban Public Transport

The term urban public transport has been used by the public, both professional and lay, for many years. Although there is no doubt about the frequent occurrence of this term, the legislation regulating the provision of public transport does not know this term (Association of Transport Companies of the Czech Republic, online). According to Section 2(7) of Act No. 111/1994 Coll., concerning road transport, as amended, urban public transport, or bus transport, is a subset of public line transport: *"Line passenger transport is the regular provision of transport services on a specified route, during which passengers alight and board at predetermined stops. Line passenger transport may be operated in the form of a public line service or in the form of a special line service, either national or international. By this is meant (a) public line transport, where transport services are offered under pre-announced conditions and are provided to meet transport needs; where the transport is provided for the needs of the city and its suburban areas, it is referred to as urban bus transport..."*

The Association of Transport Companies of the Czech Republic (online) further states that the legislation regulating rail transport does not work with this concept at all. That is why Ing. Macháček from the Association of Transport Companies sees the problem in the absence of a unified law on urban public transport. In this context, public transport does not even have its own department at the Ministry of Transport of the Czech Republic and issues related to public transport fall under various departments.

Urban public transport in the Czech Republic is provided by rail, road and water transport. Each kind of transport has its own specific means of transport. If we focus only on urban public transport, buses are typical for road transport. For rail transport, the choice of means of transport is slightly more varied. Rail transport includes metro, trains, trolleybuses, trams and also funiculars. In the Czech Republic there are also types of funiculars that belong to public transport. Examples include the city of Praha, where there is a funicular to Petřín and a funicular in the Prague Zoo, which belongs to the transport company of the Capital City, as well as Karlovy Vary and Ústí nad Labem. The characteristic feature of both Prague funiculars is being a tourist attraction. Although the Dopravní podnik hl. města Prahy a.s. is the single operator of the funicular to Petřín and the Prague Zoo funicular, it is not a typical means of public transport. The funicular to Petřín is connected to tram transport with the final stop at Petřín near the popular observation tower. For this reason in particular, the funicular is a popular tourist attraction with year-round operating hours. The funicular in the Prague Zoo is also intended for its visitors, who can use it between the end of March and the end of October (Prague City Portal, online). The Diana funicular in Karlovy Vary is no exception; like in the capital, it is a popular tourist destination. This funicular has been in service for more than 100 years and currently belongs to the Dopravní podnik Karlovy Vary a.s.. Its route starts next to the Grandhotel Pupp and ends at the Diana Lookout Tower (Diana Karlovy Vary, online). The youngest funicular in the public transport system is the funicular to Větruše in Ústí nad Labem, which started its service in 2010. It connects the Forum shopping centre and the Větruše Chateau (Transport Company of Ústí nad Labem, online).

The urban public transport system in the Czech Republic also includes water transport. Such specific public transport is operated on the Brno dam and on the Vltava river. The boating season on the Brno "Prygl" runs from April to October. The history of boat traffic on the Brno dam dates back to 1946. The route of the boat traffic runs from Bystrc to Veverská Bítýška. It operates mainly as a cruise transport and is divided into 10 stops and

takes 70 minutes in one direction (Prygl, online). The public transport system in Prague also includes ferries on the Vltava River, which are a popular way of transport between the river banks, especially where bridges are not available. For tourists in particular, they represent an interesting way of getting to know the capital from a different perspective (Prague City Portal, online).

2 Material and Methods

The requirement of the public transport service customer is to provide transport within the city. The individual transport companies can be characterised from several aspects, which can be divided into operational and performance criteria. Operational criteria can be considered as those related to the technical functioning of the transport companies, i.e. number of lines, number of vehicles, length of lines and number of employees. These criteria can then be used to assess individual transport companies. This article focuses on the evaluation based on the length of lines or the density of the transport network. Table 1 shows the average number of inhabitants of the area served and the size of that area.

Performance criteria can be characterised as criteria by which companies assess their mission, i.e. whether their core business of land management is sufficient. Performance criteria reflect, in essence, the requirements of customers. By this criterion it is possible to evaluate the performance of the transport or the transport operator in a given city. Performance criteria include, for example, the number of passengers carried, transport performance in seat kilometres and vehicle kilometres. Richtář, Křivda and Olivková (2006) state that in order to evaluate performance, criteria such as transport and carriage outputs and number of passengers carried are collected.

2.1 Model and Data

Table 1 - Transport companies

Rank	Transport company	Region	Area (km²)	Population
1.	Dopravní podnik hl. města Prahy a.s.	Capital city Praha	496	1 253 245
2.	Dopravní podnik města Brna a.s.	Jihomoravský	230	378 159
3.	Dopravní podnik Ostrava a.s.	Moravskoslezský	214	296 165
4.	Plzeňské městské dopravní podniky a.s.	Plzeňský	138	168 556
5.	Dopravní podnik měst Liberce a Jablonce nad Nisou a.s.	Liberecký	137	147 933
6.	Dopravní podnik města Olomouce a.s.	Olomoucký	103	99 765
7.	Dopravní podnik města Ústí nad Labem a.s.	Ústecký	94	93 717
8.	Dopravní společnost Zlín – Otrokovice s.r.o.	Zlínský	122	93 671
9.	Dopravní podnik města České Budějovice a.s.	Jihočeský	56	93 464
10.	Dopravní podnik města Hradce Králové a.s.	Královehradecký	105	93 123
11.	Dopravní podnik měst Mostu a Litvínova a.s.	Ústecký	127	92 236
12.	Dopravní podnik města Pardubice a.s.	Pardubický	78	89 637
13.	Dopravní podnik měst Chomutova a Jirkova a.s.	Ústecký	46	69 195
14.	Městský dopravní podnik Opava a.s.	Moravskoslezský	91	57 969
15.	Dopravní podnik města Jihlavy a.s.	Vysočina	78	50 596
16.	ARRIVA TEPLICE s.r.o.	Ústecký	24	50 134
17.	Dopravní podnik města Děčína a.s.	Ústecký	118	50 059
18.	Dopravní podnik Karlovy Vary a.s.	Karlovarský	59	49 952
19.	Městská doprava Mariánské Lázně s.r.o.	Karlovarský	52	13 331

Source: Own elaboration

2.1.1 Operational criteria

Urban public transport in the Czech Republic is provided in cities of different sizes, therefore the service coverage varies from one carrier to another. Table 2 shows the individual network lengths together with the total length for each transport company.

The density of the transport network (δ) can be calculated using the following formula:

$$\delta = \frac{\text{operational length of the transport network}}{\text{transport area}} \quad (1)$$

The area of the transport area is the area of the city in km^2, the operational length of the transport network is the distance over which a given line runs. This criteria shows the proportion of the city that is served by public transport.

Table 2 - Length of public transport lines (km)

Rank	Transport company	Trams	Trolleybuses	Buses	Total
1.	Dopravní podnik hl. města Prahy a.s.	547	-	1695	2242
2.	Dopravní podnik města Brna a.s.	124	99	801	1024
3.	Dopravní podnik Ostrava a.s.	230	116	668	1014
4.	Plzeňské městské dopravní podniky a.s.	24	87	472	583
5.	Dopravní podnik měst Liberce a Jablonce nad Nisou a.s.	37	-	626	663
6.	Dopravní podnik města Olomouce a.s.	39	-	273	312
7.	Dopravní podnik města Ústí nad Labem a.s.	-	134	290	424
8.	Dopravní společnost Zlín – Otrokovice s.r.o.	-	110	141	251
9.	Dopravní podnik města České Budějovice a.s.	-	67	159	226
10.	Dopravní podnik města Hradce Králové a.s.	-	36	287	323
11.	Dopravní podnik měst Mostu a Litvínova a.s.	73	-	220	293
12.	Dopravní podnik města Pardubice a.s.	-	158	414	572
13.	Dopravní podnik měst Chomutova a Jirkova a.s.	-	64	126	190
14.	Městský dopravní podnik Opava a.s.	-	63	140	203
15.	Dopravní podnik města Jihlavy a.s.	-	45	115	160
16.	ARRIVA TEPLICE s.r.o.	-	58	439	497
17.	Dopravní podnik města Děčína a.s.	-	-	146	146
18.	Dopravní podnik Karlovy Vary a.s.	-	-	331	331
19.	Městská doprava Mariánské Lázně s.r.o.	-	41	43	84

Source: Own elaboration

2.1.2 Performance criteria

To determine the total number of passengers, individual carriers use the guidelines of the Ministry of Transport of the Czech Republic. The number of passengers carried is determined according to the following relationship:

$$1\ \textit{ticket issued} = 1\ \textit{passenger carried} \quad (2)$$

This relationship does not take any consideration on the type of fare or the price of the fare. The total number of passengers using time tickets is determined by the number of vouchers sold in the reference period according to the following formula:

$$J = \sum (K \cdot L) \quad (3)$$

J – number of passengers carried on prepaid season tickets,

∑– the total number of passengers carried for each type of voucher,

K – number of vouchers of each type sold,

L – standard of passengers carried per individual voucher.

For an objective assessment and probably also one of the most important performance criteria is the transport performance, or the number of passengers carried. It is therefore advisable to calculate the number of passengers carried per inhabitants of a given city. This conversion can be expressed according to the following formula:

$$x = \frac{\text{average number of passengers carried}}{\text{average number of inhabitants}} \quad (4)$$

The result of this ratio is the average number of public transport passengers per capita. The average number of passengers carried over the period under review is expressed in Table 3.

Table 3 - Average number of passengers carried in the period 2010-2019 (in thousands)

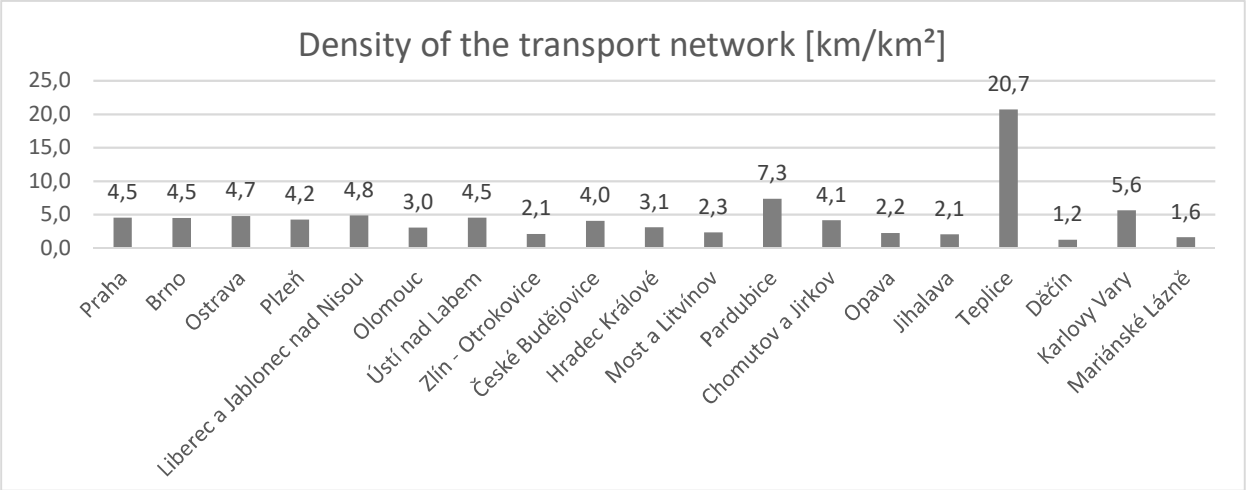
Rank	Transport company	Passengers carried
1.	Dopravní podnik hl. města Prahy a.s.	1 431 859
2.	Dopravní podnik města Brna a.s.	355 399
3.	Dopravní podnik Ostrava a.s.	94 699
4.	Plzeňské městské dopravní podniky a.s.	106 365
5.	Dopravní podnik měst Liberce a Jablonce nad Nisou a.s.	38 804
6.	Dopravní podnik města Olomouce a.s.	55 051
7.	Dopravní podnik města Ústí nad Labem a.s.	43 650
8.	Dopravní společnost Zlín – Otrokovice s.r.o.	32 710
9.	Dopravní podnik města České Budějovice a.s.	42 493
10.	Dopravní podnik města Hradce Králové a.s.	35 828
11.	Dopravní podnik měst Mostu a Litvínova a.s.	24 233
12.	Dopravní podnik města Pardubice a.s.	27 836
13.	Dopravní podnik měst Chomutova a Jirkova a.s.	6 340
14.	Městský dopravní podnik Opava a.s.	10 141
15.	Dopravní podnik města Jihlavy a.s.	14 218
16.	ARRIVA TEPLICE s.r.o.	11 206
17.	Dopravní podnik města Děčína a.s.	7 445
18.	Dopravní podnik Karlovy Vary a.s.	13 346
19.	Městská doprava Mariánské Lázně s.r.o.	3 409

Own elaboration

3 Results and Discussion

The highest density is observed in the city of Teplice, but for this provider the information is not of high value, as the area of the city is 24 km^2 and the total length of the line is 497 km. The ratio between these two values results in the highest density of service. This is due to the fact that the transport company ARRIVA TEPLICE s.r.o. serves the territory outside the municipality of Teplice. However, for the sake of comparability, the cadastral area of the municipality is used for all mentioned transport companies. If we omit the city of Teplice from the comparison of the density of the transport network, the highest density of the transport network is in Pardubice and also in Karlovy Vary (see Figure 1). The four largest cities of the Czech Republic (Prague, Brno, Ostrava, Plzeň) have similar values in the comparison of the total density of the transport network. Ostrava has the highest public transport density of these cities. In contrast, compared to the others, the lowest public transport density is in Děčín, where buses are the only means of transport.

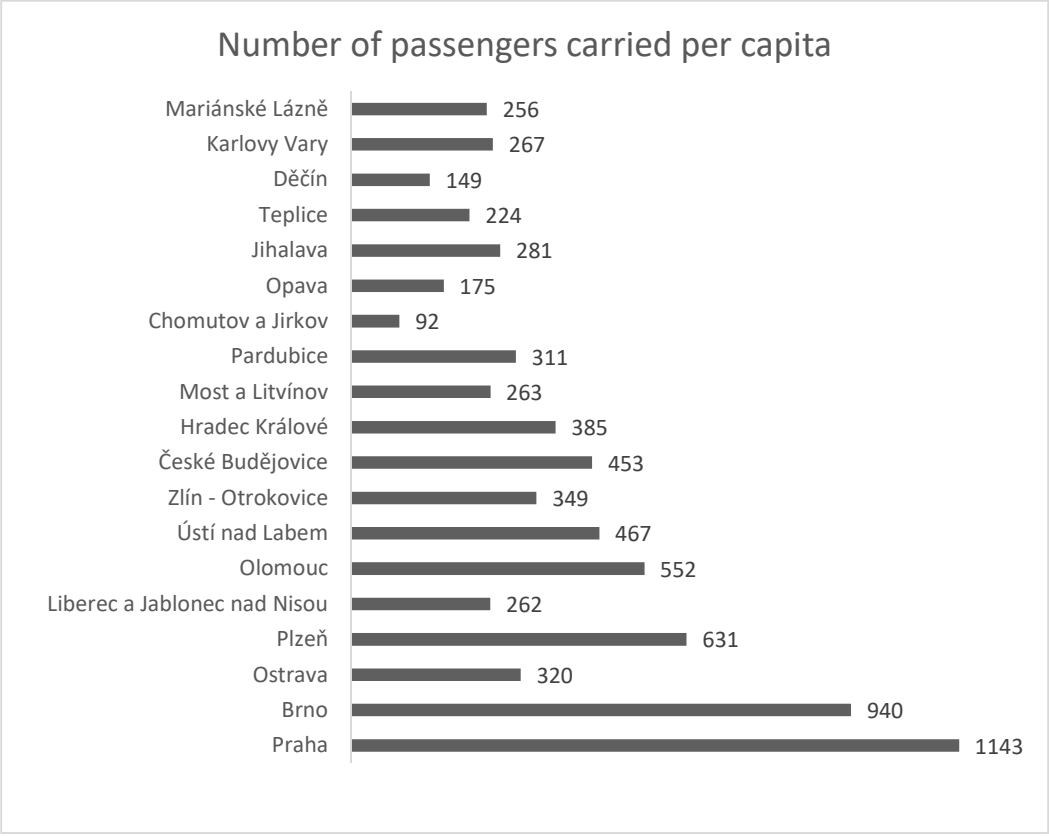
Figure 1 - Density of the transport network



Source: Own elaboration

It is perhaps not surprising that the public transport system in Prague carries the most passengers per capita. The second largest number of passengers is recorded by the Dopravní podnik města Brna a.s. Above the imaginary 100,000 mark is also a carrier from Plzeň. On the other hand, although Ostrava is the third largest city, the average value of passengers transported ranks it only on the fourth place, behind the above mentioned transport company in Plzeň. The transport company in Mariánské Lázně has the lowest number of passengers transported. Although the Dopravní podnik měst Chomutova a Jirkova a.s. provides public transport in two territories, the number of their passengers is 6304 persons for the period under review (see Table 3). This value alone is not very meaningful for the transport company, therefore it is advisable to compare the number of passengers transported with the number of inhabitants, i.e. potential passengers (see Figure 2).

Figure 2 - Number of passengers carried per capita



Source: Own elaboration

Figure 2 shows that the public transport system is used the most by people in the capital city and as well in Brno. At the other end of the spectrum are the transport companies from Chomutov and Jirkov, with 92 passengers per capita. Although Ostrava ranks as the third largest city in the Czech Republic in terms of population, in this criteria the transport company ranks among the cities in which public transport is a less used service. In addition to the Dopravní podnik Ostrava a.s., a transport company from the Moravian-Silesian Region, namely Městský dopravní podnik Opava a.s., also faces low interest in public transport according to this criteria.

4 Conclusion

Urban public transport is an integral part of larger cities, not only in the Czech Republic. The smallest city, in terms of population, in which the public transport system is operated is Mariánské Lázně. Public transport is provided by buses, trolleybuses and trams. In addition to these typical means of transport, the Prague metro is an integral part of public transport, and in addition to these means of transport, funiculars and boats are also used. In 2018, the transport company of the city of Mladá Boleslav was established, but it was not included in this evaluation due to its short service.

The city of Teplice has the highest density of the transport network, with buses and trolleybuses serving the city. Within the density of the transport network, the cities are relatively balanced, with Děčín having the lowest density and Pardubice having the second highest density (7.3 km/km^2). When comparing the four largest cities in the Czech Republic (Prague, Brno, Ostrava, Plzeň), their density of the transport network does not differ significantly, ranging from 4.2 to 4.7 km/km^2, with Ostrava having the highest overall density and Plzeň the lowest. Prague and Ostrava have the same density of tram lines, which equals 1.1 km/km^2.

Not surprisingly, the largest number of passengers per capita is attributable to the transport company from Prague, while the transport companies from Chomutov and Jirkov show the lowest number. This may be related to the region in which the cities are located, i.e. there is a greater likelihood of riding illegally, which the transport companies do not report. The Moravian-Silesian region is also experiencing low interest. Passenger-per-capita results may indicate a lack of interest in this service by inhabitants of some cities, for example, because of the price of fares resulting in the abovementioned riding illegaly. The hypothesis cannot be confirmed, as there is a fluctuating trend in the number of passengers carried by each transport company over the period under review.

References

[1] BREALEY, R. A., S. C. MYERS a F. ALLEN. *Principles of corporate finance*. 11th ed. New York: McGraw-Hill Education, 2014. ISBN 978-0-07-803476-0.

[2] EISLER, J., J. KUNST a F. ORAVA. *Ekonomika dopravního systému*. Praha: Oeconomica, 2011. 286 s. ISBN 978-80-245-1759-9.

[3] IVAN, Igor. Interchange nodes between suburban and urban public transport: A case study of the Czech Republic. *Acta geographica Slovenica* [online]. 2016, **56**(2), - [cit. 2021-05-09]. DOI: 10.3986/AGS.754. ISSN 1581-8314. Dostupné z: http://ojs.zrc-sazu.si/ags/article/view/754

[4] KLEPRLÍK, Jaroslav. *Základní pilíře integrovaného dopravního systému* [online]. 2009, [cit. 2021-05-05]. Dostupné z: http://pernerscontacts.upce.cz/13_2009/kleprlik.pdf

[5] OCHRANA, František. *Efektivnost zabezpečování vybraných veřejných služeb na úrovni obcí*. Praha: Oeconomica, 2007. ISBN 978-80-245-1259-4.

[6] OCHRANA, František. *Veřejné služby - jejich poskytování, zadávání a hodnocení: teorie a metodika poptávkového způsobu poskytování a zadávání veřejných služeb na úrovni municipalit*. Praha: Ekopress, 2007. ISBN 978-80-86929-31-6.

[7] OLIVKOVÁ, Ivana. Evaluation of Quality Public Transport Criteria in Terms of Passenger Satisfaction. *Transport and Telecommunication Journal* [online]. 2016, **17**(1), - [cit. 2021-05-05]. DOI: 10.1515/ttj-2016-0003. ISSN 1407-6179. Dostupné z: https://www.degruyter.com/view/j/ttj.2016.17.issue-1/ttj-2016-0003/ttj-2016-0003.xml

[8] PAWLASOVA, Pavlina. The Factors Influencing Satisfaction with Public City Transport: A Structural Equation Modelling Approach. *Journal of Competitiveness* [online]. 2015, **7**(4), 18-32 [cit. 2021-05-12]. DOI: 10.7441/joc.2015.04.02. ISSN 1804171x. Dostupné z: http://www.cjournal.cz/index.php?hid=clanek&cid=203 94

[9] REKTOŘÍK, Jaroslav a Jaroslav HLAVÁČ et al. *Ekonomika a řízení odvětví technické infrastruktury.* 2.vyd.Praha: Ekopress s.r.o., 2012. 209 s. ISBN 978-80-86929-79-8.

[10] SDRUŽENÍ DOPRAVNÍCH PODNIKŮ ČR. *Výroční zprávy.* [online]. [cit. 2021-06-29]. Dostupné z: http://www.sdp-cr.cz/o-nas/vyrocni-zpravy/

[11] STIGLIC, M., N. AGATZ, M. SAVELSBERGH a M. GRADISAR. Enhancing urban mobility: Integrating ride-sharing and public transit. *Computers & Operations Research* [online]. 2018, **90**, 12-21 [cit. 2017-05-30]. DOI: 10.1016/j.cor.2017.08.016. ISSN 03050548. Dostupné z: http://linkinghub.elsevier.com/retrieve/pii/S0305054817302228

[12] Zákon č. 111 ze dne 26. dubna 1994 o silniční dopravě. In: Sbírka zákonů České republiky. 1994, částka 37, s. 1154-1161. Dostupné také z: http://aplikace.mvcr.cz/sbirka-zakonu/SearchResult.aspx?q=111/1994&typeLaw=zakon&what=Cislo_zakona_smlouvy.

Assessment of the Impact of Neighbouring Countries on Districts Geographically Bounded by the State Border in the Field of SMART Development

Andrej Kóňa, Peter Horváth

University of Ss. Cyril and Methodius
Faculty of Social Sciences
Bucianska 4/A, 917 01 Trnava, Slovak Republic
andrej.kona@ucm.sk, peter.horvath@ucm.sk

Abstract

Cross border cooperation can be a solution for the development of the economy of areas geographically located at state borders. Based on the data of the Slovak Smart City Index, we compare districts according to their maturity within the overall data and data for the Smart Economy pillar. This study examines whether districts with a state border are more economically developed (in the area of smart) and how strong influence the surrounding countries have on the development of aimed districts. In what balance should states support the development of a smart agenda within districts for their continuous development?

Keywords: *development, Slovak Republic, smart city index, smart districts, smart regions, state border*

JEL Classification: *R11, O18, O19, H70*

1 Introduction

John Friedman [1] outlined model of The Center-Periphery, and an extended version of the cumulative causality was represented. Friedman four types of region – core-regions, beyond the cores, development corridors and resource-frontier regions (peripheral areas). Slovak Republic is divided into 79 districts with almost 5.3 million inhabitants. Of all the districts, there are 36 bounded by State border. It borders other countries and has a population of 2.4 million. We class the remaining districts as national, but the essence is that slightly less than half of Slovakia is made up of border districts. Their towns, villages and especially inhabitants are relatively close to neighbouring States.

1.1 Development in Cross-Border Regions

A border region is a region geographically located along the State. The cross-border regions are characterized by marginality [2] in several fields: economy, transport, infrastructure, culture, population density that could be in the process of declining due to urban migration. Lundquist and Trippi [3], identified three stages in the development of cross-border innovation. The authors described conceptual model that brings three ideal levels of cross-border integration and cooperation: weakly integrated systems, semi-integrated systems and strongly integrated systems. Several other authors did research in their studies about the problem of local and regional development in the field of cross-border participation. Authors are Prebisch [4], Frank [5], Harvey with research about general issue of development [6], Blakely and Bradshaw [7], Fitzgerald and Green Leigh [8], Stimson and Stough [9], Bebbington [10], Cypher and Dietz [11]. All these authors focused and tried to explain how economies in regions (we can use these theories also in cross-border economy development) are developing their economies.

The local and regional economic development of border regions is the most significant in cross-border cooperation (CBC). In addition to Slovakia's legislation, such as laws and other regulations, CBC also respects the system of international documents and agreements that Slovakia accepts. Such international documents and agreements include:

- European framework convention on cross-border cooperation - All activities aimed at supporting and promoting the neighbourly relations of the population living in territories located on opposite sides of the common state border are CBC. The aim of the framework convention is to promote and facilitate the conclusion of cross-border cooperation agreements within the remit of local and regional authorities.
- Protocol no. 2 to the European Framework Convention on CBC - The Protocol establishes a legal framework for cooperation between the territorial units or authorities of two or more Contracting Parties, that is different than cross-border cooperation between neighbouring authorities and includes the conclusion of cooperation agreements between non-neighbouring territorial units and authorities of other States.
- European Charter of Local Government - The Charter is the first multilateral legal document that defines and protects the principles of local government in the principle of subsidiarity, and is one of the pillars of democracy, which protection and development are the main tasks of the Council of Europe.

2 Methods

The main purpose of this work is to verify whether the regions bordered by the state border achieve better results in the development of economic factors in the field of smart, and which neighbouring countries have an impact on the economic development of the regions of the Slovak Republic. Three research hypotheses were adopted in this study, according to which it is assumed that:

Hypothesis 1 (H1): Districts geographically located on the state border achieve better economic results within the overall position in the Smart Pillars.

Hypothesis 2 (H2): Districts geographically located on the state border achieve better economic results within the field of economics in Smart evaluation.

Hypothesis3 (H3): The districts located with the State border to the most economically developed neighbour State have the best results in the field of economic indicators.

In order to verify the adopted hypotheses, F.Test with MS Excel is used in statistical analysis when comparing statistical models that have been fitted using the same underlying factors and data set to determine the model with the best fit. When F > 2,5 then we can reject the null hypothesis.

2.1 Model and Data

Slovak Smart City Index identified six ‘smart’ characteristics: economy, people, governance, mobility, environment and living. Smart characteristics are divided into 31 relevant factors which reflect the most important aspects of every smart characteristic. Each factor of a smart characteristic was defined by a group of corresponding indicators. Completely 74 indicators were defined. [12] Data types that represent indicators are data sets across Slovak Republic or Europe Union statistics.

Figure 1 – Slovak Smart City Index composition of data and its structure

Source: own elaboration based on Slovak Smart City Index, 2021

Because Indicators are defined in different ways aggregation procedure for defining the Slovak Smart City ranking is standardized through a z-transformation resulting in a distribution with an average value '0' and a standard deviation of '1'.

Through MS Excel database software we use AVERAGE and STDEV.S or STDEV.P formulas to calculate the mean and standard deviation of our final Indicators score.

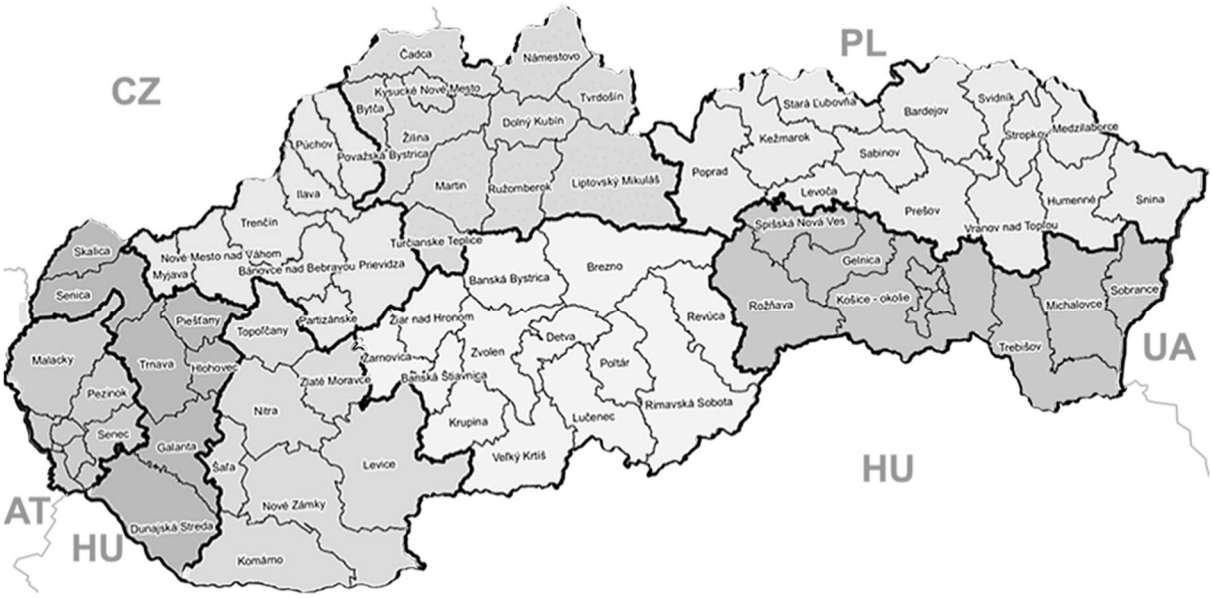
Which cities will be compared in Slovak Smart City index is determined by population size, thus municipalities over 3000 inhabitants /inclusive/ are examine and compare in the Ranking. From this point, calculating the Z-Transformation index and average mathematic formula can be used for evaluating indicators. Data for districts and regions are calculate from municipalities located in its places. Average formula is used to get score from municipalities to district(s), from districts to region(s).

It is necessary to determine the districts of the Slovak Republic that have a geographic state border and thus have border with another state and districts that are geographically located in the Slovak Republic and their inbound borders are with other districts of the Slovak Republic.

In Appendix is shown a list of all districts of the Slovak Republic with the required data about districts that are bounded by the state border. The table also shows data comparing the increase or decrease within the data comparison of the position each district in the Slovak Smart City Index within the total (all pillar) benchmark. Growing means that the district has prospered, and values have improved. Decrease shows that district indicators within the data have degraded.

It is certainly necessary to clearly define in the study the districts within their geolocation in the territory of the Slovak Republic. Therefore, all districts of the Slovak Republic are shown in Figure 2. At the same time, the districts are color-coded into eight regions. Neighbouring countries are also marked, namely the Czech Republic, Poland, Ukraine, Hungary, and Austria.

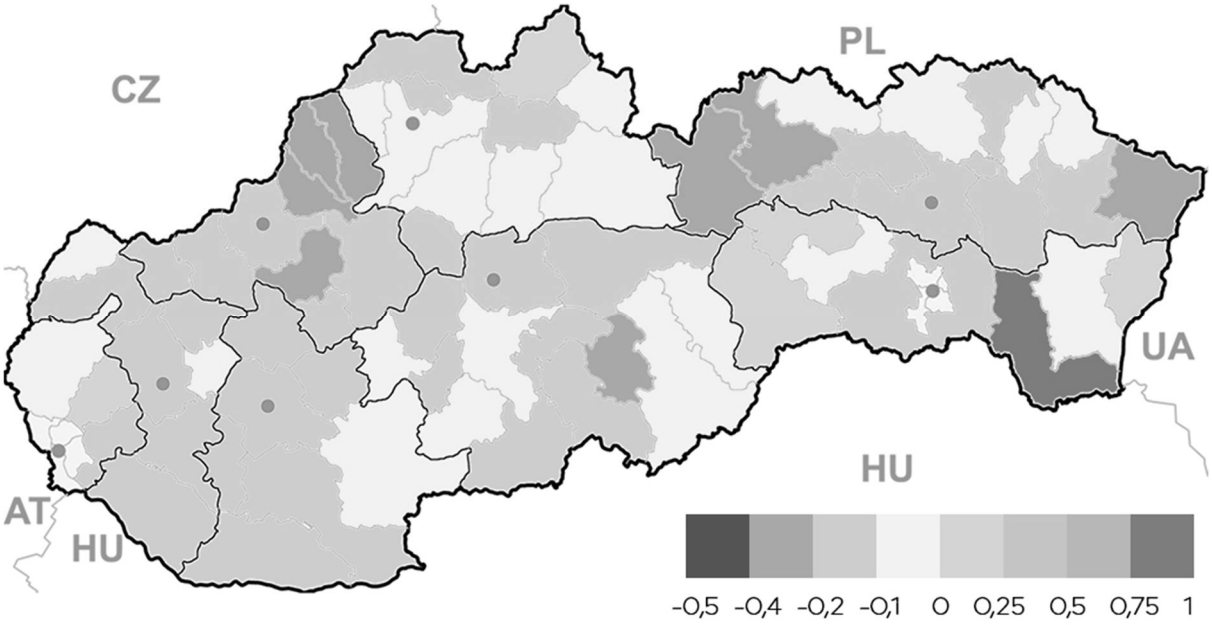
Figure 2 – Geographical location of districts in the regions of Slovakia



Source: own elaboration based on Slovak Smart City Index, 2021

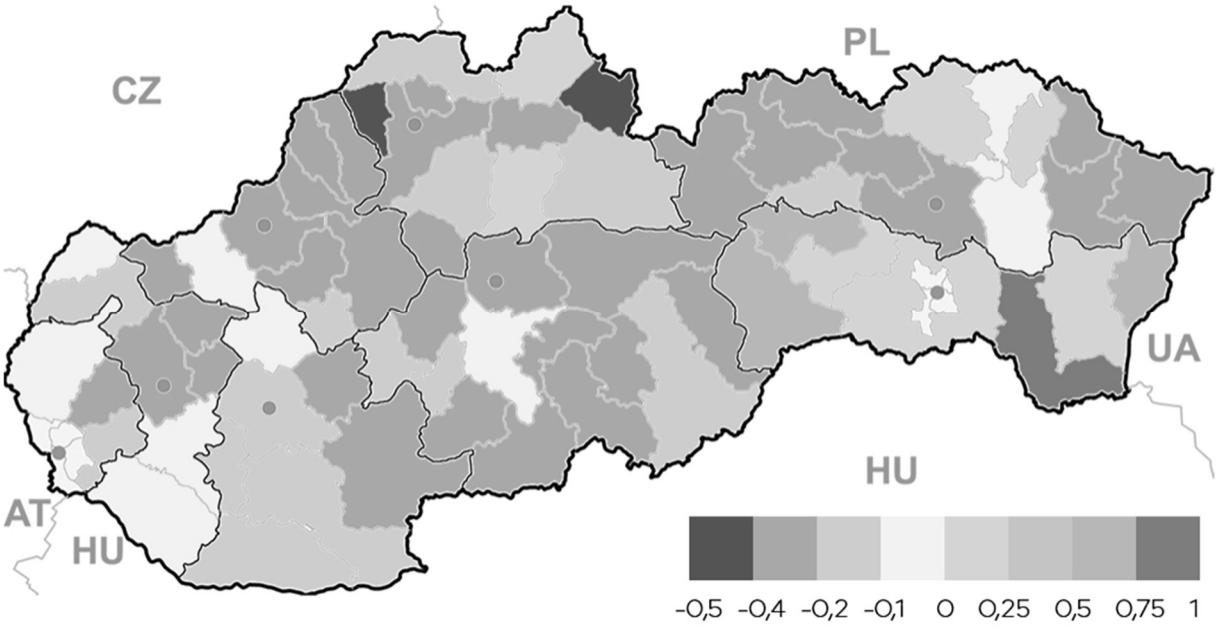
In the study we focus on the districts of Slovakia and the influence of neighbouring States on the district(s) development. For our research is important whether or a state border and geolocation with another country has impact on economy development. Therefore, for a simpler overview, the overall position of all Slovak districts in the benchmark for year 2020 are shown in Figure 3 and the position of the districts with overall position in the Smart Economy pillar for year 2020 are shown Figure 4, both in infographic. The evaluation of districts in the infographic are defined by the colour and scaled from red to green - negative rating to positive rating.

Figure 3 – The overall position of the districts in the overall comparison of Smart City in Slovakia (mathematically recalculated to the regions)



Source: own elaboration based on Slovak Smart City Index, 2021

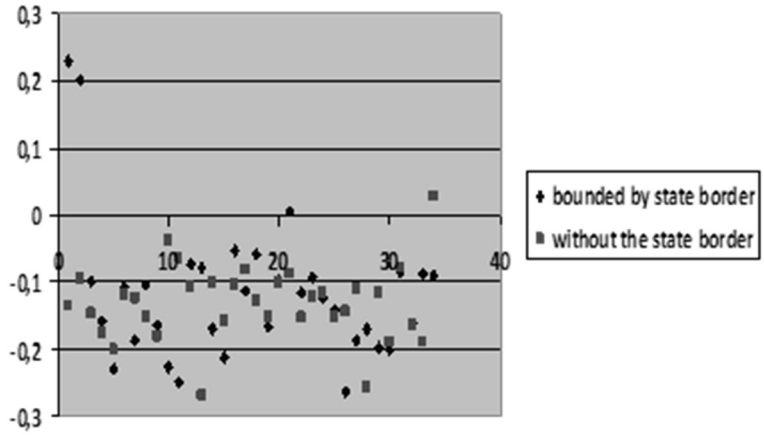
Figure 4 – The overall position of the districts in the Smart Economy comparison of Smart City in Slovakia (mathematically recalculated to the regions)



Source: own elaboration based on Slovak Smart City Index, 2021

We analyse whether districts that have a state border due to their localization achieve better results within the overall position and within the Smart Economy position in the Slovak Smart City Index. Figure 5 shows the overall position data within the benchmark.

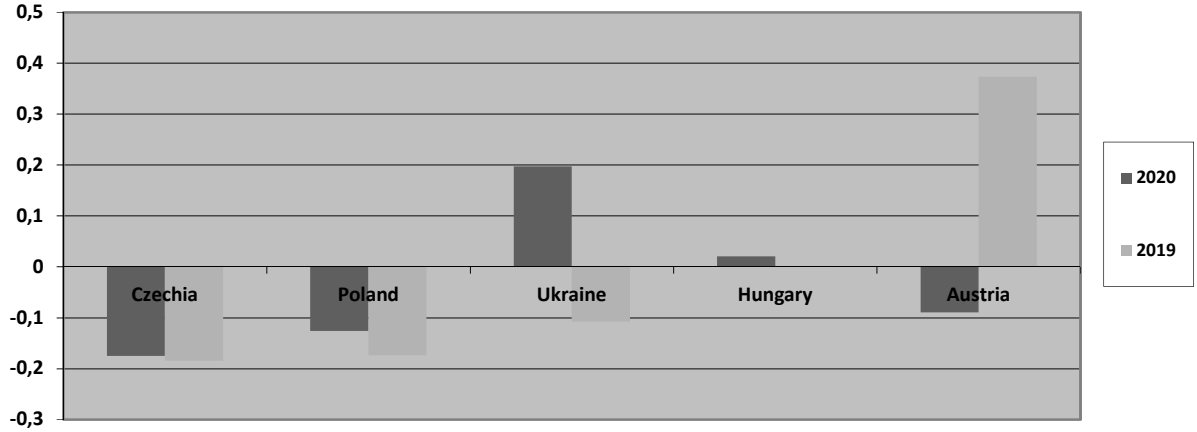
Figure 5 – The overall position in 2020 ranking of the districts in the overall comparison of Smart City in Slovakia (mathematically recalculated to the regions) divided by geographical location bounded by the state border



Source: own elaboration based on Slovak Smart City Index, 2021

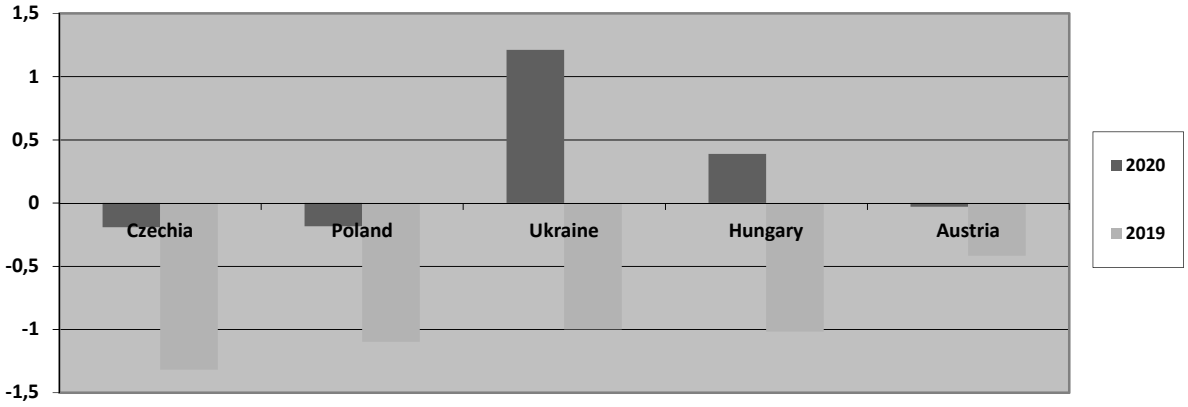
The Slovak Republic has borders with five countries. Each country has a different economic level and thus a possible impact on the economic development of districts geographically located with a given state border. Figure 6 shows the data of the data based on the distribution of districts according to their location related to the state border of the surrounding countries. Next Figure 7 is similar to previous, but data are from Smart Economy Pillar of Smart City Index that has 6 main pillars (Economy is one of them).

Figure 6 – The overall position in 2020 versus 2019 ranking of all districts in the overall comparison of Smart City in Slovakia (mathematically recalculated to the regions) only with geographical location bounded by the state border



Source: own elaboration based on Slovak Smart City Index, 2021

Figure 7 – The overall position in 2020 versus 2019 ranking of all districts in the Smart Economy comparison of Smart City in Slovakia (mathematically recalculated to the regions) only with geographical location bounded by the state border



Source: own elaboration based on Slovak Smart City Index, 2021

3 Results and Discussion

Based on the previous chapter and an overview of the structure of districts in terms of geolocation of the state border and the results with topic, data mainly in the area of Smart Economy benchmark Slovak Smart City Index, we will analyse a compare for all three hypotheses.

First Hypothesis (H1) is based on districts geographically location the state border which has more significant impact to economic results within the overall position in the Smart Pillars. As you can see in Table 1, evaluation this hypothesis is positive.

Table 1 – Regions and overall position in Smart City Index (average data from all districts in this region evaluate by Z-Transformation index and calculated by average meaning in each pillar of Smart City Index).

Region	**Geographically bounded with State border**	**Geographically located in country without bounded by State border**
Kosice Region	0,272598222	-0,01080522
Presov Region	-0,157858986	-0,160108904
Banska Bystrica Region	-0,136819118	-0,133471159
Zilina Region	-0,07967053	-0,116106466
Nitra Region	-0,11150988	-0,136153162
Trencin Region	-0,193696095	-0,170863676
Trnava Region	-0,124305974	-0,137157636
Bratislava Region	-0,08948165	-0,080351647
F.Test for Hypothesis 1	0,013021324	

Source: own elaboration based on Slovak Smart City Index, 2021

Being geographically located to be bounded by the State border has positive impact on district in overall smart position. But it is also true in Economic development in smart agenda? Hypothesis 2 (H2) is also correct. In Table 2 is statistical examination of H3 whit positive results.

Table 2 – Regions and Smart Economy data (average data from all districts in this region)

Region	**Geographically bounded with State border**	**Geographically located in country without bounded by State border**
Kosice Region	1,38256097	0,209295012
Presov Region	-0,18491369	-0,219610521
Banska Bystrica Region	-0,276581576	-0,246364457
Zilina Region	-0,222134604	-0,262894257
Nitra Region	-0,255081351	-0,251125564
Trencin Region	-0,225791565	-0,258593599
Trnava Region	-0,044199714	-0,103415755
Bratislava Region	-0,030168341	-0,193069353
F.Test for Hypothesis 2	0,003878189	

Source: own elaboration based on Slovak Smart City Index, 2021

When being bounded by the State border has impact for development, is there correlation between more or less economically developed neighbour countries to districts of Slovak Republic? Hypothesis3 (H3): The districts located with the State border to the most economically developed neighbour State have the best results in the field of economic indicators. As is shown in Table 3, there is correlation. Economically stronger neighbouring countries has bigger impact to districts.

Table 3 – Districts position in pillar Smart Economy regarding to only Districts with state-border with some neighbour country in 2020

Hypothesis 3				
Country				
Czechia	Poland	Ukraine	Hungary	Austria
-1,318902997	-1,099101466	-0,99853086	-1,01641997	-0,4180765
Gross domestic product at market prices by Eurostat data (TEC00001) in 2020 (Euro per Capita)				
19 970	13 640	NA	13 940	42 110

Source: own elaboration based on Slovak Smart City Index and Eurostat, 2021

Referring to the hypotheses, they have all been confirmed. In both cases, overall position in benchmark and districts positions in pillar Smart Economy, those districts bounded by State border are more developed than districts without State border. This may be due to cross-border cooperation and its positive affects for districts. Third hypothesis is about the influence of a neighbouring country on the development of the district according to the economic maturity of this country with which the district has a state border. The most development country in our case is Austria. Also, the best data (closest to zero and positive numbers) are from districts that have State border with Austria. This is significant, because with this country borders with Slovak republic are shortest (only 106,7 km of borders).

There will be always disparities between more and less developed districts. As this research confirmed, districts that are bounded by the State border are more developed. Also, those districts with neighbouring more developed countries has better economic results in smart agenda. Being better in smart indicators for these districts may be also needed for other reasons than improve services for citizens. In some cases, state defence is about defence the State borders. Another point of view can be for rising State import or export.

4 Conclusion

The topic of the development of intelligent technologies is one of the most discussed in Slovakia. In many cases, the topic is seen as a problem that can only be solved with funding from the European Union or the Slovak Republic. However, with this study, we pointed out another possible solution. Cross-border cooperation can

bring, not only financial resources and knowledge, but also processes to improve the implementation of smart technologies. If not in the whole country or regions, at least in geographical areas - districts bordered by the State border. This can have a positive impact on economic development.

We may also ask ourselves: “should we more promote implementation of smart agenda evenly in whole country, only in core districts or those with state border?” Logical seem to promote inner districts and drawn inspiration from districts with state border which are developing more markedly.

Acknowledgements

This contribution was supported by the project KEGA 001UCM-4/2019 “Dynamika premien verejnej správy SR”.

References

[1] FRIEDMANN, J., MILLER, J. (1965). The Urban Fields. Journal of American Institute of *Planners*. Vol. 40, 1, pp. 1-16.

[2] VERGATTI, R. (2006). Regiuni transfrontaliere: Regiunea Bihor-Hajdu-Bihar. *Geopolitica*. Year IV(20), pp. pp. 85-98.

[3] LUNDQUIST, K.-J., TRIPPI, M. (2013). Distance, Proximity and Types of Crossborder Innovation Systems: A Conceptual Analysis. *Regional Studies Journal*. Vol. 47(3), pp. 450-460.

[4] PREBISCH, R. (1950). *The Economic Development of Latin America and Its Principal Problems.* Department of Economic Affairs: New York. p. 59.

[5] FRANK, G. A. (1978). *Dependent Accumulation and Underdevelopment.* Palgrave Macmillan: London. p. 226.

[6] HARVEY, D. (2006). *Spaces of Global Capitalism Towards the Theory of Uneven Geographical Development.* Verso: London.

[7] BLAKELY, E.; BRADSHAW, T. (2002). *Planning Local Economic Development: Theory and Practice.* 3rd ed. Sage Publications: Thousand Oaks.

[8] FITZGERALD, J. (2013). *Green Leigh, N. Economic Revitalization: Cases and Strategies for City and Suburb.* 5th ed. Sage Publications: Thousand Oaks.

[9] STIMSON, R. (2008). Stough, R.R. Regional economic development methods and analysis: Linking theory to practice. In Theories of Local Economic Development: *Linking Theory to Practice*. pp. 169–192.

[10] PIKE, A.; RODRÍGUEZ-POSE, A.; TOMANEY, J. (2007). What kind of local and regional development and for whom? *Regional Studies*. Vol. 41, 1253–1269.

[11] BEBBINGTON, A. (2003). Global networks and local developments: Agendas for development geography. *Journal of Economics and Human Geography*. Vol. 94, pp. 297–309.

[12] CYPHER, J.M.; DIETZ, J.L. (2014). The Process of Economic Development, 4th ed.; Routledge: *New York*.

[13] KÓŇA. A.; GUŤAN D.; HORVÁTH. P.; (2020) Slovak Republic on the way to build Smart Cities based on KPIs with first Slovak Smart City Index. *SciPap.* Vol. 28. Issue 4.

Appendix – List of districts and their territorial scope within the region with identification of geographical location near state borders and naming of the state

District	Region	Overall position change 2019 vs. 2020	Districts geographically bounded by the state border	Czech Republic state border	Poland state border	Ukraine state border	Hungary state border	Austria state border
Trebišov	Kosice	Growing	Yes	No	No	Yes	Yes	No
Spišská Nová Ves	Kosice	Growing	No	No	No	No	No	No
Sobrance	Kosice	Growing	Yes	No	No	Yes	No	No
Rožňava	Kosice	Growing	Yes	No	No	No	Yes	No
Michalovce	Kosice	Growing	Yes	No	No	Yes	No	No
Košice - okolie	Kosice	Decrease	Yes	No	No	No	Yes	No
Košice	Kosice	Growing	No	No	No	No	No	No
Gelnica	Kosice	Growing	No	No	No	No	No	No
Vranov nad Topľou	Presov	Decrease	No	No	No	No	No	No
Svidník	Presov	Growing	Yes	No	Yes	No	No	No
Stropkov	Presov	Decrease	Yes	No	Yes	Yes	No	No
Stará Ľubovňa	Presov	Growing	Yes	No	Yes	No	No	No
Snina	Presov	Growing	Yes	No	No	Yes	No	No
Sabinov	Presov	Growing	No	No	No	No	No	No
Prešov	Presov	Decrease	No	No	No	No	No	No
Poprad	Presov	Growing	Yes	No	Yes	No	No	No
Medzilaborce	Presov	Growing	Yes	No	Yes	No	No	No
Levoča	Presov	Growing	No	No	No	No	No	No
Kežmarok	Presov	Decrease	Yes	No	Yes	No	No	No
Humenné	Presov	Growing	Yes	No	Yes	No	No	No
Bardejov	Presov	Growing	Yes	No	Yes	No	No	No
Žiar nad Hronom	Banska Bystrica	Growing	No	No	No	No	No	No
Žarnovica	Banska Bystrica	Growing	No	No	No	No	No	No
Zvolen	Banska Bystrica	Decrease	No	No	No	No	No	No
Veľký Krtíš	Banska Bystrica	Decrease	Yes	No	No	No	Yes	No
Rimavská Sobota	Banska Bystrica	Decrease	Yes	No	No	No	Yes	No
Revúca	Banska Bystrica	Decrease	Yes	No	No	No	Yes	No
Poltár	Banska Bystrica	Decrease	No	No	No	No	No	No
Lučenec	Banska Bystrica	Growing	Yes	No	No	No	Yes	No
Krupina	Banska Bystrica	Decrease	No	No	No	No	No	No
Detva	Banska Bystrica	Decrease	No	No	No	No	No	No
Brezno	Banska Bystrica	Growing	No	No	No	No	No	No

District	Region	Overall position change 2019 vs. 2020	Districts geographically bounded by the state border	Czech Republic state border	Poland state border	Ukraine state border	Hungary state border	Austria state border
Banská Štiavnica	Banska Bystrica	Growing	No	No	No	No	No	No
Banská Bystrica	Banska Bystrica	Growing	No	No	No	No	No	No
Žilina	Zilina	Growing	No	No	No	No	No	No
Tvrdošín	Zilina	Decrease	Yes	No	Yes	No	No	No
Turčianske Teplice	Zilina	Decrease	No	No	No	No	No	No
Ružomberok	Zilina	Growing	No	No	No	No	No	No
Námestovo	Zilina	Growing	Yes	No	Yes	No	No	No
Martin	Zilina	Growing	No	No	No	No	No	No
Liptovský Mikuláš	Zilina	Decrease	Yes	No	Yes	No	No	No
Kysucké Nové Mesto	Zilina	Growing	No	No	No	No	No	No
Dolný Kubín	Zilina	Growing	No	No	No	No	No	No
Čadca	Zilina	Growing	Yes	Yes	Yes	No	No	No
Bytča	Zilina	Growing	No	No	No	No	No	No
Zlaté Moravce	Nitra	Growing	No	No	No	No	No	No
Topoľčany	Nitra	Growing	No	No	No	No	No	No
Šaľa	Nitra	Decrease	No	No	No	No	No	No
Nové Zámky	Nitra	Growing	Yes	No	No	No	Yes	No
Nitra	Nitra	Decrease	No	No	No	No	No	No
Levice	Nitra	Growing	Yes	No	No	No	Yes	No
Komárno	Nitra	Decrease	Yes	No	No	No	Yes	No
Trenčín	Trencin	Decrease	Yes	Yes	No	No	No	No
Púchov	Trencin	Growing	Yes	Yes	No	No	No	No
Prievidza	Trencin	Growing	No	No	No	No	No	No
Považská Bystrica	Trencin	Decrease	Yes	Yes	No	No	No	No
Partizánske	Trencin	Decrease	No	No	No	No	No	No
Nové Mesto nad Váhom	Trencin	Growing	Yes	Yes	No	No	No	No
Myjava	Trencin	Decrease	Yes	Yes	No	No	No	No
Ilava	Trencin	Growing	Yes	Yes	No	No	No	No
Bánovce nad Bebravou	Trencin	Decrease	No	No	No	No	No	No
Trnava	Trnava	Growing	No	No	No	No	No	No
Skalica	Trnava	Decrease	Yes	Yes	No	No	No	No
Senica	Trnava	Growing	Yes	Yes	No	No	No	No
Piešťany	Trnava	Decrease	No	No	No	No	No	No
Hlohovec	Trnava	Growing	No	No	No	No	No	No
Galanta	Trnava	Decrease	No	No	No	No	No	No
Dunajská Streda	Trnava	Growing	Yes	No	No	No	Yes	No
Senec	Bratislava	Decrease	No	No	No	No	No	No

District	Region	Overall position change 2019 vs. 2020	Districts geographically bounded by the state border	Czech Republic state border	Poland state border	Ukraine state border	Hungary state border	Austria state border
Pezinok	Bratislava	Decrease	No	No	No	No	No	No
Malacky	Bratislava	Decrease	Yes	No	No	No	No	Yes
Bratislava	Bratislava	Decrease	Yes	No	No	No	No	Yes

Source: own elaboration based on Slovak Smart City Index, 2021

Participatory Budget as an Instrument of Social Participation in the Sports Sector

Maja Krasucka

University of Opole
Faculty of Economics
Institute of Economics and Finance
Ozimska 46a, 45-058 Opole, Poland
mkrasucka@uni.opole.pl

Abstract

From the perspective of local government, social participation means the participation of citizens in making decisions about the performance of public tasks. Allocation of participatory budget funds is executed by indicating the types of tasks that should be financed under this budget. Projects submitted within this budget are treated as indicators of the needs and expectations of the residents. Undertaking and organising activities popularising widely understood physical fitness and sports activities is an important sphere of life. Therefore, the paper refers to whether the participatory budget is used as an instrument of social participation in the sphere of physical fitness and sports, analysing at the same time the nature of the submitted projects. The analysis was carried out locally, as a case study, on the example of the City of Opole. It has been observed that despite the city's long-standing strategic sports activities, residents still point to the need for further development in this area. They perceive a shortage of initiatives for sports activities and the related weakness of sports infrastructure in their immediate surroundings. The largest number of selected sports projects concerned the organisation of sports activities open to the general public, popularising sports activities and integrating the local community. The construction and modernisation of sports infrastructure located in their immediate vicinity also proved to be important.

Keywords: *budget, participation, sports*

JEL Classification: *H70, H72, H76*

1 Introduction

Activating citizens in the decision-making process is perceived as a phenomenon of social participation. From the perspective of local government, participation means the participation of citizens, through various forms of direct democracy, in making decisions and performing public tasks of local character [6]. Participation can arise autonomously as a result of public action or it can be stimulated by public involvement [4]. Regardless of its source, the highest level of participation is co-deciding (authorisation), whereby the public authorities delegate part of its powers to citizens. They are combined with trustworthy partnership with the inhabitants, joint identification of problems and searching for their solutions. On the classic "ladder of participation," they are formed by three components, i.e. partnership, delegation, and citizen control. Their synergy is an indicator of the socialisation of power [1]. Participatory (civic) budgeting is indicated as a form of such co-deciding and socialisation of the budgeting processes at the local level. Projects submitted to the participatory budget are treated as indicators of the needs and expectations of residents [2][3][5]. Therefore, the paper focuses on identifying the tasks, which are submitted to participatory budgeting by residents. The aim of this paper is to answer the question whether the participatory budget is used as an instrument of social participation in the sphere of physical fitness and sports activities. The following specific questions are also aimed at achieving this goal: (1) What tasks do residents submit for the participatory budget? (2) What part of them are fitness and sports tasks? and (3) What is their nature? The analysis was carried out locally, as a case study, on the example of the City of Opole. Referring to the general features of participatory budgeting, its legal conditions in Poland were

characterised. The importance of fitness and sports activities for the development of Opole was presented next. In the development of the paper, the results of the analysis of the tasks of the Opole participatory budget (PB) between 2015 and 2021 are presented.

1.1 The Idea of Participatory Budgeting

In the literature, there is a consensus on the minimum set of features that a participatory budget should have. These include such essentials as (1) discussions of budget allocations; (2) the extent of the city or other decentralised entity that has an electable body that has the power to establish resolutions; (3) specified financial resources; (4) own administration; (5) annual character; (6) the existence of specific forms of public deliberation; and (7) responsibility for results [13].

The practical character of the participatory budget is therefore composed of its subjective and objective aspects. The subjective aspect boils down to the fact that the inhabitants of self-governing community actively participate in the process of discussion and budget decision-making. Thus, the "particularity" of this procedure is characterised by the fact that it is not reserved exclusively for local government officials or councillors. The objective aspect refers to the decision to spend a certain part of local government budget funds. By submitting and selecting tasks for the participatory budget, citizens directly co-create the budget of the local government unit. Thus, it is a systemic tool for managing the self-governmental community in a way aimed at satisfying its current needs, but also at implementing the development strategy of the given unit of local government.

1.2 Legal Conditions of the Participatory Budget in Poland

The fact that there is no point in establishing one universal model of participatory budgeting means that it is adapted to local contexts on a case-by-case basis. In the Polish legal system, until 30 September 2018 (the first PB in 2011 was introduced by Sopot), there were no regulations defining and specifying the principles of PB functioning. Additionally, the practice of participatory budgeting was implemented by local governments on an optional basis. Local government units on their own determined the conditions, the size, and scope of these budgets. It was not until 2018 that the general principles of PB in Poland were statutorily defined. It was agreed that PB is a special form of public consultation in which all residents of the municipality can participate. Thus, they decide annually, by direct voting, on the allocation of a portion of the budget's expenses. The tasks selected under PB must be implemented. In municipalities such as Opole, which are cities with district rights, the establishment of a participatory budget has become obligatory. In addition, the law requires that the value of PB is at least 0.5% of the expenditure reported in the last submitted report on budget implementation [14].

The requirements to be met by PB projects (including mandatory elements indicated by the Act) are determined by the commune council. The following basic stages of the PB procedure emerge from them, i.e. definition of the principles and procedures of conducting consultations on the PB (including, e.g., formal requirements to be met by projects, principles of evaluating the submitted projects, principles of voting and selection of the winning projects); promotion of the PB; acceptance of projects; verification of the submitted projects; voting and project selection; implementation of the winning projects; and evaluation of the project implementation. According to the rules of Opole, any idea that affects the development of the city and meets the needs of its inhabitants can be submitted as a project – it can be investment and non-investment, city-wide or district-wide, and it should be implemented within one year. Also, it must be legal and open to the public. At its submission stage, it requires the support of 20 city residents. At the same time, projects that are contrary to the city's development strategy, investments implemented on sports facilities (including those belonging to sports clubs), on facilities of voluntary fire brigades, concerning all purchases for voluntary fire brigades, or consisting only in the preparation of technical documentation may not be submitted to the Opole PB. The submitted projects are subject to formal, legal, and factual evaluation carried out by officials. Projects evaluated in terms of their merits are subject to opinion by the Team for Citizens' Proposal (an advisory and consultative body of the Mayor). The projects positively evaluated are subject to the voting procedure by the residents. The projects for which residents cast the most votes (separately for the city or district category) will qualify for implementation until the total value of the PB is exhausted. However, recognition of the outcome of the vote requires the project to reach a threshold of support of at least 150 voters. The projects are implemented by competent municipal or City Hall units. After the end of the financial year, information on the projects implementation is made public [7].

1.3 Strategic Dimension of Physical Fitness and Sports Activities in the Development Concept of Opole

Undertaking and organising activities popularising widely understood physical fitness activities, sports, and recreation is an important sphere of public tasks, in the fulfilment of which the local government actively engages. The visible improvement in the conditions of access to and practice of sports activities in Opole [8] does not exhaust the inhabitants' needs in this area; therefore it is constantly an important item of attention of the city authorities. The strategic importance of sports activities for the development of Opole is confirmed by the

Opole Development Strategy 2030 [12]. It guides the city's development towards a high quality of life. The formulated development goals related to sports activities are summarised in Table 1.

Table 1 – Priorities and objectives for the development of Opole in the 2030 perspective

	Priorities and objectives	Success factors	Space to manage
Strategic goal 1 – The city significant in the national space		1.5. City brand	Building a city brand through sports
Direction of action	Children's physical fitness activities as the basis of the pyramid of child and youth training		
	Strengthening the coordination of physical training system in education		
	Development of sports training system		
	Development of family physical fitness activities		
	Strengthening the motivational system for competitors, players, and coaches (scholarships, grants, awards), and opening a sports clinic		
	Support for the development of professional sports in specific team and individual disciplines; development of academic sports activities		
	Support for the organisation of high profile sports events		
Strategic goal 2 – The city of green and people-friendly space		2.4 Resident-friendly space	Improving conditions for sports activities and recreation
Direction of action	Creation of local physical fitness centres		
	Modernisation of school halls and sports fields		
	Creation of publicly accessible recreational areas and spaces		
	Modernisation and construction of sports and recreational facilities		
	Extension and modernisation of bicycle paths, roller tracks, and jogging tracks		
	Creation of workout parks		
	Creation of a modern skate park		
	Building successful cooperation with the fitness and sports community		
	Involving the sports community in the process of giving its opinion on the concepts and programmes for infrastructural fitness and sports projects		

Source: own study based on *Opole Development Strategy 2030*

The action plan and its directions set for the following years focus on two key success factors: the city brand and resident-friendly space. Brand building through sports activities is a continuation of undertakings defined in previous strategic documents. On the other hand, improving conditions for fitness, sports, and recreation is identified as an additional space to be developed, which is expected to translate into improved quality of life.

2 Material and Methods

Since the aim of the article is to answer the question whether PB is an instrument of public participation in the sphere of physical fitness and sports activities, the set of projects submitted and selected by Opole residents for PB between 2015 and 2021 was analysed. In individual editions, the analysis covered such parameters as the number of projects, including those in the area of sports, their type, and the amount of funds granted. The analyses of individual PBs were made on the basis of information available at www.bo.opole.pl, legal regulations, and reports on the execution of the city budget.

In Opole, the participatory budget has been implemented since 2015. Six editions already completed and the settled voting for projects introduced into the city budget for 2021 give an idea of both the needs reported by residents and the choices they made. The background to their characterisation is the size of the City's budget. Selected parameters are shown in Table 2.

Table 2 – Share of PB in the budget of the City of Opole between 2015 and 2021

Itemisation	2015	2016	2017*	2018	2019	2020	2021**
Value of PB (kPLN)	2,000	2,500	3,000	2,500	4,300	5,200	5,950
PB dynamics (in %)	-	125	120	83	172	121	114
Share of PB in the city budget (in %)	0.31	0.34	0.35	0.24	0.36	0.42	0.59
PB value *per capita* (in PLN)	16.82	21.1	23.41	19.5	33.6	40.62	46.48

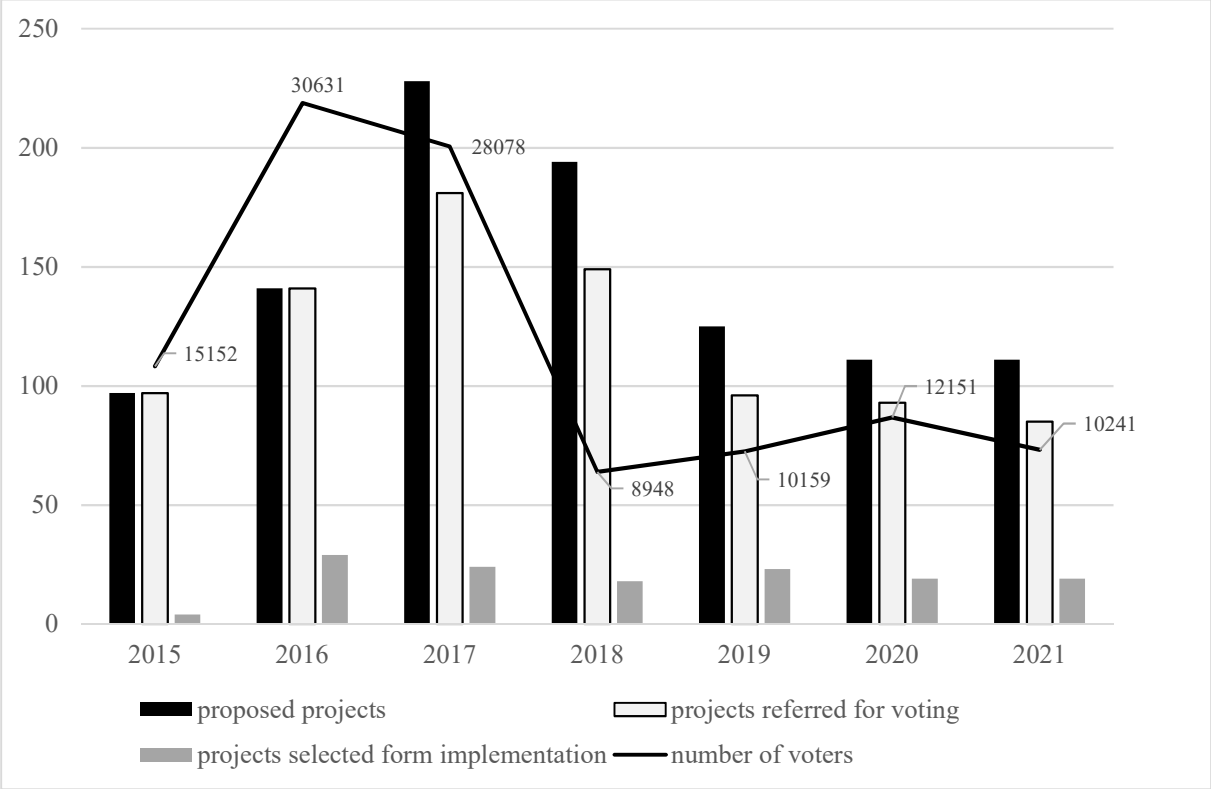
*2017 Change of the boundaries of the city with district rights as of 1 January 2017 [9]; **2020 for the planned budget

Source: own study based on the *Report of the Mayor of the City of Opole on the implementation of the budget of the City of Opole* (for consecutive years from 2015 to 2020); *Comparative analysis of the participatory budget of Opole over the years. Supporting material for evaluation*, Centrum Dialogu Obywatelskiego Urzędu Miasta Opola [Civil Dialogue Centre of Opole City Hall], Opole 2020.

The value of funds made available to residents varied from year to year. This was decided by the municipality. It significantly increased as of 2019. This is as a result of changes to national legislation introduced in 2018. However, the amount of the funds allocated to PB in relation to the value of the budget implemented in a given year can be considered insufficient. In the Polish literature on the subject, it is emphasised that in the majority of cities it does not exceed 1% of general expenditures of the municipality budget.

A total of 1018 projects were submitted between 2015 and 2021, of which 1007 were referred for voting and 136 (13.5%) were selected by residents for implementation. The number of projects at different stages of the PB procedure is presented in Figure 1. The increase in the number of projects in subsequent years (by 2018) was the result of growing interest and participation from residents. In addition, as a result of the enlargement of the city's administrative boundaries, a pool of "New Opole" funds was set aside in the 2017 PB. This was also reflected in the increase in the number of residents voting. However, during the entire period under analysis, the participation of residents in decisions on selecting projects for Opole's participatory budget amounted to approximately 13% of the total number of residents. The period of most intense interest in the PB initiatives was 2016–2017. The first edition of PB of 2015 was also relatively successful.

Figure 1 – Number of projects and voters in the participatory budget of Opole between 2015 and 2021



Source: own study based on *Comparative analysis of the civic budget of Opole over the years. Supporting material for evaluation*, Centrum Dialogu Obywatelskiego Urzędu Miasta Opola [Civil Dialogue Centre of Opole City Hall], Opole 2020.

3 Results and Discussion

The review of tasks submitted to PB in the analysed period indicates their wide range: from construction, modernisation, or renovation of public infrastructure, through those aimed at improvement of living conditions and functioning of the residents, to organisation of pro-social, cultural, educational, or sports events. In detailing the characteristics of the submitted projects, their classification by spheres of influence was used. Their summary is presented in Table 3.

The cited data shows that between 2015 and 2021, the largest share in the number of submitted projects were those in the area of "education and culture" (18.96%). The second group comprised the projects in the "roads, pavements, cycle paths" category (18.37%), followed by "sports, including sports architecture and facilities" (18.07%), and "recreational areas, playgrounds, small architecture" (18.07%) and "recreation areas, playgrounds, small architecture" (14.34%). A slightly different distribution of needs is shown by the structure of projects selected for implementation.

Table 3 – Spheres of impact of PB Opole projects submitted/selected for implementation in 2015-2021

Itemisation	Proposed projects		Selected projects			
	Number	%	Number	%	kPLN	%
Education and culture	193	19	17	12.5	726	2.9
Roads, pavements, cycle paths	187	18.4	17	12.5	5,752	22.8
Sports, including sports architecture and facilities	184	18.1	27	19.9	4,599	18.2
Recreational areas, playgrounds, small architecture	146	14.3	30	22.1	5,312	21
Green areas and planting	59	5.8	12	8.8	2,283	9
Lightning and safety	55	5.4	10	7.4	3,453	13.7
Other	52	5.1	9	6.6	1,640	6.5
Solutions for senior citizens	45	4.4	4	2.9	119	0.5
Health protection and solutions for the disabled	41	4	4	2.9	120	0.5
Renovation of municipal facilities	30	2.9	6	4.4	1,242	4.9
Public transport	26	2.6	0	0	0	0
Total	1,018	-	136	-	25,246	-

Source: own study based on the *Comparative analysis of Opole's participatory budget over the years. Supporting material for evaluation*, Centrum Dialogu Obywatelskiego Urzędu Miasta Opola [Civil Dialogue Centre of Opole City Hall], Opole 2020.

Residents who cast their votes indicated in a certain way those spaces of public life in which they are interested and which, in their opinion, deserve funding and implementation as part of PB. The categories in which most initiatives gained support [10][11] are those concerning the development and creation of recreational areas (22.06%) and the development of conditions and forms of sports activities, including amateur sports (19.85%). This was followed by educational and cultural tasks, as well as those favouring walking and cycling in urban mobility (each 12.5%). The smallest number of projects introduced to PB are those related to health and activities for senior citizens. The highest expenditures were required for tasks used by pedestrians and cyclists (22.78%), followed by recreational tasks (21%). Sports projects accounted for 18.22% of the total value of all PB editions.

As projects in the area of sports, the following initiatives were considered: construction, modernisation, and revitalisation of sports facilities; development of small sports architecture and facilities; organisation of sports classes, events, and other events. Table 4 presents the structure of the type and value of selected tasks in the sport sphere.

Table 4 – Types of sports projects selected for implementation in PB Opole between 2015 and 2021

Itemisation	% sports projects	% estimated expenditure
Construction of sports facilities	13.51	52.03
Modernisation of sports facilities	16.22	17.00
Revitalisation of sports facilities	8.11	10.26
Small sports architecture	18.92	4.53
Organisation of sports activities	29.73	7.88
Maintenance of sports facilities	5.41	0.68
Organisation of and participation in sporting events	5.41	7.30
Purchase of sports equipment	2.70	0.34

Source: own study based on the *Report of the Mayor of the City of Opole on the implementation of the budget of the City of Opole* (for subsequent years from 2015 to 2020); www.bo.opole.pl

The largest number of sports projects selected for implementation concerned the organisation of sports activities open to the public. These were the so-called soft projects, popularising sports activities and integrating the local community. Next, important for residents, were projects connected with small sports architecture and facilities – mainly outdoor gyms. Residents were also keen on selecting projects related to modernisation and construction of sports facilities, mainly playing fields. The nature of projects related to the construction, modernisation, and revitalisation of sports facilities meant that the financial resources for their implementation accounted for the largest share of the value of estimated expenditures.

4 Conclusion

The analysis indicates unsatisfied needs of residents in the sphere of recreational and sports facilities of urban space and the quality of pedestrian and bicycle infrastructure. Given the complementary nature of these activities (especially sports and recreation), these projects represent nearly one-third (32.4%, 330) of those submitted, 41.9% of those selected (57), and nearly 40% (39.3%) of those estimated to be spent. Referring to the question formulated in the introduction, i.e. whether PB constitute an instrument of social participation in the field of sport, the answer should be in the affirmative. Despite the city's long-standing strategic sports activities, residents still indicate the need for further development in this direction. They perceive a shortage of initiatives for sports activities and the related weakness of sports infrastructure in their immediate surroundings. The citizens' budget allows them to act on these needs. The submitted and implemented tasks are also consistent with the need to improve the conditions for sports and recreation in the city. The projects accepted for implementation are considerably convergent with the issues of the strategy referring to the strategic goal 2 – The city of green and people-friendly space.

References

[1] ARNSTEIN, S. R. (1969). A Ladder of Citizen Participation. *Journal of the American Institute of Planners.* No. 35(4), pp. 216–224.

[2] GAWROŃSKI, H. (2015). Efficiency of participatory instruments of city management. *Ruch Prawniczy, Ekonomiczny i Socjologiczny.* No. 77(1), pp. 273–286.

[3] KUSIŃSKA, E. (2017). Shaping urban public spaces according to the needs of local communities. *Przestrzeń – Urbanistyka – Architektura.* No. 2, pp. 85–94.

[4] LANGTON, S. (1978). *What is Citizen Participation?* In: *Citizen Participation in America: Essays on the State of the Art*. Langton, S. (ed.). Lexington: Lexington Books. cf.: Kazmierczak, T. (2011). *Partycypacja publiczna: pojęcie, ramy teoretyczne,* In: *Partycypacja publiczna. O uczestnictwie obywateli w życiu wspólnoty lokalnej*. Olech, A. (ed.). Warszawa: Instytut Spraw Publicznych.

[5] MUCHA, A. (2018). Zróżnicowanie zwycięskich projektów budżetu obywatelskiego w latach 2013–2016 w polskich miastach. *Prace Geograficzne.* No. 154, pp. 55–70.

[6] NIŻNIK-DOBOSZ, I. (2014). *Partycypacja jako pojęcie i instytucja demokratycznego państw prawnego i prawa administracyjnego*. In: *Partycypacja społeczna w samorządzie terytorialnym*. Dolnicki, B.(ed.). Warszawa: Lex a Wolters Kluwer business.

[7] Notice of the Council of the City of Opole of 27 August 2020 on the *announcement of the consolidated text on the principles of preparation and implementation of the civic budget in Opole* (Official Journal of Laws of Opole Province 2020.2449).

[8] Opole Development Strategy 2030, p. 19.

[9] Regulation of the Council of Ministers of 19 July 2016 *on establishing the boundaries of certain communes and cities, granting some localities the status of a city and changing the name of a commune*, (Dz. U. [Journal of Laws] of 2016, item 1134).

[10] *Report of the Mayor of the City of Opole on the execution of the budget of the City of Opole for 2015* (and subsequent years).

[11] *Report on the State of the City of Opole for 2018* (successively for 2019).

[12] Resolution No. XV/282/19 of the Opole City Council of 29 August 2019 on the adoption of the Opole Development Strategy 2030.

[13] SINTOMER, Y., HERZBERG, C., RÖCKE, A., ALLEGRETTI, G. (2012). Transnational Models of Citizen Participation: The Case of Participatory Budgeting. *Journal of Public Deliberation.* Vol. 8. Iss.2, Arcticle 9, pp. 1-34.

[14] Ustawa z dnia 8 marca 1990 r. *o samorządzie gminnym.* Art. 5a section 5 of the Act of 8 March 1990 *on communal self-government*, (i.e. Dz.U. [Journal of Laws] of 2019, item 506).

Implementation of the Innovativeness Support Policy in Poland and the Czech Republic

Ewelina Markowska[1], Wojciech Sońta[2]

[1]High School of Commerce in Radom
Mazowieckiego 7a, 26-600 Radom, Poland
ewelina.markowska1989@wp.pl

[2]University of Technology and Humanities in Radom
Faculty of Economics and Finance
Malczewskiego 29, 26-600 Radom, Poland
wojciechsonta@o2.pl

Abstract

The propose of the article is an analysis of the public innovation polices which have become an essential part of the economic policies of Poland and the Czech Republic. The executed comparative assessment of the economies' innovativeness of Poland and the Czech Republic allows to recognize that the both countries during the considered period use more and more tools to support the innovativeness.

The authors try to do a comparative analysis of the conducted innovation policies in Poland and the Czech Republic referring to the results of both theoretical as well as empirical research. Conclusions: The analysis of the literature's topic and the reports showed that the state policy supporting the innovative activity in Poland and in the Czech Republic has a very large importance for development and economic growth. It is also worth to mention, that Poland and the Czech Republic improved their positions in the world according to the Global Innovation Index rankings in the last years.

Keywords: *economic growth, innovations, innovation policy, research and development*

JEL Classification: *H00, H54, O10, O30*

1 Introduction

The twenty-first century has brought a dynamic increase of technological development's pace. Development of the innovative economy is an essential challenge for every country. Currently, the innovations are perceived as a priority source of competitiveness and the economic growth. The purpose of the publication is analysis of the public innovative policies which have become a fundamental part of the economic policies of Poland and the Czech Republic. In the article there were presented theoretical aspects of understanding the innovation and the innovative policy. There were also analysed instruments of the policy in Poland and the Czech Republic, namely financial support in particular for the research and the development activity (R&D). There were also discussed elements of management of the innovative policy.

2 Theoretical Aspects of the Innovation

Understanding what the innovation is and what it represents is as essential key to evaluation of the innovativeness of each organization which functions in economy of a given country (Quintane, Casselman, Reiche, Nylund, 2011). There is not any universal definition of the innovation in the literature of the subject. The concept of innovation comes from the Latin word *'innovatis'* and it means creating of something new (Tokarski

1980). The concept of innovation in the context of technical and economic development was defined first by J. A. Schumpeter. He understood it as starting production of new or improved products, using a new method of organization in the production, marketing or distribution process. Moreover, he claimed that the innovation is supposed to be a beginning of fundamental changes which are both disposable as well unique (Schumpeter, 1960). J. A. Schumpeter specifies three stages which appear when an innovation creates: an invention – an innovation – a prevalence (Schumpeter 1995). Together with J. A. Schumpeter the innovations were also broadly understood by A. J. Harman, D. E. Hagen, J. Parker, and P. R. Whitfield, who was defining the innovations as a series of complicated problem-solving activities (Whitfield, 1979). On the other hand, CH. Freeman considered the first commercial launch of a new product, process, system or a device as an innovative (Jansz 2007). However, a different way of perceiving the innovation is proposed by P. Kotler, who defines as an innovation everything what is perceived as a novelty (Kotler, 1994). P. F. Drucker broadens this thought considering that the innovation is a conscious and beneficial change resulting from needs or systematic observation of the environment (Drucker, 1992). Despite popularity of the 'innovation' term, which often appears in current scientific studies in the field of economics, it is difficult to formulate a precise and adequate definition of the issue. According to the OECD, innovations are defined as a 'new or improved product or/and process, which differs significantly from previous products or/and processes and which has been shared with potential users or put into use by an individual' (OECD, 2018).

The innovations are reflected in theories of the economic growth. To measures of the technological and innovation competitiveness should be qualified first of all (Hildebrandt):

a) total research and development expenses as a percentage of GDP (gross domestic percentage);
b) structure of the research and development expenses in division into: government expenses, universities expenses and also expenses of the business sector;
c) technology balance of payments;
d) internal and external patent applications;
e) number of research and development employees per 10 000 hired employees;
f) number of scientific publications;
g) intensity of the research and development works in an industry (research and development expenses in enterprises as a percentage of an added value);
h) import of a technology (technologies included in imported goods);
i) expenses on the innovations (launch of a new product, a modernized product or a new manufacturing process) as a percentage of total turnover.

In the 20th century, a company's philosophy was clear: successful innovation requires control. It is believed that only by investing in the internal development it is possible to make a progress in comparison with competition on the market. Therefore, in relation to the implemented innovations, employment of qualified staff is also crucial to gain the greatest competitive advantage in a given market segment due to large investments in the development and protection of intellectual property (Bezecný, 2020).

The economy's innovativeness is defined as ability and willingness of economic entities operating in a state for constant searching as well using in economic practice the research results and research and development works, new concepts, inventions, improvement and development of using of material and non-material (services) production's technology, implementation of new methods and techniques in organization and management, developing infrastructure as well as knowledge resources. The economic innovation may include production, services sector as well all factors leading ultimately to create a new quality. From the economic theory point of view, the innovations nowadays play an extremely important role in organizing the economic growth. Additionally, it should be noted that they also gain increasing importance as a subject of research (Frankowski, Skubiak, 2012).

3 The Essence of the Innovation Policy

The innovation policy is one of the elements of the economic policy. Its priority goal is to create an effective network of connections between science, technology, administration and market aimed at supporting the economy's innovativeness through a method of building conditions for creating new products, services, technological processes and management techniques. The innovation policy is created by a government which influences shape of the economy's innovativeness through properly formulated tools (institutional, economic, legal) in accordance with the assumed goals of a social-economic nature (Janasz, 1999). The innovation policy is a combination of the industrial policy and the science and technology policy, wherein the second one is a part of the science policy, while the industrial policy is a part of the economic policy (Kozioł, 2009). The innovation policy is understood as a public intervention, mainly aimed at supporting, creating and disseminating the innovation. The entity which performs the intervention can be among others government, state agencies or any other type of governmental entities (Edler, 2016).

There can be distinguished a whole spectrum of instruments which states dispose as a part of the innovation policy. The instruments of the state's innovation policy implementation are of the following nature: legal, financial, institutional, infrastructural, structural as well commercial. It should be noted that in case of the financial instruments there are listed so-called direct instruments (grants, subsidies and debt instruments) and indirect instruments (tax reliefs). There are also entities which take actions as part of the policy where governments invoke special ministries for this purpose (e.g., in the Czech Republic in 2002 there was established The Research and Innovation Council – Rada pro Vědu, Výzkum a Inovace České Republiky). The instruments of the legal nature relate to legal regulations, especially control of monopolies and intellectual property protection. On the other hand, the institutional instruments are all training institutions or other enabling technology transfer or exchange of experience. The infrastructure instruments are mainly technology parks, busines incubators or innovation and technology transfer centres. The structural instruments include educational programs. Whereas, the innovation policy instruments of a commercial nature include first of all trade agreements, customs, export subsidies, quotas (Przychodzeń, 2011).

4 The Innovation Polices of Poland and the Czech Republic – Results and Interpretations

There can be listed multiple instruments which the states dispose as part of the innovation policy. Table 1 presents instruments used by Poland and the Czech Republic.

Table 1 - The innovation policy's instruments of Poland and the Czech Republic

The innovation policy's instruments	Poland	The Czech Republic
Direct financial support	**124**	**24**
Projects' grants (public research)	61	6
R&D subsidies and innovations in business	23	5
Scholarships and loans for graduates	15	1
Capital financing	8	2
Loans and credits for innovations in companies	5	3
R&D and innovation procurement programs	4	1
Innovations' vouchers	3	1
Institutional financing of public research	3	4
Centres of excellence – grants	2	1
Indirect financial support	**4**	**4**
Tax relief for enterprises for R&D and innovations	3	3
Tax reliefs for supporters of R&D and innovations	1	0
Warranties, risk management instruments	0	1
Management of the innovation policy	**55**	**23**
National strategies, programs and plans	22	14
Information campaigns and other information activities	13	3
Analyses (e.g., evaluations, comparative analyses and forecasts)	10	3
Creation or reform of management structures or institutions	6	1
Formal consultations with instruments' recipients or experts	4	2
Standards and certificates concerning development and implementation of a technology	0	0
Guidelines, regulations	**37**	**33**
Regulations and incentives for employees' mobility	7	2
Business and technology consultancy	5	3
Intellectual property regulations and incentives	2	1
Awards and distinctions in the field of science and innovation	1	6
Regulations concerning new technologies	1	1
Instruments of cooperation	16	15
Dedicated support for research infrastructures	3	4
Information services and access to data sets	2	5

Source: based on A.M. Kowalski and others, The level of the economies' innovativeness of Central and Eastern Europe countries, in: Report of SGH and Economic Forum, Warsaw 2020.

Based on the data included in the table: *'The innovation policy's instruments of Poland and the Czech Republic'* it should be noted that there are used more various types of tools as a part of the conducted innovation policy in Poland compared to the Czech Republic. It results mainly from using of direct and indirect financial support instruments.

An important group of the innovation policy instruments of Poland and the Czech Republic are the ones which are related to management of the policy. Table 2 presents key strategies, programs as well as plans implemented by the analysed countries.

Table 2 - Strategies, programs and implemented plans realized by Poland and the Czech Republic

Country	Name of a strategy/program	Characteristic of a strategy/program
POLAND	National Road Map of Research Infrastructure	It was established in 2011. It indicates devices and objects of key importance for development of the scientific research.
	National Research Program. Assumptions of the state's science-technology and innovation policy.	The program was approved by the Council of Ministers on August 16, 2011. It indicates directions of both research as well as development works conducting of the country which next are basis for development of strategic programs by the National Centre for Research and Development (NCBiR). The directions are first of all: new technologies in the field of power engineering, civilization diseases, new medicines and regenerative medicine, advanced information, telecommunications and mechatronic technologies, modern material technologies, natural environment, agriculture and forestry, social and economic development.
	Strategy of the economy's innovativeness and efficiency. Dynamic Poland 2020.	It was issued by the Ministry of Economy in 2013 which fundamental purpose is highly competitive economy (innovative and effective) based on knowledge and cooperation what was supposed to lead till 2020 among others to increase expenditures on R&D activities up to 1,7% of GDP, transition of Poland from group of moderate innovators to group of the countries catching up leaders according to the Innovation Union Scoreboard and improvement of position in the Global Competitiveness Report ranking to classify Poland among countries with innovation-related indicators above the EU average.
	Intelligent Development Operational Program 2014-2020.	Its main goal is to stimulate the innovativeness of the Polish economy.
	Knowledge, Education, Development Operational Program.	One of the goals is to invest in education, including higher education.
	Strategy for Responsible Development until 2020 (with a perspective until 2030).	It was accepted by the Council of Ministers on February 14, 2017. It assumes increase of the innovativeness of the Polish enterprises on the domestic market as well foreign markets within the first specific objective, it means persistent economic growth based more and more for knowledge, data and organizational excellence.
THE CZECH REPUBLIC	National research, experimental development and innovation priorities (Národní priority výzkumu, experimentálního vývoje a inovací).	They were adopted on July 19, 2012 and they cover period until 2030. They are continuation, detailing and orientation of goals and actions adopted on June 8, 2009. They also indicate on the institutional support for development of the research organizations.
	National Strategy for Research and Innovation for Intelligent Specialization of the Czech Republic (Národní výzkumná a inovační strategie pro inteligentní specializaci České republiky).	It was adapted on October 23, 20013. It is implemented to focus investments around areas which are able to provide an increase of added value of the country's economy. This in turn is achieved by designating areas where a country has the greatest potential and resources.
	National research, development and innovation policy for years 2016-2020. (Národní politika výzkumu, vývoje a inovací České	It was adopted in 2015. The basic strategic document, which designates main directions in the field of research, development and innovations. The document is more targeted on support of research using for needs of the economy and

	republiky na léta 2016-2020).	state administration and it identifies key areas and research topics which they should focus on. It also proposes changes in the management and financing of science.
	ERA (European Research Area) National Road Map of the Czech Republic (Národní ERA Roadmap ČR pro léta 2016-2020).	It was adopted on May 11, 2016. It describes devices and objects of key importance for development of scientific research.
	Road Map of the Czech Republic for large research infrastructures, experimental development and innovations (Cestovní mapa České republiky velkých infrastruktur pro výzkum, experimentální vývoj a inovace).	It was adopted on September 30, 2015. It describes devices and objects of key importance for development of scientific research.
	Innovation Strategy of the Czech Republic for years 2019-2030 (Inovační strategie České republiky 2019-2030).	It was approved by the government resolution on February 4, 2019. It is a strategic framework describing the government policy in the R&D and innovation field which is to allow the Czechs to move to the group of innovation leaders according to the Innovation Union Scoreboard.

Source: own study based on Eurostat.

As it is shown by the data included in the Table 2, Poland and the Czech Republic adopt a series of strategies, programs and plans in the field of the innovation policy management.

Table 3 - Selected tax reliefs for the R&D and innovation activities in Poland and the Czech Republic.

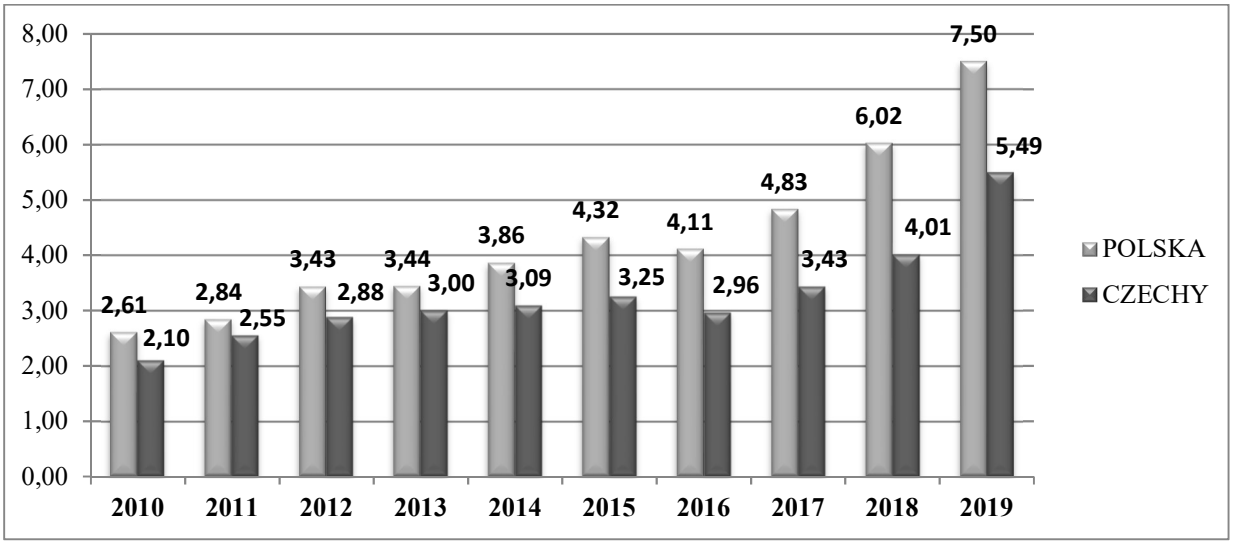
Country	Years of validity	Type of a relief	Description of an applied relief
POLAND	2006 – 2016	Relief for new technologies	Deduction of 50% amount for purchase of the so-called 'new technologies' (e.g., licenses, patents, research results).
	since 2016	Relief for R&D	Deduction of 100% of the qualified costs (150% in case of the research and development centres since 2018) incurred on R&D.
	since 2019	'Innovation box' relief	Reduction of the income taxation level obtaining from intellectual property up to 5%.
THE CZECH REPUBLIC	since 2005	Relief for R&D	Deduction of 100% of the qualified costs incurred on R&D (110% since 2014 in case of costs exceeding the written sum in the write-off for realization of a project in an appropriate time, in addition extension of the qualified expenses to external services provided by public R&D institutions).

Source: own study based on the OECD data.

Financial support in the form of the tax reliefs in Poland is applied since 2006. In terms of such type of the fiscal solutions their use as a part of the R&D activities was earlier introduced by the Czech Republic.

Total national expenditures for the R&D activities (GERD: Gross Domestic Expenditure on Research and Development) carried out on a territory of a given country are a measure used to assess a level of the innovative activity of a given country. They are sum of costs of the four sectors: enterprises, government, higher education and private non-profit institutions. The expenditures are presented in the chart 1.

Chart 1 - Gross domestic expenditures for R&D (GERD) in billion EUR in Poland and the Czech Republic in 2010-2019



Source: own study based on Eurostat data.

Among the analysed countries in the considered period the highest nominal expenditures were noted in Poland in 2019, when they exceed 7.5 billion EUR. It should be noted that both in Poland as well as in the Czech Republic in 2010 - 2019 it is visible an upward trend in terms of the incurred R&D expenditures.

Table 4 - Gross domestic expenditures for R&D as % of GDP in Poland and in the Czech Republic in 2010-2019

Year	Poland	The Czech Republic
2010	0,72	1,34
2011	0,75	1,56
2012	0,88	1,78
2013	0,87	1,90
2014	0,94	1,97
2015	1,00	1,93
2016	0,96	1,68
2017	1,03	1,79
2018	1,21	1,93
2019	1,42	2,14

Source: own study based on the Eurostat and the Czech Statistical Office.

It is worth to notice based on the data contained in the table 4, that in 2010 – 2019 expenditures on R&D in the analysed countries has increased in relation to GDP. They have doubled in Poland and increased more than a half in the Czech Republic during the nine surveyed years.

Table 5 - Position of Poland and the Czech Republic in the Global Innovation Index ranking in 2010-2020

Year	Poland	The Czech Republic
2010	47	27
2011	43	27
2012	44	27
2013	49	28
2014	45	26
2015	46	24
2016	39	27
2017	38	24
2018	39	27
2019	39	26
2020	38	24

Source: own study based on the Global Innovation Index data.

An important method of estimation of the innovation policy in Poland and the Czech Republic is indication their position in the Global Innovation Index (GII). It is a result of cooperation of the Cornell University and also the World Intellectual Property Organization (WIPO) which is an agency of the United Nations. It is created based on eighty detailed indicators. Based on the data presented in the table 5, it should be noticed that in 2010 - 2020 Poland and the Czech Republic improved their positions in it, with the Czech Republic being the best.

5 Summary

The aim of the article was to present realization of the innovation policy in terms of support in Poland and the Czech Republic. The conducted comparative assessment of Poland and the Czech Republic economies' innovativeness allows to conclude that the both countries use more and more tools in the analysed period to support the innovativeness. The policy of supporting the innovativeness in Poland and the Czech Republic is realized mainly by the innovation and entrepreneurship centres which general dynamics of development, although it is not high, is still positive. The analysed countries in the innovation policy management area adopted a number of national strategies, programs and plans in which they set themselves ambitious goals. The ventures should be considered as positive. It is also worth to mention, that Poland and the Czech Republic have improved their positions according to the Global Innovation Index ranking in recent years. The actions taken by Poland and the Czech Republic herald that it will be possible to define them as the innovative economies in the future. Currently, the driving force behind innovative activity in Poland and the Czech Republic is the systematic generation and dissemination of R&D solutions. An assessment of the innovativeness of Polish and Czech economies shows that the Czech Republic is the most developed country in this respect. developed in this respect. In Poland, a number of measures should be taken to increase the share of R&D activity in the economy. Firstly, there must be a close link between of three links: science, the economy and the government in terms of a common innovation policy in Poland. In the area of science, the state should provide such conditions that would encourage an increase in expenditure on research and development activity in relation to GDP in such a way that funds coming from the budget and structural funds would serve a greater share of development work and applied research. Such a measure would allow the development of infrastructure that could increase the R&D potential by popularising the system of promotion of R&D works, their wider commercialisation, which would lead to more effective use of the existing R&D potential and scientific staff. Secondly, with regard to the economy, the innovation policy should be conducted in such a way that it would serve first of all to shape greater ability of the economy to absorb innovations.

References

[1] BEZECNY, J.,(2020) The Impact of IP on Open and Closed Innovation Models for Sustainable Innovation [w:] *Development and administration of border areas of the Czech Republic and Poland, RASPO, Ostrava, Czech Republic* , pp. 32-35.

[2] DRUCKER, P.F.,(1992) *Innowacje i przedsiębiorczość. Praktyka i zasady*, PWE, Warszawa , pp 40-45.

[3] EUROSTAT (2021). *(https://ec.europa.eu/eurostat),* [data dostępu 10.03.2021 r.].

[4] FRANKOWSKI, P., SKUBIAK, B., Innowacyjność w teorii ekonomii i praktyce gospodarczej [w:] *Makro- i mikroekonomiczne zagadnienia gospodarowania, finansowania, zarządzania, Studia i prace Wydziału Nauk Ekonomicznych i Zarządzania,* pp 30, 274.

[5] Handbook of innovation policy impact (2017). Innovation policy: what, why, and how, „*Oxford Review of Economic Policy*" 2017, 33(1), pp 2-23.

[6] HILDEBRANT, A.,(2002) Konkurencyjność – próby zdefiniowania i pomiaru zjawiska, *Wspólnoty Europejskie nr 3*, pp 71.

[7] Czech Statistical Office | CZSO (https:/ www.czso.cz/csu/czso/home), [data dostępu 10.03.2021 r.].

[8] JANASZ, W. (1999). *Innowacyjne strategie rozwoju przemysłu, Fundacja na rzecz Uniwersytetu Szczecińskiego,* Szczecin , pp 28.

[9] JANASZ W., KOZIOŁ K., (2007). *Determinanty działalności innowacyjnej przedsiębiorstw*, PWE, Warszawa .

[10] KOTLER, P.,(1994). *Marketing*, Warszawa, pp 14.

[11] KOZIOŁ, K.(2009). Ewolucja polityki innowacyjnej w Unii Europejskiej, (w:) *Innowacje w strategii rozwoju organizacji w Unii Europejskiej,* (red.) W. Janasz, Difin, Warszawa, pp 79.

[12] PRZYCHODZEŃ, J., Realizacja polityki w zakresie wspierania innowacyjności w Polsce w okresie ostatniego kryzysu finansowego. *Management and Business Administration. Central Europe*. 21, No. 2(121): pp. 106–116, ISSN 2084–3356, Copyright by Akademia Leona Koźmińskiego, pp 109.

[13] OECD, Eurostat, Oslo Manual (2018). *Guidelines for Collecting, Reporting and Using Data on Innovation,* www.oecd.org/science/oslo-manual-2018- 9789264304604-en.htm [data dostępu 15.02.2021 r.].

[14] QUINTANE, E., CASSELMAN, R.M., REICHE, B.S., NYLUND, P.A. (2011), Innovation as a knowledge-based outcome, *Journal of Knowledge Management*, No.6, pp. 928.

[15] SCHUMPETER, J.A.,(1995), *Kapitalizm, socjalizm, demokracja*, Warszawa , pp 110.

[16] SCHUMPETER, J.A., (1960), *Teoria wzrostu gospodarczego*. Warszawa: PWN .

[17] Słownik wyrazów obcych, red. Tokarski, (1980) PWN, Warszawa

[18] WHITFIEL, P.R. (1979), *Innowacje w przemyśle, tłum. T. Mroczkowski*, PWE, Warszawa , pp 26.

[19] www.globalinnovationindex.org/Home [data dostępu 10.03.2021 r.].

Industrial Harmony – a New Concept or a Newer Version of an Old Idea?

Katarzyna Mazur-Włodarczyk[1], Przemysław Misiurski[1]

Opole University of Technology
Faculty of Economics and Management
Department of Enterprise Management, E-business and Electronic Economy
St. Luboszycka 7, 45-036 Opole, Poland
k.mazur-wlodarczyk@po.edu.pl, p.misiurski@po.edu.pl

Abstract

The article attempts to define the category of *industrial harmony*, as well as answer the question as to whether this category is a new concept, or does it concern issues that have existed for a long time but are rarely described under this category. The text also presents an analysis of the number of strikes in selected European Union countries in various sectors of the economy. This analysis aims to show the degree of the realization of *industrial harmony* in the economic reality in Europe.

Keywords: *conflict management, economic culture, effective communication, employment relationships, harmony, industrial harmony, strike*

JEL Classification: *Z1, J89, L14*

1 Introduction - Harmony and Human Work Environment

The concept of harmony accompanies man in many spheres of his life, both private and professional. It is a concept that has its roots in the Greek language [*αρμονία*] - meaningfully referring to the compatibility of sounds, shapes and features of beauty, and in the Chinese language [和谐] - combining the concepts of *compliance* and *participation*. The presence of the category of harmony is noticeable, inter alia, in the space of philosophy (e.g. as a category that organizes and shows the order of the world that can be described by numbers, the property of the cosmos, the state of the soul and moral ideal, as well as the power of a higher entity or reality), music (vocal harmony, sound system, tones), aesthetics (proportions used), mathematics (harmonious division), psychology (internal harmony), pedagogy (harmonious development), sociology (social harmony, family harmony), and economics (law of harmonization). In the literature on the subject, much attention is paid to the subject of harmony within the field related to art (mainly musical art) and the social sciences (referring to Chinese culture) (Chen 2010; *China 2030 Building a Modern, Harmonious, and Creative Society* 2013; Li et al. 2020; Mazur-Kajta K. 2018; Mazur-Kajta 2019; Mazur-Kajta 2020; Nordin 2016; Sole-Farras 2008; Wei & Li 2013).

In the sphere of human professional activity, the category of harmony is related, among others with the following concepts: *work-life balance*, *sustainable business management*, *sustainable development*, and *industrial harmony*. The first of the mentioned concepts refer to the management of time related to finding healthy proportions between the involvement of one's time in the space of professional duties and private life (various related spheres, among others, associated with family life, relationships with friends, hobbies, religious commitment, etc.). Maintaining the right balance between both spheres of life is not a simple task, and due to the popular style and pace of modern life, neglect in this area may result in overwork, difficulties in interpersonal communication in the professional environment and within the household, a decrease in self-esteem and a general feeling of mental discomfort. The concept of sustainable business management refers to the continuous learning of the organization, its adaptation, development, revitalization, reconstruction, and reorientation (Grudzewski et al. 2010). This aspect consists of managing change, adjusting the company's strategy and its business activity to satisfy the emerging needs and expectations without limiting development opportunities in the future. It includes pro-ethical, pro-ecological, and pro-social activities. The third of the aforementioned concepts of *sustainable development* is closely related to the previous one, and concerns "development that meets the needs of the present without jeopardizing the possibilities of meeting the needs of future generations"

(*Brundtland Report: Our Common Future* 1987). This aspect can be considered both on a macro scale (as an attempt to build a circular economy, and ecological economy) and on a micro-scale (e.g., through the concept of *corporate social responsibility*). The need to implement sustainable business management and sustainable development is also related to the changes noted in human life, primarily related to the current preference for the pace of economic development over the protection of the natural environment. The last of the aforementioned concepts - industrial harmony seems to be the concept that received the least attention in the literature on the subject. For example, encyclopedias and lexicons do not include this category at all, while the Web of Science database contains only 17 records devoted to it[1]. The first associations related to the term *industrial harmony*, considered in the contemporary context, may be related to its individual elements. The first of them - *harmony* may indicate the importance of interpersonal and group relations in the human work environment - in an industrial enterprise. The second part - *industry*, referring to material production related to the extraction of natural resources and the production of products in a mass manner for the needs of people (*Encyklopedia PWN*). Therefore, it may be associated with the fourth industrial revolution, with balancing the solutions of new technologies and the human factor, or new technologies and the natural environment. The authors of the article came across the term industrial harmony while researching the value of harmony as an important element of Chinese economic culture. The texts devoted to it, however, did not refer mainly to the People's Republic of China, or the Belt and Road Initiative launched in 2013, but to the African continent, mainly Nigeria, and topics not related to the 4.0 revolution, but conflict management in the workplace. However, it is well known that industrial organizations cannot function optimally without a certain degree of harmonious relations between the people who compose them (Lasisi & Lolo 2018), as this constitutes its integral link. On the other hand, the perception of the *industrial harmony* category as a new concept, as well as the lack of direct references to *industrial harmony* in Polish-language literature, have become other factors indicating the need to explore this topic in more detail. This article describes the category of harmony from the point of view of a manufacturing plant, which is a place of employment for people who are related to each other during the performance of work and its performance. The article attempts to define the category of *industrial harmony*, as well as to answer the question whether this category is a new concept, or of whether it concerns issues that have existed for a long time, but are rarely described under this category.

2 Material and Methods

As part of the research, the literature on the subject and existing research devoted to the issue of *industrial harmony* was analyzed, with particular emphasis on data relating to the area of Europe, using such databases of articles as *Research Gate* and *Web of Science*, ETUI - European Trade Union Institute, and ILOSTAT - International Labour Organization. The texts on industrial harmony were searched for in Polish and English language. No references to this category have been found in Polish texts [as *harmonia przemysłowa*]. Due to the above, the research was continued only in English. The method of literature analysis was used, which showed the area of research narrowed mainly to Africa and Far East countries. The statistical method made it possible to compare quantitatively the elements representing industrial harmony disturbances and present them in a graphic form.

The aim of the study was not only to organize information on the category of *industrial harmony*, define it, and assign it to a specific sphere of human professional activity, but also to answer the question of whether this category is a new concept, or whether it already has a rich history, and thus covers issues that have previously existed and researched, but only overlooked in the area of research in Poland and Europe.

3 Results and Discussion

3.1. Industrial Harmony – Theoretical Approach

In the dictionary of synonyms, can be found the following terms for the replacement of *industrial harmony*: *social harmony, social peace, industrial peace, labour peace, social stability*, and *communal harmony* (*Power thesaurus*). The above-mentioned terms outline, inter alia, the social and community framework of this concept, as well as its connection with the space of work performed. When analyzing the chapters of monographs and articles from scientific journals, it can be noticed that of the abovementioned equivalents in the titles of texts devoted to these issues, the first category usually appears - *industrial harmony* and not another term.

Texts devoted to *industrial harmony* began to appear in America after 1937 (Sundelson 1937), then after less than two decades (Speroff 1953), intensifying in the African scientific community at the beginning of the 21st century. Not all texts whose titles point to the issues of industrial harmony explain this concept, some of them treat these aspects as commonly known categories (Nkiinebari 2014; Yusuf-Habeeb & Kazeem 2017; Lasisi &

[1] Of the 27 depicted records, 10 of them are related to the same publication, accessed: 16.03.2021.

Lolo 2018). This may indicate the fact that this category cannot be a concept fully defined as new, i.e. not presented before. On the other hand, the available quantitative texts indicate that they are the object of research mainly of the scientific community of the African (Nwuche & Amah 2016; Ochuko & Nnatu 2018; Onyeizugbe et al. 2018; Ani et al. 2018; Wobodo 2019; Oluwafemi et al. 2019; Medoye 2020) and Asian continents (Wad 1997; Biddulph 2012; Mohamed et al. 2014; Abd et al. 2016; Kinzley 2020), so they can be treated as relatively new to other areas.

In organizing the information on *industrial harmony*, it can be noticed that this category is most often defined in respect to specific areas:

- the function of effective communication between stakeholders (Lawal et al. 2010) or also as an effective interchange of information in organization (Mukoro 2013);
- policies and practices of the organization based on the principles of justice, equality, and fairness (Yusuf-Habeeb & Kazeem 2017);
- friendly and cooperative agreement on working relationships between employers and employees for their mutual benefit (Ladan 2012);
- the goal of achieving a peaceful working environment (Chinedu, Vincent & Enaini 2018) or relative peace in an industrial organization (Bassey et al., 2004);
- the goal of achieving economic growth, improving the living standards and quality of life of the employee (Ladan 2012);
- absence of strikes and distrust among workgroups or unions, peaceful relationship between the unions and management of the organization, employees' positive perception of their contribution within the organization (Bassey et al. 2004);
- knowledge of responsibilities, goals, effective communication (e.g., regarding views, innovations, changes), cooperation with trade unions, establishing dispute resolution procedures, contracts, and compliance procedures (Mukoro 2013);
- cooperation, collective bargaining, employment policy, and consultations (Odia & Omofonmwan 2007).

Industrial harmony is closely related to: *industrial relations*/ *labour relations* - interpersonal interactions based on a contract of employment, constituting a system of rules and procedures used to define the terms of employment and protect the interests of cooperating parties. As well as with *collective bargaining* (Yusuf-Habeeb & Kazeem 2017), *industrial democracy* (Fejoh 2015), with *conflict management* (Yusuf-Habeeb & Kazeem 2017), and the inevitability of organizational conflict (Nwuche & Amah 2016). Most of the analyzed texts referred to the area of conflict management and strikes undertaken by industrial workers - periodic cessation of basic activities in the work process to enforce the implementation of group requests. In articles devoted to the issue of industrial harmony, it was also emphasized, that no organization can survive or succeed without unflinching manifestations of harmonious and peaceful coexistence between the various stakeholders ranging from the internal stakeholders (Wobodo 2019), as well as *industrial harmony,* which is an important factor of organizational productivity and performance (Ogunola 2018).

On the other hand, in opposition, i.e., to the group of factors creating industrial disharmony, the following are mentioned:

- lack of high-quality leadership skills (Hatch & Cunliffe 2013);
- limited employee satisfaction (Ogunola 2018);
- open hostility, distrust, disrespect, noncooperation, and avoidance of interaction (Hatch & Cunliffe 2013).

3.2. Industrial Harmony – European Realities

One of the measurable examples of the disturbance of harmony in the sphere of professional activity are the occurrence of workers' strikes in many countries.

According to the ILO Department of Statistics, a *strike* is defined as *a temporary work stoppage carried out by one or more groups of workers with a view to enforcing or resisting demands or expressing grievances, or supporting other workers in their demands or grievances* (ILO 1993). The ILO defines also the concept of *lockout* as *a total or partial temporary closure of one or more places of employment, or the hindering of the normal work activities of employees, by one or more employers with a view to enforcing or resisting demands or expressing grievances, or supporting other employers in their demands or grievances* (ILO 1993).

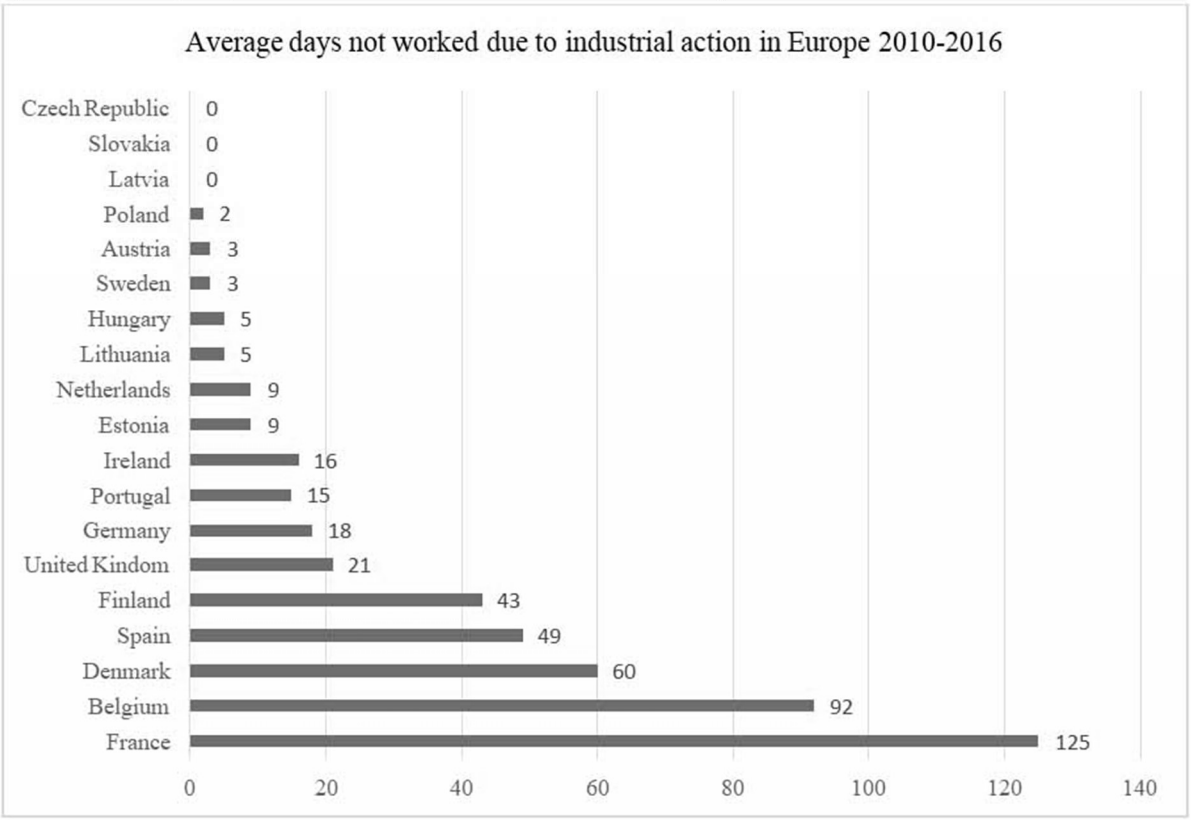
In order to illustrate the scale of the occurrence of strikes in selected European Union countries, the available statistical data on the number of strikes in 2010-2019 was analyzed. The most comprehensive international source of data on strikes and lockouts is the ILO database, which contains an annual series for countries, areas and territories. One of the most useful measures for comparing information at both the national and international

levels is the rate of days not worked per 1.000 employees. For the purposes of this paper, the list of the number of strikes in the EU countries and their dynamics of occurrence were presented and analyzed.

According to Figure 1, on average in the period of 2010-2016, the highest levels of industrial action were found in France (125 days lost per 1,000 workers) and Belgium (118 days lost) and the lowest in Czech Republic, Slovakia, and Latvia (no days lost). For the period of 2010-2016, the countries can be divided into three groups:

- where industrial action was at very low levels, with an average of no more than 11 working days lost per year for every 1,000 workers – Czech Republic, Slovakia, Latvia, Poland, Austria, Sweden, Hungary, Lithuania, the Netherlands, and Estonia;
- where industrial action was at moderate levels, with an average of 12-60 working days lost per year for every 1,000 workers – Ireland, Portugal, Germany, the UK, Finland, Spain and Denmark;
- where industrial action was at relatively high levels, with an average of over 60 working days lost per year for every 1,000 workers – Belgium and France.

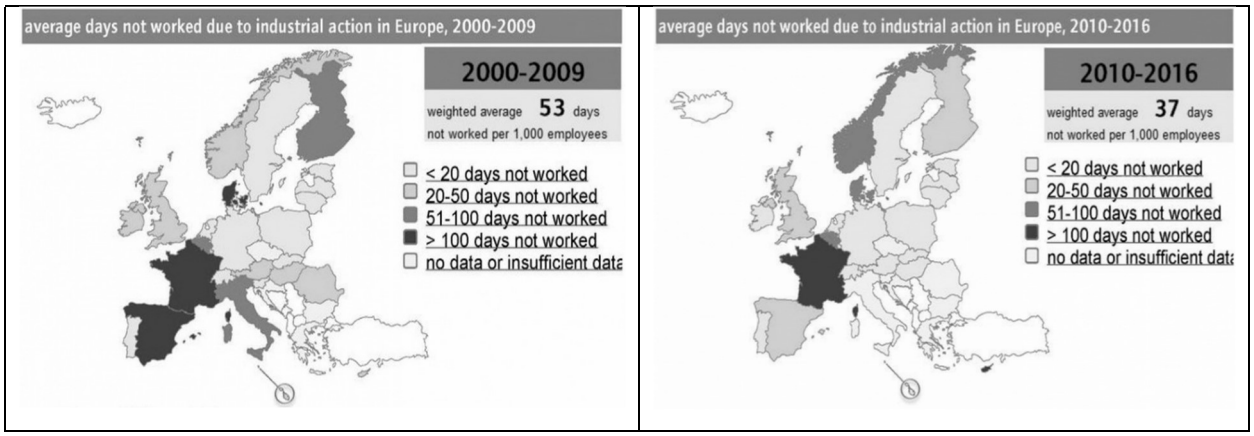
Figure 1 - Average days not worked due to industrial action in Europe, 2010-2016



Source: ETUI (2019) and ILO (2021). Insufficient or no data for Bulgaria, Croatia, Greece, Italy, Luxembourg, Romania and Slovenia. No data available (yet) Estonia (2016), France(2016), Hungary (2011 and 2013-2015), Latvia (2016), Portugal (2016).

Figure 2 presents the average days not worked due to industrial in Europe in two time periods in the years 2000-2009 and 2010-2016. Considering the average of all European countries, a downward trend can be noticed in average days not worked due to industrial action. In the years 2000-2009, the weighted average was 53 days not worked per 1,000 employees, and in 2010-2016 this indicator dropped to 37 days.

Figure 2 - Average days not worked due to industrial action in Europe, 2000-2016



Source: ETUI (2019)

4 Conclusion

Although the concept of industrial harmony has not yet been used intuitively by researchers around the globe, it is not a new concept. Its scope covers issues related to creating positive relationships and effective communication in the workspace, the principles of fairness and equality, as well as improving the quality and standard of work/life.

Conflicts are an inevitable part of organizational, social and professional life. They can manifest themselves in various forms, of which strikes are the most spectacular form of expression of dissatisfaction (opposition). The data presented in the article show that strikes occur in most European Union countries, but with a different degree of intensification. Undoubtedly, any manifestation of industrial conflicts, including strikes, disturbs the level of harmony. Thus, it can be safely stated that the introduction, extension or popularization of harmony in industry could significantly contribute to reducing downtime resulting from strike actions taken by employees.

This analysis is part of broader research on work efficiency in industry and is also an interesting element of research on sustainable development. Due to the above, this text is only an introduction to the issue and requires additional research in the future. It is suggested to conduct an exploratory survey among industrial workers - the functioning of harmony in industry. A comparative analysis of its occurrence and application in the industry of highly developed and developing countries would also be noteworthy. When narrowing down, it is also worth focusing on the perception of harmony in the industry in Poland, as there is no such research.

Acknowledgments

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

[1] ABD, K.J., JAMALUDDIN, S.Z., AHMAN, A.M. (2017). Enhancement of Employee's Pre-Dismissal Procedures in Malaysia: Lessons from the UAE, *Advanced Science Letters*, 23(9), pp. 8356-8361, http://dx.doi.org/10.1166/asl.2017.9891.

[2] ABIORO, M.A., ODUNLAMI, S.A., EKPUDU, J.E. (2019). Conflicts Management Strategies: a Tool for Industrial Harmony, *Izvestiya Journal of Varna University of Economics*, 63(1), pp. 19 - 34.

[3] ANI, G.J., OKPALA, P.U., AKESE, M.I., Obadiah, D.E. (2018). The influence of equitable remuneration among health care professionals on industrial harmony in a university teaching hospital in southeast, Nigeria, *Academic Journal of Nursing and Health Education*, 7(4), pp. 18-29.

[4] BASSEY, A.O. et al. (2004). The impact of inter-union conflicts on industrial harmony: The case of tertiary health institutions in Cross River State, Nigeria, *Malaysia Journal of Society and Space*, 8(4), pp. 33-9.

[5] BIDDULPH, S. (2012). Responding to Industrial Unrest in China: Prospects for Strengthening the Role of Collective Bargaining, *Sydney Law Review*, 34(1).

[6] *Brundtland Report: Our Common Future* (1987). World Commission on Environment and Development (WCED).

[7] CHEN, E.C. (2010). Harmonious And Integrated Culture And The Building And Communication Of China's National Image, *Intercultural Communication Studies*, XIX, 1, pp. 148-154.

[8] *China 2030 Building a Modern, Harmonious, and Creative Society* (2013). The World Bank, Development Research Center of the State Council, the People's Republic of China, Washington.

[9] CHINEDU, U.O., VINCENT, A., ENAINI, S.O. (2018). Industrial harmony and employee performance in food and beverage firms in Anambra State of Nigeria, *International Journal of Managerial Studies and Research*, 6(6), pp. 22-35.

[10] DURRAH, O., ALLIL, K., GHARIB, M., ALHAMOUD, A. (2018). How Different Styles of Conflict Management Determine Creativity? Exploring Petrochemical Companies in Oman, *Journal of Economics and Business*, 1(4), pp. 455-463, http://dx.doi.org/10.31014/aior.1992.01.04.41 .

[11] *Encyklopedia PWN*. [online] [cit.2021-03-07]. Available: https://encyklopedia.pwn.pl/szukaj/przemys%C5%82.html

[12] ETUI, *Europe strikes*. [online] European Trade Union Institute, [cit.2021-04-20]. Available: https://www.etui.org/outils/facts-figures/book-poster/europe-strikes

[13] FEJOH, J. (2015). Industrial democracy as determinant of job satisfaction among workers of public health institutions in Ogun State, Nigeria, *International Journal of Humanities and Social Science*, 5(10), pp. 25-37.

[14] GRUDZEWSK, W.M., HEJDUK, I.K., SANKOWSKA, A., WAŃTUCHOWICZ, M. (2010). *Sustainability w biznesie czyli przedsiębiorstwo przyszłości, zmiany paradygmatów i koncepcji zarządzania*. Warszawa: Wydawnictwo Poltext.

[15] HABEEB, M.O.Y., KAZEEM, A.O. (2018). Organization Conflict and Industrial Harmony: A Synthesis of Literature, *European Journal of Business and Management*, 10(11).

[16] HATCH, M., CUNLIFFE, A. (2013). *Organization theory, modern, symbolic, and postmodern perspectives*. United Kingdom: Oxford.

[17] ILO, International Labour Organization ILOSTAT. [online] [cit.2021-04-15]. Available: https://ilostat.ilo.org/data/#

[18] KINZLEY, W.D. (2020). *Industrial Harmony in Modern Japan. The Invention of a Tradition*, Taylor and Francis.

[19] KORAB-KARPOWICZ, J. (2015). Umowa czy harmonia społeczna?, *Societas et ius*, 4/2015, http://dx.doi.org/10.12775/SEI.2015.001 .

[20] LADAN, M.T. (2012). *The imperatives of industrial harmony and academic excellence in a productive educational system.* The National Orientation Agency, University of Calabar, Cross River State, Nigeria.

[21] LASISI, R., LOLO, A. (2018). Collective Bargaining: how Useful is it for Industrial Harmony? Evidence from Shell Petroleum Development Company (SPDC), Port Harcourt, Rivers State, Social *Science and Law Journal of Policy Review and Development Strategies*, 6 (1), pp. 28-41.

[22] LAWAL, M.O., OMOTAYO, O.L., KOLAWOLE, G.T., ADEDAMOLA, T.A. (2010). Effective Communication as a Tool for Industrial Harmony, High Productivity and Development: A Focuc on Academic Environmental, *Journal of Communication and Culture: International Perspective* , 1(3), pp. 21-27.

[23] LI, C.Y., KWOK, S.H., DURING, D. (2020). *Harmony in Chinese Thought A Philosophical Introduction*. Rowman & Littlefield.

[24] MAZUR-KAJTA, K. (2018). Harmonia w komunikacji o chińskim charakterze – spostrzeżenia z polskiej (europejskiej) perspektywy, *Zeszyty Naukowe Politechniki Śląskiej*, Organizacja i Zarządzanie z 124, Wydawnictwo Politechniki Śląskiej w Gliwicach, pp. 59-76.

[25] MAZUR-KAJTA, K. (2019). *Perception Of Harmony As A Key Element In Interpersonal Communication: Polish And Chinese Point Of View*, [in:] Communication As A Life Process Volume Two: The Holistic Paradigm In Language Sciences, eds.: Bogusławska-Tafelska M., Haładewicz-Grzelak M., Cambridge Scholars Publishing, pp. 18-40.

[26] MAZUR-KAJTA, K. (2020). The Concept of Harmony with Chinese Characteristic and the Chinese Sustainable Development, *Organization and Management Series* No. 148, Scientific Papers of Silesian University of Technology, Silesian University of Technology Publishing House, http://dx.doi.org/10.29119/1641-3466.2020.148.33.

[27] MEDOYE, D.T. (2020). *Crisis Management in Nigeria's Public Sector and the Impact of the Organised Labour Union: Interrogating the Nexus between Industrial Harmony and Political Stability*, [in:] *Public Sector Crisis Management*, eds. Rozanov A., Barannikov A., Belyaeva O., Smirnov M., IntechOpen, http://dx.doi.org/10.5772/intechopen.89562 .

[28] MOHAMED, A.A.A., BAIG, F.B.S., TRAKIC, A., MALLOW, M.S., SURAJUDEEN, A.T. (2014). *Sexual Harassment in Malaysian Educational Institutions: Caused and Solutions*, ed. Uslu F., Sosioint14: International Conference on Social Sciences and Humanities, pp. 595-605.

[29] MUKORO, A.S. (2013). Improving Industrial Harmony and Staff Performance in a School Organization through Effective Communication, *International Journal of Scientific Research in Education*, 6(3), pp. 263-270.

[30] NKIINEBARI, N.P. (2014). Workplace Democracy and Industrial Harmony in Nigeria, *International Journal of Innovative Research & Development*, 3(1), pp. 441-446.

[31] NORDIN, A.H.M. (2016). *China's International Relations And Harmonious World*. London & New York: Routledge.

[32] NWUCHE, C.A., AMAH, E. (2016). Organizational Conflict Management Styles And Industrial Harmony In Nigerian Manufacturing Firms, *IOSR Journal of Business and Management*, 18(8), pp. 24-31, http://dx.doi.org/10.9790/487X-1808022431 .

[33] OCHUKO, I., NNATU, S. (2018). Strategic Planning and Industrial Harmony in Employer/Employee Relationship in Agen Aluminum Company, Benin City, *MKAR Journal of Sociology*, Maiden Edition, 1(1).

[34] ODIA, L.O., OMOFONMWAM, S.I. (2007). Educational System in Nigeria: problems and prospects, *Journal of Social Sciences*, 14(1), pp. 81-86.

[35] OGUNOLA, A.A. (2018). Harmonizing the Employment Relationship for Sustainable Organizational and Personal Development, *Journal of Advanced Research in Psychology & Psychotherapy*, 1/3&4, pp. 1-11, http://dx.doi.org/https://doi.org/10.24321/2581.5822.201801 .

[36] OLUWAFEMI, I., AIGBAVBOA, C., PRETORIUS, J.H.C., OLUW, F. (2019). *Survey on the Influence of Managing Strikes, Industrial Manifestation for Industrial Harmony in Nigeria*, eds. Ahram T., Karwowski W., Taiar R., Human Systems Engeneering and Design, IHSED 2018, pp. 1139-1146, http://dx.doi.org/10.1007/978-3-030-02053-8_174.

[37] ONYEBUCHI, O., LUCKY, O. (2019). The Roles of Labour Union in Nigeria Industrial Harmony and Development, *International Journal of Sustainable Development & World Policy*, 8(1), pp. 10-20, http://dx.doi.org/10.18488/journal.26.2019.81.10.20 .

[38] ONYEIZUGBE, C.U., AGHARA, V., OLOHI, E.S., CHIDIOGO, A.P. (2018). Industrial Harmony and Employee Performance in Food and Beverage Firms in Anambra State of Nigeria, *International Journal of Managerial Studies and Research*, 6(6), pp. 22-35, http://dx.doi.org/10.20431/2349-0349.0606004 .

[39] *Power thesaurus*. [online] [cit.2021-03-07]. Available: https://www.powerthesaurus.org/industrial_harmony/synonyms

[40] *Resolution concerning statistics of strikes, lockouts and other action due to labour stoppages, adopted by the Fifteenth International Conference of Labour Statisticians*. [online] January 1993, International Labour Office, [cit.2021-01-20]. Available: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/normativeinstrument/wcms_087544.pdf

[41] SOLE-FARRAS, J. (2008). *Harmony In Contemporary New Confucianism And In Socialism With Chinese Characteristics*. [online] China Media Research, 4(4), [cit.2019-01-20]. Available: https://www.researchgate.net/publication/295258546

[42] SPEROFF, B.J. (1953). Empathy and Role-Reversal, as Factors in Industrial Harmony, *The Journal of Social Psychology*, 37, pp. 117-120.

[43] WAD P. (1997). Enterprise Unions: Panacea for Industrial Harmony in Malaysia?, *Copenhagen Journal of Asian Studies*, 12, pp. 89-125.

[44] WEI, X.H., LI, Q.Y. (2013). The Confucian Value Of Harmony And Its Influence On Chinese Social Interaction, *Cross-Cultural Communication*, 9(1), pp. 60-66.

[45] WOBODO, C.C. (2019). Conflict Management Strategies and Industrial Harmony: a Theoretical Review of River State University, Port Harcourt, *The Strategic Journal*, 6(2), pp. 981 – 994.

[46] YUSUF, M.O., KAZEEM, A.O. (2017). Appraisal of Conflict Management as a Tool for Achieving Industrial Harmony, *Nile Journal of Business and Economics*, 7, pp. 28-51, http://dx.doi.org/10.20321/nilejbe.v3i6.xxx .

Sustainable Development of Productive Social Systems - Concept of the Theory of the Potential of Productive Social Systems

Zdeněk Mikoláš

University of Business and Law
Department of Entrepreneurship and Management
Michálkovická 1810/181, 710 00 Ostrava, Czech Republic
zdenek.mikolas@vspp.cz

Abstract

Sustainable development of productive social systems, especially family businesses, is a current topic for the Czech Republic and Central Europe. The aim of the paper is to present new theoretical knowledge of the author's twenty-year research. These findings were achieved in research in the years 2000-2020, especially in research projects SP / 2010167 *Contemporary concept of competitive business potentials of industrial enterprises*, and *Podejście oparte na okazjach do zarzaąinnowacjami w małych i średnich przedsiębiorstwach / An opportunity-based approach to managing innovation in small and medium-sized enterprises (2/015/17/BHS4/00988)* and other projects in cooperation with Czech and Polish universities.

Research activities have recently focused mainly on the synergy of the links between the family business and the owners' family, their innovative dynamics and competitiveness. The concept of evolutionary business modelling is based on business diagnostics and therapy, a specific approach to scientific research known as effectuality. The paper offers a generalization of knowledge to the theory of potential. Theoretical findings are verified by empirical research in more than 230 small and medium-sized family companies in the Czech Republic and Poland.

Keywords: *family business, innovation, potential, social system, succession*

JEL Classification: *M20, O10, P42*

1 Introduction

Sustainable development of productive social systems, especially family businesses, is a current topic for the Czech Republic and Central Europe.

The aim of the paper is to present new theoretical knowledge of the author's twenty-year research. Throughout (20 years), the author's research projects intertwined the following two research questions:

1. What is the relationship between natural processes and laws and productive social systems (for example, entrepreneurship)?
2. How is it manifested and what are the principles of existence of competitive potential and dynamics of development of productive social systems (e.g. business)?

The paper is based on the business theory of the company (enterprise, business) and on the principles of "golden" cut (Mikoláš et al., 2011, pp. 164-65 and 168). These findings were achieved in research in the years 2000-2020, especially in research projects SP / 2010167 *Contemporary concept of competitive business potentials of industrial enterprises*, and 402/08 / H051 *Optimization of multidisciplinary design and modelling of the production system of virtual companies,* also *Podejście oparte na okazjach do zarzaąinnowacjami w małych i średnich przedsiębiorstwach / An opportunity-based approach to managing innovation in small and medium-sized enterprises (2/015/17/BHS4/00988)* and other projects in cooperation with Czech and Polish universities.

The practical research activities have focused in the last period (over the past 10 years), in particular, on the synergy of the links between the family business, innovative dynamism and competitiveness of the companies. Practical research was based on theoretical knowledge of the research of the productive social system. After the practical phase of research applied to family business, the synthesis of knowledge was generalized to productive social systems.

The paper offers a generalization of the findings to the theory of the family business, especially in the dynamism of the evolutionary family business potential in the process of succession. Research activities have recently focused mainly on the synergy of the links between the family business and the owners' family, their innovative dynamics and competitiveness. The concept of evolutionary business modelling is based on business diagnostics and therapy, a specific approach to scientific research known as effectuality. The paper offers a generalization of knowledge to the theory of potential.

Theoretical findings have been verified by empirical research in more than 230 small and medium-sized family companies in the Czech Republic and Poland.

The presented results deserve a wide discussion and further verification in practice depending on the cultural differences of the manifestations of globalization in different parts of the world (especially in Central Europe) under the influence of the Industrial Revolution 4. 0 (resp. 5.0). The following text is based on the theoretical conclusions of previous research projects (Mikoláš, 2005, 2011, 2012, 2014, 2015, 2016, 2017, 2018).

2 Key Sources and Terms of the Problem

The presented research findings have no alternative in the available information sources - it is a completely original concept of the evolution of productive social systems. Only a few authors approach the researched issue thematically.

A. Pavlík's publication devoted to the issue of spontaneous order and the concept of potential was a great inspiration in the Czech professional literature for the solved problem (Pavlík, 2004).

The comparative analysis concluded that the findings of the theory of innovation, defined by Professor František Valenta (Valenta, 1969, 2001), can be successfully applied in research of the spontaneous order of productive social systems (e.g. family companies).

The conclusions from the research also confirm the findings published by A. Kopčaj on the issue of spiral management (Kopčaj, 2007) or J. Mihola, who analysed the influence of intensive factors in economic development (Mihola, 2017).

Foreign sources include inspiring publications *The evolution of a manufacturing system at Toyota* by T. Fujimoto (Fujimoto, 1999). Research projects also drew knowledge from the following areas and other authors:

- *Science and Management of Sustainability* (Constanza, 1991)
- *Kondratieff Waves, Warfare and World Security* (Dator, 2006)
- *Cycles in basic innovations* (Groot et al., 2008, 2009; Dewey, 1967; Filson, 2002; Hirooka, 2006; Christensen et al., 2003)
- *Physical self-organized growth process and Business Darwinism* (Doudy et al., 1992; Chen, 2005; Marks, 2002)
- *The golden ratio and Fibonacci numbers (*Dunlap, 1997; Ghyka, 2008; Livio, 2006; Scott, 2013)
- Family business (Keyon-Rouvinez et al., 2016; Hisrich et al., 1996)
- Turbulence and forecasting (Greenspan, 2008; Haustein 1972)
- *Effectuation and Value analysis (*Polak, 2005, 2011; Sarasvathy, 2008).

.

The paper is also based on the following research activities:

a) research project VŠPP GA AA 6_2 / 2016 "Contemporary paradigms of family business in the Czech Republic at the beginning of the Industrial Revolution 4.0"

b) International research under the guarantee of the Silesian University in Katowice "Competitiveness Research - Barometer 24" (see practical application at www.vspp.cz, section "Cooperation with practice")

c) Polish grant NCN nr. 2015/17 / B / HS4 / 0098 "Approach based on the possibilities of innovation management in small and medium-sized enterprises" - VŠPP is a research partner of the Łód Poly Polytechnic

d) Coordinated "Research of family business in Poland (especially in Upper Silesia) and in the Czech Republic (especially in the Moravian-Silesian region)" between the University of Economics in Katowice (Faculty of Economics, Department of Entrepreneurship and Innovation Management) and VŠPP (Department of Business and Management).

Other concepts, theoretical background and discussion of secondary sources are given in the publications of the author Z. Mikoláš et al. (see the list of sources). During the research, about 500 literary sources were discussed and implemented over a hundred consultations with *experts* were carried out.
This article is a presentation of a number of research projects. It is a series of completely original research projects, while in the available literature on the issue of productive social systems (entrepreneurship) there are no (based on available sources) analogous projects. Therefore, the next part of the article defines the basic terms used, which derives from the above sources and publications of the author (Mikoláš).

Social system is defined in this paper as *a purposefully defined interaction of elements of the system in order to optimally satisfy the consumption of individual elements and the system as a whole. At the same time, the elements of the system are forced to respect the constraints of the environment outside and inside the system and, in particular, the cultural value structure of the system.* This defined social system enables to analyse interactions and roles of elements in the system. When examining the social system, it is necessary to accept the environment (defined mainly by natural sciences) and at the same time absorb the knowledge of history, psychology, economics and other humanities, but with a systemic (exact, (logical) approach).

Productive social system is a social system, that *creates something (product, service, etc.) which has value, through spending time, effort and other resources, taking on the associated financial, psychological, social and other risks, and earning the resulting reward in the form of personal, financial and other satisfaction*.

Family is a specific social system, a solidarity group of persons related to each other by marriage, in other intimate relationships or adoption, that they live together in the long term and whose adult members are responsible for the upbringing of children.

Family business defines the synergies (unification) with *4 subsystems* (circles): *family, business (family business), environment and outputs from these subsystems.*

Entrepreneurship is a process of the formation of something else, which belongs to a value, by spending the necessary time and effort, taking accompanying financial, psychological and social risks, and the acquisition of the resulting rewards in a form of funds and personal satisfaction.

Potential is the difference between what it is and what it can be (e.g. results of knowledge) or it must be (e.g., limitations resulting from natural and legal laws).

3 Concept of Evolutionary Model of Enterprising Social System and Research Methods

The concept of evolutionary business modelling is based on business *diagnostics* and *therapeutics,* e.g. *GM-TREND diagnostic concept* (Mikoláš et al., 2011), on a specific approach of scientific research known as "*empiriology*", based on experience, comparison of personal knowledge with available theoretical knowledge. Then the new theories are formulated and to their empirical verification in practice (Mikoláš, 2018). The author of the model (Mikoláš, Z.) combines the Sarasvathy (2008) *effectuation* and *causal logic*. Together, these principles lead to an effective way of reasoning and acting, drawing on the potential of previous generations.

The development of productive social systems (e.g. family business) is *structured* and rarely homogeneous at different *hierarchical levels* (unified in terms of development). Individual elements of systems have different dynamics of development, different life, different role in the system, etc. The system as a whole almost always shows a *tendency to harmonious* (optimal) development. Thus, it is a *process of harmonizing development in many dimensions.*

We define the general model (Mikoláš, 2016) by *"n-dimensional" space* $\mathbf{Vn = \pi*a*b* \ldots *n}$ **(**1*),* where for individual $\mathbf{x = a, b, \ldots\ldots, n}$*,* the individual **x** belongs to the interval **0** *to* **n***,* and $\mathbf{n + 1}$ is a dimension of *time.*

Thus, if $\mathbf{x = 0}$*,* the system as a whole is in *chaos (*entropy) due to the absence of one or more dimensions. It is the *point of birth of the system* from its potential state, in which the order of the system is concentrated into its genetic code (evolutionary "memory"), essence and content without form and orderly manifestation. For $\mathbf{0 < x < 1}$ the *system is formed* (system structure is created). Furthermore, if $\mathbf{x = 1}$, the modelled dimension stagnates (it is static, respectively, in the quiescent state of existence) and the system in this dimension gets into a state of *order* (maximum ordering, stabilization) and the *evolutionary memory* (genetic code) of potential system. And

for **1 < x**, the dimension develops toward infinity (expanding, heading for a *new type of chaos*). A very paradoxical situation arises when **x < 0**. It is a latent (directly undiscovered) *process of developing the* potential of the system. It is a "mirror" (unrealistic) process to process **0 < x**. To understand the dynamics of system changes, it is essential to understand the evolution of potential in the interval **-1 < x < 0**, which is the *interval of transformation of potential into reality*. It follows that the model of the system can take various forms from a straight line to a multidimensional ellipsoid, etc.

In the following, only two basic dimensions are defined ***a*** - *potential*, ***b*** - *time*, that are structured into *sub-dimensions of potential and time* at lower levels. This simplified model is used for *logical experimental simulations*.

4 Evolutional Model of Social Productive System

4.1 The Morphology of the Potentials

The total potential **P** of the family business has this basic morphology of **P = A + B + C** (2). Where **A** is the effective potential, which changes to the effect **E** (output). **B** is the spending potential, that is converted into the mass of the spent resource **M** to achieve the effect of **E** and eliminate the negative emission and loss. C is the stabilized potential (deferred for the next generation). More in detail (Mikoláš et al., 2011, 2012, 2018).

4.2 Spontaneous Order of Synergistic Network of Potentials

The above-mentioned morphology of the potential of a productive social system (family business) is dynamically changing by the spontaneous order of objective and subjective factors. It manifests itself as a combination of the synergy of the effects of objective and subjective order and spontaneity (Mikoláš et al., 2011, 2018) in the form of threats, opportunities, strengths and weaknesses of family business.

The following text contains the author's general research findings describing the “ideal theoretical” variant of a family business that exists within the natural (objective) order and rational subjective (human) behaviour (negentropy), considering objective and subjective spontaneity (entropy).

The basic prerequisite for research and derived models is that *the family as a social system is at the core of family business and the family business is the tool of the family to achieve its development.* A family business is to strengthen and expand the family's potential, abilities and skills.

4.3 Evolutionary Dynamism

The ideal theoretical variant of the family business relies on the validity of the two *basic natural and social evolutionary principles* (it is given by the laws of nature, instincts, reflexes etc.):

a) $\mathbf{P_{i+1} > P_i}$

b) $\mathbf{(A_{i+1} + B_{i+1}) > (A_i + B_i)}$

for two consecutive generations (**i**, **i + 1**) of a family business.

The potential of a productive social system (family business) is divided into four dimensions: inanimate nature, living nature, human society (social system) and artificial nature (created by human activity).

Under these conditions, the basic evolutionary (reproductive) equations for two consecutive generations of a productive social system (e.g. family businesses) can be written in two equivalent variants:

a) $\chi_{i+1} = \mathbf{P_{i+1} : P_i = 2 - (C_i : P_i)}$ (3),

b) $\chi_{i+1} = \mathbf{1 + ((A_i + B_i) : P_i)}$ (4).

In addition, *a productive social system (e.g. family business)* is characterized by the following two tendencies:

a) propensity to consumption $\mathbf{1 > \alpha_i = (P_i - C_i) : P_i > 0}$ (5),

b) propensity to save $\mathbf{\beta_i = 1 : ((P_i - C_i) : C_i) > 0}$ (6).

It is necessary to recall information about the “new fuzzy” philosophy of the concept of reproduction (evolution), which offers not only a standard analytical view, i.e. *what proportion has a part in the whole* - see a) equation of *propensity to consume*. But it also seeks to answer the question of *what is the future of the new whole* (**i + 1**) *in the old part* (**i**) *from which it is born* - see b) the equation of *propensity to save*. The propensity for consumption and savings *is inversely proportional*.

The solution of this relationship (a, b) has two roots - the first leads to the evolutionary growth of potential and the second to the evolutionary reduction of the potential of the examined system. In the following part of the text we will focus on the growth potential development. At the end of the article, we explain the potential reduction.

Ideal (perfect) dynamics of growth potential (**P**) of productive social system (e.g. family business), two successive generations (**i**, **i + 1**) $\varphi = P_{i+1} : P_i$ (7). The derivation of formulas and their solution is given in the sources (Mikoláš et al., 2011, 2012, 2018).

This growth dynamics is given by the ratio of the stabilized (for the next generation of deferred) potential (**C**) to the total potential (**P**) of the previous generation (**i**), i.e. $\varphi = 2 - (C_i : P_i)$ (8).

By striking a balance between propensity to consume and savings, we receive the following optimal values for the growth of a productive social system:

a) $\gamma = C_i : P_i = 2 - \varphi$ (9), approx. $\gamma = 0{,}382$,

b) $\omega = (A_i + B_i) : P_i = \varphi - 1$ (10), approx. $\omega = 0{,}618$,

c) $\vartheta = C_i : (A_i + B_i) = \varphi - 1$ (11), approx. $\vartheta = 0{,}618$.

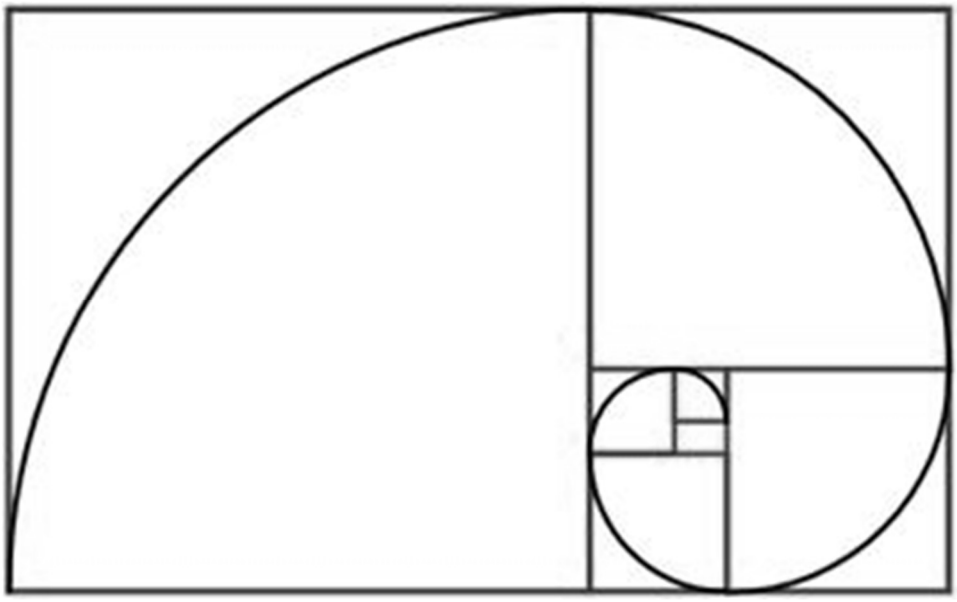
Therefore, if the default **(i)** generation lays down approximately ***38.2%*** of your potential for the future generation, then the following generation **(i+1)** will increase the total potential of approximately ***61.8%*** compared to the total potential of the previous generation **(i)**. To be aware that it is a valid value for the "ideal" conditions of reproduction.

Therefore, the total consumption **(A+B)** of default generation **(i)** is approximately ***61.8%*** of the total potential **(P),** but also the proportion of deferred (stabilized) potential **(C)** on consumption **(A+B)** is also around ***61.8%*** (Mikoláš et al., 2011, 2012). These figures (which were derived for some natural phenomena already in ancient Greece) are called *Golden Ratio*.

At the same time, we can deduce that $\varphi = 1 + \sum_{i=1}^{n} (1 : \varphi^i)^2$ (12), for **n** approaching asymptotically to $(+\infty)$.

In other words, *the ideal dynamics of the growth potential of a productive social system (e.g. a family business) is defined by a number of evolutionary potentials from (I) present ($P_i = 1$) to past (asymptotically in an infinite series of "ancestors": II, III, IV,. ..).* This statement can be graphically demonstrated.

Figure 1 - Evolutionary series of potentials in business



Source: author

Growth development is conditioned by new evolutionary changes (innovations) in the content, structure and behaviour of elements and the system as a whole. Evolutionary changes (innovations) have several orders. The lowest growth order of the system are changes in regeneration (stabilization of the original state of the system) and quantitative, and changes in the structure of the *system.* Higher order are qualitative changes to the system, for example. *adaptation changes* (i.e. adaptation to environmental changes), *changes in functions*, *emergence of*

new variants and concepts of the system. Another higher order of evolutionary change is *reproductive change*; *birth of a new generation* (or birth of a "child", birth of a family). Eventually, evolutionary changes enter the *emergence of the genus* (i.e. the family system in a broad sense) and the highest order of changes in social systems is the *emergence of a strain* (including qualitative changes in genera).

This development can be described by a *logarithmic spiral* (Figure 1) and is virtually unreachable in real life. The so-called "golden spiral" represents an ideal harmonious growth development. In reality, however, there are also *degenerative changes* (destructive "innovation") of the system. Therefore, the development of the system goes through the *development phases: birth, dynamic growth, subdued growth, peak growth* and *decay phases: gradual decay, dynamic retreat and demise of the system*.

4.4 Degeneration Variant of Productive Social System Development

The balance between propensity for consumption and savings has two variants ("roots"). On the one hand, the optimal growth values of the productive social system (see above): $\gamma = C_i : P_i = 2 - \varphi$ (13), approximately $\gamma = 0.382$, while $\varphi = 2 - (C_i : P_i)$ (8), approximately $\varphi = 1{,}618$.

At the same time, there is a "degenerative root" of calculating the equation describing the relationship between the two tendencies of the development of the potential of the social productive system. However, this result is at first sight irrational: $\gamma'' = C_i'' : P_i'' = 2 - \varphi''$ (14), approximately $\gamma'' = 2{,}618$.

This irrational variant can be described as follows: $\gamma'' = 2{,}618 = 1 + 1{,}618 = (P_i : P_i) + (P_{i+1} : P_i) = 1 + \varphi$ (15), i.e. γ'' is a specific (backward) picture of the development of total potential **P**.

The degenerative variant of the development of a productive social system is hardly understandable on the basis of contemporary theoretical knowledge of economic and social processes. It indicates the existence of specific cyclical development, potential limitations, etc. Therefore, this knowledge deserves further investigation and explanation of this "absurd" phenomenon. At the macroeconomic level we encounter such phenomena as "hyperinflation", the fall of the state budget into the "debt trap", etc., at the microeconomic level it is the "over-indebtedness" of the company, household, etc.

If we look at this degenerative process from the point of view of the natural sciences, then we can say that it is a "collapse" of the system and its decline to values several generations back. So:
a) $\omega'' = (A_i'' + B_i'') : P_i'' = 1 - \gamma'' = 1 - C_i'' : P_i'' = 1 - 2{,}618 = -1{,}618$ (16),

which means that in cycle **i+1** the total consumption of **A** + **B** decreases by two cycles back because the indicator $\omega'' = -1{,}618 = -1 - 0{,}618$, therefore $(A_i'' + B_i'') = 0{,}618 * P_i''$ a $(A_{i+1}'' + B_{i+1}'') = 0{,}618 * P_{i+1}'' = 0{,}618 * 1{,}618 * P_i'' = P_i''$ (17),

b) $\varphi'' = P_{i+1}'' : P_i'' = 2 - (C_i'' : P_i'')$ (18), approximately $\varphi'' = -0{,}618$,

i.e. the cycle of the new generation **i+1** reaches the total potential two cycles lower to the level of generation **i-1**, so $P_{i+1}'' = P_{i-1}''$ (19), because $P_{i-1}'' = 0{,}618 * P_i''$ (20),

c) then logically we can interpret the relationship $\gamma'' = 2{,}618 = (P_i : P_i) + (P_{i+1} : P_i)$ (21) on the basis of the findings referred to in paragraphs a), b). It is thus clear that the stabilized potential C_i of cycle **i** by the collapse of the system to the level of cycle **i-1** accumulates both the fall of potential **A**+ **B** and the failure to apply the stabilized potential **C** in the subsequent two cycles i and **i** + **1**. Therefore $C_i = P_i + P_{i+1}$ (22).

d) the total potential of the next generation in both variants ("roots") P_{i+1} and P_{i+1}'' is distributed around the initial total potential P_i into two values (points) + **0.618** and - **0.618**. Thus, the values of cycles **i+1**, **i-1** oscillate around the values of cycle **i**.

The degeneration process takes place differently in the sub-dimensions of the potential and it is disharmonic (instead of growth there is a decrease), but at the same time it is harmonious (it has a certain order, it works according to the principle of the golden ratio). If degeneration reaches the above values, there will be minimal residual potential for the social system to survive. The unanswered question is in what situation growth will turn into degenerative development and the productive social system will collapse to the **i-1** level (from the expected **i+1** level).

5 Conclusion

The paper develops previous theoretical knowledge (Mikoláš et al., 2005, 2011) in the form of specific thought models and simulations that respond to some contemporary social, economic and political events and current knowledge of various sciences (biological, social, economic and other scientific disciplines).

The real behaviour of productive social systems deviates from the principles of the "golden" cuts and the harmony of the spontaneous order. The systems are usually temporary out of the ideal harmonic state and permanently address the temporarily created imbalance in the current (or previous) evolutionary (generational) cycle.

The previous considerations are focused on the description and simulation of the development of the cyclical development of the potential of productive social systems. It is an exogenous (external) view of the cycles of individual generations of systems. It is also necessary to pay attention to endogenous principles of development of these cycles - to examine the course of the cycle of individual generation, causes of changes, etc. It is necessary to describe the spontaneous order of potential of productive social system (Mikoláš, 2011, p. 3 - 68, 152 - 191).

To understand the spontaneous order of productive social systems, it is necessary to understand the philosophical consequences of the development of the world and society (Mikoláš et al., 2018).

The available literature on economics, management and entrepreneurship does not investigate this issue. It is very remarkable that the presented reflection on the two "positions" of the potential of the productive social system reminds remotely of the knowledge of contemporary physics related to the research of elementary parts of matter.

The findings presented in this article confirm other literary sources, connecting natural, economic and social processes and technological innovations (e.g. Constanza, 1991; Dator, 2006; Groot et al. 2008, 2009 and others).

The basic research questions were adequately answered within the research projects by the currently available knowledge.

1. The relationship between natural processes and laws and productive social systems has been proven. Business and other productive systems cannot be realized in such a way that the subjective spontaneous order (the will of the owners, managers, etc.) must be subordinated to the objective spontaneous order. The Covid 19 pandemic is clear evidence of this.

2. It is obvious that the development of productive social systems (e.g. entrepreneurship) depends on their competitive potential and the principles of their origin and existence. The ideal dynamics of the evolution of productive social systems is given by the "golden" cut. Most of the examined family companies do not achieve this ideal dynamic, which indicates an asymmetry in the accumulation of potentials. The discrepancy between the processes in living, inanimate and artificial nature and in society is growing. If these contradictions are not resolved in the coming decades, revolutionary (leap) changes in productive social systems (especially in family business) must be expected.

The present research has come to the fragmentary conclusion. *A key factor for business development (development of productive social systems) at present is the innovation process in the field of technology, often completely new and still practically unknown. Family businesses to absorb this trend, they should proceed to internal changes in paradigms and the dogmas of the behaviour of the families. There should be the innovation in behaviour of the families. It is essential that the successors should be trained from childhood to entrepreneurship, to contemporary technological mind-set, to maintain family traditions and values in the new historical and social context.* Our conclusions are also confirmed by the latest medical knowledge, especially psychology, psychiatry and genetics.

The submitted theory deserves a broad discussion and further verification in practice, depending on the cultural differences in manifestations of globalization in various parts of the world and under the influence of the industrial revolution 4.0 or 5.0 ingoing, the migration of nations, environmental changes, etc. We should be aware of the current world is turned (different from before), without we exactly know what it will follow. Therefore, each expert opinion and scientific discussion are completely necessary and useful. The presented findings show that if human society does not fulfil the *principles of spontaneous order*, especially in the form of *"golden"* and *"relative" cuts* (see text above), *revolutionary (leap) changes may occur instead of the natural evolution of productive social systems (often associated with the collapse of contemporary systems).*

We can also say that the social and "industrial revolution" 5.0 is approaching and other global economic, social, cultural, ecological and other current turbulences will be based on the "microcosmic optimization" of living matter (taking place in cells, molecules, atoms and other elements of living matter). These findings will be the basis for understanding psychosomatic and natural processes that affect the evolutionary development of a productive social system, such as family business (Mikoláš et al., 2018).

Acknowledgements

Polish grant NCN nr. 2015/17 / B / HS4 / 0098 "Approach based on the possibilities of innovation management in small and medium-sized enterprises".

References

[1] COSTANZA, R. (ed.) (1991). *Ecological Economics: The Science and Management of Sustainability*. New York: Columbia University Press.

[2] DATOR, J. (2006). *Kondratieff Waves, Warfare and World Security.* Amsterdam: IOS Press.

[3] DE GROOT, B., FRANSES, H., P. (2008). Stability through cycles. *Technological Forecasting & Social Change, vol. 75, 301-311.*

[4] DE GROOT, B., FRANSES, H., P. (2009). Cycles in basic innovations. *Technological Forecasting & Social Change, vol.76, 1021-1025.*

[5] DEWEY, R. E. (1967). *The Case for Cycles*, Cycles Research Institute. [cit. 2020-07-27]. http://cyclesresearchinstitute.org/cycles-general/case_for_cycles.pdf

[6] DOUADY, S., COUDER, Y. (1996). Phyllotaxis as a Dynamical Self Organizing Process Part I: The Spiral Modes Resulting from Time-Periodic Iterations. *Journal of Theoretical Biology. Volume 178*, *Issue 3*, 255-273.

[7] DUNLAP, A. R. (1997). *The golden ratio and Fibonacci numbers*. Singapore: World Scientific.

[8] FILSON, D. (2002). Product and process innovations in the life cycle of an industry. *Journal of Economic Behaviour & Organization, Vol. 49,* 97-112.

[9] FUJIMOTO, T. (1999). *The evolution of a manufacturing system at Toyota.* New York: Oxford University Press.

[10] GREENSPAN, A. (2008). *The Age of Turbulence: Adventures in a New World*. New York: The Penguin Press.

[11] HAUSTEIN, H. D. (1972). *Ekonomická prognóza.* Praha: Svoboda.

[12] HIROOKA, M. (2006). Innovation *Dynamism and Economic Growth: A Nonlinear Perspective.* Cheltenham, UK: Edward Elgar Publishing.

[13] HISHRICH, R. D. & Peters, M. P. (1996). *Založení a řízení nového podniku.* Praha: Victoria Publishing.

[14] CHEN, J. (2005). *The Physical Foundation of Economics: An Analytical Thermodynamic Theory.* Singapore: World Scientific.

[15] CHISTENSEN, M., C., RAYNOR, E., M. (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth*. Cambridge: Harvard Business Press.

[16] GHYKA, M. C. (2008). *Zlaté číslo.* Praha: ARGO.

[17] KEYON-ROUVINEZOVÁ, D., WARD, J. L. (2016). *Rodinná firma. Jak vybudovat, úspěšně vést a předat rodinný podnik.* Brno: Barrister&Principal.

[18] KOPČAJ, A. (2007). *Spirálový management.* Praha: Alfa Publishing.

[19] LIVIO, M. (2006). *Zlatý řez.* Praha: Dokořán.

[20] MATEJUN, M., MIKOLÁŠ, Z. (2017). Small Business live Cycle: Statics and Dynamics (S&D) Model. *Engineering Management in Production and Services.* 9(4), 48–58.

[21] MARKS, E. A. (2002). *Business Darwinism: Evolve or Dissolve: Adaptive Strategies for the Information Age.* New York: John Wiley & sons, Inc.

[22] MIHOLA, J. (2017). *Analýza vlivu intenzivních faktorů vývoje ekonomiky*. Praha: VŠFS.

[23] MIKOLÁŠ, Z., LUDVÍK, L. (1987). K problematice intenzifikace národního hospodářství (s aplikacemi na úrovní ČR). *Ekonomický časopis* 35, č. 5, s. 450 - 466.

[24] MIKOLÁŠ, Z. (2000). *Synergické podnikání – nový svět podnikání.* Jilešovice: MAJ.

[25] MIKOLÁŠ, Z., FOLVARČNÁ, A. (2000a). *Malá a střední firma. Manuál podnikatelského vedení.* Jilešovice: MAJ.

[26] MIKOLÁŠ, Z. (2005, 2011). *Jak zvýšit konkurenceschopnost podniku. Konkurenční potenciál a dynamika podnikáni.* Praha: Grada Publishing.

[27] MIKOLÁŠ, Z., Peterková, J., Tvrdíková, M., KOL. (2011). *Konkurenční potenciál průmyslového podniku.* Praha: C. H. Beck.

[28] MIKOLÁŠ, Z. (2012). Dilema spontánního řádu produktivního systému. *Ekonomický časopis* 60/2012, č. 8, s. 815 – 834.

[29] MIKOLÁŠ, Z., WOZNIAKOVÁ, Z. (2014). Synergic Time Effect of Intelligent Enterprise. *International Journal of Latest Research in Science And Technology.* Volume 3, Issus 3, June 2014.

[30] MIKOLÁŠ, Z. (2014a). *Potential Theory and Innovation Dynamics of Enterprise.* Studia Ekonomiczne 2014, nr 183, s. 197 – 204, Uniwersytet Ekonomiczny w Katowicach, Katowice.

[31] MIKOLÁŠ, Z., Peterková, J. (2015). Dilemmas of Innovative Dynamism and Social Responsibility. I*nternational Journal of Investment Management and Financial Innovations.* Volume 2, Issus 1/2015, p. 35-40.

[32] MIKOLÁŠ, Z., KARPETA, J. (2015a): Family business – the Potential for further Business Development in the Czech Republic. *International Journal of development Research.* Volume 5, Issue 06, June 2015.

[33] MIKOLÁŠ, Z., ZAMARSKÝ, V., FIALOVÁ, V., NIKOLSKAJA, M. (2016). *Jak se dívám na svět ... Soudobé projevy globalizace.* Hradec Králové: TZ-one.

[34] MIKOLÁŠ, Z., FIALOVÁ, V. (2016a). *The Dilemmas of the Power of Market Economy.* Studia Ekonomiczne. Zeszyty Naukowe, Nr 303, s. 9 - 23. Uniwersytet Ekonomiczny w Katowicach.

[35] MIKOLÁŠ, Z. (2016b). *Potenciál rodinného podnikání.* S. Majtán (red.), Aktuálne problémy podnikovej sféry 2016: zborník vedeckých prác, Bratislava, Vydavateľstvo EKONÓM, s. 750-757.

[36] MIKOLÁŠ, Z., KARPETA, J. (2016c). *Przedsiębiorczośc rodzinna – wyniki i dalsze kierunki badań.* Studia Ekonomiczne. Zeszyty Naukowe. Uniwersytetu Ekonomicznego w Katowicach, Nr 278, s. 21 – 29.

[37] MIKOLÁŠ, Z., KARPETA, J., MIKOLÁŠOVÁ, J. (2016d). *Biznes rodzinny – badania terenowe.* Studia Ekonomiczne. Zeszyty Naukowe. Uniwersytetu Ekonomicznego w Katowicach, Nr 270, s. 209 – 218.

[38] MIKOLÁŠ, Z., WOZNIAKOVÁ, Z. (2017). *Soudobá paradigmata rodinného podnikání v České republice na počátku průmyslové revoluce 4.0.* In. Štefan Majtán (ed.) a kolektív; *Aktuálne problémy podnikovej sféry 2017*. Zborník vedeckých prác. Bratislava: EKONÓM, s. 735 – 744.

[39] MIKOLÁŠ, Z. (2018). *Jak se dívám na svět ... Potenciál harmonie nebo tragédie.* Ostrava: REPRONIS.

[40] MIKOLÁŠ, Z. (2020). *Jak se dívám na svět ... na prahu před evolucí nebo revolucí?!* Hradec Králové: TZ-one.

[41] MISSIKOFF, M., CAUNDUCIC, M., MAIDEN, N. (2015). *Enterprise Innovation: From Creativity to Engineering.* London: ISTE/WILEY.

[42] PAVLÍK, J. (2004). *F. A. Hayek a teorie spontánního řádu.* Praha: Profesional Publishing.

[43] PETERS, M. P., HISHRICH, R. D., SHEPHERD, D. A. (2011). *Entrepreneurship.* McGraw-Hill Education.

[44] POLAK, H. (2005, 2011). Jak odstranit neopodstatněné náklady. Hodnotová analýza v praxi. Praha: Grada Publishing.

[45] SARASVATHY, S. D. (2008). *Effectuation. Elements of Entrepreneurial Expertise.* Cheltenham: Edward Elgar.

[46] SCOTT, O. (2013). *Záhadný zlatý řez.* Praha: Dokořán.

[47] VALENTA, F. (1969). *Tvůrčí aktivita – inovace – efekty*. Praha: Svoboda.

[48] VALENTA, F. (2001). *Inovace v manažerské praxi.* Praha: Velryba.

[49] VEBER, J., KOL. (2016). *Management inovací.* Praha: Management Press.

Health Care Availability Evaluation in the Regions of the Czech Republic

Eva Molnárová

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
eva.molnarova@vsb.cz

Abstract

Health is something we all share and it is an object of research from many angles. Many research papers aims to explore if a hospital care is on good level, if it is efficient and financially stable. Examined system in Czech Republic went through a big change after political transformation. Since than many researchers examined it from size efficiency, types and data availability. Some papers used DEA method for selected hospitals. The aim of this article is to evaluate the availability of health services from the point of view of the regions of the Czech Republic for the period from 2014 to 2018 using model TOPSIS. With capital city included the availability is the biggest in Prague, without it is in South Moravian region. The smallest availability is in the Karlovy Vary region with or without capital city included. Based on these calculations it is possible to aim government resources to improve health care standard.

Keywords: *healthcare, hospitals, physicians, TOPSIS*

JEL Classification: *C10, C67, I10, I12*

1 Introduction

Healthcare is a specific area, the development of which is characteristic of the historical and socio-economic framework of individual states. An important factor that affects health care is the economy of the country. On economy depends for example the level of health care or the availability and equipment of health care facilities. Access to health care is one of the main criteria of the health system. The interest of public health care is not only to maintain and improve the health status of the population, but also to ensure the fair provision of health care. Primary health care must be provided to everyone equally. The aim of this article is to evaluate the availability of these health services from the point of view of the regions of the Czech Republic using model TOPSIS.

Availability will be examined in two models. The first model will include 13 regions of the Czech Republic plus the capital city, Prague. In the second model, only 13 regions will be examined, the capital city will no longer be included in it. To support the goal, was formulated the hypothesis - in the TOPSIS model, in both models, with and without the capital city, the ranking of the individual regions will remain unchanged.

2 Literature Review

The healthcare system of the Czech Republic changed after 1989 with a transformation from a state-controlled one and a tax - funded system to the general health insurance model, where the main one responsibility for financing and organizing health care was provided by health insurance companies. Until 1990, there was a network of medical facilities in the Czech Republic, which was built on a strictly territorial three-level structure (republic, region, district). All medical facilities were state, medical and preventive care was, with few exceptions in dental care, provided without direct payments and financed by the state from general taxes. The funds were transferred by the Ministry of Finance to regional and district national committees, which distributed the corresponding budget amounts to the national health institutes within their competence. The Ministry of

Health managed health care methodically through main, regional and district experts for individual fields (Daňková, 2010).

Shortly after the political changes in 1989, work began on the design of a new health care system in the Czech Republic. Everything was under the control of the Ministry of Health. The main principles of this concept were as follows:

- the state will guarantee adequate health care to all citizens,
- healthcare will be provided in a competitive environment,
- the citizen will have the right to freely choose a doctor and a medical facility,
- the monopoly position of state health care will be removed, health care for the public will be provided regardless of the type of ownership of the medical facility,
- a basic element of public health care will be a separate medical facility with its own legal personality,
- the focus of medical care will be outpatient (especially primary) care,
- health care will be financed from several sources (state budget, health insurance, resources of municipalities, enterprises, inhabitants, etc.),
- compulsory health insurance will be an integral part of the health care system. (Svejkovský et al., 2016)

At the end of 1990, this proposal was approved and its implementation was entrusted to the Ministry healthcare. In accordance with a government resolution, the regional institutes of national health were abolished at the end of 1990, and the facilities associated with them were transferred, with a few exceptions, under the direct leadership of the Ministry of Health (Daňková, 2010).

In January 1992, some laws regulating the issue of healthcare came into force. Application imperfect legislation was first shown by a rapid increase in the number of health insurance companies, namely in 1992 there were 27 health insurance companies. Without any regulation and control by the state, they soon found themselves in significant financial difficulties. This led to the collapse and subsequent demise of some insurance companies, or to mergers with others, more financially successful. Gradually, the number of functioning health insurance companies reduced to nine (Daňková, 2010).

In the first three years of the existence of health insurance companies, the medical care provided was financed by procedure-based payments, but it turned out that this system causing a waste of funds. In 1997, it was established that health insurance companies provided physicians per capita payments for each registered patient and for advance payments derived from the previous period in inpatient care. The procedure-based payments system was maintained only by outpatient specialists (Gladkij, 2003, Daňková, 2010).

The privatization of health care in the Czech Republic began in the second half of 1992, when the Act on Health Care Provided in Non-State Health Care Facilities was applied. It started slowly from the beginning and concerned only a small number of separate outpatient surgeries in the first phase, and small private maternity hospitals in inpatient care. The private sector did not strengthen significantly until 1993. The start of privatization led to a rapid increase in the number of medical facilities. While in 1989, less than 8,000 were registered, by the end of 1993 their number had risen above 17 thousand, then to 25 thousand by the year 2000 In 2009 there were almost 28 thousand medical facilities with almost 45,200 doctors and 106,800 medical facilities non-medical staff with professional qualifications in the Czech Republic (Daňková, 2010, Maaytová, 2012).

As healthcare concerns every inhabitant of a country, it is important to research and further improve it. Different authors examine the health care system from different perspectives. For example, Vrabková and Vaňková (2021) exmine differences in the technical efficiency of public hospitals, with regard to the size of hospitals and partial types of human resources in Czech Republic, using Data Envelopment Analysis model.

The same method was used by Dlouhý, Jablonský and Novosádová (2007) to evaluate the efficiency of Czech hospitals on a sample of 22 hospitals. In their research, they point out to the unavailability of data about hospitals to the public. Vaňková, Vrabková (2014) evaluated the factors influencing the allocation and technical efficiency of hospitals that establish regions, according to the DEA model. Votápková and Šťastná (2013) also focus on the efficiency of hospitals in the Czech Republic. They use the Stochastic Frontier Analysis (SFA) method for evaluation. The efficiency is examined on a sample of 99 hospitals, which are divided into four groups - small, medium, large and teaching hospitals.

3 Material and Methods

In this chapter are information about data collection methodology and about method for analysing data.

3.1 Data Collection

Used data are form Czech Health Statistics for individual years from 2014 to 2018. This publication has been available since 1957, in the Czech-English version since 1991. The content is mainly based on data from the National Health Information System and demographic data of the Czech Statistical Office. Provides comprehensive information on health care in the Czech Republic. It includes data on demography, health status of the population, networks and activities of health facilities, workers and health education, economic indicators and international comparisons of selected indicators. (Institute of Health Information and Statistics of the Czech Republic, 2020).

Data from Czech Health Statistics for individual years from 2014 to 2018 were used for the research. The data were divided into two categories, namely data representing institutional security and data for personnel security at the level of regions of the Czech Republic.

As for institutional security, from the survey of healthcare establishments by region of the seat were selected hospitals, specialised therapeutic institutes, independent establishments of out-patient care and establishments of pharmaceutical service. Data are used in absolute numbers, i.e. number of establishments.

As for personnel security, contract workers were divided by category and region of the seat of healthcare establishment. In research are included physicians, dentists, pharmacists and general nurses and midwives paediatric nurses. Data is converted per 10 0000 inhabitants.

In both categories, the average for the years 2014 to 2018 was calculated. In one part of the model, the data are processed for 13 regions of the Czech Republic plus for the capital city, Prague. In the second part of the model, data are processed only for 13 regions, without the capital city.

3.2 Data Analysis Method

For fulfilling the aim of this paper author is using the Technique for Order of Preference by Similarity to Ideal Solution (shortly TOPSIS) method, which is a multi-criteria decision analysis method. The TOPSIS method is based on the selection of the variant that is closest to the so-called ideal variant. The ideal variant is characterized by a vector of the best criterion values and at the same time it is furthest from the so-called basal variant. The basal variant is represented by the vector of the worst criterion values. (Jablonský and Dlouhý, 2015)

The main condition of the TOPSIS method is that all criteria are of the maximization type. If the minimization criterion is used, it is necessary to convert it to the maximization criterion. The minimization criterion can be converted into a maximization criterion so that the newly created criterion will indicate the difference compared to the worst, i.e. the highest, value. The TOPSIS method can be described as follows:

1. The original criterion values y_{ij} are transformed into values according r_{ij} to the following relation

$$r_{ij} = \frac{y_{ij}}{\left(\sum_{i=1}^{n} y_{ij}^2\right)^{\frac{1}{2}}}, \qquad i = 1,2,\ldots,n,\ j = 1,2,\ldots,k. \tag{1}$$

2. The elements of the weighted criterion matrix W = (w_{ij}) are calculated as $w_{ij} = v_j r_{ij}$, where v_j is the weight of the j-th criterion.

3. From the elements of the matrix W, an ideal variant with criterion values ($H_1, H_2, \ldots, H_k$) and a basal variant with values ($D_1, D_2, \ldots, D_k$) are determined, where $H_j = \max_i (w_{ij})$ a $D_j = \min_i (w_{ij})$, $j = 1,2,\ldots,k$.

4. The distance of the variants from the ideal and basal variants is calculated according to the formulas

$$d_i^+ = \left[\sum_{j=1}^{k} (w_{ij} - H_j)^2\right]^{1/2}, \qquad i = 1,2,\ldots,n,$$

$$d_i^- = \left[\sum_{j=1}^{k}(w_{ij} - D_j)^2\right]^{1/2}, \qquad i = 1,2,\dots,n. \tag{2}$$

5. The indicator c_i is calculated as the relative distance of the variants from the basal variant

$$c_j = \frac{d_i^-}{d_i^- + d_i^+}, \qquad i = 1,2,\dots,n. \tag{3}$$

The values of c_i come from the interval $\langle 0,\ 1\rangle$. They take values for the basal variant and values 1 for the ideal variant. The overall arrangement of variants can therefore be obtained according to the decreasing values of the indicator c_i. (Jablonský and Dlouhý, 2015, Vrabková et al., 2019).

3 Results

Healthcare services availability in the regions of the Czech Republic were evaluated in two categories. In one category were evaluated 13 regions of the Czech Republic plus for the capital city, Prague. Second category is 13 regions of Czech Republic, without Prague.

The results of the model with capital city are displayed in Table 1. It is possible to see that Prague were the best of all evaluated regions. The index of TOPSIS method is the highest, 0.98. The index is consisted of availability of physicians, dentists, pharmacists, general nurses and midwives paediatric nurses and availability of hospitals, specialised therapeutic institutes, independent establishments of out-patient care and establishments of pharmaceutical service. On the other hand, the lowest index appeared in the Karlovy Vary region. The value of the index here was approximately 0.01. Table 1 also shows the overall ranking of all regions.

Table 1 - Healthcare services availability in the regions of the Czech Republic with capital city

Region (with CC)	Index	Rank
Prague	0.982886241	1st
Central Bohemian	0.561739567	4th
South Bohemian	0.240076337	8th
Plzeň	0.248719752	6th
Karlovy Vary	0.010178472	14th
Ústí nad Labem	0.462033612	5th
Liberec	0.132209139	13th
Hradec Králové	0.241396142	7th
Pardubice	0.150104306	12th
Vysočina	0.170108036	11th
South Moravian	0.722073498	2nd
Olomouc	0.238449622	9th
Zlín	0.177192762	10th
Moravian-Silesian	0.599288419	3rd

Source: author's calculations

The results of the model without capital city are displayed in Table 2. While the Karlovy Vary region still remains the last with an index value of 0.01, the best results in this model were achieved by the South Moravian region. The value of the TOPSIS index in South Moravian region is approximately 0.92.

Table 2 - Healthcare services availability in the regions of the Czech Republic without capital city

Region (without CC)	Index	Rank
Central Bohemian	0.687205344	3rd
South Bohemian	0.335730378	8th
Plzeň	0.376844483	5th
Karlovy Vary	0.146041161	13th
Ústí nad Labem	0.60234406	4th
Liberec	0.191122439	12th
Hradec Králové	0.358093463	7th
Pardubice	0.210367439	11th
Vysočina	0.241768417	10th
South Moravian	0.920357582	1st
Olomouc	0.374085381	6th
Zlín	0.247910799	9th
Moravian-Silesian	0.801676758	2nd

Source: author's calculations

When comparing the two models, it can be observed that if we exclude the capital from the model, the order of the other regions does not change. In other words, in the model with the capital, Prague wins, the second highest index can be found in the South Moravian region and the third highest index in the Moravian-Silesian region. In the model without the capital, the South Moravian region has the highest index, the Moravian-Silesian region the second highest index and the Central Bohemian region the third highest index. Thus, even if the indices change numerically, the order remains unchanged. The same phenomenon can be observed at the other end of the tables. In both models, with and without the capital, the lowest index appeared in the Karlovy Vary region. The second lowest index appears in the Liberec region and the third lowest index appears in the Pardubice region.

4 Conclusion

The best availability of health services came out in the first TOPSIS model in Prague. In the second TOPSIS model, the best availability of health services was in the South Moravian region. In both models, the worst availability was in the Karlovy Vary region. The index is consisted of availability of physicians, dentists, pharmacists, general nurses and midwives pediatric nurses and availability of hospitals, specialized therapeutic institutes, independent establishments of out-patient care and establishments of pharmaceutical service. Data from 2014 to 2018 were monitored.

For three indicators - hospitals, specialized therapeutic institutes and independent establishments of out-patient care, the data were converted to vacant beds in the given facilities. For example, on average for the years 2014 to 2018, in the model with the capital, 9,508 hospital beds, 2,248 beds in specialized therapeutic institutes and 4,411 beds in independent establishments of out-patient care were available in Prague. There is also a well-accessible transport network in Prague and a large number of medical facilities in a relatively small area (According to Czech Statistical Office (2021) Prague is the smallest region of the Czech Republic in terms of area).

On the other hand, in the Karlovy Vary region this average is much lower. Again, the average for the years 2014 to 2018 shows that the number of hospital beds is 1,323, the number of beds in specialized therapeutic institutes is 411 and in independent establishments of out-patient care it is 891. According to Czech Statistical Office (2021) the Karlovy Vary region has long been the least populated region of all the regions of the Czech Republic.

It is the third smallest region in the Czech Republic, after Prague and the Liberec region, with the lowest population density, and Prague is the smallest region in terms of area, with the second highest population in the Czech Republic. This factor certainly influenced the index of the order of individual regions.

To support the goal, was formulated the hypothesis - in the TOPSIS model, in both models, with and without the capital city, the ranking of the individual regions will remain unchanged. This hypothesis was confirmed.

This model certainly has its weaknesses. One is the concentration on only 8 factors. Another disadvantage is that in this model different weights were assigned to the individual indicators. In this paper, the indicators of hospitals and physicians had the greatest weight, however, the weights of indicators could be divided in other ways and this would certainly affect the results.

Acknowledgements

This paper was supported by project SGS No. SP2021/67, International Evaluation of the Performance of Health and Social Services with a Focus on the Application of Multicriteria Methods, Faculty of Economics, VSB – Technical University of Ostrava.

References

[1] Český statistický úřad [online]. Praha, 2021 [cit. 2021-6-10]. Available from: https://www.czso.cz/csu/czso/home

[2] DAŇKOVÁ, Š. (2010). *Vývoj zdravotnictví České republiky po roce 1989: vydáno k 50. výročí ÚZIS ČR*. Praha: Ústav zdravotnických informací a statistiky České republiky, 2010. ISBN 978-80-7280-900-4.

[3] DLOUHÝ, M., JABLONSKYÝ, J., NOVOSÁDOVÁ, I. (2007). Use of data envelopment analysis for efficiency evaluation of Czech hospitals [Využití analýzy obalu dat pro hodnocení efektivnosti Českých nemocnic]. *Politicka Ekonomie*. 55. 60-71. 10.18267/j.polek.590.

[4] GLADKIJ, I. et al. (2003). *Management ve zdravotnictví*. 1. vyd. Brno: Computer Press, 2003. 380 s. ISBN 80-7226-996-8.

[5] Institute of Health Information and Statistics of the Czech Republic [online]. Praha [cit. 2021-6-4]. Available from: https://www.uzis.cz/index.php?pg=vystupy--knihovna&id=275

[6] JABLONSKÝ, J., DLOUHÝ, M. (2015). *Modely hodnocení efektivnosti a alokace zdrojů*. Praha: Professional Publishing, 2015. ISBN 978-80-7431-155-0.

[7] MAAYTOVÁ, A. (2012). *Otázky ekonomiky zdravotnictví s ohledem na zvyšování efektivnosti*. Praha: Wolters Kluwer Česká republika, 2012. ISBN 978-80-7357-912-8.

[8] SVEJKOVSKÝ, J., VOJTEK, P., TESKA ARNOŠTOVÁ, L. (2016). *Zdravotnictví a právo*. V Praze: C.H. Beck, 2016. Praktická knihovna. ISBN 978-80-7400-619-7.

[9] VAŇKOVÁ, I., VRABKOVÁ, I. (2014). The Factors Influencing Economic Efficiency of the Hospital Bed Care in Terms of the Regional Allowance Organizations. *Review of Economic Perspectives*, Vol. 14, Issue 3, 2014, pp. 233–248, DOI: 10.2478/revecp-2014-0012

[10] VOTÁPKOVÁ, J., ŠŤASTNÁ, L. (2013). Efficiency of Hospitals in the Czech Republic. *Prague Economic Papers* 22(4):524-541.

[11] VRABKOVÁ, I., ERTINGEROVÁ, I., VAVREK, R. (2019). Information gaps in the market for social services: Retirement homes in the czech republic. *Review of Economic Perspectives, 19*(3), 175-191. doi:http://dx.doi.org/10.2478/revecp-2019-0010

[12] VRABKOVÁ, I., VAŇKOVÁ, I. (2021). Efficiency of Human Resources in Public Hospitals: An Example from the Czech Republic. *Int. J. Environ. Res. Public Health 2021*, 18, 4711. https://doi.org/10.3390/ijerph18094711

Comparative Analysis of the Official Websites of the Partner Cities of Głuchołazy and Jesenik - in Terms of Auto-Presentation of their Potential: Spa, Tourist, Cultural and Investment

Wanda Musialik[1], Roman Śmietański[1]

[1]Opole University of Technology
Faculty of Economics and Management
ul. Prószkowska 76, 45-758 Opole, Poland
w.musialik@po.edu.pl, r.smietanski@po.edu.pl

Abstract

Since the 1990s the Internet has become an effective tool in social and economic communication in Central Europe. The authors aimed to investigate the extent to which the Internet has been used in promoting towns located in Polish and Czech border area. The authors analysed the official websites of Głuchołazy and Jesenik. In the past both of these towns had been located in the same country but were later divided by the border. The authors examined the presentation of spa, tourist, investment and cultural advantages emphasised by the local authorities in charge of each town. According to the authors these towns developed different approaches in using the Internet: a dynamic attitude in Jesenik and a more static strategy in Głuchołazy. The Internet has been skilfully used in promoting tourist values and concise in providing economic information. The analysis showed that unlike Jesenik, the city of Głuchołazy has been using the Internet for economic promotion. The following research may help to improve the content of promotional websites developed by the presented towns.

Keywords: *Głuchołazy, Jesenik, official website, promotion of cities, qualities of the city*

JEL Classification: *O18, R11, Z19*

1 Introduction

For several decades the social and economic development of many countries and cities has been influenced by information provided online. The Internet started in the 1960s, and came into general use in the early 1990s. Communicating over the Internet shortened the time needed to transfer information and changed its visual form used in regional promotion.

The authors compared the frequency of the Internet usage in the promotion of two cities: Głuchołazy and Jesenik. At the end of the Middle Ages both of these towns were located within one state, however in subsequent historical periods they were separated by a national border. This division was reinforced by successive wars, locating these cities on both sides of the initially Austro-Prussian, then German-Czech-Slovak in the interwar period, and after 1945 Polish-Czech border.

The aim of the article is to provide a comparative analysis of the official websites of Głuchołazy (Republic of Poland) and Jesenik (Czech Republic) which have been cooperating within the town twinning program. The analysis includes the presentation of spa, tourist, investment and cultural advantages promoted by the local authorities. Both cities are just 19 kilometres away. Apart from different mentalities, inhabitants of these cites speak different official languages. In Głuchołazy it is Polish, and in Jesenik – Czech. However, it is worth noting that some inhabitants know the Silesian dialect. This reduces the language barrier.

The city of Głuchołazy is a rural-urban municipality with two official websites. The first website is available at www.glucholazy.pl, and the second one at www.nowe.glucholazy.pl. Currently, the second website is archival and presents the city of Głuchołazy. It no longer provides information about the activities undertaken by the

local authorities. The website has not been updated, therefore, it will not be analysed in this study. The official website of Jesenik is available at https://www.jesenik.org.

It is worth pointing out that although the administrative divisions of Poland and Czech Republic are similar in their structure (province, district, municipality) some significant differences also appear. On average, Polish municipality covers many locations, whereas Czech municipality is usually a single location. Hence, unlike Czech official websites, Polish municipalities provide websites addressed to a larger number of inhabitants (in terms of administrative service) and are more formal. The availability of information presented in foreign languages should also be emphasised. The website of Głuchołazy does not offer a machine translation service. The official website of Jesenik provides a link to translate the website into foreign languages, but it is not active. Considering the fact that tourism and spa advantages as well as attracting foreign investors and tourists can affect the social and economic development of both towns, the lack of information in foreign languages may be considered as a missed opportunity. People with visual impairment can access the information on the official website of Głuchołazy by adjusting the contrast and font size of the text. The text on the website can also be read aloud. Both cities present their advantages in social media. The city of Jesenik is available on Facebook, Instagram and YouTube, while the city of Gluchołazy is available on Facebook and YouTube.

1.1 General Characteristics of the Common Elements of Głuchołazy and Jesenik

In the distant past Głuchołazy and Jesenik were part of the same state – Austria. This changed along with the Silesian Wars (1740-1763), when the border between the cities marked the border between the Kingdom of Prussia and the Austrian Empire. As both cities were located in the two competing states this favoured their development based on their spa resources. Both towns are located in mountainous area with climate and water conditions which enhanced the development of spa infrastructure in the second half of the 19th century. The decline of Głuchołazy (former Ziegenhals Bad) and Jesenik started in the 1940s. It was caused by the defeat of the Third Reich and the forced departure of the German minority which resulted from Yalta-Potsdam decisions and Beneš decrees. Local population was replaced by people from other places. The existing infrastructure was used to satisfy the needs of the socialist government. Along with the democratic transformation after 1989, the historical urban space (especially in Głuchołazy) was not protected by the state. This along with low social awareness resulted in the degradation of the historical infrastructure. However, after 2004 cultural advantages and heritage became the developmental opportunity for Głuchołazy to emerge from economic stagnation. Many Sudeten towns located on the Czech side of the border, which were separated from the rest of their country by mountains, were challenged by difficulties in economic development [Opałka P., 2015]. Overcoming the barriers in communities which were divided by the state border was facilitated by the spread of the Internet.

Both cities are located in the Pradziad Euroregion, which covers the south-eastern part of the Silesian Lowland and the eastern part of the Sudetes. The area may be characterized by a varied landscape, large forest complexes, and high-quality agricultural land. It is rich in such environmental resources as: mineral deposits (including raw materials used in chemical and lime industry), as well as mineral and healing waters. The natural advantages of the region include landscape parks and protected areas. Głuchołazy is situated on the border of the Opawskie Mountains Landscape Park, while Jesenik is situated in the Jeseníky Landscape Park. Therefore, both of these cities have favourable conditions for the development of tourism. There are many artefacts of material culture such as religious buildings and medieval urban arrangements. Tourists are also attracted by the interesting landscape of this region, especially the Opawskie Mountains and the Jeseníky Mountains along with their picturesque mountain landscapes full of hiking, biking and skiing routes (especially on the Czech side) as well as karst caves. The Jeseníky region is known for numerous healing water springs and a clean and healthy environment. [Statistical Office in Opole, 2019, p.15] All of the above-mentioned regional advantages may affect not only the social, economic and cultural development of both cities but also the entire region. Therefore, they should be promoted on official websites. This is an opportunity to attract investors, especially in such industries as: tourism, catering, accommodation and services.

1.2 Contemporary Demographic Resources

Głuchołazy is the seat of the urban and rural municipality which includes 17 locations. The city is located in the Nysa district, in the Opole Province. It covers 6.8 square kilometres. In December 2019, it was inhabited by 13 503 people, out of whom 53.2% were women and 46.8% were men. 59.1% of the population was in the working age, 14.6% in the pre-working age, and 26.3% in the post-working age. [Poland in numbers]

Jesenik is the district town located in the Olomouc region with 24 locations (including Jesenik). It covers an area of 38.22 square kilometres. In 2017, it was populated by 11,271 inhabitants, out of whom 51.79% were women. 63.83% of the population was in the working age, 13.54% in the pre-working age and 22.63% in the post-working age. [kurzy.cz]

1.3 Presentation of Spa Values

The official website of Głuchołazy does not directly present spa advantages of the city. It currently promotes climatic spa benefits which have been indirectly shown on the subpage related to tourism. In the "Attractions" tab there are three such indications among 22 recommended tourist attractions. The spa character of the city is reflected in the Spa Park, the Park of Senses as well as in the 15-meter high and 6-level Brine Graduation Tower, revitalized in 2019. On the subpage which presents the history of Głuchołazy, provided by Paweł Szymkowicz, visitors can read about the past spa qualities of the city. According to Szymkowicz, Głuchołazy became a spa town in the second half of the 19th century and flourished until the first half of the 20th century. At first, treatment methods used in Głuchłazy were based on a model developed by Vincenz Priessnitz from the nearby Gräfenberg (now Lásne Jesenik). Later they were replaced by methods introduced by Fr. Sebastian Kneipp, which contributed to the development of medical treatment against obesity, nervous pains, anaemia and respiratory diseases. The treatments included: galvanic baths, ice packs, electric shocks, baths in pine infusions and wood pulp. Spa patients included addicts affected by morphine, cocaine, alcohol, medications, as well as patients with malnutrition and metabolic disorders, people in need of rest, nervous disorders and tuberculosis. "The advantages of the spa in Bad Ziegenhals could be reflected in three words: air, light and diet."

The description of spa advantages of Jesenik on its official website is much more extensive than in the case of Głuchołazy. The existence of 80 registered springs, a new Balneopark and a well-developed space for fitness exercises have been emphasized. The website provides information about the available short-term regenerative accommodation, which offers sauna, gym, tennis and mini golf courts as well as a playground for children. These attractions also include the nature route of the legendary doctor Vincenz Priessnitz (1799-1851), at the end of which travellers can drink spring water.

The differences in the presentation of spa values result from the status of this type of therapeutic activities in both cities. Despite the fact that there is a spa hospital in Głuchołazy, no such information is presented on the town's website. Perhaps this is due to the fact that this facility is only available for patients, who are registered with National Health Service (NFZ). The Specialist Hospital of the Ministry of Interior and Administration specializes in treatment, recovery and prevention of respiratory and cardiovascular diseases. After the World War II, this hospital was the spa facility, however nowadays it provides medical treatment such as SARS-Covid-19. It also organizes educational and research activities, uses and implements new medical technologies and methods of treatment. [SP ZOZ]

Furthermore, the Głuchołazy website offers no information about the Health and Recovery Centre, which is available to all potential patients but on commercial terms. [OFRW]

According to the information presented on the Jesenik website, Jeseníky spas were privatized after 1989. They were transformed into a joint-stock company named after famous founder of this spa town – Priessnitz. The health resort uses natural resources and the latest scientific research to restore health and joy of life in its patients.

In the years 1996-2004, the main spa buildings were renovated and tourists expanded and improved the offer of provided accommodation and services. Currently, the Priessnitz spa specializes in modern treatment methods aimed at treating psychological, locomotor and dermatological difficulties. In 2010, the construction of a new spa facility in a spa building was successfully completed. The differences in the information presented result from the type of activities both cities undertake in terms of spa advantages.

1.4 Presentation of the Tourist and Cultural Offer

On the Głuchołazy website, the link to the subpage "Tourism" was placed in a visible section of the website. After clicking it, viewers will enter the section entitled "Use the planner", which provides links to the selected tours, attractions and accommodation. Additionally, on the subpage menu there are further links to such tabs as: Information, Attractions, Accommodation, Routes and Events. Some of them have been linked to the photo folder. The first tab presents information about the Tourist Information Center as well as the information about the opening hours of the Upper Gate Tower and tourist information services available in the Opawskie Mountains. 9 out of 22 objects presented in the "Attractions" tab, are located in Głuchłazy. Photos of these places are linked to the interactive descriptions, presenting their history, dates of modernization, and other interesting information. Other tabs provide information not only about objects located in the city, but also about the municipality. This practice improves the offer addressed to those who visit Głuchołazy.

The authors of the website about Jesenik presented tourist attractions in the section "Volný čas". This subpage presents information about monuments, interesting places, trips, photos, audio and video presentations. Viewers can also download a mobile game for children, in which one of the characters is related to the Jeseníky Mountains. Video presentations of Jesenik and its surroundings make tourist attractions even more appealing. For example, Jesenik is presented as "The Last Islands of Freedom", as well as "The city at the heart of nature".

Videos which present tourist attractions as well as important and interesting events organized in the city have been uploaded on YouTube (e.g. the 750th anniversary of the city's founding, the opening of the spa season in 2017 or events organized by cultural facilities). Over hundred exceptionally dynamic video presentations attract viewers not only with the high quality images but also with background cheerful music.

Accommodation base in Głuchołazy is rather poor. Tourists who would like to stay overnight in the city do not have much to choose from. No information about the exact number of accommodation facilities is presented on the city's website. By clicking the subpage "Tourism", and then "Accommodation" tab, visitors may find out that there are 8 accommodation facilities in Głuchołazy, however after clicking "Attractions and accommodation on the map" they can find 9 to 12 accommodation facilities. According to statistical data published in April 2021, in 2019 there were 18 accommodation facilities in Głuchołazy, out of which 13 were located in the so-called rural part of Głuchołazy. [CSO BDL] Revitalization of the old part of the city and recreating its spa character would probably increase the number of tourists and patients, and thus increase the number of accommodation facilities. Therefore, there is a gap which might attract investors from the tourism and catering industries. Jesenik is much better in this respect. In the tabs "Volný čas" and "Ubytování" of the city's website, visitors can find information about 84 different types of accommodation. 50 of them are available in Jeseník.

Both Głuchołazy and Jesenik promote their cultural activities quite well on their websites. Cultural information on the Jesenik website is provided in the tabs "Volný čas" where after clicking "Kultura na Jesenicku", users will be redirected to the city's website about culture https://jesinfo.cz/cz/. It provides dozens of interesting suggestions not only for residents but also for tourists. The website is not available in foreign languages, but it is available on Facebook where visitors can find information about such regional events as: theatre performances, gastronomic events, concerts, sports events, festivals, including film festivals and lectures, dance events, fairs, exhibitions and workshops. Interestingly, the website also provides information about cultural events organized in Polish border towns of Nysa district, including Głuchołazy. [JESINFO].

Similarly to Jesenik, Głuchołazy provides a website about the cultural activities. However, it differs significantly from the website developed in Jesenik. It is maintained by the Knight of the Order of the Smile Cultural Centre in Głuchołazy. It presents information about cultural events, film repertoire and the library [CK im. KOU]. Information about sports events has been posted on the website of the Municipal Sports and Recreation Centre. The website provides information about sports facilities and sports events. [GOSiR]. These websites are not available in foreign languages, but they are available on Facebook. The official website of Głuchołazy redirects visitors to these websites after clicking "Culture" and "Sport" tabs at the bottom of the main webpage. Unfortunately, Głuchołazy does not organise as many cultural events as Jesenik.

1.5 Investment Offer

Creating conditions for investment is important in terms of municipality's development. M. Trojanek defines them as "activities aimed at increasing the efficiency of investments to encourage potential investors to develop projects which may satisfy – directly or indirectly – specific local needs". Hence, local authorities should prioritise the area development (strategies) which will attract investors. Therefore, municipal investments should also take into account potential needs of investors. When designing projects, local authorities should investigate whether their projects will inhibit or eliminate private initiatives, trigger external multiplier and synergy effects [Źróbek-Różańska A., 2010, p. 49]

The review of the Głuchołazy website seems to indicate that the municipality is not interested in using its own website to attract investors. However, local authorities changed their approach towards entrepreneurs. Back in 2018, two tabs addressed to entrepreneurs were available on the website. The first tab "For companies and investors", provided information about tax benefits that entrepreneurs were entitled to. The second tab "Microentrepreneur for entrepreneurs" informed about the appointment of a spokesman, who would represent small and medium-sized enterprises, as well as links to websites offering various forms of support for companies. [Musialik W., Śmietański R., 2018[1] p. 108]. These tabs are no longer offered. Also no information has been provided about the investment areas or any content encouraging potential investors to invest in Głuchołazy and other places within the municipality. Although the Głuchołazy website provides the tab "Investor" which leads to "Tenders" and "Inquiries", presented information is addressed to investors who would undertake their own activities or activities commissioned by municipalities. On municipal subpages, local authorities present information about competitions and tenders for performing specific activities, for example a tender for thermomodernization of a building serving for education, health and social purposes in Głuchołazy (the design and build method). Providing this type of information about competitions and tenders on a municipal website is obligatory and is imposed by the Public Procurement Act. According to Article 36 of this Act, the information available on the website must include the "Specification of Essential Terms of Contract", which is the essential document required in the public procurement procedures. The exceptions are the single-hand procurement and

electronic bidding. [DzU 2015 poz. 2164]. Information on competitions and tenders on the website is posted in Polish. This may suggest that local authorities are not interested in offering tender to foreign companies.

On the Jesenik website there is no tab addressed to investors. However, the city developed a special industrial zone. The city uses the website to inform about the functioning of the zone and the rules for entering into it However, finding this information is not intuitive. It can be accessed by clicking the tabs in the following order: "Město a městský úřad" (City and local authorities), "Nakládání s majetkem měst" (Management of city property), "Průmyslová zóna" (Industrial Zone). According to the rules, potential investors may purchase land intended for business activity if all the requirements are met. Similarly to Głuchołazy, Jesenik has published information about its own investments that have been or are to be made in 2014-2021. This information can be found when clicking the following tabs "Město a městský úřad" (City and local authorities), "Města projects"(City projects). As in the case of Głuchołazy, this information is not available in a foreign languages.

2 Material and Methods

The article was written based on a comparative analysis of the information presented on the official websites of two cities: Głuchołazy and Jesenik. The information which addressed the spa, tourist, cultural and investment values was compared. The research also included statistical and demographical data about both cities. The review of the websites was carried out over the same period of time, and this also applies to the statistical data. In addition, the results were organised in the following order: spa, tourist and cultural, investment values. The advantages of the analysed websites were presented in the same order.

3 Results and Discussion

A comparative analysis of the official websites of Głuchołazy and Jesenik answered the question of how the authorities of both cities use the Internet to promote them. Recent studies on the influence of the Internet on cross-border communication have rarely investigated this topic. The authors have previously discussed the usage od the neighbour's language on the webites of Opava and Glubczyce [Musialik W., Śmietański R. 2018[2] 184-190]. The analysis included four areas selected by the authors: spa, tourist, cultural and investment values. Both cities are similar in terms of demographics, potential for the development of tourism and both have the status of a spa town. They are located close to each other and share almost identical natural conditions. However, they differ in terms of their territorial (state) affiliation, the legal conditions in which they operate, and their inhabitants: mentality, cultural conditions, and the language they use. Taking into account the above-mentioned aspects, the authors believe that the authorities of Jesenik are better at presenting the spa, tourist and cultural values, but they are not as good at promoting investment values of the city. The analysis showed that Jesenik is much better in promoting its spa values. It emphasizes the spa character of the city, but when it comes to its investment values, the authorities do not publish virtually any information that could attract investors. Tourist and cultural values in both cities are presented similarly. They both present advantages and cultural activities which can attract tourists. Examining the differences in the usage of websites will enable their authors to improve the presented content and coose the right direction for the necessary changes by demonstrating its qualities.

4 Conclusion

The authors of the official websites of Jesenik and Głuchołazy made an effort to present the advantages of their cities using similar means of expression and content. For this purpose, static and visual methods were used. The presentations differ in the type and scope of the information provided.

Based on the presented content and the structure of websites of both cities, it can be concluded that although they use the Internet in different ways to promote their values, they both emphasise the importance of tourist benefits and cultural activities. The reasons for this can be found in poorer services, tourist and cultural facilities in Głuchołazy (e.g. theater, museums, galleries), as well as the availability of sports facilities.

When compared to the website of Jesenik, the website of Głuchołazy is worse in presenting the town as a health resort. The website of Głuchołazy mentions its spa character, but in its historical dimension. It also presents the beautiful spa park, which was renewed by the local authorities, there is no information about the two recovery and spa facilities that operate in the city.

Local authorities of Głuchołazy and Jesenik have not been focused on attracting investors, but presenting the results of activities undertaken by them locally. They aimed at presenting the achievements of residents supported by municipal structures. Compared to Głuchołazy, the accommodation in Jesenik is well or even very well-developed along with well-organized gastronomic services, hence investments in this industry should not be

expected. Most of the accommodation facilities and other tourist and catering services are run by local people. The city expects investments in other sectors for which it has allocated land in the industrial zone.

Głuchołazy has been struggling with the challenges of social and economic development for years. The collapse of many enterprises after 1989 and the high unemployment rates have contributed to the decline of the tourist and economic character of the city, as well as its importance as a health resort (started in the second half of the 20th century). Focusing on tourism may help in revitalising the city, but it also requires more efforts in presenting its tourist and spa values on the official websites. The same has been done by the authorities of Jesenik – a town which, apart from beautiful spa facilities, has much fewer historical buildings in its old part than Głuchołazy. It is important for the authorities of Głuchołazy to know their strong and weak points. In 2004, they analysed them in the development strategy for the municipality entitled "Development Strategy for the Municipality of Głuchołazy". [SRGG, 2004] However, to achieve this, it is necessary to attract investors, revitalize the city, which will then attract tourists and patients. This will lead to its social and economic development. Unfortunately, it seems local authorities in Głuchołazy have difficulties in implementing the development strategy. The results of undertaken activities are poorly visible, probably due to the lack of financial means necessary for the implementation of tasks included in the strategy. The promoting opportunities provided by the Internet might be helpful in overcoming these difficulties. When browsing through the official website of Głuchołazy, it seems the authorities look for their solutions on how to use rhe Inernet without noticing good practicing of their foreign neighbours. The analysis should facilitate the development of cross-border cooperation in this area.

References

[1] Centrum Kultury im. Kawalerów Orderu Uśmiechu w Głuchołazach, [online]. [cit.2021-05-02]. Available at https://www.ckglucholazy.pl/

[2] Główny Urząd Statystyczny – Baza Danych Lokalnych, Turystyczne obiekty noclegowe i ich wykorzystanie [online]. [cit.2021-05-01]. Available at: https://bdl.stat.gov.pl/BDL/dane/podgrup/tablica

[3] Gminny Ośrodek Sportu i Rekreacji [online]. [cit.2021-05-02]. Available at, http://gosirglucholazy.pl/

[4] MUSIALIK W., ŚMIETAŃSKI R. (2018[1]) Potential: spa, tourist, investment and cultural of the partner cities of Głuchołazy and Jesenik - on the basis of the analysis of their official websites. Source: education and science of the 21st century. Articles of the 3rd International Scientific and Practical Conference. Oct 2018. Publisher: Vitebsk State Technological University, pages: 107-109 [online]. [cit.2021-04-04]. Available from https://elibrary.ru/item.asp?id=37054133

[5] MUSIALIK W., ŚMIETAŃSKI R. (2018[2]) Potential: spa, tourist, investment and cultural of the partner cities of Głuchołazy and Jesenik - on the basis of the analysis of their official websites. Source: education and science of the 21st century. Articles of the 3rd International Scientific and Practical Conference. Oct 2018. Publisher: Vitebsk State Technological University, pages: 107-109 [online]. [cit.2021-04-04]. Available from https://elibrary.ru/item.asp?id=37054133

[6] Oficjalna strona internetowa gminy Głuchołazy, [online]. [cit.2021-04-04]. Available at, https://glucholazy.pl/1189/strona-glowna.html

[7] Oficjalna strona internetowa gminy Głuchołazy (nowa wersja), [online]. [cit.2021-04-04]. Available at, https://www.nowe.glucholazy.pl/

[8] Oficjalna strona internetowa gminy Jesenik, [online]. [cit.2021-04-04]. Available at, https://www.jesenik.org/

[9] OPAŁKA, P. (2015) Głuchołazy – szanse i zagrożenia rozwoju [online]. [cit.2021-04-04]. Available: https://docplayer.pl/14821938-Glucholazy-szanse-i-zagrozenia-rozwoju-glucholazy-chances-and-dangers-of-development.html

[10] O szpitalu – Strona internetowa SP ZOZ Szpital Specjalistyczny MSWiA w Głuchołazach im. św. Jana Pawła II, [online]. [cit.2021-04-30]. Available at, https://szpitalmsw-glucholazy.pl/szpital/

[11] Ośrodek Formacyjno-Rehabilitacyjno-Wypoczynkowy, [online]. [cit.2021-05-01]. Available at, http://www.skowronek.info.pl/

[12] Ustawa z 29 stycznia 2004 r. ─ Prawo zamówień publicznych. (Dz.U. z 2015 r. poz. 2164 ze zm.)

[13] Portal internetowy Kurzycz [online]. [cit.2018-10-22]. Available at https://www.kurzy.cz/obec/jesenik/stats-PU-MOSZV-DEMSTAV-stranka/

[14] Portal internetowy „Polska w liczbach" [online]. [cit.2021-04-04]. Available at http://www.polskawliczbach.pl/Glucholazy.

[15] Portal wydarzeń kulturalnych, gastronomicznych lub sportowych z regionu Jesenice, [online]. [cit.2021-05-02]. Available at: https://jesinfo.cz/

[16] Strategia Rozwoju Gminy Głuchołazy - Uchwała Nr XX/159/04 Rady Miejskiej w Głuchołazach z dnia 30 czerwca 2004 r. w sprawie uchwalenia „Strategii rozwoju gminy Głuchołazy" [online]. [cit.2021-05-02]. Available from, https://bip.glucholazy.pl/65/183/strategia-gminy-glucholazy.html https://bip.glucholazy.pl/download/attachment/123/xx_159_04.pdf

[17] Urząd Statystyczny w Opolu, Urzędu Statystyczny w Ołomuńcu, Urząd Statystyczny w Ostrawie (2019) Analiza sytuacji społeczno – gospodarczej obszaru Euroregionu Pradziad. Wyd. Stowarzyszenie Gmin Polskich Euroregionu Pradziad, Opole 2019 [online]. [cit.2021-04-22]. Available at: https://opole.stat.gov.pl/publikacje-i-foldery/inne-opracowania/analiza-sytuacji-spolecznej-i-gospodarczej-obszaru-euroregionu-pradziad,19,1.html

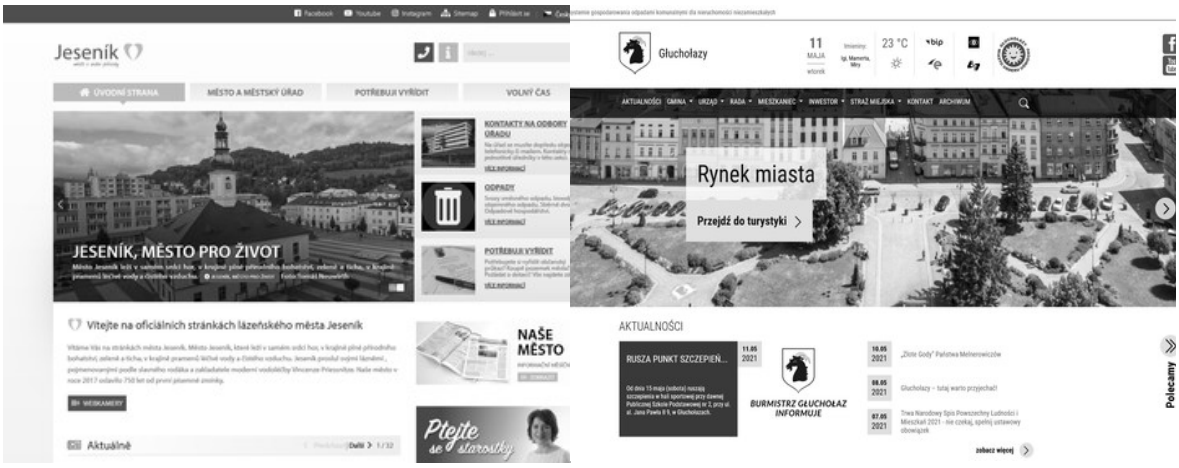
[18] ŹRÓBEK-RÓŻAŃSKA A. (2010). Gospodarowanie gruntami a lokalizacja inwestycji w gminie (rozprawa doktorska) Promotor: dr hab. Maria Trojanek, prof., UE Poznań 2010 [online]. [cit.2021-05-03]. Available at, https://www.wbc.poznan.pl/Content/158523/PDF/%C5%B9r%C3%B3bek-R%C3%B3%C5%BCa%C5%84ska_Alina-rozprawa_doktorska.pdf

Appendix

Picture 1 - Spa buildings "Priessnitz" in Jesenik and "Skowronek" in Głuchołazy

Source: Photo by Roman Śmietański

Picture 2 - Official websites of the cities of Jesenik and Głouchołazy



Source: www.jesenik.org; www.glucholazy.pl

Flexible Forms of Amployment Among Young and Old Employees in Countries of the Visegrad Group - Comparative Analysis

Anna Niewiadomska[1], Ewa Sobolewska-Poniedziałek[1]

[1]University of Zielona Gora
Faculty of Economics and Management
Department of Macroeconomics and Finance
Podgórna 50, 65-246 Zielona Gora, Poland
a.niewiadomska@wez.uz.zgora.pl, e.sobolewska-poniedzialek@wez.uz.zgora.pl

Abstract

The gradual phasing out the traditional employment model, work organization and collective labour relations observed in recent decades is a consequence of the progressing globalization of economic processes. These changes are also fostered by the dynamic development of information technologies and the growing importance of services in the economy. Increasing competition on the market forces companies to improve the flexibility of their operations, hence the growing importance of atypical employment forms.

The aim of this paper is to analyze the scale of flexible employment in the Visegrad countries (V4). However, due to the limited availability of data, it was decided to analyze selected flexible employment forms in two age groups of employees, i.e. aged 15-24 and 55-64. An additional criterion for the selection of research group was the fact that employees of younger and older generation are in a special situation on the labor market. The paper uses desk research method and comparative analysis, while the source of statistical data was the Eurostat database.

Keywords: *flexible forms of employment, labour market, young employees and older employees*

JEL Classification: *J20, J40, J10*

1 Introduction

Changes in the economic, demographic and social spheres at the turn of the 20th and 21st century had a fundamental impact on the transformations taking place in modern economies. The global character of changes and their high dynamics made it necessary for business entities to implement strategies that take into account the high variability of market environment. Increased competition causes that companies seek new markets and adjust their production techniques and forms of work organization to the growing market requirements. Entrepreneurs are often forced to make decisions on which the existence of their companies often depends. The changing conditions in the environment also require employees to be more willing and able to adapt to new working conditions. Flexibility understood as the ability to adapt to a dynamically changing environment is currently one of the most desirable characteristics on the labor market.

As a result, economic entities are increasingly focused on increasing the effectiveness of human resources management process, willingly using for this purpose atypical employment forms. Employers' willingness to use non-traditional forms depends on the existence of possible profits and savings compared to the traditional model of employment for an indefinite period of time. Available statistical data indicate that in the era of dynamic changes in economies and labor markets, the popularity of flexible employment forms has significantly increased.

2 Material and Methods

Age is one of the important characteristics of employees, determining their position in the contemporary labour market. Taking this into account, an attempt was made to determine the scale of flexible employment forms in the Visegrad countries by limiting the analysis to two age groups: young people aged 15-24 and older people aged 55-64. Such a choice of subpopulations results from the special position in the labour market of representatives of the young generation at the beginning of their professional career and those who have experienced a significant part of it. The choice of the Visegrad countries was dictated by their similar development level and direction of economic transformations.

The starting point for consideration is the analysis of an impact of processes occurring in the modern economic reality on employment. In addition to the comparative analysis of statistical data showing the scale of flexible employment in the research group, the paper also provides a brief description of the advantages and disadvantages of atypical employment forms considered from the employee's and employer's perspective.

In the research process, the main method used to identify research problems in the area of employment flexibility was desk research, which included the analysis of available literature sources, scientific publications and statistical data available in the Eurostat database.

It should be emphasized that the research has been conducted in order to initially determine the scale of phenomenon, which is necessary in the context of clarifying the scope of further research on workforce flexibility in the Visegrad countries.

3 The Growing Importance of Employment Flexibility in Globalization Conditions

The progressive globalization process has contributed to fundamental changes in the functioning of world economy, which becomes an increasingly complex system, including national economies linked not only by trade or capital flows, but also by complex investment, production or technological relationships. The consequences of these dependencies and relationships are noticeable in all areas of socio-economic life (Bogdanienko 2006, pp. 11-12; Grabowska 2012, p. 98).

The growing dynamics of globalization processes, which in fact means an increase in the internationalization of national economies, is reflected in changes occurring in national labor markets. This results from the relationship between the dynamics of economic growth and the employment situation. According to economic theory, the dynamics and structure of GDP determines the employment level and structure, and on the other hand the employment size and labor productivity affect the dynamics of economic growth.

While analyzing the globalization impact on the sphere of employment, it is necessary to pay attention to several phenomena that are at the basis of this process, i.e. scientific and technological progress, liberalization of the development conditions of international exchange and foreign investment. New technologies influence both the organization of production and employment relations, i.e. the shape of collective agreements and individual contracts. The effects of ICT development on employment include (Rydlewska 2020; IOE 2014):

- working time – there is a transition from permanent employment to the so-called flexible working time,
- workplace – change of the production process location favors the implementation of tasks outside the permanent workplace,
- employer-employee relationship – there is a deformation of the relationship between the employer and the employee,
- period of employment – employment related to the performance of task and terminated after its completion.

Liberalization of international trade conditions, improved access to new markets, strengthened international economic interdependence, as well as the expansion of multinational corporations, have significantly affected the sphere of employment. Through international production links, the system of orders for local companies, the above-mentioned corporations influence the situation in local labour markets. Above all, by shaping the demand for transnational labour they influence the size and structure of labour demand in national labour markets (Dach 2008, p. 252; Conen and Schippers 2019, p. 26)).

The situation in the employment sphere is significantly influenced by foreign investments, primarily those that result in the creation and development of local enterprises, e.g. supplying components or providing other services for a foreign investor.

It should be emphasized that the emergence and development of transnational corporations involves a higher level of competitive struggle to maintain or strengthen the company's position in both domestic and international

markets. Moreover, in order to compete successfully in modern conditions, the company must be globally competitive, even if it does not operate directly in international markets, because small companies now experience competition from global companies already in their local markets.

Therefore, the growing importance of competitiveness, innovation in the activities of companies has given rise to the need to increase the flexibility level of labor market. One of the important methods for enterprises to adapt freely to changing conditions is the use of atypical, flexible employment forms.

The concept of flexible employment is not unambiguous, as it may refer on the one hand to flexible organization of working time (its non-standard distribution), on the other to flexible, atypical employment forms (based on an atypical employment relationship). The use of flexible forms is determined by economic reasons (as one of methods to increase the effectiveness of companies), as well as by the fact that it is a way to reduce unemployment and an instrument that facilitates the reconciliation of work and family life.

However, most often flexible or atypical employment forms are presented as a counterbalance to the traditional (typical) form of employment, which is considered to be the provision of work (Kryńska 2007, p. 7):

- on the basis of employment contract for indefinite period of time,
- full-time employment,
- under permanent supervision of the employer,
- performed on the employer's premises,
- at specific, fixed times.

In other words, in the flexible model, the employment form and type of contract may be different than an employment contract for an indefinite period of time, the working time may differ from full-time employment, the place of employment may be different than the employer's seat, the regularity of employment may differ from work at specific hours, and the duration of employment may be different than long-term, continuous employment. This employment model is also characterized by less subordination of employees to the employer in favor of respect for autonomy and responsibility to work independently.

The basic types of atypical employment include (Bąk 2006):

- fixed-term contracts (for a specified period of time),
- part-time employment,
- self-employment,
- temporary employment (hiring of workers),
- freelance work,
- teleworking.

4 Research Results – Comparative Analysis

It should be emphasized that among the publicly available statistics, only limited information can be found on flexible forms of employment. For this reason, the analysis carried out in the article concerns only selected forms. Nevertheless, the analysis of the employment structure of EU countries shows the growing popularity of flexible employment.

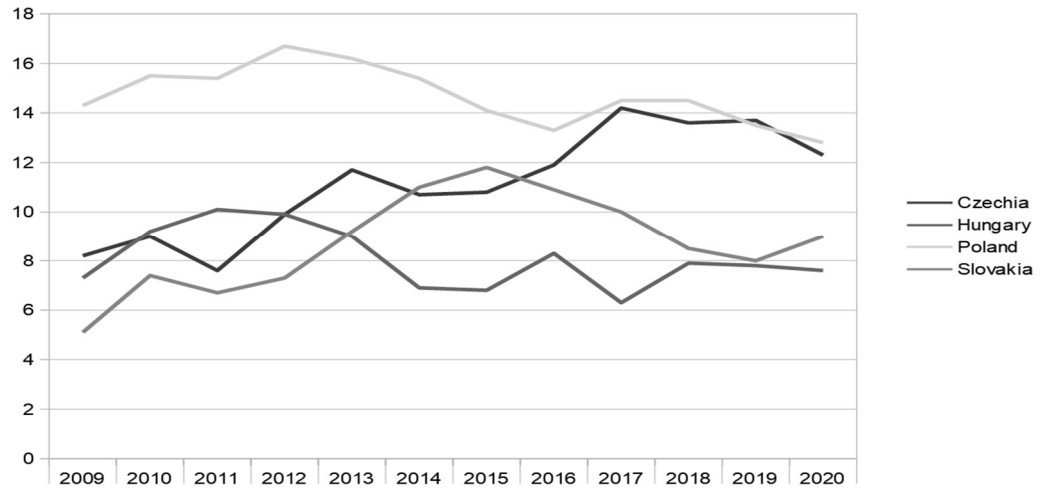
Using data on flexible employment forms by age group available in Eurostat statistics, a comparative analysis of the studied phenomenon has been carried out. The development of parameters describing employment flexibility has been based on the analysis of statistical data for countries belonging to the Visegrad Group.

One of the frequently used forms of flexible employment in the Visegrad countries is part-time work. The term 'part-time worker' refers to an employee whose normal hours of work, calculated on a weekly basis or on average over a period of employment of up to one year, are less than the normal hours of work of a comparable full-time worker (Council Directive 97/81/EC).

The analysis of data illustrating total use of this form of employment in the labor markets in the surveyed countries shows that several percent of employees were employed part-time. For example, in 2019 it was respectively 6,3 % in the Czech Republic, 4,4 % in Hungary, 6,1 % in Poland and 4,5 % in Slovakia. (Eurostat base). While in the Czech Republic, Poland and Slovakia a slight increase in the share of part-time workers was recorded over the last decade, a downward trend was recorded in Hungary. Part-time work is a solution that may be attractive for women who run a household, for learners, for people with family responsibilities other than looking after children, for young or elderly people who, due to their health condition, can only work in a limited working time. However, it should not be forgotten that many part-time workers are interested in full-time employment.

Young employees working part-time constitute a significant percentage of the employed population in Poland and the Czech Republic. However, the percentage of young Polish people working part-time has slightly decreased in the period 2011-2020, while among young Czechs this percentage has increased by 4.7 percentage points in 2020 compared to 2011. The percentage of young Hungarians and Slovaks working part-time is lower, with a decreasing trend in Hungary (Fig. 1). It is worth adding that in the group of young workers the highest employment rate is recorded in Poland, and Slovakia the lowest in the group of V4 countries.

Figure – 1 Persons aged 15-24 employed part-time - Percentage of total employment

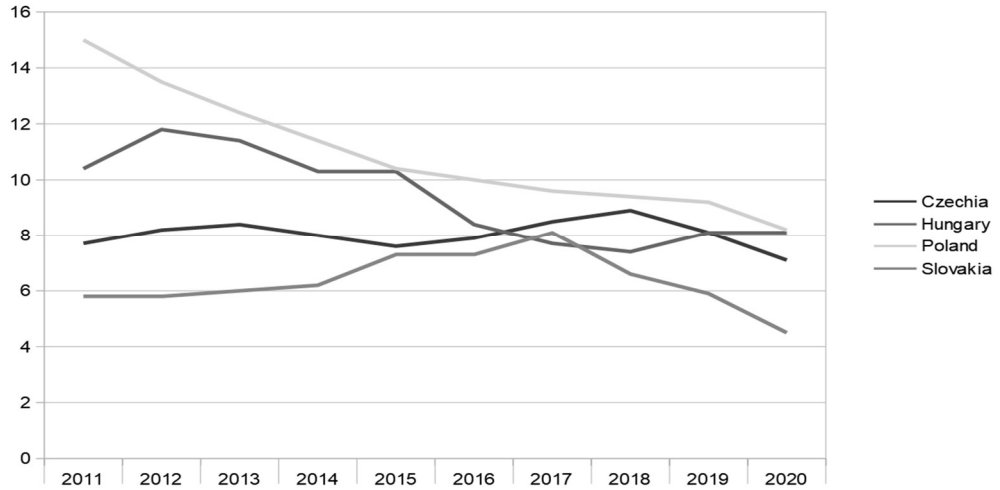


Source: own study based on Eurostat data.

Analysing the data in Figure 2, it is worth noticing that in recent years, the percentage of people in the 55-64 age range working part-time has not differed substantially in the Czech Republic, Poland and Hungary. However, in Slovakia the percentage is much lower. It is also important to note that during the analysis period, the most stable situation was in the Czech Republic with respect to the analysed variable, while in Poland a clear downward trend was observed. At the same time, it should be noted that in the group of older workers, the highest employment rate is in the Czech Republic, and in Poland - the lowest.

When comparing the data concerning the percentage of young and older people working part-time, it should be pointed out that this type of employment is more common for young people than for older ones in 3 member countries of the Visegrad Group, i.e. the Czech Republic, Poland and Slovakia. The situation in Hungary is similar in both age groups.

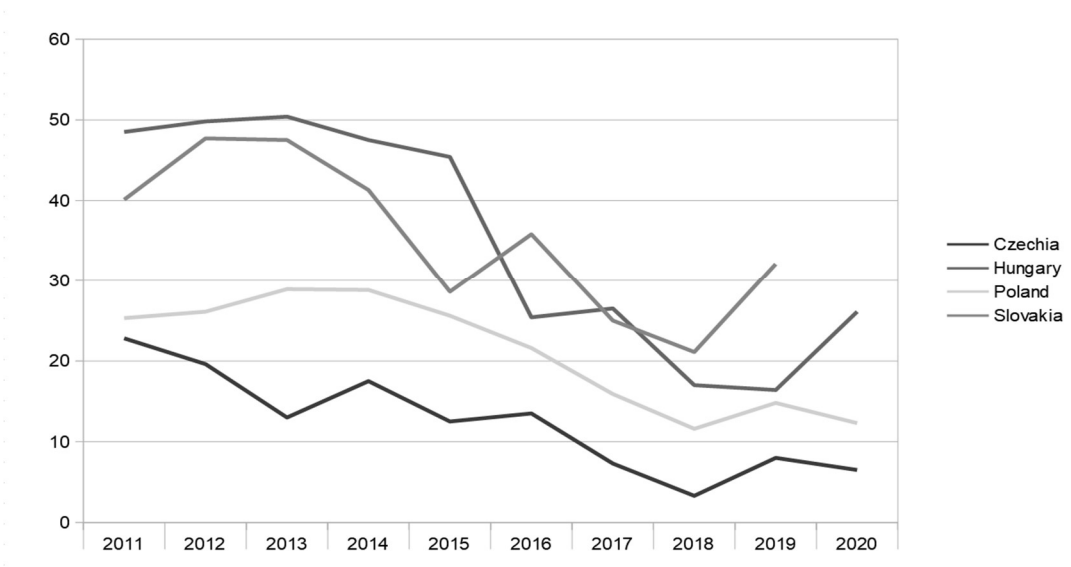
Figure – 2 Persons aged 55-64 employed part-time - Percentage of total employment



Source: own study based on Eurostat data.

Involuntary part-time work as percentage of the total part-time employment in the 15-24 age group is higher in Hungary and Slovakia than in Poland and the Czech Republic. In Poland and the Czech Republic, on the other hand, there is a noticeable decrease in the percentage of involuntary part-time employees (Fig. 3).

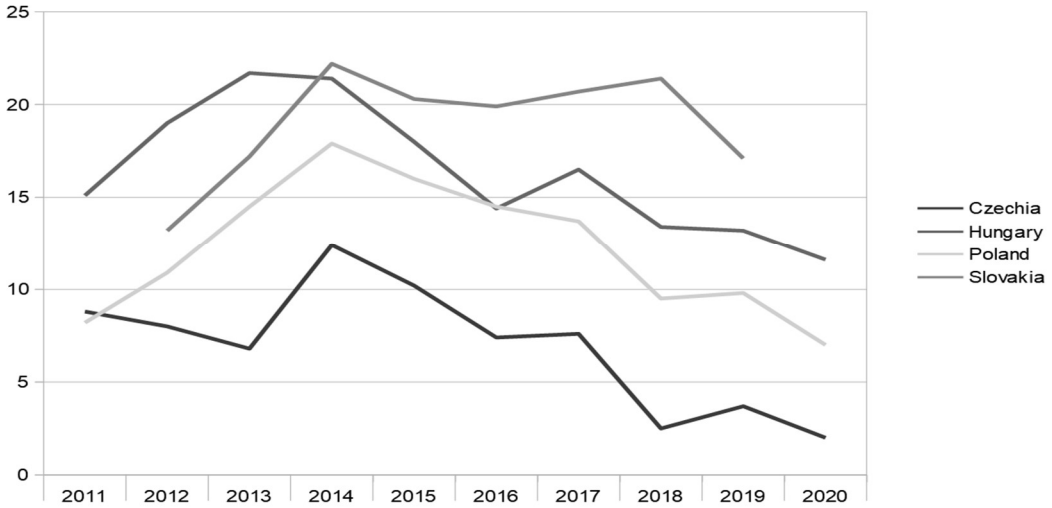
Figure – 3 Involuntary part-time employment as percentage of the total part-time employment, age group: 15-24 years



Source: own study based on Eurostat data

In the 55-64 age group, Hungary and Slovakia also have the highest percentage of people in involuntary part-time work, but it is worth noticing that this percentage is systematically decreasing. In the group of Polish and Czech older employees, the percentage of involuntary part-time work is much lower. At the same time there is a noticeable downward trend in the percentage of involuntary part-time employees in all analysed countries (Fig. 4).

Figure – 4 Involuntary part-time employment as percentage of the total part-time employment, age group:55-64 years



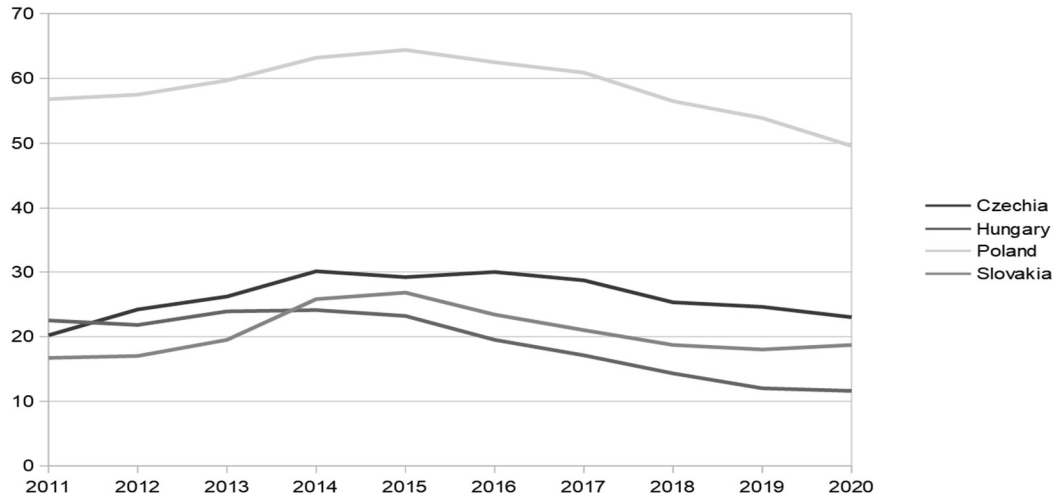
Source: own study based on Eurostat data

Larger differences between the studied countries are visible in the use of limited duration contracts. Eurostat data show that the percentage of people employed on a contract of limited duration has been very high in Poland for many years. For example, in 2019 nearly 54 % of Poles worked under this contracts, while in the Czech

Republic almost 25 %, in Slovakia 18 %, while in Hungary only 12 %. The mentioned differentiation between the studied countries is also visible in the analyzed age groups.

Analysing the situation of the Visegrad countries in terms of percentage of employees working under fixed-term contracts, it should be noted that in the group of young people (15-24 year-olds) the situation in Poland differs significantly from the other countries. Between 2011 and 2019, the percentage of young employees on fixed-term contracts ranged between 55-64%, decreasing to 49.6% in 2020. Hungary is at the other extreme in relation to Poland, as on the one hand, the percentage of young employees is much lower (3-4 times), and also clearly decreases in the analysed period. As for the Czech Republic and Slovakia, the variations in the percentage of employees on fixed-term contracts are smaller, with a downward trend observed since 2015 (Fig. 5).

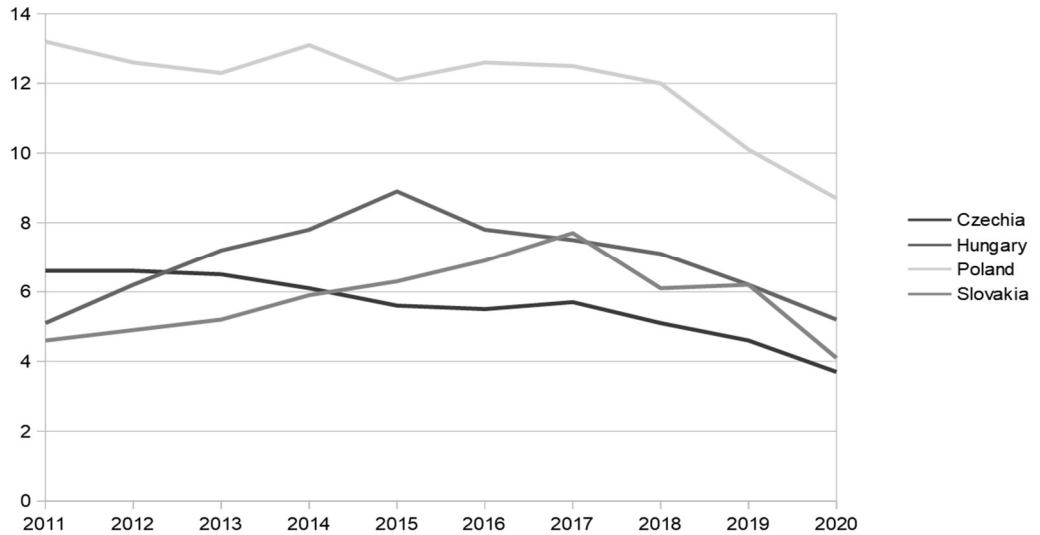
Figure – 5 Employees with a contract of limited duration – age group:15-24 years



Source: own study based on Eurostat data.

Fixed-term employees in the 55-64 age group represent a significantly lower percentage in their group compared to the group of young employees. At the same time, in this age group, as in the case of young people, the highest values of indicators are observed in Poland. Analysing the data, a downward trend can be observed in Poland and the Czech Republic. On the other hand, in Hungary and Slovakia rates are also decreasing, but one-off increases are visible (Fig. 6).

Figure – 6 Employees with a contract of limited duration – age group: 55-64 years



Source: own study based on Eurostat data.

According to the 2020 Employment Flexibility Index (LFMI Report: Employment Flexibility Index 2020), the Czech Republic was in the highest position in the group of V4 countries, being 8th among 41 EU and OECD countries. Hungary ranked 12th in the aforementioned ranking, while Poland was ranked 27th. The lowest result in this respect was recorded by Slovakia, taking 36th place. The data presented in the paper largely confirm the results of the elasticity index. In the Czech Republic, there is a downward trend in both age groups, both in terms of fixed-term work and the percentage of part-time forced labor.

5 Benefits and Costs of Flexible Employment Forms – Older and Younger People vs. Employers

The issue of flexibility with regard to the labor market is interpreted as the ability to adapt to new conditions in a dynamically changing market as well as the ability to adapt to new solutions that emerge. However, for employers and employees, this will mean something different. In the case of employers, flexible employment forms are associated with the need to adapt many areas of the company's operation, e.g. the production scale to the customers' demand. Employers using untypical forms of work in the assumption want to optimize the employment level, as well as reduce labor costs while improving the business efficiency. In the case of employees, the use of flexible employment forms will result in the necessity to adapt to new solutions emerging in the area of labour market, e.g. different time and place of work, new skills and qualifications.

It is worth emphasizing that, when considering the possibility of applying non-standard employment, it is crucial to know the nature of position and to adapt such a form in order for the new organization of work to bring notable benefits for both the employer and the employee. Therefore, on the part of an employer, it is necessary, above all, to determine the actual need for using a flexible form, resulting from the perception of certain problems or organizational challenges, and to investigate the possibility of applying such a solution, e.g. in terms of legal conditions. In the case of an employee, it is necessary to determine the possession of sufficient qualifications, predispositions and motivation to take up employment in the system of flexible forms.

Among the general social benefits related to the use of flexible employment forms, the most often indicated is the increase in professional activation of people and the creation of additional jobs, and thus reducing unemployment. In particular, such effects concern people with difficult access to the labour market or at risk of labour market exclusion, e.g. people with disabilities, elderly, long-term unemployed. It is emphasized that flexible employment forms allow to:

- enter or return to the labour market of persons after a longer absence, e.g. women after parental leaves;
- introduction into professional life of young people without professional experience;
- reconciliation of work and non-work duties, e.g. studies, care for a dependent person;
- gaining work experience, developing competences and making contacts through working in many companies, which is often the first step to gaining a satisfying job.

The observed increase in popularity of flexible employment forms is mainly due to the advantages they bring to both the employer and the employee. However, at the same time, the spread of flexible employment brings with it certain risks. Table 1 presents examples of advantages and disadvantages of flexible employment forms.

Table – 1 Consequences of flexible employment forms from the employee's and employer's perspective

Consequences of flexible employment forms from the employee's perspective	
Advantages	**Disadvantages**
– increase in employment opportunities, – possibility to work for more than one employer, – greater freedom to choose the type and place of work, – possibility to adjust working time to individual needs, – easier compatibility of professional and family life, – maintaining contact with the labour market, especially by the long-term unemployed, – gaining professional experience, mainly by people just entering the labour market, – greater individual responsibility and independence in organizing work, – easier and smooth withdrawal from the labour market by the elderly	– lack of effective legal protection related to remuneration for work, – financial burden related to the necessity of self-training and acquiring necessary skills, – low possibilities of employees' unions, – lack of certainty regarding the stability and continuity of received orders and jobs, – lack of possibility to exercise employment rights, e.g. the right to leave, – worse access to vocational training organized by the employer, – risk of work interfering with private and family life, e.g. by using the place of residence to perform professional tasks

Consequences of flexible employment forms from the employer's perspective	
Advantages	**Disadvantages**
– reduction of labour costs by reducing tax burdens and social security contributions, – reduction of costs for the company's functioning or costs incurred for the creation of workplaces, e.g. by eliminating or reducing the costs of renting and/or maintaining an office, – more effective adaptation of the state and structure of employment to the company's needs, – reduction of costs and expenses related to the company's HR policy, i.e. training and recruitment of employees, – reduction of burdens related to termination of employment, – better use of the employees' work potential, – possibility of performing non-standard and timely works, – possibility of cooperation with highly qualified specialists in various fields, – possibility to hire employees from regions where labour costs are lower	– lower control of the employee's effort and honesty, e.g. when outsourcing work from home, – short-term nature of the relationship, which results in a lack or low degree of employee identification with the company, which can reduce motivation to work, – need for more frequent employee training, – difficulty in determining an adequate remuneration, – lack of guarantee for the employer as to the timeliness and quality of execution of orders

Source: [Kalinowska, Kujszczyk, Mańturz, Świerszcz 2019, pp. 11-12; Sekuła 2001, pp. 105-107; Fiedor, Matysiak 2006, p. 118].

There is no doubt that the increase in flexibility of employment allows to minimize the costs of matching the labour supply to its demand in structural and quantitative terms, which favors the emergence of advantages both for employers and employees. From the point of view of young people, flexible employment forms allow for gaining experience, freedom in choosing the workplace or accelerating professional development. However, at the same time there is a lack of social security and employment stability, which results in postponing important decisions, e.g. concerning having children.

In the case of older people, who have already experienced a significant part of their professional life, flexible employment forms cause fear and anxiety through the lack of job security, lack of guarantee of stable and decent income, or reduction of the social protection level. The subject literature contains opinions that flexible employment forms carry the risk of dehumanization of work, as their use is associated with the occurrence of the following circumstances (Skowron-Mielnik, 2008, pp. 63-66):

- increase in the intensity of work per unit of time, which increases the level of employee psychophysical fatigue;
- extension of working time beyond the standard 8 hours, which leads to an increase in the risk of occupational accidents;
- deregulation of work and non-work life due to difficulties in synchronizing work with personal life in the lack of fixed working hours;
- impeded social integration and communication problems in the workplace due to asynchronous attendance;
- physical burden due to prolonged working hours and/or mobility, accompanying multi-site working;
- psychosocial burden due to changing tasks;
- increased employee responsibility for consequences of actions, need for constant decision-making, and coordination of work and non-work life.

6 Conclusions

Despite the growing importance of flexible employment forms in the modern world, the possibility of analyzing the scale of their use in Europe is limited, due to the small scope of data. Based on international statistics, it is only possible to investigate such forms of employment as part-time job, work based on fixed-term contracts and self-employment.

Undoubtedly, flexible employment forms can be both an alternative to traditional forms and a complement to them. It is particularly important in those groups of employees who are most exposed to exclusion on the labour market, in particular due to age or health condition. As can be seen from the analysis of the Visegrad countries,

the level of using flexible employment forms differs in individual countries and also varies among the analysed age groups. It should be noted that both the percentage of fixed-term contracts and part-time jobs is higher among young workers than among older ones.

On the one hand, it can be seen that the percentage of part-time employees aged 15-24 was definitely higher in Poland and the Czech Republic in relation to Slovakia and Hungary in the analyzed period. On the other hand, the share of part-time workers in the group of older people aged 55-64 was higher in Hungary and Slovakia. It is worth emphasizing that taking up part-time work may result from the inability to take up employment on more satisfactory terms, and this applies to everyone, regardless of age. When it comes to the use of contract of limited duration in the surveyed countries, Poland has a significant advantage over other countries in the Visegrad Group.

Moreover, both young and older employees in Poland have the highest proportion of flexible employment forms in terms of temporary contracts and part-time jobs. The conducted analysis also shown, both the percentage of fixed-term contracts and part-time work is higher in the group of young workers than in the group of older workers in all surveyed countries.

Thanks to greater flexibility, both employees and employers have greater freedom in adjusting the employment relationship to the specificity of work, as well as to changes taking place in the economy, including the labor market. Improving flexibility does not have to involve the use of atypical forms of employment, but may result from changes in the lifting of stiffening, e.g. in the area of the permissible number of fixed-term contracts or the manner of dismissal.

Conclusions from the analysis are limited, due to the small scope of statistical data on flexible employment forms included in public statistics. However, taking into account the growing dynamics of globalization processes, it is possible to expect the development of atypical employment forms as a solution allowing businesses to adapt more quickly to the changing market environment.

References

[1] BĄK E. (2006). *Elastyczne formy zatrudnienia*, Biblioteka Monitora Prawa Pracy, Warszawa: C.H. Beck.

[2] BOGDANIENKO J. (red.) (2006). *Firma w otoczeniu globalnym*, TNOiK, Toruń , pp. 11–12.

[3] CONEN W., SCHIPPERS J. (2019). *Self-Employment as Precarious Work. A European Perspective*, Cheltenham, UK: Edward Elgar Publishing, p. 26.

[4] Council Directive 97/81/EC of 15 December 1997 concerning the Framework Agreement on part-time work concluded by UNICE, CEEP and the ETUC; https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31997L0081&from=PL

[5] DACH Z. (2008). *Przemiany współczesnych rynków pracy*, Zeszyty Naukowe Polskiego Towarzystwa Ekonomicznego, nr 6, Kraków, pp. 249–263.

[6] FIEDOR B., MATYSIAK A. (2006). *Niepewność i ryzyko na elastycznym rynku pracy* [w:] *Problemy zatrudnienia i rynku pracy w Polsce i Unii Europejskiej*, red. Nauk. B. Fiedor, G. Dieckheur. Prace Naukowe Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, nr 1138, p.118.

[7] GRABOWSKA M. (2012). *Flexible Employment Forms as an Element of Flexicurity*, Journal of International Studies, Vol. 5, No 2, p. 98.

[8] IOE (2014). *Flexible Forms of Work*, https://www.ioe-emp.org/fileadmin/ioe_documents/publications/Policy%20Areas/employment/EN/IOE_Flexible_Forms_of_Work_eng_06_03.pdf

[9] KALINOWSKA I., KUJSZCZYK B., MAŃTURZ M., ŚWIERSZCZ B. (2019). *Elastyczne formy zatrudnienia* Wojewódzki Urząd Pracy w Warszawie, Warszawa, pp.10-13.

[10] KRYŃSKA E. (2007). *Elastyczność zatrudnienia na polskim rynku pracy*, Polityka Społeczna nr 11-12, p.7.

[11] SKOWRON-MIELNIK B. (2008). *Zagrożenia ze strony elastycznych form zatrudnienia i organizowania pracy* [w:]: C. Sadowska – Snarka (red.), *Elastyczne formy pracy. Szanse i zagrożenia*. Białystok: Wyższa Szkoła Ekonomiczna w Białymstoku, pp. 63-68.

[12] LFMI Report: *Employment Flexibility Index 2020*, https://for.org.pl/pliki/artykuly/7835_komunikat-12020indeks-elastycznosci-zatrudnienia-2020-jeden-rozmiar-nie-jest-dla-wszystkichpdfraport-lfmiemployment-flexibility-index-2020.pdf

[13] RYDLEWSKA D., *Wpływ globalizacji na rynek pracy*, http://www.psz.pl/tekst-2020/Wplyw-globalizacjina-rynek-pracy.

[14] SEKUŁA Z. (2001). *Planowanie zatrudnienia*. Oficyna Ekonomiczna. Dom wydawniczy ABC, Kraków, pp. 105-107.

Impacts of COVID-19 on Trade in Border Areas

Michaela Petrová[1], Martina Krügerová[1], Michal Kozieł[1]

[1] VŠB – Technical University of Ostrava
Faculty of Economics
Department of Law
Sokolská 33, 702 00, Ostrava, Czech Republic
michaela.petrova@vsb.cz, martina.krugerova@vsb.cz, michal.koziel@vsb.cz

Abstract

The coronavirus pandemic has affected many segments and supplier relationships are no exception. Typical dangers in the delivery of goods are, above all, the risk of loss and the risk of damage, which is associated with the subsequent delay of the debtor in fulfilling the obligation to the creditor. However, at the time of the pandemic, the risk of delays or non-compliance increased due to the unexpected fact that the business relationship was affected by restrictions on cross-border transport. The advantage is that the parties use the Incoterms delivery conditions, which define the obligations of the seller and the buyer, are internationally recognized rules, and thus reduce the legal risks of the parties. The question arises, as is the case with the relationship between pandemic, delivery terms and liability in international trade when using Incoterms delivery terms. The authors assess the effects of the pandemic on mutual trade in general and subsequently on the example of traders between the Czech Republic and Poland. They also assess the situation in which, in the event of a pandemic, force majeure clauses can be invoked, as the pandemic or restrictions associated with the pandemic can be considered. While at the beginning of the pandemic in February and March 2020 it was possible to apply the impossibility of performance due to force majeure, at a later stage this cannot be done, but it is always necessary to examine the detailed conditions of the business relationship.

Keywords: *COVID-19, Delivered at Place, Incoterms, international trade*

JEL Classification: *F13, F36, F53, K33*

1 Introduction

In today's difficult situation, when the coronavirus pandemic affected the whole world, individual states were forced to introduce various temporary measures, mainly in the form of restrictions on the movement of persons and the crossing of state borders. These included bans on arrival and departure, mandatory testing, ordered quarantine and other restrictions. All these restrictions have had to have an impact, negative on international trade and the world economy in general. Tourism and education are experiencing an unprecedented crisis, but trade in goods has also been affected (WTO, 2020), with an impact on transport services, information, and transaction costs. The globally exceptional situation has brought not only problems, but also a high degree of loyalty and great support from stakeholders, which cannot be taken for granted in the circumstances. In the first quarter of 2020, Euler Hermes downgraded the risk rating of a record 126 industries, and in the second quarter even in 325 cases. (Euler Hermes, 2020a, 2020b). This is the highest overall rating downgrade since 2016, from which the company performs regular monitoring. All downgrades have a direct or indirect link to the proliferation of Covid-19 and the closure of individual countries. According to Euler Hermes (2020a), the sectors of transport, automotive, electronics manufacturing and retail appear to be the riskiest. "*The downgrade did not escape the Czech Republic either, which received a worsened rating in the sectors of textiles, manufacturing and wholesale of equipment for households, mechanical engineering, the automotive industry, transport, construction and metal.* " Euler Hermes (2020b).

The worst situation for the Czech Republic occurred in April and May 2020 (CZSO, 2020a). The first wave of a pandemic broke out in Europe in February, and there was a first closing of the border between the states affected. The consequences of these measures did not take long, and in April the Czech Republic had the lowest value of the balance of foreign trade in goods since joining the EU - a negative value of -24.7 billion CZK. *"The highest year-on-year declines occurred in April and May on the export side. Due to the reduction of part of production, exports decreased by 38.0% in April and by 28.9% in May. Decreases in the value of imports of goods were then by 26.4%, respectively by 23.2%."* (CZSO, 2020a). The article deals with the impact of Covid-19 on mutual trade between the Czech Republic and Poland. Poland is an important trading partner with which the Czech Republic has been trading for a long time. Poland is also the third most important trading partner in terms of exports, after Germany and Slovakia. At the same time, many companies from the Polish border also do business in the Czech Republic, and vice versa.

The aim of the article is to show, by way of example, the impact of the Covid-19 pandemic and the measures introduced in connection with the pandemic on commercial relations in the nearby Czech-Polish border. What was commonplace before February 2020, as governed by the INCOTERMS clauses, was, after the outbreak of the pandemic, an obstacle for many, which placed them, from a legal point of view, in the unflattering position of debtors unable to meet their contractual obligations. However, like the pandemic itself, the view of the trade relations affected by the pandemic has gradually evolved. Society and business practice have tried to deal with this phenomenon.

1.1 Literature Review

Several authors have analysed the effects of Covid-19 in their studies. The effects of the pandemic on international trade are being investigated by Curran et al. (2021), when assessing the compatibility of individual trade policy interventions with WTO law. Ferreira et al. (2021) examine the dependence of the demand for insignificant goods and services on global gross domestic product. The results of their study show that with a drop in demand of 50%, gross domestic product will also fall by 23%. However, they also point to indirect effects of the pandemic, such as changes in supply chains, changes in purchasing systems. It also mentions indirect effects related to the reduction of intermediate consumption and the redistribution of income.

The effects of the pandemic on logistics and transport were examined in a study by Zhang et al. (2021) with the resulting differences between countries and regions. The steps taken vary both in the regions and in the industries, and thus the individual impacts. Based on the analysis of "triple hit - supply disruptions, supply contagion and demand disruptions", Castañeda-Navarrete et al. (2021) explain the differentiated effects of the pandemic on the global clothing industry and the deepening of the unequal distribution of profits and losses. Tardivo at al. (2021) outline the necessary steps to increase the competitiveness and resilience of rail transport in crises that may arise in the future. Road haulage, although the transport of goods was exempted under the restrictions, also faced the consequences of closing the border due to Covid -19 also inland. This was caused by border controls or compulsory quarantine for drivers. Long columns were often formed, and drivers had to prove themselves, for example, with a negative Covid-19 border crossing test. As a result, delivery times have often been extended.

Since the beginning of the pandemic, many of the effects of this unprecedented situation on the functioning of states, their democratic institutions and legal systems have had to be addressed. It is for this reason that the European Law Institute (ELI) has published a summary of some important legal issues that arise in relation to Covid-19. In order to preserve democratic values and the rule of law, everything has been summarized in a total of 15 principles, which should serve as a guide for not only European states. (ELI, 2020). There are also principles for force majeure and hardship. In this area, it is recommended that states ensure that existing law on impossibility or force majeure applies in an effective way and provides reasonable solutions. So far, we do not come across any definitive and globally acceptable definition explaining force majeure. However, several different individual definitions have developed, which indicate that these are unexpected external conditions that hinder the performance of the contract (Nwedu, 2021). Due to the inconsistent definition, it is difficult to say what such a clause entails in theory and practice. Precisely because of the uncertainty as to whether a pandemic can be included in the definition of force majeure, some countries, such as China or Italy, have started issuing so-called "force majeure certificates". (Ferrante, 2020). Khanderia (2020) states that it is thanks to these certificates that entrepreneurs can solve problems with non-performance of contracts due to the outbreak of Covid-19. This means that such agreements will be considered impossible to fulfil regardless of the law chosen by the parties.

Can Covid-19 be considered force majeure? At the time of the pandemic, Covid was recognized as a force majeure in contracts around the world and in various sectors. A pandemic meets the criteria of unpredictability and uncontrollability, mostly generally contained in legislation around the world. But now we are at a time when we have learned to live with a pandemic and can consider it an everyday situation. In the framework of contracts concluded during a pandemic, we cannot expect Covid-19 to continue to be considered force majeure. Just as recourse to force majeure currently is no longer a guarantee of recognition. Nwedu (2021) himself states that it is increasingly unlikely that an appeal to force majeure could prevail today. In the current situation, the ongoing pandemic does not meet us with signs of force majeure such as unpredictability or uncontrollability.

2 Material and Methods

Statistical data on the development of exports are obtained from the official data of the Czech Statistical Office in the years 2005-2020. The data illustrates the development of foreign trade in comparison with the year of the pandemic due to the introduced restrictions. The authors also use scientific methods to assess the application of force majeure to the case of a coronavirus pandemic.

2.1 Model and Data

It has been more than a year since Europe became the epicentre of the Covid-19 pandemic. From mid-March 2020, countries began to implement various anti-epidemic measures in an effort to prevent the further spread of the virus, then not yet known. Individual countries began to close not only shops, services, schools, and kindergartens, but also their borders (see Figure 1). For fear of the transmission and further spread of the virus, everyday life in Europe has stalled.

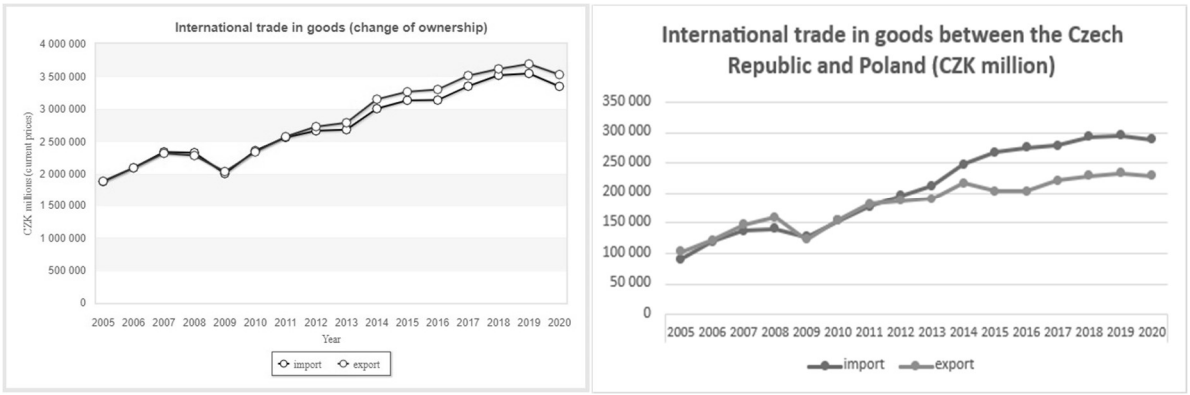
Figure 1 – Border closures due to Covid-19 at the end of March 2020

Source: Pew Research Center, 2020

The Czech Republic closed its borders on 16 March 2020 (Government of the Czech Republic, 2020). Poland closed its borders on March 15. However, these closures did not apply to the transport of goods, which were covered by exceptions. At that time, these measures, often implemented overnight, caused chaos and uncertainty in otherwise established business practices. There were no uniform and predictable rules, so the common situation was that someone who went abroad was no longer able to return, or his return was automatically associated with a mandatory 14-day quarantine. Another border closure occurred during the so-called second wave of the pandemic. Poland closes its borders on February 20, 2021 (Poland Considering Partial Closure at Czech, Slovak Borders - Health Min, n.d.). Border closures, border controls, testing, quarantine have caused congestion and delays in cross-border freight transport. Of course, sea and air transport have also been affected, but if we focus on trade between the Czech Republic and Poland, these modes of transport are now irrelevant.

Pandemics and related restrictions have affected the development of foreign trade. In Figure 2 we can see how foreign trade in goods in the Czech Republic has developed over the last 15 years. The Czech Republic was worst off in 2009, which is a result of the impact of the economic crisis, which caused a reduction in consumption throughout Europe. And another decline is observable in 2020, when the coronavirus epidemic just broke out.

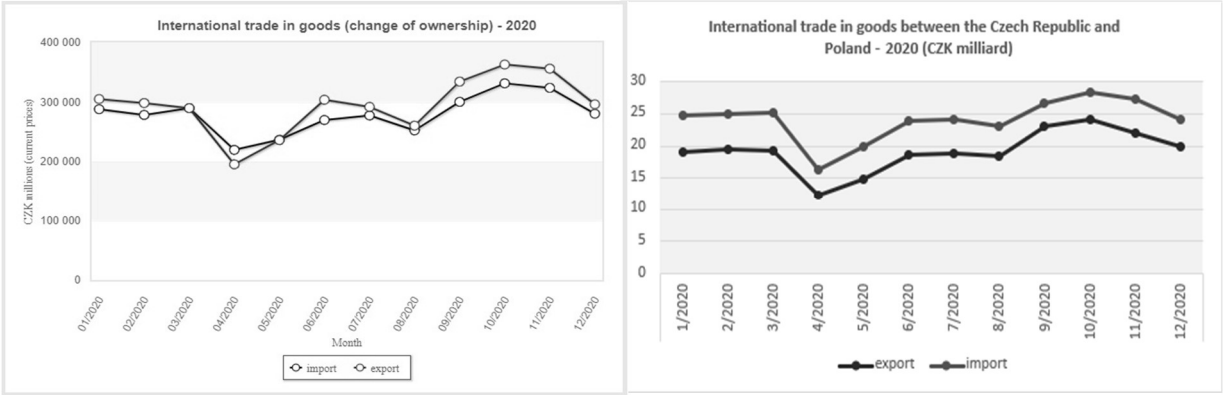
Figure 2 – Development of foreign trade in goods in the Czech Republic and between the Czech Republic and Poland



Source: CZSO, 2020b, own processing

In Figure 3 we see the development of foreign trade in 2020 - the year of the pandemic. The biggest drop was during the first wave of the pandemic - in March, April, and May, when the borders were closed for the first time, creating an unprecedented situation for all entrepreneurs. The anti-epidemic measures in place affected both exports and imports. During the summer, the situation in the Czech Republic began to deteriorate, which was again reflected in a decline in exports and imports. From October, there was another decline due to the beginning of another, already the second, wave of the pandemic.

Figure 3 – Development of foreign trade in goods in the Czech Republic in 2020 and between the Czech Republic and Poland in 2020



Source: CZSO, 2020b, 2020c, own processing

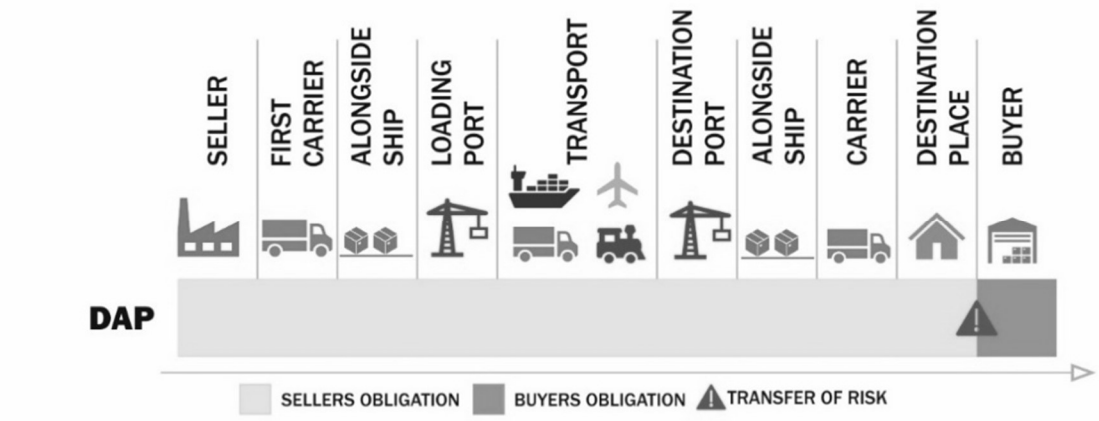
As far as Poland is concerned, the decline in exports for last year 2020 was not so rapid - it reached 237.5 billion EUR, which is only 0.3% less than in 2019. Compared to other European Union countries, Poland performed very well (Germany - fall of 9%, Netherlands - fall of 7%, France - fall of 16%, Italy - fall of 10%, Spain - fall of 10%). Polish companies were able to react very quickly to the restrictions imposed and found new distribution channels. Imports were not bad either - the value of imports fell by 4.8% to 225.5 billion EUR. (MRPT, 2021)

Let us apply the acquired knowledge to the real case also in connection with the agreed delivery condition Incoterms. A trader in construction materials from Poland concluded a purchase agreement with a construction company from the Czech Republic. The condition INCOTERMS DAP 2020 was agreed, where the place of delivery was a construction near Ostrava in the Czech Republic. The trader from Poland therefore bore all the risks associated with the delivery of the goods. The purchase contract was concluded on 15.2.2020 with a delivery date of 31.3.2020. During March 2020, the global situation in connection with the Covid-19 pandemic

deteriorated significantly and the borders between Poland and the Czech Republic closed unexpectedly. The trader from Poland was therefore unable to fulfil his obligation when his driver was prevented from crossing the Czech-Polish border on 31.3.2020.

The Incoterms 2020 delivery condition is used in the contract of carriage, specifically the DAP clause - Delivered at Place (see Figure 4). Under normal circumstances (without the occurrence of the Covid-19 pandemic), the DAP clause would clearly address the situation. A trader from Poland would be liable for a delay in the delivery of goods if his duty was to deliver the goods until DESTINATION PLACE. If he did not do so, he did not fulfil his obligation and is thus liable for the damage.

Figure 4 – DAP clause, Incoterms 2020



Source: ICC, 2019, own processing

The authors discuss the possibility of whether force majeure clauses can be used in situations such as the current pandemic. Since in the case of force majeure we are talking about unpredictable and insurmountable circumstances, the question arises here whether the entrepreneur can invoke this clause. Force majeure can be regulated either in the contract, in practice, which was introduced by the parties, or last but not least in the law. If the contracting parties adjust the rules of application of force majeure to their contractual relationship directly in the contract, the procedure regarding the principle of contractual freedom shall be in accordance with these contractual provisions (Hulmák et al., 2014). If we rely only on practice, we can very easily get into a situation where we will not be able to prove this practice. As mentioned above, the Covid-19 pandemic is an unprecedented situation, and as entrepreneurs have not yet encountered this situation, it will not be possible to refer to established practice. This variant comes into consideration only later, when the pandemic broke out in full, and entrepreneurs had to respond to this situation by introducing a practice among themselves that responded to the situation. However, it can also be assumed that entrepreneurs will already remember this situation and will also adjust it in their contracts.

Whether force majeure is agreed in the contract or not, it is possible to refer to the Czech Civil Code in the event of non-compliance with obligations under Czech law. Although force majeure is not explicitly defined in Czech law, a guide can be found in § 2913 (2) of the Civil Code, which gives us a situation like force majeure as one of the liberation reasons for the obligation to pay damages. "*A tortfeasor is released from the duty to provide compensation if he proves that he was temporarily or permanently prevented from fulfilling his contractual duty due to an extraordinary, unforeseeable and insurmountable obstacle created independently of his will…*" Thus, the law does not directly use the concept of force majeure, but describes the obstacle as unpredictable and insurmountable, which arose independently of his will. The definition of what is force majeure can be found in Czech and European judicial case law, for example in the Decision of the Czech Supreme Court 23 Cdo 3066/2010: "*An exclusionary circumstance is an obstacle which has arisen independently of the will of the obligated party and prevents it from fulfilling its obligation, unless it can be reasonably assumed that the obligated party would avert or overcome this obstacle or its consequences, and that at the time the obligation arises foresaw this obstacle*."

To summarize the solution of our example, it is first necessary to know the exact contractual documentation, if it has been concluded, and the established practice. If the contract with the DAP clause was concluded before the imposition of restrictive measures and the parties could not know that these measures would be imposed, then the Polish trader may refer to force majeure in connection with the unexpected closure of the borders. However, if the contract was concluded after the introduction of the restrictive measures, or the parties were aware of the potential introduction of a border crossing and this could be expected, it can no longer be argued in this case that this is an unforeseeable obstacle. In this situation, therefore, the liability under the DAP clause will be applied classically and the Covid-19 pandemic will no longer affect this contractual relationship from the point of view of the right. However, these rules must always be interpreted regarding the specific facts of the case, contractual arrangements, and the specifics of a particular commercial relationship. Nwedu (2021) also considers the question whether a subsequent act, already performed by a person (government measures, etc.), can also be described as force majeure in the event of a breach of a contractual obligation. However, the specifics of concluded contracts and the legislative system of the relevant state or country come into play here.

It follows from the above that it would be appropriate for Incoterms clauses to remember in the future also the above-mentioned pitfalls associated with force majeure (specifically the pandemic). An effective force majeure clause should therefore include a framework of force majeure events. A separate set of questions sets out the obligations arising from the contract for the contracting parties to the contractual penalty.

3 Results and Discussion

From the data on the development of foreign trade in 2020, we can conclude that the world pandemic had an impact on the development of both exports and imports. However, on the other hand, it was found that not every country had such large declines. An example is Poland, which has been able to react quickly to the current restrictions. It was through a rapid response and new distribution channels that they were able to mitigate the impact of the pandemic on the national economy. The World Trade Organization itself has come up with proposals for the current crisis, but also for possible future crises. It emphasizes cooperation between states in the form of exchanging information on experiences, the negative effects of the restrictions imposed. The G20 ministers supported the idea of developing guidelines for the cross-border movement of people, which could apply in the event of similar crises, to allow at least the necessary trade routes. (MPO, 2020). Curran et al. (2021) also point out that a precise assessment of interventions requires a sectoral approach.

The above example shows that the greatest uncertainty in trade in the Czech-Polish border areas was at the beginning of the pandemic in February and March 2020, when entrepreneurs faced an unprecedented situation that caused uncertainty. Later declines in exports and imports were rather associated with nationwide restrictions on service operations when demand for goods also fell. In the following waves, precise rules were already set, and entrepreneurs adapted to these rules without any major problems, which, on the contrary, cannot be said of the initial phase of the Covid-19 pandemic.

The introduction of restrictions and the subsequent closure of borders did not only have negative effects. All these measures have encouraged economic operators to come up with innovative solutions to minimize trade distortions. In its report, the WTO (2020) highlights, for example, the introduction of alternative conformity and compliance assessment measures, such as online tools for certificate verification, remote control via video links and verification through documentary analysis instead of on-site visits.

4 Conclusion

The restrictions that have been and still are being introduced because of the global Covid-19 pandemic must always be assessed comprehensively and in context. While the first drop in exports and imports was caused not only by the closure of all service establishments, but also by a drastic restriction on the movement of people across borders. Further declines in exports and imports were rather due to a renewed reduction in service establishments, but restrictions on the movement of people contributed minimally to these declines. As follows from the above example, entrepreneurs in the Czech-Polish border area had to react very quickly to the introduced restrictions, for which they were not prepared and were not informed about them in advance. Similarly, in the first wave of a pandemic, national governments were looking for ways to reduce or slow down the pandemic. This has often been associated with severe restrictions for both entrepreneurs and consumers. Various limitations have been tried, and exceptions have been accepted very slowly and not exactly conceptually. From today's point of view, it is possible to evaluate the period somewhat chaotically, however, at the beginning of the pandemic, no one had the experience we have now, so it was necessary to look for the ideal solution.

Restrictions on travel and mobility, even if only temporarily, have significant trade implications, as cross-border human mobility is a key intermediary for trade in goods and services and an important type of trade in services (WTO, 2020). The CNB (2020) states that the closure of borders has resulted in a sharp decline in supply and demand, leading to an unprecedented decline in GDP in individual countries as well as in entire regions. The overall situation made trade in goods slower, more expensive, and uncertain, and affected the functioning of value chains. The situation also had a negative effect on the conclusion of new contracts, as the situation prevented direct contacts and access to some information. WTO members (WTO, 2020) are also aware that international mobility often promotes trade with the countries of origin of foreign nationals.

In the articles, we often encounter the opinion that once the pandemic begins to subside, we must assess the reactions of individual states and what effects they have had on trade, but also on society. The exchange of information will be important not only between organizations and stakeholders, but also the analysis of academics and scientists. From the point of view of international trade, it will also be appropriate to assess the readiness of contractual relations, Incoterms delivery conditions, so that in the future they will also remember the above-mentioned pitfalls associated with force majeure (specifically the pandemic).

The authors are aware of the fact that the problems associated with a pandemic are very topical, and this issue is evolving dynamically over time. The reactions of individual states are also evolving, and what was considered a suitable solution a year ago would not currently have to pass the test of the adequacy of public intervention in fundamental rights. The same will be true in the future when the solutions adopted now in a year or two in connection with the experience gained may no longer succeed. The authors therefore consider it appropriate to return to the issue in future publications and assess it in other contexts.

Acknowledgements

This research was financially supported within the VŠB–Technical University SGS grant project No. SP2021/74 (Minimization of Risks Related to the Delivery of Goods Against the Background of the Use of INCOTERMS 2020). We thank the co-researchers Varčoková J., Hradilová T., Kubenková V., Novosadová A., Kovářová V., Zahrajová K. for assistance in obtaining and preparing data.

References

[1] Act No. 89/2012 Sb., the Civil Code, as amended.

[2] CASTAÑEDA-NAVARRETE, J. et al. (2021). COVID-19's impacts on global value chains, as seen in the apparel industry. *Development Policy Review*,

[3] CNB (2020). Mezinárodní obchod se zbožím v čase nástupu koronavirové pandemie z pohledu ekonomických region [online]. [cit.2021-05-27]. Available from https://www.cnb.cz/cs/o_cnb/cnblog/Mezinarodni-obchod-se-zbozim-v-case-nastupu-koronavirove-pandemie-z-pohledu-ekonomickych-regionu/

[4] CURRAN, L. et al. (2021). The trade policy response to COVID-19 and its implications for international business. *Critical Perspectives on International Business*, Vol. 17(2), pp. 252–320.

[5] CZSO (2020a). Pandemie koronaviru rozkolísala zahraniční obchod [online]. [cit.2021-04-16]. Available from https://www.czso.cz/csu/czso/pandemie-koronaviru-rozkolisala-zahranicni-obchod

[6] CZSO (2020b). Zahraniční obchod – statistiky [online]. [cit.2021-04-16]. Available from https://www.czso.cz/csu/czso/zo_se_zbozim_podle_zmeny_vlastnictvi_narodni_pojeti

[7] CZSO (2020c). Zahraniční obchod – statistiky [online]. [cit.2021-04-16]. Available from https://www.czso.cz/csu/czso/cri/zahranicni-obchod-se-zbozim-s-polskem-v-letech-2015-az-2020

[8] Decision of the Czech Supreme Court of 25 January 2012, Ref. No. 23 Cdo 3066/2010, ECLI:CZ:NS:2012:23.CDO.3066.2010.1. [online]. [cit.2021-04-20]. Available from https://www.nsoud.cz/Judikatura/judikatura_ns.nsf/WebSearch/5DA260D4813EA0FEC1257A4E0067C163?openDocument&Highlight=0

[9] ELI. (2020). ELI Principles for the COVID-19 Crisis [online]. [cit.2021-05-10]. Available: https://www.europeanlawinstitute.eu/news-events/news-contd/news/eli-publishes-principles-for-the-covid-19-crisis/?tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&cHash=32885703f7c5c5e3a1b4f6753c6c73e2

[10] EULER HERMES (2020a). Euler Hermes snižuje rizikový rating 18 zemí a 126 sektorů [online]. [cit.2021-04-16]. Available from https://www.eulerhermes.com/cs_CZ/novinky-a-analyzy/tiskove-zpravy/euler-hermes-snizuje-rizikovy-rating-18-zemi-a-126-sektoru.html

[11] EULER HERMES (2020b). Druhé čtvrtletí letošního roku přineslo rekordní zvyšování sektorového rizika. ČR nevyjímaje. [online]. [cit.2021-04-16]. Available from https://www.eulerhermes.com/cs_CZ/novinky-a-analyzy/tiskove-zpravy/druhe-ctrvrtleti-letosniho-roku-prineslo-rekordni-zvysovani-sektoroveho-rizika.html

[12] FERRANTE, M. (2020). Managing the impact of the COVID-19 pandemic on IP contracts governed by Chinese law: the SPC's Guiding Opinion on force majeure. *Journal of Intellectual Property Law & Practice*, Vol. 15(9), pp. 689–690

[13] FERREIRA, J-P. et al (2021). The impact of COVID-19 on global value chains: Disruption in nonessential goods production. *Regional Science Policy & Practice*, pp. 1–23.

[14] HULMÁK, M. et al. (2014) Občanský zákoník VI. Závazkové právo. Zvláštní část (§ 2055–3014). Praha: C. H. Beck.

[15] ICC (2019) *Incoterms 2020.* [online]. [cit.2021-04-16]. Available from https://2go.iccwbo.org/incoterms-2020-introduction-free-document-pdf.html

[16] KHANDERIA, S. (2020). Transnational Contracts and Their Performance During the COVID-19 Crisis: Reflections from India. *BRICS Law Journal*. Vol. 7(3), pp. 52-80.

[17] MPO (2020). WTO: Dopady omezení přeshraničního pohybu v souvislosti s COVID-19 na mezinárodní obchod [online]. [cit.2021-04-20]. Available from https://www.mpo.cz/cz/zahranicni-obchod/spolecna-obchodni-politika-eu/svetova-obchodni-organizace/ruzne/wto-dopady-omezeni-preshranicniho-pohybu-v-souvislosti-s-covid-19-na-mezinarodni-obchod--256664/

[18] MRPT (2021). COVID-19 nie zatrzymał polskich eksporterów [online]. [cit.2021-04-16]. Available from https://www.gov.pl/web/rozwoj-praca-technologia/covid-19-nie-zatrzymal-polskich-eksporterow

[19] NWEDU, C. N. (2021). The Rise of Force Majeure amid Coronavirus Pandemic: Legitimacy and Implications for Energy Laws and Contracts. *Natural Resources Journal*. Vol. 61.

[20] PEW RESEARCH CENTER (2020). Most countries in the world have imposed partial or complete border closures to foreign nationals due to coronavirus outbreak [online]. [cit.2021-04-15]. Available from https://www.pewresearch.org/fact-tank/2020/04/01/more-than-nine-in-ten-people-worldwide-live-in-countries-with-travel-restrictions-amid-covid-19/ft_2020-04-01_borderclosures/

[21] *Poland considering partial closure at Czech, Slovak borders—Health min*. (n.d.). [online]. [cit.2021-06-01]. Available from https://www.thefirstnews.com/article/poland-considering-partial-closure-at-czech-slovak-borders---health-min-19983

[22] TARDIVO, A., et al. (2021). COVID-19 Impact on Transport: A Paper from the Railways' Systems Research Perspective. *Transportation Research Record: Journal of the Transportation Research Board*, pp. 1-12.

[23] GOVERNMENT OF THE CZECH REPUBLIC (2020). Vládní usnesení související s bojem proti epidemii koronaviru - rok 2020 [online]. [cit.2021-04-20]. Available from https://www.vlada.cz/cz/epidemie-koronaviru/dulezite-informace/vladni-usneseni-souvisejici-s-bojem-proti-epidemii-koronaviru---rok-2020-186999/#brezen

[24] WTO (2020). CROSS-BORDER MOBILITY, COVID-19 AND GLOBAL TRADE [online]. [cit.2021-04-20]. Available from https://www.wto.org/english/tratop_e/covid19_e/mobility_report_e.pdf

[25] ZHANG, J., et al. (2021). COVID-19 and transport: Findings from a world-wide expert survey. *Transport Policy*, Vol. *103*, pp. 68–85.

Human Capital as Sustainability Factor in Regional Development - Some Observations in Cross-Border Regions of Moravian-Silesian and Opole Regions

Laura Płatkowska-Prokopczyk

University of Opole
Faculty of Economics
Institute of Management and Quality Sciences
Ozimska 46a, 45-058 Opole, Poland
lplatkowska@uni.opole.pl

Abstract

The main goal of cooperation of European border areas is to ensure the sustainable development, to reduce the negative effects of borders as administrative, legal and natural barriers, and to better use the untapped potential. That also refers to Moravian-Silesian and Opole regions. The objective of this paper is to present a research results of the human capital as a component of one of the dimensions of sustainable development concept in the case of two cross-borderly cooperating regions in Czech Republic and Poland: Moravian-Silesian and Opole. The research was based on a Eurostat data that include the time range between 2004 and 2020. The article is a continuation of the research, the results of which were presented in 2016.

The research showed that Social Progress Index for both regions is lower than EU-27 average, but only slightly for Moravian-Silesian, and a little more for Opole region. Also the advanced education is stated being more developed in Czech region. As for Regional Competitiveness Index evolution and it's components between 2016 and 2019 is not fully satisfactory. To maintain the progress in competitiveness, regional authorities have to support the education from basic to higher levels infused with proper enterprising and innovative approach. Gaps in education results as well as in the generation reproduction can critically endanger the realization of regional development projects, because of the systematic decrease of children number. As for economy it is seen as a source of opportunities by adapting education to the needs of the labour market requirements of the region and supporting development of economic activities with high added value and helping pro-export entrepreneurs. But that not necessarily means the higher education levels to attain for the regions employees.

Keywords: *border regions, human capital, sustainable development*

JEL Classification: *J24, I125, O10*

1 Introduction

Globalization – even during the SARS-COV-19 pandemics – didn't slow down, although the reactions of national economies were different, and its recovery will take some time. There is an interesting issue for theory and practice: to what extent actions taken to revitalize national economies also address the issue of sustainable development, as the methods used to remedy may ignore, support or conflict with the sustainability goals. Even if first glimpses of big picture are already visible through various statistical data sets, we have to wait some time to acceed confirmed data and find reliable answers. Refering to data from before and during pademics we continue to track the link between human capital and regional development in sustainability perspective, maintaining our basic assumption that human component is inexorable element in the triad: environment –

economy – society. This assumption is supported in the literature, in which human capital is seen as a part of social or cultural capital, synergistic toward natural capital, depending on learning skills [13]. The active role of the human factor in capital creation and exploitation is enhanced through various institutions, both formal and informal, such as academia [16] playing important role in sustainability promotion [4], overall education system [5], or social and company networks [8] to enumerate only a few. Even if as human beings we are part of nature, the impact on environment transformation appeals to distinction between aware and thus able to tackle with its responsibility and non-avare, non-responsible components of environment.

The specific human capital of any region, yet developed in compliance with national regulations and frameworks is active in a given territory, and as governance becomes more professionalized on all levels [16] even become a resource, and at the same time – an object of management [2] [8]. Whatever other resources of a region would be, their connection still depends on people and their skills, competencies and relationships. Providing the space for development and, as a result, stimulating the development of a given territory becomes a rising challenge in times of promoted individual wellbeing orientation, or citizen pension discussion and experiments with social protection and paternalism far advanced in most developed countries. People, with their knowledge, attitudes, health, vital energy, creativity and potential are still crucial factor of sustainable development for all regions.

This paper aims to actualize the image of human capital as sustainable development factor in two cross-borderly cooperating regions in Czech Republic and Poland – namely Moravian-Silesian and Opole, identifying its dimensions relative to innovativeness and entrepreneurship. Starting from social progress comparison for both regions is connected with regional competitiveness index. To explain more specifically the reason of differences between regions, we refer to statistical data on human capital features in both places, to conclude on further perspectives of development.

2 Material and Methods

The data used in this paper comes from the official analysis of Moravian-Silesian and Opole regions, which can be seen as formally announced vision of this cross-border unity: potential, development directions and political choices to realize. In this context, to assess the sustainable consciousness and understanding of their complexity among the regional actors it is possible to use such document as publicly announced expert's analysis. It is to represent in main points the official's view and to be agreed by them before the public presentation. Other documents describing the cooperating regions' presence and the future, were not accessible. As a starting point, the most important for initial analysis, were the scope and scale in which the documents reflect the sustainability idea and the human capital theme [15]. The assumptions made as a basis for officially presented goals and programs are to be confronted with statistical data describing the human capital reality of both observed regions. The comparison of main challenges image providing from the Eurostat database and programming documents served to formulate the conclusions.

3 Results and Discussion

The development of cross-border cooperation is one of the priorities of the European Union. The main aim of the cooperation is to ensure the sustainable development of European border areas, reducing the negative consequences of the existence of borders as administrative barriers, legal and natural solutions to common problems and better utilization of untapped potential. Between Czech Republic and Poland, there are strong social and economic ties holding a long tradition. An important precondition for economic growth on both sides of the border is to help to create a favourable environment for the creation and development of small and medium enterprises, which creates an important sector of the market economy of both countries. Operational Programme of Cross Border Cooperation Czech Republic - Republic of Poland 2007 - 2013 refers to the Community Initiative Programme INTERREG IIIA Czech Republic - Republic of Poland, which was implemented in the period from 2004 to 2006. The main objective of the program was cross-border cooperation and the development of the Czech-Polish border. The priority was to strengthen the relations of economic, social and cultural common concern for the natural resources, development of tourism, building resilient labour market and other areas of development. One of the priorities of the project "Cross-border network of cooperation for the development of entrepreneurship and the labour market" was to create an efficient and resilient cross-border labour market [6].

Processes occurring in the world economy have a significant impact on the functioning of regions and enterprises, regardless of the scale of their business activity. One of the forms of a partnership aimed at developing cooperation between enterprises, local governments, academic institutions and business environment institutions, located in immediate geographical proximity and representing related sectors are clusters [7].

World Committee of Environmental Development defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It

contains within it two key concepts: the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."[2] [10].

Implementation of sustainable development should be based on a combination of three areas of human activity: economy, ecology and society. As J. Platje stated, different groups of people have different goals and interpretations of what sustainable development is. A business may interpret sustainable development as economic sustainability, focusing on profit, while environmental non-governmental organizations may interpret it as ecological sustainability. Making clear what interpretation of sustainable development different stakeholders use and what their priorities are, facilitates eventual negotiations and cooperation aimed at achieving sustainable development [14]. In general, however, it can be stated that sustainable development means social progress combined with economic growth without entailing a rise in the entropy of the natural environment [6], as all three components of sustainability, seem equally important and complementary.

One of synthetic measures for society evolution reported on NUTS 2 level is Social Progress Index (c.f. figure 1.). It includes 12 measures grouped in 3 sub-indexes, synthetised in one SPI measure. Sub-indexes cover:

- basic needs satisfaction, such as nutrition and care, water and sanitation, shelter and personal security,
- foundation needs for basic knowledge, ICT access, health and wellness and environmental quality
- opportunity exploitation factors, such as personal rights, personal freedom and choice, tolerance inclusion and advanced education.

Of 12 measures comparing EU-27 average with levels stated for Moravian-Silesian and Opole regions, in 4 cases (personal security, basic knowledge, personal freedom and choice and water and sanitation) both have superior level than average among EU member countries. For 5 is the opposite: nutrition and care, health and wellness, environmental quality, tolerance inclusion and advanced education have bigger EU-27 average. With shelter, ICT access and personal rights, results reported for Moravian-Silesian are superior to EU-27 average and Opole levels. Only in personal security case, Opole have better results than Moravian-Silesian and EU.

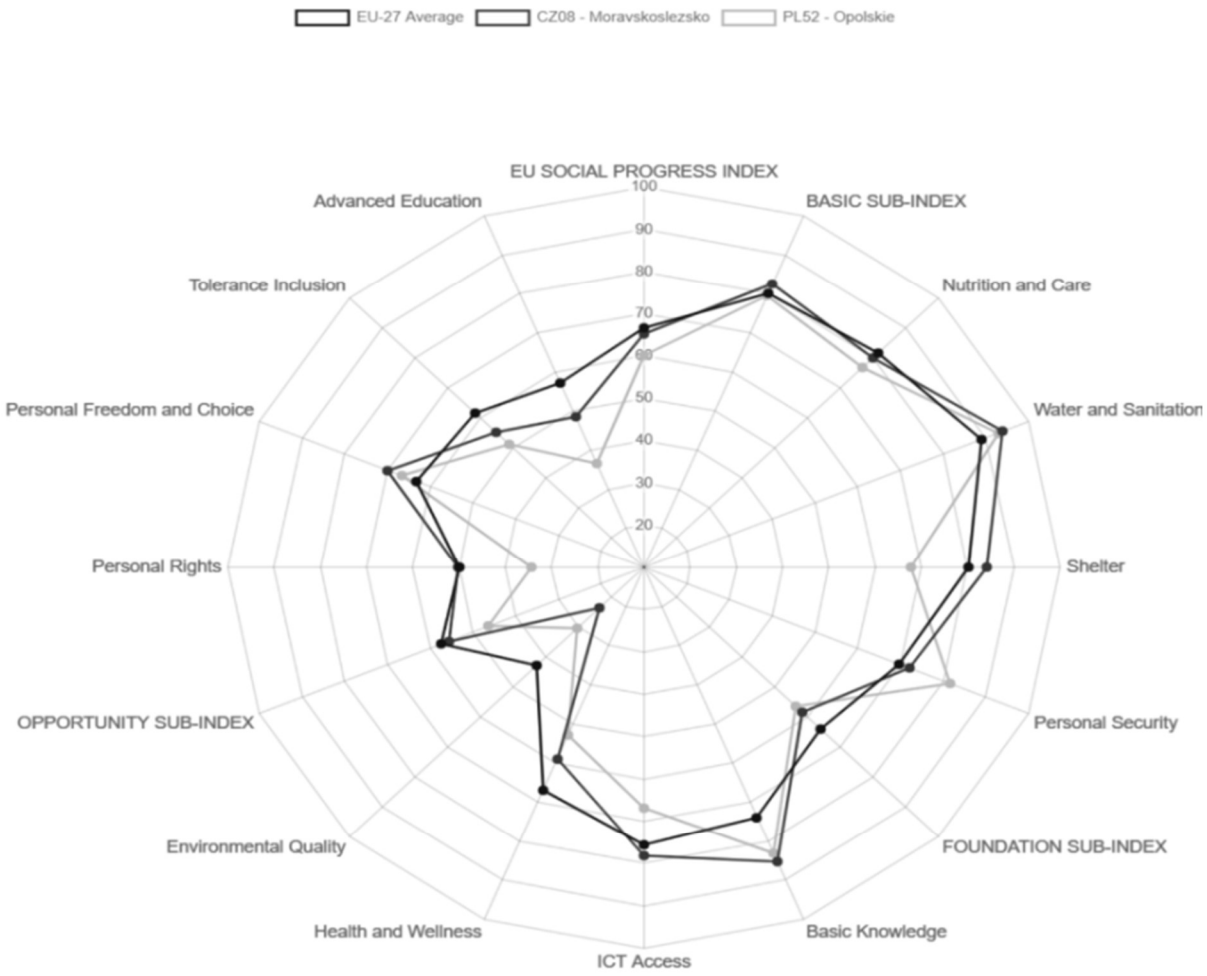
[2] It seems important to cite the Commission's Communication on the CAP toward 2020 recommendation regarding strategic aims:

- to guarantee long-term food security for European citizens and to contribute to growing world food demand,
- to provide European citizens with quality, value and diversity of food produced sustainably, that is, in line with requirements of natural resources and public health,
- to maintain viable rural communities, thus contributing to employment and to territorial balance.

Based on these three aims, the European Commission has formulated three objectives:

- viable food production,
- sustainable management of natural resources and climate action,
- balanced territorial development [3].

Figure 1 - Social Progress Index – comparison between Moravian-Silesian and Opole regions



Source: European Social Progress Index - Regional Policy - European Commission (europa.eu) (access: 16.06.2021)

In synthetic view, the SPI for both regions is lower than EU-27 average, but only slightly for Moravian-Silesian , and a little more for Opole region. It's worth notice, that some particular measures are not easy to explain in line with other regional statistics. I.e. in tertiary education attainment we have 6,5 p.p. bigger part of population with diploma in Opole than in Moravian-Silesian region (c.f. table 1.). Nevertheless, the advanced education is stated being more developed in Czech region.

Table 1 - Tertiary education attainment, age group 25-64 by NUTS 2 regions (% of total population)

No.	Name of the region	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Moravian-Silesian region	15,4[b]	16,2	17,6	16,7[b]	18,8	19,8	21,6	21,1	20,3	21,1
2	Opole region	18,1	20	20,9	23,1[b]	24,8	24,7[b]	25,9	25,9	26,3	27,6

b - break in time series

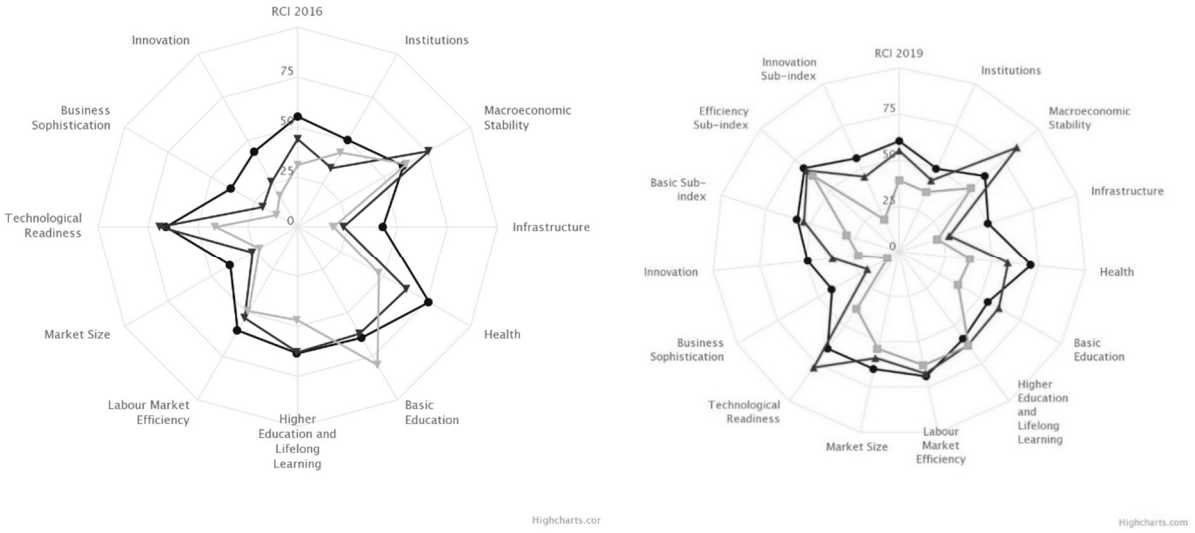
Source: Eurostat, http://ec.europa.eu/eurostat/data/database (access: 06.05.2021)

The tertiary education attainment indicator is defined as the percentage of the population aged 25-64 who have successfully completed tertiary studies (university, higher technical institution, etc.). This educational attainment refers to ISCED (International Standard Classification of Education) 2011 level 5-8 for data from 2014 onwards and to ISCED 1997 level 5-6 for data up to 2013. The measure comes from EU Labour Force Survey.

In particular, advanced education along with ICT access can be seen as the main factor of regional competitiveness (c.f. fig. 2). It's dimensions are also classified into 3 groups including specific measures, such as:

- for basic sub-index: institutions, macroeconomic stability, infrastructure, health and basic education,
- for efficiency sub-index -higher education and lifelong learning, with also labor market efficiency, market size, technological readiness and business sophistication
- for innovation sub-index the innovation is included.

Figure 2 - Regional Competitiveness Index – comparison between Moravian-Silesian and Opole regions



Legend: colours as in fig. 1.

Source: European Regional Competitiveness Index - Regional Policy - European Commission (europa.eu) (access: 16.06.2021)

The evolution pictured by RCI and it's components between 2016 and 2019 is not fully satisfactory. Although most indicators progressed for each entity (EU-27, Czechia, Poland), some of them recessed. Which is inquieting, that recession is deployed in basic education domain and health in each analysis entity/unit. Other parameters racqueted: in Moravian-Silesian technological readiness primed, when in Opole region market size more than doubled. Still, if basic social features do not increase, the competitiveness will remain only a dream.

To maintain the progress in competitiveness, regional authorities have to support the education from basic to higher levels infused with proper enterprising and innovative approach. Gaps in education results as well as in the generation reproduction can critically endanger the realization of more or less ambitious regional development projects, because of the systematic decrease of children number.

As both, Moravian-Silesian and Opole regions can be qualified as peripheral, with all of paradoxical phenomenons accompanying the areas outside metropolises, such as:

- The natural increase in population is still negative in big cities, which are the poles of development and growth for the demand for labor.
- The natural increase in population is positive in peripheries, especially in the countryside, where there is a lack of jobs and economic development factors.

The logical consequence of the above should be migration from peripheral areas, especially from rural to metropolitan areas. Excessive emigration would result in 'leaching' development factors: migration of active, better-educated people, which reduces the opportunities for the development of peripheral areas. We can observe that phenomenon in those regions for more than a decade, but a need for regional development policy in these areas is still actual [19].

In both regions the 15 to 24 years old participle less in education at regional level (in 2019 56,9% for Moravian-Silesian, and 56,4% for Opole), compared to national levels – respectively 65,0 for Czech Republic and 68,6 for Poland. Differences are visible in many aspects of the human capital prospect situation: neonatal mortality rate in

Opole (2,11) is almost twice as much in comparison to Moravian-Silesian (1,34). It aggravates the depopulation problem (c.f. table 2.), even if social transfers supporting families with children have some impact less or more visible in Poland also at the regional level.

Table 2 - Crude rates of population change by NUTS 2 region per 1000 person

No.	Name of the region	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1	Moravian-Silesian region	-2,8	-3,6	-3,3	-3,3	-3,9	-3,4	-3,6	-2,8	-3,3	-2,1	-2,3
2	Opole egion	-1,9	-2,4	-3,5	-3,5	-6,2	-3,5	-4,6	-1,9	-2,0	-2,9	-4,0

Source: Eurostat, dataset from DEMO_R_GIND3, http://ec.europa.eu/eurostat/data/database (access:20.05.2021)

Besides only the physical subsistence of the regional population, protected by the satisfaction of its basic needs, the human potential must be differently perceived according to age. In that aspect, both regions are nearby with the median at 43,7 years for Moravian-Silesian and 42,8 for Opole. In both regions employment rates were relatively high in 2020, respectively 71,7 for the first and 68,7 for the former in the population from 15 to 64 years. During the last decade, both regional labour markets integrated about 10 pp. more employed workforce than in 2011 (c.f. Eurostat dataset LFST_R_LFE2EMPRT, access 17.06.2021). At the same time, the unemployment rate dropped from nearly 9,3% of the economically active population in 2011 to 2,9% for the Opole region and 3,6% for Moravian-Silesian in 2020 (c.f. Eurostat dataset LFST_R_LFU2RT, access 17.06.2021). An important problem is still related to long-term unemployment (c.f. table 3.) It erodes the competencies of people touched by this problem, and their return to the labour market needs important investment in skills update or modification.

Table 3 - Long-term unemployment rate (12 months and more) by NUTS 2 regions [% of active population]

No	Name of the region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	Moravian-Silesian region	7,5	4,9	4,3	3,7	4,6	4,4 b	4,5	4,9	4,2	4,5	3,7	2,1	1,4	1,4	1,2
2	Opole region	5,8	3,9	2,0 bu	2,1 u	2,5 bu	2,5 u	3,1 u	3,3 u	2,7 u	2,0 u	:(b u)	: (u)	: (u)	: (u)	: (u)

b=break in time series u=low reliability (:) =not avaliable

Source: Eurostat, http://ec.europa.eu/eurostat/data/database (access: 15.06.2021)

As for economy it is seen as a source of opportunities by adapting education to the needs of the labor market requirements of the region and supporting development of economic activities with high added value and helping pro-export entrepreneurs. But that not necessarily means the higher education levels to attain for the regions employees. Vocational training can be more useful in short or medium perspective and such adaptations are made on secondary and postsecondary levels both in Poland [18] and in Moravian-Silesian region. To develop innovativeness in regional or local scales, the vocational training should be completed by entrepreneurial formation, in particular on bachelor degree studies. With sensibility to environmental problems, present among young people and their natural interest to find decent work and place to live – next generation can foster transition to balanced and sustainable development path for both regions. On Czech part of frontier such interests are more visible, even among big industrial players such as Sustainable development – LIBERTY Steel Czech Republic (libertysteelgroup.com), but not so much in Opole region (see: Zrównoważony rozwój (grupaazoty.com)). The same for official regional development programs – in Moravian-Silesian region we find mature plans for mining industry transition (MATERIALS AND DOCUMENTS | Invest MORE (invest-msr.com) and Region | Invest MORE (invest-msr.com))[3], when Opole region invested directly in triple-bottom line programs (ROP 8 Regional Operational Programme for Opolskie Voivodeship - Regional Policy - European Commission (europa.eu)) in its operational programme for 2014-2020.

4 Conclusion

European integration used to be carried out every day in various initiatives - from infrastructure development through environmental protection, up to projects for cultural exchange and mutual contacts of youth. Implementation of transnational projects is a unique opportunity to support projects important for several countries. It also should be stated that the provision of funds from the EU budget should respond in a dynamic way to the results of statistical findings in individual regions of the EU. Financial support from EU funds should be more targeted at supporting specific activities that would lead to the improvement of selected areas

[3] Relative documents are accessible here: Regional Innovation Report: Moravskoslezsko - Internal Market, Industry, Entrepreneurship And Smes - European Commission (europa.eu) or here: Panorama 69: Moravia-Silesia emerges from its industrial past - Regional Policy - European Commission (europa.eu)

(monitored indicators) in the affected regions, which show statistically worse long-term results than other regions in the EU countries. Also, regional policy should include the presence of a common vision among stakeholders, enshrined in the strategy of innovative development of the cross-border regional innovation system, high level of innovative business activity and the desire to share and adopt knowledge as they are important factors affecting sustainability of regional innovation level. At the same time creating an atmosphere of innovative entrepreneurship (i.e. risk encouragement); the possibility of informal contacts and information exchange between employees of various companies; availability of mechanisms for interaction between the three institutional helices – the government authorities, academic research and business sectors; institutional assistance to the development of various forms of networking not only in the region, but also across borders [12].

Nowadays, because of pandemic limitations, all those activities had to be significantly limited. And as strengthening of bonds between communities is crucial for economic and social stimulation it is important to maintain those in any possible way. In this situation, further undertakings to enhance economic, social and cultural cooperation are even more important than before.

Even though the pandemic has had many negative effects, both in the economic and social areas, it is worth remembering that difficult situations can be a catalyst for changes in the right direction. As a result of the pandemic and related travel restrictions, there has been an increase in interest in less populated destinations and agritourism. It may be proved by the growing interest in motorhomes that allow you to travel freely with your own house on wheels. This is a great opportunity for border areas with interesting places to visit, such as Opole and Moravian-Silesian region, which will hopefully be used. Also, the lack of direct contacts, felt by many, can be transformed into more close cooperation, exchange of ideas and mutual support in the implementation of projects. Thus, it can be concluded that activities and efforts of all players (institutions representatives, local leaders and every member of local communities) in the field of sustainable development should be continued and even advisable increased, especially regarding human capital as a key factor of this development.

Strong relationships between innovation of firms and sustainable development of regions and countries have priority in issues related to firms' innovation performance. As the role of human capital cannot be overestimated, it is relevant to provide conditions for the development of human resources to enhance firms' competitive advantage and sustainable growth of regions and countries. There is also a need to strengthen knowledge diffusion processes among firms, universities, and research organisations in order to improve innovation activities of firms [21].Therefore it can be concluded that nowadays as society develops, the main factor influencing the creative economy is human capital, on which the development of human capital depends on the level of education and science development in the country. Empirical data [9] show that targeting investments in human capital contributes to strengthening the creative economy, improving the country's competitiveness, and thus time, ensuring an appropriate pace of socio-economic development.

Since the border regions deploy some particular challenges and opportunities [20]. nuanced by geophysical features (i.e. highlands or riverlands demand more intensive infrastructural investments in comparison to lowlands, offering in turn bigger turism potential), the creativity and robustness of it's inhabitants can be a more expected result of everyday living conditions. With pandemia experience and progress in supply modes for even far located villages, with developing e-commerce solutions, that potential can pick in few years if properly managed. Multifunctionality of rural areas can be largely discovered by turists and customers imprisoned by last months in their cities, now thirsty of contact with nature, natural products and heterogenous landscapes. Will local policy support the sustainable development and exploitation of natural and cultural capital? That's the question to the territorial administration, which must be answered in cooperaton with the inhabitants, and other stakeholders. These answers must include the supporting guidance for new entrepreneurs, changing profession because of downsizing in former workplace, those who want explore new market opportunities or for those who want to test it, developing new activities in their existing businesses.

References

[1] ANNONI P., DIJKSTRA L. (2019). The EU Regional Competitiveness Index 2019. *European Commission*, 1–42. https://ec.europa.eu/regional_policy/sources/docgener/work/2019_03_rci2019.pdf

[2] ANOPCHENKO T. Y., GRINENKO S. V., EDALOVA E. S., ZADOROZHNYAYA E. K. & MURZIN A.D. (2018). Management of human capital reproduction processes in post-Soviet countries. Espacios, 39(9).

[3] European Commission – Standing Committee on Agricultural Research (2011). Sustainable food consumption and production in a resource-constrained world [online] [cit.2016-08-30] Avaliable: http://ec.europa.eu/research/agriculture/scar/pdf/scar_feg3_final_report_01_02_2011.pdf

[4] FILHO W. L., EUSTACHIO J. H. P. P., CALDANA A. C. F., WILL M., SALVIA, A. L., RAMPASSO I.

S., ANHOLON R., PLATJE J., & KOVALEVA M. (2020). Sustainability leadership in higher education institutions: An overview of challenges. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093761

[5] GERASIMOV V., SHARAFUTDINOV R., KOLMAKOV V., ERZINKYAN E., ADAMENKO A., & VASILYEVA A. (2019). *Control in the Human Capital Management System in the Strategy of*. *7*(2), pp. 1074–1088.

[6] HRUŠKA L. et al.(2014). Analiza istniejących transgranicznych działań gospodarczych na terenie okręgu morawsko-śląskiego i województwa opolskiego. Cel 3, 2007-2013, Europejski Fundusz Rozwoju Lokalnego. Przekraczamy granice, Studium opracowane w ramach projektu „Zapewnienie analizy istniejących transgranicznych działań gospodarczych na terenie okręgu morawsko-śląskiego i województwa opolskiego", jak również podstawowego dokumentu dla realizacji projektu „Transgraniczna sieć współpracy na rzecz rozwoju przedsiębiorczości i rynku pracy" nr ewidencyjny CZ.3.22/2.1.00/12.03440, współfinansowany ze środków EFRR i budżetu państwa w ramach Programu Operacyjnego Współpracy Transgranicznej Republika Czeska – Rzeczpospolita Polska 2007 – 2013. Dokument opracowany przez spółkę PROCES – Centrum pro rozvoj obcí a regionů, s. r. o.

[7] KUROWSKA-PYSZ J. (2016). Opportunities for Cross-Border Entrepreneurship Development in a Cluster Model Exemplified by the Polish–Czech Border Region. Sustainability, Vol. 8(3):230.

[8] LAVRINENKO O., OHOTINA A., AMOSOVA J., & TEIVANS-TREINOVSKIS J. (2017). Intercompany networks of the cross-border region (Latvia-Lithuania-Belarus). *Journal of Security and Sustainability Issues*, *7*(1), pp. 39–54. https://doi.org/10.9770/jssi.2017.7.1(4)

[9] LONDAR S., LYTVYNCHUK A., VERSAL N., POSNOVA T., TERESHCHENKO H. (2020). Investment in Human Capital Within the Creative Economy Formation: Case of the Eastern and Central Europe Countries. *Comparative Economic Research. Central and Eastern Europe* Volume 23, Number 4, 2020.

[10] LOREK S., SPANGENBERG J. H. (2014). Sustainable consumption within a sustainable economy - beyond green growth and green economies. Journal of Cleaner Production 63 (2014), pp. 33-44.

[11] MANTEUFFEL SZOEGE H. (2013). Sustainable development in rural Poland from the perspective of environmental economics. Economic and Environmental Studies Vol. 13, No. 3 (27/2013), pp. 265-278.

[12] MIKHAYLOV A. S., MIKHAYLOVA A. A., SAVCHINA O. V. (2018). Innovation security of cross-border innovative milieu, The International Journal ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES, 2018 Volume 6 Number 2 (December) [online]. [cit.2021-06-15] Avaliable: http://jssidoi.org/jesi/

[13] MOLNÁR Z., & BERKES F. (2018). Role of traditional ecological knowledge in linking cultural and natural capital in cultural landscapes. In *Reconnecting Natural and Cultural Capital: Contributions from Science and Policy; Paracchini, ML, Zingari, PC, Blasi, C., Eds*.

[14] PLATJE J. (2013). Who is interested in what kind of sustainable development? Time horizons and stakeholder interests, Economic and Environmental Studies Vol. 13, No. 3 (27/2013), pp. 255-263 [online]. [cit.2016-08-30] Avaliable: http://www.ees.uni.opole.pl/content/03_13/ees_13_3_fulltext_04.pdf

[15] PŁATKOWSKA-PROKOPCZYK L. (2016). Human Capital as a Dimension of Sustainable Development of the Border Regions – the Example of Moravian-Silesian and Opole Regions, in: DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND, Conference Proceedings of the International Scientific Conference September 21-22, 2016 Ostrava, Czech Republic, VŠB – Technical University of Ostrava Faculty of Economics Department of Public Economics and Statutory City of Ostrava 2016, pp. 135-145.

[16] POPESCU C. R. G. (2019). Demonstrating How Universities Extend Value Creation and Performance: Convergence Between Intellectual Capital Contributions and Research Quality – a Romanian Collective Intelligence Framework. *EDULEARN19 Proceedings*, *1*(July), pp. 48–58.

[17] PRAUSE G., TUISK T., & OLANIYI E. O. (2019). Between sustainability, social cohesion and security regional development in northeastern estonia. *Entrepreneurship and Sustainability Issues*, *6*(3), 1235–1254. https://doi.org/10.9770/jesi.2019.6.3(13)

[18] SOBOTKA, B., SZYMAŃSKA-CZAPLAK, E., & BRUSKA, A. (2020). Potential of vocational education in Opole - state and recommendations. *Journal of Modern Science*, *44*(1), pp. 151–173. https://doi.org/10.13166/jms/125592

[19] SOŁTYS J. (2015). Typology of towns in the peripheries of Polish coastal regions: conclusions for urban policy. Journal of Economics and Management, Vol. 19 (1), p.181.

[20] SZLACHTA J., DZIEMIANOWICZ W. (2017). Wnioski i rekomendacje do dalszych badań dotyczących ścieżek rozwoju słabo rozwiniętych regionów. Studia KPZK nr 179 (2017), Polska Akademia Nauk Komitet Przestrzennego Zagospodarowania Kraju, pp. 376-389.[21] ZYGMUNT A. (2020). Do Human Resources and the Research System Affect Firms' Innovation Activities? Results from Poland and the Czech Republic. Sustainability 2020, 12(6), 2519; https://doi.org/10.3390/su12062519

Integration of Children through Sport Using the Example of the Project "Sport at the Border"

Anna Rajchel[1], Dariusz Rajchel[1]

Opole University of Technology
Faculty of Economics and Management
St. Luboszycka 7, 45-036 Opole, Poland
a.rajchel@po.edu.pl, d.rajchel@po.edu.pl

Abstract

The article presents results of the "Sport at the Border" project completed by schools in Poland and the Czech Republic in 2017. It is primarily intended to draw attention to several aspects: integrating children through sports, financing of sports facilities, and opportunities to strengthen cooperation between schools and the borders areas. It also attempts to evaluate the project in retrospect and point to other potential areas of interest for educational institutions. The rather theoretical nature of the article includes an analysis of literature dealing with sports, physical activity, and financing methods. The dissertation also discusses the numerical data concerning local authorities' outlays on sports facilities. Secondly, integrating children through sports teaches them tolerance, respect and a healthy lifestyle. These are the reasons for schools to continue cooperation and not limit it only to this aspect but include other areas as well, such as culture, environment and its protection. Sports and physical culture represent communities' own responsibilities and thus directly related to the issue of financing sports facilities. New investments in this area have become necessary and crucial as they represent the attitude of local authorities to physical culture, as well as their financial and organization capabilities. Method: analysis of source texts.

Keywords: *financing, integration, sport*

JEL Classification: *Z23*

1 Introduction

Sport is an integral part of human life and it does not matter whether it is done professionally or as an amateur. Physical activity brings people closer, makes it possible to learn about one's abilities as well as weaknesses. It teaches discipline, perseverance and respect. This is especially important in terms of the maturation and adolescence of children. That is why many schools carry out such activities with educational institutions from other countries. Such projects are not just about sporting rivalry between children and young people. It is primarily an opportunity to meet peers from other European regions, make friends and create a platform for continuing and deepening cooperation between teachers, pupils and local administration. The article is designed to discuss steps taken under the "Sport at the Border" project aimed uppermost at integration of children and young people in a broad sense of the concept. The article - rather of a theoretical nature - presents the most vital tasks carried out by two partner schools in the Polish – Czech border area with the idea to use the conclusions mainly to highlight several facets of the project. First of all, this type of action helps blur the economic, social, and other differences among children. Secondly, sports integrate children with physical disabilities with healthy ones. Thirdly, the project performance both in Poland and the Czech Republic contributes to promoting a civil society among young Europeans. Fourthly, sports prevent social exclusion of children, and last but not the least – involving children in the project also translates into using not just the Czech and Polish sports infrastructure but teaching them a healthy lifestyle as well. „Mass media, mass sports and recreational events dedicated to amateur athletes play an important role in the process of health and active lifestyle promotion. It is an important element of the social policy of many countries, including Poland" cyt. za: Kruszyńska&Poczta (2020).

I. Müller-Frączek also pointed to a similar aspect of sports in an article entitled *Sports infrastructure vs. sport development in Poland*. „In aging societies, physical activity becomes an increasingly significant aspect of life, therefore stimulating the development of sport is an important task of social policy. In Poland, the government's actions in this area focus mainly on expanding sports infrastructure. Hence the question of how strongly the material base stimulates the development of sport" Müller-Frączek (2021). Then, the article raises the issue of financing sports infrastructure in both partner countries and refers to a publication by M. Haláskova and R. Halásková (2020) entitled *Public Expenditures on Sport, Recreation and Leisure Activities: Analytical Approach in Self-governing Regions in the Czech Republic,* and to certain budget resolutions adopted by Chrząstowice community to approve current expenditure for sports facilities, among others.

1.1 Integrative Function of Sport

Physical education lessons or amateur as well as professional sports, play a significant role in shaping the character of children and adolescents. Sport teaches respect for the opponent, independence, perseverance in pursuing goals, tolerance, and discipline. It improves the physical and mental condition of young people.

"Sports exert a tremendous influence on shaping young people's personality traits and attitudes. Physical activity affects their physical development while fitness is just one of the factors preparing them for life in the community" Saska-Dymnicka (2011). Physical activity connects people, a fact pointed out in the article Local Communities and Sport Activities Expenditures and Image: Residents' Role in Sustainable Tourism and Recreation Perna&Custódio&Oliveira (2019). In the literature, there are many functions of sport to which attention was paid: from ones related to improving health to those related to the psychological, pedagogical or educational dimension. The following sports functions are distinguished.

- Educational function
- Recreational function
- Integrative function
- Promotional function, Waśkowski (2011).

One of the most important functions of sport is that of integration. This aspect has been highlighted by a number of institutions and papers, including the 2007 White Paper on sport, the European Parliament resolution of 2 February 2017 on an integrated approach to sport policy: good governance, accessibility and fairness in the Commission's communication to the European Parliament, the Council, the European Economic and Social Committee and Committee on Regional Development of the European Dimension in Sport. Two Polish documents deserve special attention. Namely, Program rozwoju sportu 2020 and Sportowa Polska – Program rozwoju lokalnej infrastruktury sportowej" - edycja 2021. In the first document, special attention was paid to the physical activity of children and young people, which influences their peer relationships and learning. "It is also possible to observe a correlation between pupils' activity and their good academic performance and good relationships with peers" Program rozwoju sportu (2015). Integration presupposes the coexistence of disabled and non-disabled children, healthy and sick children, children of foreigners, migrants and refugees. Sport is a means that connects people, supports social integration, builds and shapes interpersonal relationships. It limits phenomena related to xenophobia, racism, sexual, national and other discrimination. In this context it is worthwhile to note the research conducted by O. Špaček, who in his article Sporting activities and social stratification in the Czech Republic: a temporal perspective observes that following 1989, sports participation in the Czech Republic was not hindered by any economic barriers but rather cultural differences among various social classes Špaček (2016).

2 Material and Methods

The article has a theoretical character and refers to, among others, informacji o projekcie, informacji dotyczących programu Interreg V-A Republika Czeska – Polska 2014-2020. The issue of financing regional sport infrastructure has been discussed primarily in papers of M. Haláskova (2019); Hobza&Schwartzhoffova& Skoumal (2014). Polish documents dealing with the subject include, inter alia, publications of the Ministry of Sport and Tourism whereas in the case of local communities these are budget resolutions. Attention has been paid to Chrząstowice community's current expenses for sports facilities. The integration aspect of sports was discussed first of all by using a publication by Z. Waśkowski, a Polish government document *Program rozwoju sportu do 2020 roku* and a publication by Perna&Custódio&Oliveira (2019). The discussion on participation in physical activities is based on a publication by O. Špaček (2016), reports of the Polish Ministry of Sports. Therefore, literature and documents on the subject were reviewed. Reference was made to both international sources and Polish literature publications. The collected material was selected, the content was analysed and conclusions were drawn, which are important mainly because of the possibility of deepening the cooperation of schools in other disciplines as well. The text primarily uses the theoretical method related to the analysis of

source texts concerning, inter alia, sports, sports facilities, and educational projects increasing the integration of children.

3 Results

Polish primary and secondary schools from Opolskie Voivodship carry out many projects in cooperation with partner schools from Czech Republic. Examples of activities are shown in table 1.

Table 1 - Examples of projects and other undertakings carried out by schools from Opolskie Voivodship in cooperation with schools from the Czech Republic

School name	Name of the project / venture	Sample goals
B. Koraszewski Vocational School Complex No. 4 in Opole-Poland	"Joint forces on the Czech-Polish labor market"	• Internships in hotels, restaurants, tourist information in Jesenik. • Czech language course • Apprenticeships in the Czech Republic
Prince Jerzy II Piast Construction School Complex in Brzeg-Poland	Meetings of young people from partner schools from Germany, Poland and the Czech Republic	• Broadly understood cooperation between schools.
School Complex in Komorno	Erasmus+	• Internships in the Czech Republic and Greece.

Source: Projekt „Wspólnymi siłami na czesko-polski rynek pracy". [online]. [cit. 2021-05-25]. Available from https://www.zsz4.opole.pl/index.php/wspolnymi-silami-na-czesko-polski-rynek-pracy; Współpraca z zagranicą. [online]. [cit. 2021-05-25]. Available from http://zsbbrzeg.wodip.opole.pl/joomla/index.php?option=com_content&view=category&layout=blog&id=38&Itemid=79; Zespół Szkół w Komornie. [online]. [cit. 2021-05-25]. Available from http://www.zskomorno.pl/index.php/erasmus.

In the implementation of the project "Sport at the Border", several areas can be distinguished that can be deepened in the long term. These are:

1. involving more schools and kindergartens in the implementation of educational, cultural and sports projects in partnership with educational institutions from Czech Republic and other countries.

2. getting to know the regions, their culture, traditions and language

4. involving the districts in the implementation of further projects in the fields of education, culture, environmental protection, etc.

5. exchange of experiences between the teachers of the schools

6. promotion activities of the schools

The "Sport at the Border" project was financed jointly with the 2014-2020 Interreg V-A Czech Republic-Poland Program which made it possible to co-finance certain cross-border projects in the Poland - Czech Republic border regions. The program consisted of four priority axes:

- Priority axis 1: Joint risk management
- Priority axis 2: Development of natural and cultural potential to support employment
- Priority axis 3: Education and qualifications
- Priority axis 4: Collaboration between institutions and communities (Podstawowe informacje…)

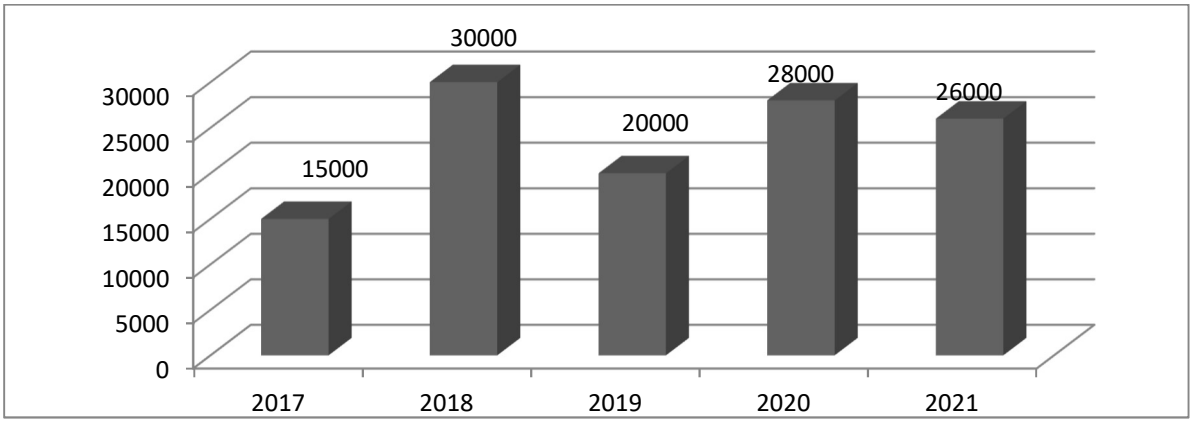
"The program covered the area of 5 Czech counties: Liberecki, Hradecki, Pardubicki, Olomouc, Moravian-Silesian and 6 Polish sub-regions: Bielski and Rybnik (Śląskie Voivodeship), Jelenia Góra and Wałbrzych (Dolnośląskie Voivodeship), Nysa and Opolski (Opolskie Voivodeship). The eligible area on the Polish side also includes Strzelin County (Wrocław sub-region in Dolnośląskie Voivodeship) and Pszczyna County (Tychy sub-region in Śląskie Voivodeship)" (Informacje podstawowe dotyczące Programu…). In 2017, two schools implemented a project entitled "Sport at the Border". These were the Public Primary School with a kindergarten branch in Daniec in the Chrząstowice district and the Primary School in Zátor. In 2015, the municipality of Chrząstowice, located in Opolskie Voivodship, signed a partnership agreement with the Czech municipality of Zátor.

The areas of their cooperation are:

- tourism
- culture
- recreation
- sport
- education (Współpraca międzynarodowa…)

The project "Sport at the Border" is primarily a series of activities aimed at getting to know the Polish and Czech regions, bringing two educational institutions closer together and organizing joint sports and cultural events. The project activities: sport games, learning to ride cross-country skis, trips to Praděd, Jakartovice and Ostrava, departure to Bierkowice, to Krasiejów, trip to the Technical Museum in Vitkovice, departure to aqapark in Kravaře (Projekt realizowany…) The budget for the project was €26,246.85. The project performance highlighted yet another aspect - financing this type of activities and developing the sports infrastructure in the regions involved. In Poland, sport - in a broad sense – is conceived to be the responsibility of local authorities. Art. 7 of the Act of March 8, 1990 says: "Local authorities shall be responsible for meeting collective needs of the community; in particular, such responsibilities shall include decisions concerning physical culture and tourism, as well as recreational areas and sports facilities (Ustawa o samorządzie gminnym…). The Office of Statistics Poland reports "roughly 3.9 thousand facilities in Poland were used to improve the population's physical fitness, with the largest numbers of such centers found in the Mazovian (approx. 19%) and Silesian voivodships (approx. 12%) whereas Lubuskie, Opolskie and Świętokrzyskie voivodships lagged behind with barely about 2% each (Obiekty służące poprawie kondycji fizycznej w 2020 r…). A school at Daniec, Chrząstowice community, was one to carry out the "Sport at the Border" project: Fig. 1 shows the community's current expenditure on sports facilities in 2017-2021.

Figure 1 - Current expenditure on physical culture facilities in the Chrząstowice



Source: Uchwała budżetowa nr XXII.1 7 6 . 2020 Rady Gminy Chrząstowice z dnia 30 grudnia 2020 r. w sprawie uchwalenia budżetu Gminy Chrząstowice na 2021 rok, Dz. Urz. Woj. Opolskiego 2021.181; Uchwała Nr XIII. 9 2. 2019 Rady Gminy Chrząstowice z dnia 18 grudnia 2019 r. w sprawie uchwalenia budżetu Gminy Chrząstowice na 2020 rok, Dz. Urz. Woj. Opolskiego2020.94; Uchwała Nr XXVIII.218.2017 Rady Gminy Chrząstowice z dnia 20 grudnia 2017 r. w sprawie uchwalenia budżetu Gminy Chrząstowice na 2018 rok, Dz. Urz. Woj. Opolskiego 2018.39; Uchwała Nr XIX.151.2016 Rady Gminy Chrząstowice z dnia 14 grudnia 2016 r. w sprawie uchwalenia budżetu Gminy Chrząstowice na 2017 rok, Dz. Urz. Woj. Opolskiego 2017.39

The expenditure to co-finance physical culture and maintain sports facilities depends on the local authorities' budget, planned investments, and operations. As reported in an article by A. Sekot *Sport and Physical Activities in the Czech Republic:* „The authority for the implementation of the decisions with reference to sport policy and its evaluation is usually delegated onto municipal Department of Education and Culture with one specialized staff person responsible for sport, and onto the Department of the Environment, which is in charge of the reconstruction and maintenance of sports facilities owned by the municipality" Sekot (2010). Other research: M. Haláskova and R. Halásková (2020), M. Halásková (2019), Popelka (2015). The project "Sport at the Border" was a micro-project realized by the Microproject Fund, whose main objective was: "influencing the development areas of interpersonal cross-border relations, development of educational and cultural activities development of social initiatives, support for micro-projects aimed at improving infrastructure in a given area, especially in the field of tourist infrastructure with cross-border impact" (Fundusz Mikroprojektów). The project "Sport at the border", implemented by schools from Poland and Czech Republic, is multidimensional. First of all, it should be noted that it is children and teachers who participated in the activities.

Projects of this kind allow:

- the building of friendships between pupils and teachers
- the implementation of joint initiatives that bring children and adults together
- to get in touch with another language, culture, tradition...
- getting to know the region
- visits to the partner schools

Sports games, tournaments, competitions are a great lesson of fair competition, fair play attitude. But it is also getting to know sports, cultural and natural facilities, new solutions, games and activities that integrate the whole school community. When evaluating a completed project one should point out the following:

1. The effect of the efforts on improving integration of children and young people
2. Increased resources to finance physical culture
3. Cooperation among schools following the Covid-19 pandemic
4. New areas of cooperation between schools and regions in Poland and the Czech Republic
5. Civil society development

4 Conclusion

Partnership cooperation between Polish and Czech schools, especially the implementation of sports projects, is above all a lesson in tolerance, respect and responsibility. It is also a practical way to learn ethical and wise behaviour. Sport connects people, generations and integrates youth and adults. It is a platform for understanding between healthy and sick children, boys and girls, and disabled and non-disabled people. Sport does not discriminate and does not exclude. It enables everyone to achieve success according to their abilities and strengths. The project carried out by the Polish and Czech schools is primarily about making friends, getting to know the culture and traditions of a particular region, its language and customs. Thanks to such activities, young people just entering adult life learn to respect, tolerate and understand each other. Such cooperation is especially important in the borderland, where two cultures meet. Collaboration between friendly schools produces tangible results for students, teachers, schools, and the district. It is difficult to talk about European education without such undertakings and activities. Therefore, after the end of the Covid 19 pandemic, educational units should return to cooperation, deepen and intensify it. It is also worth paying attention to other aspects of the projects already completed and those planned for the future. This can be learning the language, getting to know the work of the school, the education policy of both countries, and measures taken to support and finance future development of physical culture. Sport integrates not only children, but also adults, which was shown by the implementation of the project "Sport at the border". Other educational units and local authorities should pay special attention to this type of undertaking. Multiculturalism at school, on the playground or sports field is an added value. Getting to know and understand them is an essential element of education of the young generation born after Poland and Czech Republic joined European Union. Projects, especially those specifically aimed at students, have been included in the government policy on the future of young people, their upbringing and education. The “Sport at the Border” project should be continued in other areas as well, such as culture, history, environmental protection, etc. Raising a civil society begins in childhood and schools - particularly those in small communities - should join the efforts supporting such initiatives. The same practice holds true with respect to further development of the community and its education or young generation policy.

References

[1] Fundusz Mikroprojektów Programu Interreg V-A Republika Czeska-Polska w Euroregionie Śląsk Cieszyński. [online]. [cit. 2021-05-25]. Available from http://www.interreg.olza.pl/#/informacje-ogolne.

[2] HALÁSKOVA, M., HALÁSKOVÁ, R. (2020). Public Expenditures on Sport, Recreation and Leisure Activities: Analytical Approach in Self-governing Regions in the Czech Republic. *Lex Localis - Journal of Local Self-Government*, Vol. 18, No. 4, pp. 713-737.

[3] HALÁSKOVÁ, M. (2019). Support and Financing of Sport in the Moravian-Silesian Region and Comparison with the Regions of the Czech Republic. *Proceedings of the 2019 13th International Scientific Conference Public Economics and Administration 2019,* pp. 104-115.

[4] HOBZA, V., SCHWARTZHOFFOVA, E., SKOUMAL, J. (2014). The Relationship Between the Development of Sports Infrastructure and Future Spending Flexibility in Municipal Budgets. In *Proceedings of the 2014 18th International Conference Current Trends in Public Sector Research,* pp. 249-254.

[5] Informacje podstawowe dotyczące Programu Interreg V-A Republika Czeska – Polska. [cit. 2021-05-25]. Available from https://duw.pl/pl/urzad/programy/interreg/7035,Informacje-podstawowe-dotyczace-Programu-Interreg-V-A-Republika-Czeska-Polska.html.

[6] KRUSZYŃSKA, E., POCZTA, J. (2020). Difficulties Limiting Access to Sports and Recreational Facilities in the City in the Perceptions of Service Users. Sports and Recreational Infrastructure Management Policy—Poznan Case Study. *International Journal of Environmental Research and Public Health.* Vol. 17(5), p. 2. [online]. [cit. 2021-05-25]. Available from https://www.mdpi.com/1660-4601/17/5/1768.

[7] MÜLLER-FRĄCZEK, I. (2021). Sports infrastructure vs. sport development in Poland. *Journal of Physical Education and Sport*. Vol. 21, suppl. 2, p. 1018. [online]. [cit. 2021-05-25]. Available from https://efsupit.ro/images/stories/aprilie2021/Art%20126.pdf.

[8] Obiekty służące poprawie kondycji fizycznej w 2020 r. Główny Urząd Statystyczny, p. 1. [online]. [cit. 2021-05-25]. Available from https://stat.gov.pl/obszary-tematyczne/kultura-turystyka-sport/sport/obiekty-sluzace-poprawie-kondycji-fizycznej-w-2020-r-,15,1.html.

[9] PERNA, F., CUSTÓDIO, M. J, OLIVEIRA, V. (2019). Local Communities and Sport Activities Expenditures and Image: Residents' Role in Sustainable Tourism and Recreation. *European Journal of Tourism Hospitality and Recreation.* Vol. 9(1), pp. 49-59.

[10] Podstawowe informacje o programie. [online]. [cit. 2021-05-25]. Available from https://pl.cz-pl.eu/zakladni-informace-o-programu-pl.

[11] POPELKA, J. (2015), Providing Public Sport Facilities in Post-Socialist Times: The Case of the Czech Republic, *Central European Journal of Public Policy*, Vol. 9(2), pp. 190-208.

[12] Program rozwoju sportu do roku 2020. (2015), p. 29. [online]. [cit. 2021-05-25]. Available fromhttps://bip.msit.gov.pl/download/2/9960/Uchwala_nr_150_RM_z_dnia_31_sierpnia_2015_w_sprawie_przyjecia____Programu_Rozwoju_Sportu_do_roku_2020___.pdf.

[13] Projekt „Wspólnymi siłami na czesko-polski rynek pracy". [online]. [cit. 2021-05-25]. Available from https://www.zsz4.opole.pl/index.php/wspolnymi-silami-na-czesko-polski-rynek-pracy.

[14] Projekt realizowany wspólnie z Gminą partnerską Zator. [online]. [cit. 2021-05-25]. Available from https://szkoladaniec.weebly.com/projekt-sport-na-pograniczu.html.

[15] SASKA-DYMNICKA, J. (2011). Sport młodzieżowy kuźnią charakteru i postaw prospołecznych. [w:] *Zeszyty Naukowe Uniwersytetu Szczecińskiego.* Ekonomiczne problemy usług, Vol. 78. Sport i rekreacja a wyzwania współczesnej cywilizacji, p. 114. [online]. [cit. 2021-05-25]. Available from http://www.wzieu.pl/zn/689/ZN_689.pdf.

[16] SEKOT, A. (2010). Sport and Physical Activities in the Czech Republic. *Physical Culture and Sport. Studies and Research,* Vol. 48, Issue 1, p. 46. [online]. [cit. 2021-05-25]. Available from https://sciendo.com/downloadpdf/journals/pcssr/48/1/article-p44.pdf.

[17] ŠPAČEK, O. (2016). Sporting activities and social stratification in the Czech Republic: a temporal perspective. *European Journal for Sport and Society.* Vol. 13(4), pp. 256-273.

[18] Uchwały budżetowe gminy Chrząstowice. [online]. [cit. 2021-05-25]. Available from https://chrzastowice.bip.net.pl/?c=92.

[19] Ustawa z dnia 8 marca 1990 r. o samorządzie gminnym, Dz. U. 1990 Nr 16 poz. 95 z późn. zm.

[20] WAŚKOWSKI, Z. (2011). Integracyjna rola sportu we współczesnym świecie. *Ekonomiczne Problemy Usług* no 78, p. 27-28. [online]. [cit. 2021-05-25]. Available from http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.ekon-element-000171244613.

[21] Współpraca z zagranicą. [online]. [cit. 2021-05-25]. Available from http://zsbbrzeg.wodip.opole.pl/joomla/index.php?option=com_content&view=category&layout=blog&id=38&It emid=79.

[22] Współpraca międzynarodowa. [online]. [cit. 2021-05-25]. Available from http://chrzastowice.pl/160/wspolpraca-miedzynarodowa.html.

[23] Zespół Szkół w Komornie. [online]. [cit. 2021-05-25]. Available from http://www.zskomorno.pl/index.php/erasmus

Complementary Activity as an Alternative Financial Source of Secondary Schools in the Moravian-Silesian Region

Petra Schwarzová[1], David Ulčák[2]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
petra.schwarzova.st@vsb.cz

[2]VŠB – Technical University of Ostrava
Faculty of Electrical Engineering and Computer Science
Department of Applied Mathematics
17. listopadu 2172/15, 708 00 Ostrava-Poruba, Czech Republic
david.ulcak@vsb.cz

Abstract

The paper studies the funding for education and the analysis of public expenditures focusing on secondary education. It focuses mainly on the complementary activity of school as an alternative way of funding for education. The 30 chosen secondary schools from the Moravian-Silesian region, divided into three categories according to similar school characteristics (first grammars schools, second business schools and secondary technical schools, third secondary vocational schools), are evaluated. The groups of complementary activity determined for comparing are educational courses, renting of property, catering, providing services, and renting sports grounds. The aim is to assess the gaining of alternative resources from complementary activity with the chosen sample of the 30 schools established by the Moravian-Silesian region by the Kruskal-Wallis test comparing incomes in 2019. The results show that from the point of view of the group of complementary activity, the type of school does not matter so much. According to the individual activities, considerably different anomalies could be observed mainly in catering and sports grounds. By contrast, the most stable values at all types of schools are in renting.

Keywords: *education, financial resources, Moravian-Silesian region*

JEL Classification: *H72, H75, I220*

1 Introduction

Education belongs to the collective mixed goods provided on a non-profitable principle. It is a part of the public sector same as e.g. sport, culture, and health service. The problem of public goods, decisions about their production, providing or the way of their funding is the topic of many authors e.g. Ochrana (2001), Jackson, Brown (2003), Meričková, Stejskal (2014). Education is, without doubt, the key topic of The long-term intention of education 2019-2023 in the Czech Republic (hereinafter referred to as the CZ) (MŠMT, 2019). Strategy Europe 2030+ also sees education as the area of priority, which influences the reported high level of employment, productivity, and social unity in the member countries (European Commission, 2018). The perception of education as a specific value is possible only in context with the needs of the labour market, which reflects currently. The integral part of education politics is funding for education. It is not only about the number of financial resources expended on education, but also about setting priorities to funding for education (Brdek, Vychová, 2004). The resources and forms of funding in the countries of the European Union (hereinafter referred to as the EU) discusses in foreign researches and studies, e.g. (Akyüz, 2015; Gouvias, 2011, Massih-

Tehrani et al., 2015; Jovanović, Zelenika, 2013; Mura, 2014; Halásková, 2019). Papers about funding for education in the countries of OECD research also the interaction between public and private expenditures and their impact on economic growth. The researchers also focus on the effect of globalization on changes in education politics (Carnoy, Rhoten, 2002). The effective use of public expenditures education in the European countries is the key topic of the research (Halásková, Halásková, 2020).

1.1 Financial Resources on Education in the CZ

The aim of education in the CZ is, from the point of view of funding and also Strategy 2030+, not only to increase the number of financial resources but also to provide stability in a given area (MŠMT, 2020). The process of gaining financial resources and the flow of financial resources in the CZ depends on the establisher (e.g. region, town, ministry, church, private legal or natural person) and the type of school (e.g. preliminary, primary, secondary school) (Zeman, 2005, Peková et al., 2012). According to the Act no. 561/2004 Collection of Law on Pre-school, Basic, Secondary, Tertiary Professional and Other Education, as amended (hereinafter as „the Education Act"), schools realize especially the main activity (education), but they also have an opportunity to do the complementary activity. However, the amount of financial resources gained from the public budget for the main activity is precisely limited by given rules, and thus schools effort to gain additional financial resources by the complementary activity. For this activity, they use not only school property, that has been given into their usage, but also the professional knowledge of teachers or the productive activities of students (mainly at secondary vocational schools). Even the primary aim of schools is high-quality education, it is the possibility to improve their economic level (Poláková, et al., 2005). The options for complementary activities depend on each school, however, they have to respect principles set in the Education Act (Valenta, 2004, Pešková, 2007).

The paper aims to analyze financial resources for public secondary schools established by the Moravian-Silesian region (hereinafter referred to as MSR) in 2019. Financial resources gained by the own school initiative are compared within the individual sectors of complementary activity. The paper attempts to give a better picture of out normative financial resources of school subjects with the Kruskal-Wallis test.

2 Material and Methods

The statistical data used for processing are from reports about activity and fulfilling of tasks of the contributory organizations and from compulsory reports about economic activities not provided from the budget of the MSR in 2019.The reason was to assess current economical activity at studied subjects. The selected file represents 30 schools divided into three categories. Categories were specified based on a similar focus of Educational Programmes, that are connected with the possibilities of complementary activity realization. The first category is grammar schools, the second secondary technical schools and business academies (hereinafter referred to as STS and BA), the third is secondary vocational schools that comprise the branches of study with a vocational certificate or maturity exam (hereinafter referred to as SVS). For this comparison, the five criteria (areas of complementary activity) have been chosen. These are courses (providing retraining, professional and education courses, training courses and other education events including their arrangement), catering (providing of company catering and services for providing food and drink), renting of property (includes renting of classrooms and school equipment except for sports equipment), services (copy services, accommodation services, manufacturing of products, business activity, etc.) and renting of sports grounds (includes running of sports facilities and organization of sports activities). The appropriate data are standardized per student for adequate comparison. In the case of not realization, the value for the criterion is zero. A negative value indicates, that the expenses in the area have been higher than profits. To compare data from the perspective of the influence of two factors together would be an ideal solution using double-factor analysis of variance - ANOVA. This analysis has quite strict data requirements, because, besides other things, it presupposes normality in individual cells, in our case, the profits from a given type of activity for a given type of school. For verification of normality, the Shapiro-Wilk test has been used, which is used standardly in practice. Those interested in details and other methods of verification of normality can see the publication (Thode, 2002).

Table 1 shows, the presumption of normality has been fulfilled, which means that p-value > 0,05 only for three from 15 cells. The ANOVA test cannot be used. Let's note that the stated level of importance 0,005 is used in the rest of the text.

Table 1 - P-values of the Shapiro-Wilk test for individual factor combinations

Type of school	Activity	P-value
Grammar schools	Courses	0,011689
	Catering	0,000007
	Renting	0,018412
	Services	0,034517
	Sports grounds	0,263098
STS and BA	Courses	0,004448
	Catering	0,000002
	Renting	0,011108
	Services	0,000129
	Sports grounds	0,000191
SVS	Courses	0,012011
	Catering	0,000003
	Renting	0,164314
	Services	0,065222
	Sports grounds	0,045692

Source: own processing

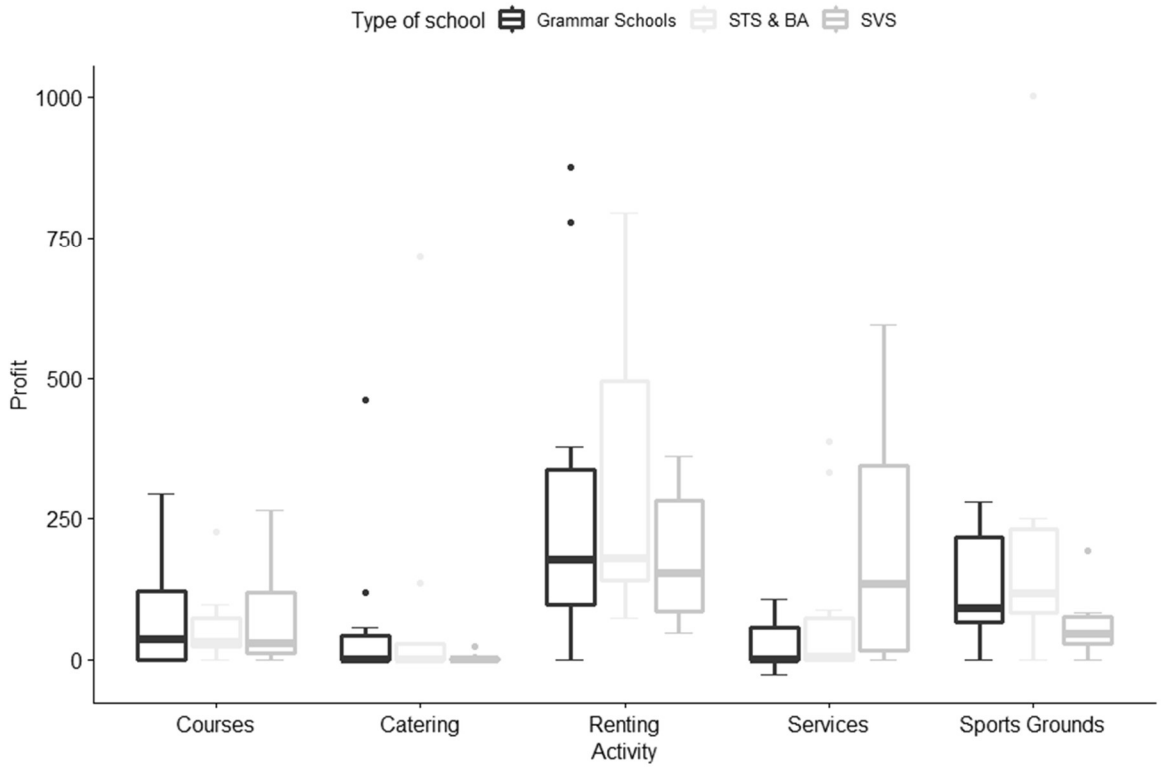
Looking at Figure 1 and Figure 2, it is obvious that with recalculation of profit per student, the type of school does not play a significant role in our data sample, which is quite surprising (this result is presented again below). Given this observation, the impossibility of the application of the ANOVA test, and a relatively low amount of data, it was decided to analyze significant differences separately from the point of view of both factors by the Kruskal-Wallis test.

Kruskal-Wallis test is a non-parametric alternative to single-factor ANOVA test. It does not assume normality and it is also more suitable for work with data with distant observations. It uses test statistics

$$H = \frac{12}{N(N+1)} \sum_{i=1}^{g} \frac{R_i^2}{n_i} - 3(N+1),$$

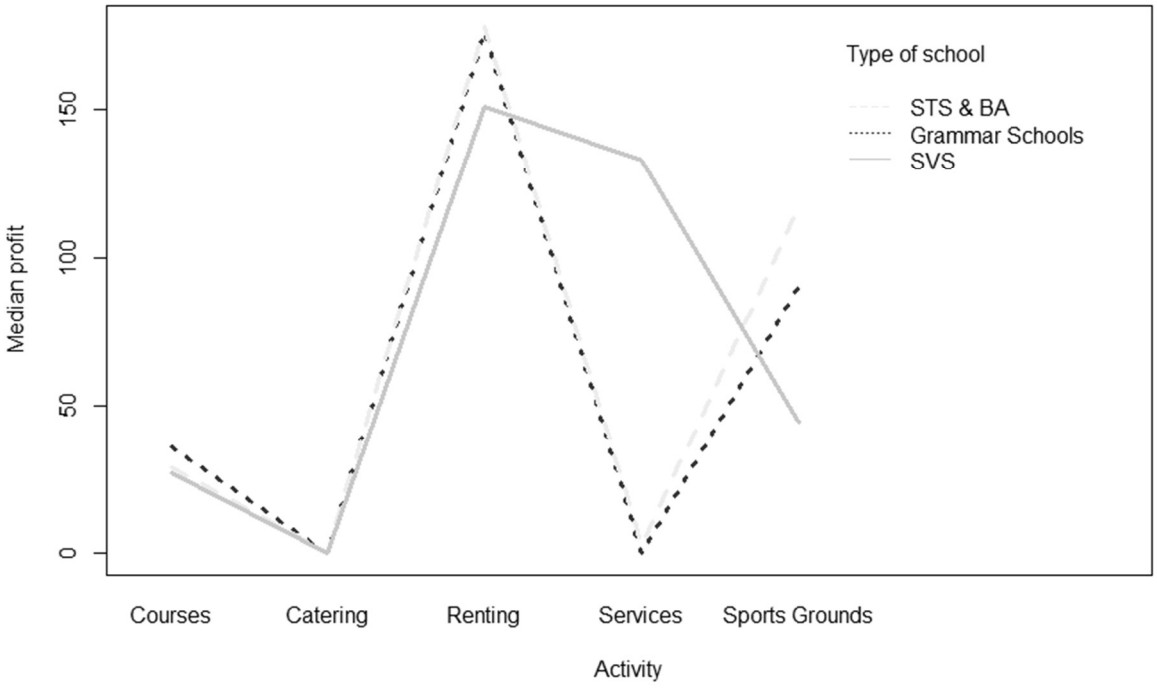
where N is the amount of data, n_i number of observations in the i-th group (category), g is a number of groups and R_i is the sum of an order of all data in the i-th group. For an adequate amount of data, the critical value can be evaluated by χ^2 -division with g-1 degrees of freedom. In case of proving of statistically significant difference the Dunn test will be used for post-hoc analysis. Those interested in details from the area of non-parametric test of hypothesis see (Hollander et al., 2013).

Figure 1 - Summarizing multiple boxplots of the individual cells distribution.



Source: own processing

Figure 2 - Interaction diagram according to type of school.



Source: processed in R studio

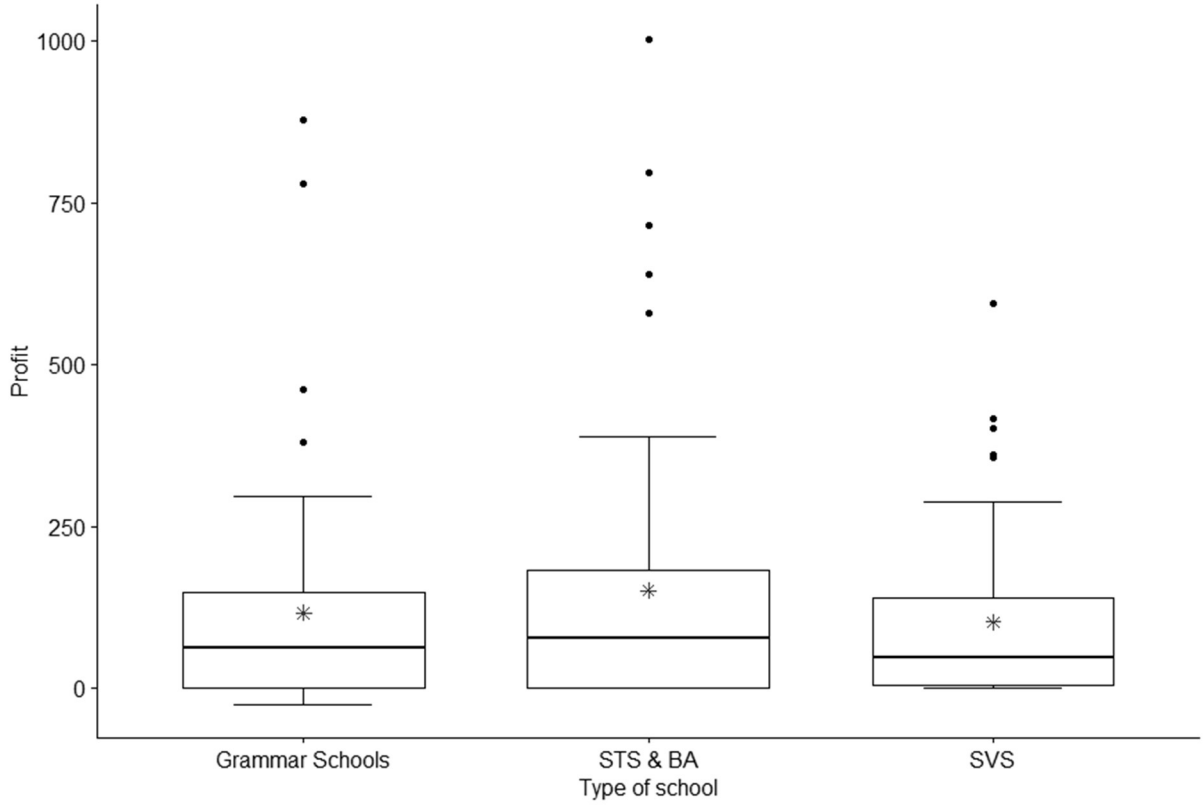
3 Results and Discussion

This part of the contribution focuses on the comparison of 30 secondary schools established by the MSR from the point of view of profits with chosen types of complementary activities. Schools were divided into three categories, according to their profile, on grammar schools, STS and BA, SVS. The comparison uses resources of incomes (profits) that have been gained by own activity of school within the complementary activity in the division to education courses, renting of property, catering, providing of services and renting of sports fields.

3.1 Comparison of Profits at Secondary Schools Established by the MSR

Let's start with the comparison of profits for various types of schools regardless of the type of activity. In this case, there are distinguished three groups with 50 observations. Figure 3 preliminary confirms our previous assumption about a very similar arrangement of values in R studio across the types of schools. The only one that seems to be slightly more "profitable" than others is STS and BA. At the same time, it is visible that there is only one significant negative value at grammar schools. Not fulfilling the presumptions of normality is also evident here in the number of distant observations only at the one end of the spectrum and inequality of medians and averages (marked with a red star in the figure). By using the Kruskal-Wallis test, we get the value H = 0,807. The corresponding critical value $\chi 2$- division is 5,991 and p-value equals 0,668. That data, from the point of view of types of schools, cannot be declared as significantly different.

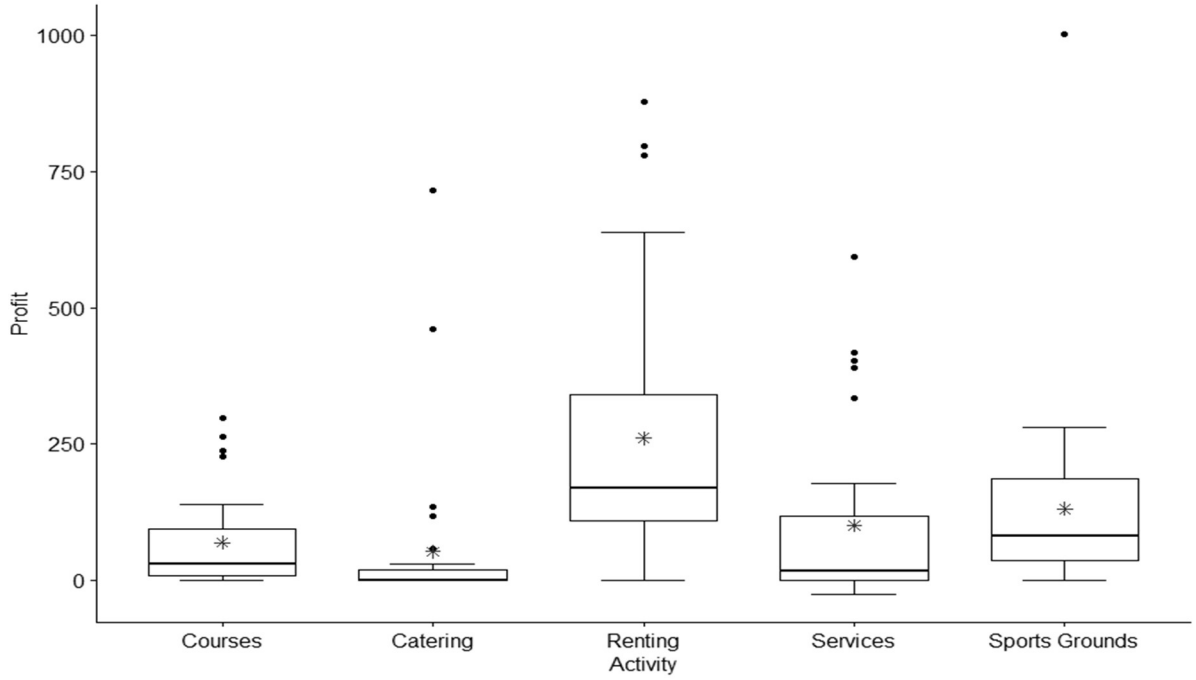
Figure 3 - Multiple boxplots of the profit distribution for individual types of schools.



Source: processed in R studio

However, the situation across the individual types of activities, if we take five groups with 30 observations, is more difficult, as in Figure 4. This also supports previous conclusions about the abnormality of data. Moreover, together with Figure 2, it is apparent, that even if the distant observation is in all groups and all groups show a high degree of variability, clearly different anomalies can be observed mostly in catering and sports grounds. This is mainly because of the material facilities for these areas at individual schools, which can be various for schools. Some schools do not have their canteen or large sports ground at all. The most stable, quite high values are in renting, which can be seen in the layout of quartiles, skewness, and coefficient of variation which, even if it is still high, is the lowest in all categories. The reason is, that it is the easiest form of complementary activity when every school dispose of classrooms and can use them after classes.

Figure 4 - Multiple boxplots of the profit distribution for individual types of activity.



Source: processed in R studio

Table 2 - Selected characteristics for individual types of activities.

Activity	**Courses**	**Catering**	**Renting**	**Services**	**Sports grounds**
Minimum	0,00	-0,99	0,00	-26,51	0,00
Lower quartile	9,10	0,00	108,63	0,00	36,89
Median	29,13	0,00	168,42	16,19	81,19
Average	68,78	52,30	259,67	100,38	130,52
Upper quartile	93,78	19,09	338,45	116,21	184,74
Maximum	295,73	715,92	876,36	593,66	1002,22
Standard deviation	85,90	153,19	239,91	160,76	185,99
Var. coefficient (%)	124,90	292,91	92,39	160,15	142,50
Standard skewness	1,39	3,50	1,36	1,68	3,57
Standard kurtosis	0,78	11,39	0,75	1,75	14,31

Source: processed in R studio

Kruskal-Wallis test confirms preliminary observations: the resulting value of the test statistics is H = 41,48 when the critical value χ2-division is 9,49 and p-value is only $2 \cdot 10^{-8}$. The zero hypothesis about the equality of division is then denied. The table with the Dunn test (Table 3) shows that the compared pairs, which cannot be analytically proved with significant differences, are only three from ten, specifically Courses - Services, Courses - Sports grounds, and Services - Sports grounds. Renting and catering do not show any similarity with another group. Concerning the previous exploratory analysis, it is obvious, that catering brings only low profit to school,

significant at only a few specific schools, however, the highest profit root from renting. The reasons were stated above. The other groups of activities show comparable results. The only ones that step out are profits from services at vocational schools. It is logical as they dispose of appropriate material backgrounds and the students' options in terms of productive activity.

Table 3 - P-values of Dunn's test for double comparison of the activity types.

p-value	**Catering**	**Renting**	**Services**	**Sports grounds**
Courses	0,0106	0,0001	0,3752	0,0690
Catering	-	0,0000	0,0235	0,0001
Renting	-	-	0,0000	0,0098
Services	-	-	-	0,0358

Source: processed in R studio

The bigger picture in context with other public goods directed into the culture, sport, health service, etc. cannot be omitted at education too. The evaluation of mixed public goods provided in the cultural sector is also a field of Ardielli, Bečica (2018)., In health service, where the judicial subjects are contributory organizations, same at schools, is the effectivity assessed also by exact methods (Vaňková, Vrábková, 2014).

4 Conclusion

The paper aimed to evaluate financial resources gained by the own initiative of schools within the individual areas of complementary activity at 30 chosen schools of the MSR divided into three categories. Education as a part of the public sector has its specifications and follows the rules in current legislation. Public schools in the CZ gain the majority of financial resources on education (main activity) through the MEYS and their establisher. Under the terms of legislation, it is possible to realize also complementary activity and its profit use to the main activity. For the complementary activity, they use not only the school property that has been given into their usage but also professional knowledge of teachers or the productive activity of students. The area of complementary activity depends on the headmaster. The results show that the arrangement of values across the school types is very similar. The only one that is slightly more "profitable" than others seems to be STS and BA. The distant observations are in all groups. The only significantly more negative value is at grammar schools. Considerably different anomalies can be observed mainly at catering and sports grounds. It is mainly because of the material base for these areas at particular schools, which is various for individual schools. Some schools do not have their canteen or large sports grounds at their disposal at all. The most stable high values are mostly at renting. The reason is that it is the easiest form of complementary activity when every school has classrooms and can use them after normal classes.

Complementary activity is one of the indicators the characterizes the activity of the school or headmaster. To that, the attention to its evaluation should be higher from the establisher, from the perspective of modern statistical methods, not only by comparative comparison. As well, the research might be an important source also for the individual subject as a data source for an improvement and increase in efficiency of activity in a given area. The given topic deserves further research, not only for the sample of schools but also for all subjects in the MSR.

References

[1] ARDIELLI, E., BEČICA, J. (2018). Review of Economic Perspectives. Multi-criteria Evaluation of the State of Professional Theatres in the Czech Republic in Terms of Mixed Public Goods Provided to the Citizens. Vol.18, No. 2, 2018, pp.155.

[2] AKYÜZ ÜNAL (2015). Egitim Ve Bilim - Education And Science. *Assessment of European Union Funded Projects Finalised by the Ministry of National Education based on the Opinions of Administrators and Experts*. Vol. 40, No. 181, pp. 191-216.

[3] BRDEK, M., VYCHOVÁ, H. (2004). *Evropská vzdělávací politika: programy, principy a cíle*. Praha. Aspi Publishing.

[4] CARNOY, M., RHOTEN, D. (2002). Comparative Education Review. *What does globalization mean for educational change? A comparative approach.* Vol. 46, No. 1, pp. 1-9+154.

[5] EUROPEAN COMMISION (2018) *The European Semester*. [online]. [cit.2021-03-03]. Available from: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester_en .

[6] GOUVIAS, D. (2011). European Educational Research Journal. *EU funding and issues of 'marketisation' of higher education in Greece*. Vol. 10, No. 3, pp. 393-406.

[7] HALASKOVA, R. (2019). Quality of Education from the Perspective of Selected Indicators in European Countries. In Proceedings of the 2019 *12th International Conference of Education*, *Research and Innovation (ICERI 2019)*, pp. 2604-2613.

[8] HALÁSKOVÁ, R., HALÁSKOVÁ, M. (2020). Public Expenditures on Education: An Empirical Analysis in European Countries. In Proceedings of the 2020 *13th International Conference of Education, Research and Innovation (ICERI 2020),* pp. 1880-1889.

[9] HOLLANDER, M., WOLFE, D. A., CHICKEN, E. (2013). *Nonparametric statistical methods*. New Jersey: John Wiley & Sons.

[10] JACKSON, P. M., BROWN, C. V. (2003). Ekonomie veřejného sektoru. Praha: Eurolex Bohemia. ISBN 8086432092.

[11] JOVANOVIĆ, Ž., ZELENIKA, S. (2013). Periodicum Biologorum. *Science and higher education in Croatia at the verge of entering the EU.* Vol. 115, No. 1, pp. 27-31.

[12] MASSIH-TEHRANI, N., BAIER, C., GENGNAGEL, V. (2015). Soziale Welt. *Research Funding in German Higher Education: Universities between Knowledge Economy and Academic Autonomy*. Vol. 66, No. 1, pp. 55-74.

[13] MERICKOVA, B., STEJSKAL, J. (2014). *Value of Collective Consumption Goods, Politicka ekonomie. Vol. 62(2), pp. 216-231.*

[14] MŠMT (2019). *DZ ČR 2019-2023.* [online]. [cit.2021-04-17]. Available from: https://www.msmt.cz/vzdelavani/skolstvi-v-cr/dz-cr-2019-2023.

[15] MŠMT (2020). *Strategie vzdělávací politiky ČR do roku 2030+.* [online]. [cit.2021-03-03]. Available from: https://www.msmt.cz/vzdelavani/skolstvi-v-cr/strategie-2030.

[16] MURA, P. O. (2014). Theoretical and Applied Economics. *How growth- friendly are productive public expenditure? An empirical analysis for Eastern Europe.* Vol. XXI(2014), No. 10 (599), pp. 7-20.

[17] OCHRANA, F. (2001). Veřejný sektor a efektivní rozhodování. Praha: Management Press.

[18] PEKOVÁ, J., PILNÝ, J., JETMAR, M. (2012). *Veřejný sektor – řízení a financování.* Praha: Wolters Kluwer Česká republika.

[19] PEŠKOVÁ, R. (2007). *Finanční management školy.* Liberec: Technická univerzita v Liberci.

[20] POLÁKOVÁ, M., BLŮZL, F., DVOŘÁK, I., KUBÍČE, V. (2005) *Studium pro ředitele škol a školských zařízení I.* Praha: Národní institut pro další vzdělávání.

[21] THODE, H. C. (2002). *Testing for normality.* Basel: CRC press.

[22] VALENTA, J. (2004) *Financování a rozpočet školy.* Karviná: Paris.

[23] VAŇKOVÁ, I.,VRABKOVÁ, I. (2014). Review of Economic Perspectives. The Factors Influencing Economic Efficiency of the Hospital Bed Care in Terms of the Regional Allowance Organizations. Vol. 14, No.3, 2014, pp. 234–248.

[24] ZEMAN a kol. (2005). *Studium pro ředitele škol a školských zařízení.* Praha: Národní institut pro další vzdělávání.

Appendix

List of schools
Grammar schools: Všeobecné a sportovní gymnázium, Bruntál: Gymnázium Frýdlant nad Ostravicí: Gymnázium Mikoláše Koperníka, Bílovec: Gymnázium Olgy Havlové, Ostrava-Poruba: Gymnázium, Ostrava-Hrabůvka: Gymnázium a SOŠ, Frýdek-Místek, Cihelní 410: Gymnázium Jana Kainara, Hlučín: Gymnázium, Havířov-Město, Komenského 2: Gymnázium Josefa Božka, Český Těšín: Gymnázium, Karviná.
Secondary technical schools and Business Academies: SPŠ a OA, Bruntál: SPŠ, OA a JŠ s právem SJZ, Frýdek-Místek: OA, Ostrava-Poruba: SPŠ chemická akademika Heyrovského, Ostrava: SPŠ elektrotechniky a informatiky, Ostrava: SPŠ, Ostrava-Vítkovice: OA a SOŠ logistická, Opava: OA, Český Těšín: SPŠ, Karviná: SPŠ stavební, Havířov.
Secondary vocational schools: SŠ služeb a podnikání, Ostrava-Poruba: SŠ gastronomie, oděvnictví a služeb, Frýdek-Místek: VOŠ, SOŠ a SOU, Kopřivnice: SŠ stavební a dřevozpracující, Ostrava: SŠ průmyslová, Krnov: SŠ techniky a služeb, Karviná: SŠ technická a dopravní, Ostrava-Vítkovice: Masarykova SŠ zemědělská a VOŠ, Opava: SŠ, Bohumín: SŠ technických oborů, Havířov- Šumbark.

The Comparison of Housing Investment Opportunities of Czech and Polish Regions in 2021

David Slavata[1], Olena Panova[2]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
david.slavata@vsb.cz

[2]OM Beketov National University of Urban Economy in Kharkiv
17 Marshal Bazhanov Street, 61002 Kharkiv, Ukraine
lenagerum@gmail.co

Abstract

The paper is focused on the analysis of housing investment opportunities of Czech and Polish regions. The aim is to create some simple indicator for decision making of investors to housing and as second to calculate its value for separate Czech and Polish region. The indicator will be compared with its values in the year 2020 and 2021 to find out possible improvements or worsening in separate regions. The investors often have to choose the most appropriate option to secure their profit. There will be constructed investment index for particular Czech and Polish region. The index will be calculated from three basic decision elements that are necessary for decision making of investors. The main parameters to construct the investment index will be the share of flats for sale of housing market, the price of flats, the rent and the average salary. All the parameters will be given for particular Czech and Polish region. The parameters will be calculated to get three most investment important indicators. They are: I/P ratio indicates the real price of flats, P/R ratio indicates the profitability and flats for sale to supply of housing indicates what is the share of flats for sale. The aim of the paper is to find out (with the help of mentioned ratios), if there are better or worse investment opportunities between Czech and Polish regions. The results show the Czech regions are in average the regions with low level of investment opportunities in comparison to the Polish regions.

Keywords: *housing, ownership, price/income ratio, price/rent ratio, real estate market, vsb invest index*

JEL Classification: *R30, P50*

1 Introduction

The paper focuses on analyse of housing investment opportunities in Czech and Polish regions. Many countries in the world have been experiencing boom in house prices for a couple of years, and the European countries are no exception. The house price is one of the highly monitored indicator. To analyse housing prices and housing bubbles is very common topic in literature. The house price analysis has become very common in connection with crisis in 2008. From the time up to now the economists make many of researches to explore potential risk of house price increase. Now in 2020 again many of papers are analysing the potential risk due to coronacrisis. Under condition of rising prices of homes and rising amount of mortgages there are some worries of Czech National Bank, that is afraid of too high prices of flats in Czech Republic. It forecasts the flat prices are more

than 25% overestimated in Czech Republic. In these unclear conditions it is very difficult to make the right decision for many of real estate investors.

This paper is related to the increasing literature, which focuses on the empirical investigation in housing market. The main goal of this paper is to make an analysis of investment opportunities in the housing market of Czech and Poland. Using the main housing ratios I will transform them to the common investment indicator. The housing ratios are often used as indicators not only for investment decisions. The housing ratios are used as an indicators of real estate bubble, which can affect both investors, landlords and tenants. The topic of real estate bubble is very common in literature.

There are many of different view and factors how to identify the real estate bubble. Under the condition of Czech Republic there are several authors who analyse the situation of house prices in Czech Republic. J Cadil (2009) tries to analyse the real estate bubble in Czech Republic using the R/I ratio and regression analysis. He states the price bubble is the expectation of price acceleration of particular asset, which results in higher demand and such increase in demand is pushing prices up. The self – reinforcing mechanism is working until bubble bursts.

There are some other authors who try to analyse the Czech real estate market from the point of real estate bubble. Hlavacek, Komarek (2010) define real estate bubble as residual of housing price growth that cannot be explained by the aforementioned "standard" factors. The main factors for increase of real estate prices in national economy they define as:

1. a process of catching-up with the usual level in developed economies combined with macroeconomic convergence,
2. a correction in relative prices,
3. the development of the Czech housing market and
4. the constantly expanding mortgage market in the Czech Republic.

They analyse the property prices using three alternative approaches – an approach based on simple indicators of housing price sustainability (price-to-income and rental returns) and two simple econometric models (a time series model and panel regression).

Zemcik and Mikhed (2009) in their paper investigate the situation of decreasing of U.S. real estate market after the beginning of the financial crisis. Thea use the regression analysis to explain the main fluctuations.

Many of sources use for identification of price real estate bubble the simple housing market indicators. There are mainly compared the historical levels of indicators with the current level of indicators. The most typical indicator using by accredited institutions (national and international financial institutions such as Goldman Sachs, Czech National Bank etc.) is P/I ratio. The comparison of P/I can indicate potential real estate bubble.

The main simple real estate indicators can be divided into the four separate groups:

1. housing affordability measures
2. housing debt measures
3. housing ownership and rent indicators
4. housing price indexes

The similar topic of flat price analysis in Czech – Polish border regions you can find in Ardielli and Ardielli (2018). The authors analyse each segments of real estate market and present the main differences.

2 Material and Methods

As the main source of data the internet analytical portal www.trzniceny.cz for recording of data describing Czech real estate market was used. To record the data describing Polish real estate market the portal www.otodom.pl was used. There were recorded the information of flat prices, rent prices and share of flats for sale. The other needed data were recorded from official national statistical offices www.czso.cz and www.stat.gov.pl. Especially the information describing the level of salaries in Czech and Polish regions. To analyse the Czech and Polish real estate market the data from the July 2020 and July 2021 were from online renewed web pages collected and recorded.

The construction of VSB invest index is based on the assumption of rational considerations of investor. It tries to combine the three most important parameters of investor decision on real estate market. All the investors who want to reach profit should take into the account return of investment, amount of flat supply and price of flat. It is understandable, the return of investment should be the shorter the better, amount of flat supply should be the bigger the better and the price should be the lower the better. All these assumptions will be involved in new

created VSB invest index. As the first step for construction it is necessary to state the basic indicators describing return of investment, share of supply and real flat price. The construction of VSB invest index was inspired by Polednikova (2014) and Halaskova (2015).

The indicators are:

1. IP ratio
2. RP ratio
3. FSR ratio

The income to price ratio (see the formula 2.1) is the basic affordability measure for housing in a given area. It is generally the ratio of average dispose incomes to average house prices, expressed as a percentage or as area of the flat in m^2, which is available to the investor per average income. As bigger area per average salary the investor can buy as better.

IP ratio = I/P (1)

where

P…… Average price of flat

I…… Average personal income

The rent to price ratio express the value of capitalization. It shows what is the profit from investing in an flat. As higher the R/P ratio is as better investment.

RP ratio = R/P (2)

where

P…… Average price of flat

R…… Average gross year rent

The FSR ratio shows the share of flat for sale in real estate market. As higher the share as better position for investor. If there is lower amount of flat for rent on the market the situation seems to be convenient for the landlord, because there is low competition on rent market. In such situation the investor can choose the most credible tenant to rent him his flat. On the other hand if there is high share of flat for sale, the investor can choose the best one. In such situation the market of flat for sale is competitive and the investor is in better situation than seller.

FSR = FS / (FS+FR) (3)

where

FS……flat for sale on the market

FR……flats for rent on the market

To construct VSB invest index we will use the previous three indicators. To construct the VSB invest index we will assume the higher value the indicator the better position for the potential investor. The best situation would be if the values of all indicators were on its maximum value. Using of VSB index we will search for the best regions with the highest levels of the three indicators, which are transformed to the VSB index. To calculate VSB we will use the Pythagorean theorem. The larger the diaphragm, the length of which is bounded by points (values of indicators) on the perpendiculars, the better. The VSB invest is defined by the length of diaphragm. The mathematical formula:

$$VSB\ invest = \sqrt{VSBp^2 + FSR^2} \quad (4)$$

where

$$VSBp = \sqrt{RP^2 + IP^2} \quad (5)$$

To calculate the VSB invest index, it is necessary to inspect the basic parameters of Czech and Polish real estate markets such as prices of flats of separate regions, rents of flats of separate regions, wages of separate regions and share of flats for sale of separate regions. Specificly, because of inter comparison the data were modified. They were transformed to their average values - flat price per m^2 , year payed rent per m^2 and year gross salaries.

3 Results and Discussion

The basic data describing Czech real estate market are in Table 1 presented. Praha region seems to be highly exceptional within the Czech regions. It is typical with the highest level of flat price (117,7 thousand CZK/flat), rent price (304,- CZK/m^2/month) and gross year salary (533184,-CZK). Even in Praha there is offered the highest number of flats for sale and for rent in comparison to other Czech regions. On the other hand the most cheapest region is Ústecký region, with the price 25,2 thousands CZK/m^2 of flat. Ustecky region seems to be the cheapest from the point of rent. Its price is 157,-CZK/m^2/month. The lowest salary is indicated in Karlovarský region (361 776,-CZK/year).

Table 1 - Czech market basic data June 2021

Region	Price per m2 in ths. Kč	Flats for sale	Month Rent per m2 in Kč	Flats for Rent	Gross Year Salary in Kč
Praha	117,7	2486	304	8218	533184
Jihomoravský	73	424	237	1362	414480
Karlovarský	43,8	610	162	290	361776
Středočeský	57,7	551	217	696	423552
Plzeňský	46,2	244	172	539	400524
Liberecký	47,5	196	207	249	387720
Jihočeský	47,2	280	170	282	384732
Vysočina	44	119	178	171	389568
Královéhradecký	50,3	188	199	245	395004
Pardubický	46,1	191	183	246	373380
Zlínský	49,8	158	206	234	371424
Olomoucký	46,7	237	189	461	380520
Moravskoslezský	36,4	590	158	1063	379284
Ústecký	25,2	654	157	768	397260

Source: Own calculations, www.trzniceny.cz, www.czso.cz

The basic data describing Polish real estate market are in Table 2 presented. The most expensive seems to be Maloposki region the table 2 presents. Mazowiecki region seems to be exceptional within the Polish regions in the rest shown data. It is typical with the highest level of, rent price and gross year salary. Even in Mazowiecki region there is offered the most flats for sale and for rent in comparison to other Polish regions. On the other hand the most cheapest region is Lubuski region, with the price of 29334,- CZK/m2 of flat. The cheapest region from the point of rent seems to be Kujawsko – pomorski region. Its price is 185,17 CZK/m2/month. The lowest salary is indicated in Swietokrzyski region (343 013,-CZK/year).

Table 2 - Polish market basic data June 2021

Region	Price per m2 in Kč	Flats for sale	Month Rent per m2 in Kč	Flats for Rent	Gross Year Salary in Kč
Małopolskie	60955	6907	231,59	5711	398533
Mazowieckie	57099	14725	286,84	10920	455521
Pomorskie	54571	6060	256,83	1180	393685
Podlaskie	40711	1121	187,42	285	362888
Wielkopolskie	42661	3440	222,82	2256	356000
Świętokrzyskie	34773	1090	180,66	263	343013
Zachodniopomorskie	41163	3593	235,04	798	371270
Lubelskie	42747	1859	204,58	640	352275
Kujawsko-pomorskie	36582	4783	185,17	1066	347269
Podkarpackie	34614	1490	187,45	909	343237
Warmińsko-mazurskie	34497	1109	207,05	144	344479
Dolnośląskie	39310	8996	257,24	3354	411847
Opolskie	27663	763	186,99	209	364912
Lubuskie	29334	1360	185,9	289	348653
Łódzkie	34689	2742	241,2	1208	376859
Śląskie	30380	6522	212,9	2907	405844

Source: Own calculations, www.otodom.pl, www.stat.gov.pl, exchange rate 5,683CZK/PLN

The table 3 the value levels of main indicators shows. The most exceptional region in Czech Republic seems to be Praha. All the shown indicators show exceptional position of Praha region. IP value indicates the real prices of flats in Praha are the highest in comparison to other Czech regions (4,53 m^2 per annual gross salary). RP the same shows very low profitability. The gross profit stays on the level of 3,10. That level is the lowest in comparison of other Czech regions. The FSR indicator presents the share of flat for sale. The lowest level you can find again in Praha (23,22%).

On the other hand the most lowest real prices of flats in comparison to the average salary are indicated in Ustecky region (15,76 m^2 per annual gross salary). The same RP indicates the highest profitability (7,48%) in Ustecky region. The highest level of FSR you can find in Karlovarsky region. The share of flat for sale is 67,78%.

Table 3 - Czech Republic, values of indicators

Region	FSR	RP	IP
Praha	23,22	3,10	4,53
Jihomoravský	23,74	3,90	5,68
Karlovarský	67,78	4,44	8,26
Středočeský	44,19	4,51	7,34
Plzeňský	31,16	4,47	8,67
Liberecký	44,04	5,23	8,16
Jihočeský	49,82	4,32	8,15
Vysočina	41,03	4,85	8,85
Královéhradecký	43,42	4,75	7,85
Pardubický	43,71	4,76	8,10
Zlínský	40,31	4,96	7,46
Olomoucký	33,95	4,86	8,15
Moravskoslezský	35,69	5,21	10,42
Ústecký	45,99	7,48	15,76

Source: Own calculations, www.trzniceny.cz, www.czso.cz

The table 4 the value levels of main indicators in Poland shows. IP value indicates the real prices of flats in Malopolski region is the highest in comparison to other Polish regions (6,54 m2 per annual gross salary). RP shows very low profitability for Malopolski region. The gross profit stays on the level of 4,56. That level is the lowest in comparison of other Polish regions. The FSR indicator presents the share of flat for sale. The lowest level you can find again in Malopolski region (54,74%).

On the other hand the most lowest real prices of flats in comparison to the average salary are indicated in Slaski region (13,36 m2 per annual gross salary). The same RP indicates the highest profitability (8,41%) in Slaski region. The highest level of FSR you can find in Warminsko Mazurski region. The share of flat for sale is 88,51%.

Table 4 - Poland, Values of indicators

Region	FSR	RP	IP
Małopolskie	54,74	4,56	6,54
Mazowieckie	57,42	6,03	7,98
Pomorskie	83,70	5,65	7,21
Podlaskie	79,73	5,52	8,91
Wielkopolskie	60,39	6,27	8,34
Świętokrzyskie	80,56	6,23	9,86
Zachodniopomorskie	81,83	6,85	9,02
Lubelskie	74,39	5,74	8,24
Kujawsko-pomorskie	81,77	6,07	9,49
Podkarpackie	62,11	6,50	9,92
Warmińsko-mazurskie	88,51	7,20	9,99
Dolnośląskie	72,84	7,85	10,48
Opolskie	78,50	8,11	13,19
Lubuskie	82,47	7,60	11,89
Łódzkie	69,42	8,34	10,86
Śląskie	69,17	8,41	13,36

Source: Own calculations, www.otodom.pl, www.stat.gov.pl

The table 5 presents the result of the research. The regions Czech and Polish are presented due to the value of VSB invest index in the YEAR 2021 and compared with the situation of the year 2020. The lowest values in 2021 on the top, the highest values in the 2021 down the table. The lowest values present the worse investment position, the highest values present the best for potential investment.

The top of the table 5 is occupied by Praha region with the lowest value of VSB invest index 21 (23,86). By other words it says the worst flat investment environment in region Praha exists. Its value is even 40,25% of its average value (59,27). The most interesting region for flat investment within the Czech regions you can find in Karlovarsky region (68,42). There has not been indicated any change in position since the year 2020.

The fourteenth position of the table 5 belongs to the Polish region Malopolski. It presents the worst value within the Polish regions (55,32). On the other hand the highest level of flat investment opportunities in Poland you can find in Warminsko-Mazurski region with the value of VSB invest index on the level 89,36. Warminsko Mazurski region represents even the highest level of flat investment opportunities within all the 30 searched regions.

Table 5 - VSB invest index in year 2020 and 2021

Region	VŠB invest 20	VŠB invest 21	Change in %
Praha	35,83	23,86	-33,39
Jihomoravský	47,34	24,72	-47,79
Plzeňský	52,85	32,65	-38,21
Olomoucký	63,50	35,25	-44,48
Moravskoslezský	49,04	37,55	-23,43
Zlínský	58,38	41,29	-29,28
Vysočina	57,04	42,26	-25,91
Královéhradecký	66,34	44,38	-33,10
Pardubický	60,81	44,71	-26,49
Středočeský	66,51	45,02	-32,31
Liberecký	62,81	45,10	-28,20
Ústecký	63,38	49,19	-22,39
Jihočeský	61,17	50,67	-17,16
Małopolskie	53,60	55,32	3,20
Mazowieckie	60,27	58,28	-3,30
Wielkopolskie	60,93	61,29	0,60
Podkarpackie	68,24	63,23	-7,34
Karlovarský	80,21	68,42	-14,70
Łódzkie	71,00	70,76	-0,34
Śląskie	73,03	70,95	-2,85
Dolnośląskie	70,49	74,01	5,00
Lubelskie	77,37	75,06	-2,98
Opolskie	84,33	80,01	-5,12
Podlaskie	83,03	80,42	-3,14
Świętokrzyskie	83,88	81,40	-2,96
Kujawsko-pomorskie	80,95	82,55	1,97
Zachodniopomorskie	81,40	82,61	1,49
Lubuskie	83,07	83,67	0,72
Pomorskie	68,97	84,20	22,08
Warmińsko-mazurskie	87,64	89,36	1,96
Average	**67,11**	**59,27**	**-11,68**

Own calculations, www.otodom.pl, www.stat.gov.pl, www.trzniceny.cz, www.czso.cz

The table 5 presents the changes of VSB invest index values between the years 2021 and 2020. It is shown in average decrease of investment opportunity. The average value of VSB invest index dropped by 11,68%. From the point of regions the deepest decrease is indicated in Jihomoravsky region (-47,79%). On the other hand the highest increase was indicated in case of Pomorski region (+22,08%). In average the flat investment opportunities of Czech regions are worse than in Polish ones. Below the average level you can find 13 Czech regions and only the 2 Polish regions (the law level of flat investment opportunities). Up to the average level there are 14 Polish regions and only the one Czech region (the high level of flat investment opportunities).

5 Conclusion

The results made by indicators and by VSB invest index show the low level of flat investment opportunities in Czech regions in comparison to Polish regions. The Czech region with the highest level of flat investment opportunities looks to be Karlovarsky region as the VSB invest index shows. The region is highly depended on the touristic industry, which is temporary risky segment because of Covid disease and possible reason for the high level of flat investment opportunities. On the other hand the lowest level of flat investment opportunities seems to be still in Praha region despite of Covid disease.

The VSB invest index show the higher level of flat investment opportunities in Polish regions with comparison to the Czech regions. The Polish region with the highest level of flat investment opportunities looks to be Warminsko – Mazurski region. The region is depended on touristic industry and from that point of view it is similar to the Czech Karlovarsky region. The lowest level of flat investment opportunities in Poland you can find in Malopolski region.

References

[13] ARDIELLI, E.; ARDIELLI, J. (2018). Dates on Real Estate Market in the Czech-Polish Borderland: Spatial Analysis in the Segment of Apartments in Ostrava Region. In Proceedings *of 2nd International Scientific Conference on Development and Administration of Border Areas of the Czech Republic and Poland: Support for Sustainable Development, 2018,* Ostrava: VSB – TUO. pp. 20-28.

[14] CADIL, J. (2009). Housing Price Bubble Analysis – Case of the Czech Republic. *Prague Economic Papers 1* 2009 pp. 38 – 47.

[15] GOMEZ-GONZALES, J. E. et al., (2018). When Bubble Meets Bubble: Contagion in OECD Countries. *Journal of Real Estate Finance and Economics*, vol. 56, issue 4, pp. 546-566.

[16] HALASKOVÁ, M., HALASKOVA, R (2015). Quality and Availability Assessment of Public Services using the Example of Social and Health Services *In Proceedings of the 2015 19th International Conference Current Trends in Public Sector Reserch.* pp. 205-213.

[17] HLAVACEK, M., KOMAREK, L. Housing Price Bubbles and Their Determinants in the Czech Republic and its Regions. Prague: *CNB WP 12*.

[18] KRAWCZYK – SOLTYS, A. (2017). From Healthcare Manager´s Competencies to Healthcare Organization´s Competences. *Vadyba Journal of Management 2017,* vol. 31, issue 2, pp. 9 – 15.

[19] MIKHED, V., ZEMCIK, P. Do House Prices Reflect Fundamentals? Aggregate an Panel Data Evidence. *Journal of Housing Economics.* pp. 140 – 149.

[20] POLEDNIKOVA, E. (2014). Multicriteria Evaluation of Regional Disparities in Visegrad Four. In *The 8th International Days of Statistics and Economics Conference Proceedings.* Czech Republic: Prague, 2014. p.1197-1207.ISBN 978-80-87990-02-5.

[21] TRULIA. *Trulia: Real Estate Listings, Homes For Sale, Housing Data.* [online]. [2018-08-10]. Available from: www.trulia.com

[22] www.czso.cz [online 2021 - 10 - 06]

[23] www.otodom.pl [online 2021 - 10 - 06]

[24] www.trzniceny.cz [online 2021- 10 - 06]

[25] ZEMCIK, P. (2011). Is There a Real Estate Bubble in the Czech Republic? *Finance a uver – Czech Journal of Economics and Finance*, vol. 61, issue 1, pp. 49-66.

[26] ZHANG et al. (2017). Price bubbles and policy interventions in the Chinese housing market. *Journal of Housing and the Built Environment,* vol. 32, issue 1, pp. 133-155.

Differences in Life Expectancy at the Level of EGTC TRITIA Regions

Ivan Šotkovský

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Marketing and Business
Havlíčkovo nábřeží 3120/38a, Ostrava 1, Czech Republic
ivan.sotkovsky@vsb.cz

Abstract

The main goal of the paper will be to compare the differences in life expectancy at birth of the four European regions that launched territorial cooperation in 2013 within the European Grouping of Territorial Cooperation TRITIA. The main actors in this effort to expand cooperation were the Moravian-Silesian Region, the Opole Voivodeship, the Silesian Voivodeship and the Žilina Self-governing Region. The four border regions at the common borders of the Czechia, Poland and Slovakia are an area where many economic and social decisions took place in a very similar way. Nevertheless, the border barrier has often acted as a major obstacle to long-term co-development. By analysing life expectancy at birth for the last twenty years since 2001, we will try to show the differences in this very important indicator of sustainable development at the level of the four monitored regions. Subsequently, we will try to justify the differences and find the causes of the differences, especially the social pillar of sustainable development. The analysis of the life expectancy at birth of these four regions will be supplemented by an assessment of its achieved level in comparison with other regions of the Czechia, Poland and Slovakia. In the case of the Czechia and Slovakia, it will be at the level of their regions (NUTS 3), in the case of Poland at the level of its voivodships (NUTS 2).

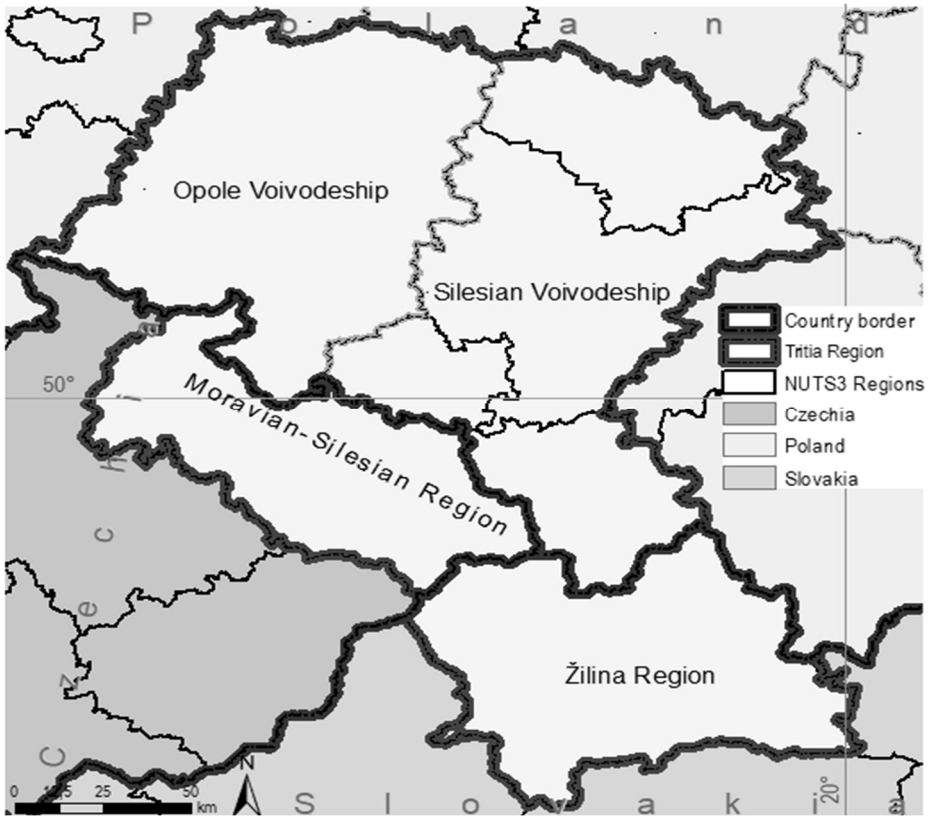
Keywords: *life expectancy at birth, Moravian-Silesian Region, Opole Voivodeship, Silesian Voivodeship, Žilina Self-governing region*

JEL Classification: *J11, J13, R23*

1 Introduction

The European Grouping of Territorial Cooperation Tritia (EGTC TRITIA) was established in 2013 (EGTC TRITIA, 2021). The purpose of establishing the region was to improve cross-border cooperation in an area where the borders of three Central European countries meet: the Czechia, Poland and Slovakia. Four regional self-governments at the NUTS2 (Opole Voivodeship and Silesian Voivodeship) and NUTS3 (Moravian-Silesian Region and Žilina Self-governing Region) levels initially decided to strengthen social and economic cooperation, in particular through the implementation of territorial cooperation projects or programs of EU Member States (Figure 1).

Figure 1 – Basic map of the Tritia region



Source: author

Although the Opole Voivodeship has no longer participated in this cooperation in recent years, it is an area of significant and long-term political, social, economic and environmental influences. It is certainly worth paying attention to conduct long-term research in this area. As another reason for the meaning of this cooperation, we can emphasize a better option for addressing most Sustainable Development Goals (SDGs). A total of 17 SDGs have been identified, in particular the latter encouraging partnerships to meet all objectives (United Nations, 2021). In addition, it is a large area (almost 34,000 km2) with a higher concentration of population. Today, more than 7 million people live here and the population density reaches more than 200 inhabitants / km2 (Šotkovský, 2020). The central area of this region (Silesian Voivodeship and Moravian-Silesian Region) has undergone major changes in its economic structure over the last hundred years. This area with a concentration of more than 5.8 million inhabitants achieves a population density of over 320 inhabitants /km^2 and occupies more than half of the entire area. The important position of the central regions is also evidenced by the fact that the Silesian Voivodeship is the second most populous in Poland out of a total of sixteen voivodships. Today, the Moravian-Silesian Region is the fourth most populous region out of a total of fourteen regions in the Czechia. The latest trends are a stress test for all Tritia regions due to the necessary restructuring of the initially very strong concentration of the heavy industry, including very large coal mining. This fact then has the greatest impact on the fact that the region is losing population in the long run. Over the last 20 years, this loss has reached a value of around 300,000 inhabitants, mainly due to the negative migration balance (Šotkovský, 2016). Another new challenging situation is created by the aging process of the population. Over the last two decades, the number of children in the region has decreased by more than three percentage points and the number of children in the Tritia region is just over 14%. The higher the loss of the number of children, the higher the increase in the number of seniors in this area. In the same period, their weight increased by more than six percentage points and their share in the region's population exceeds 18%. The age index thus reached the value of 130 and thus documents the fact that for every hundred children in the region there are 130 seniors aged 65 and over (Šotkovský, 2018).

In this article, we will focus on the social pillar of sustainable development. We will try to compare the differences between the four regions of the Tritia EGTC depending on the nature and development of the life expectancy indicator. We know that this indicator is often chosen at the moment when we try to examine the level of human society. It is basically an index of health, as it has been incorporated into its comprehensive concept of the maturity of the UN states. This institution with an extraordinary position in human development

has been compiling this Human Development Index (HDI) since 1990. In addition to the health index, its other components are the education index and the income index. The study of longevity in connection with mortality tables is part of a number of professional publications of various scientific disciplines (demography, sociology, economics). Differences in mortality by age of death can be considered a useful tool for analysing not only social differences between regions.

In our work we will try to show the differences between the four territorial units of the Tritia region when comparing the state and development of life expectancy at birth. In comparison, the Silesian Voivodeship will be at a smaller disadvantage due to significantly greater humanity than the other three regions. The Žilina Self-governing Region has the lowest population, which is 6.5 times smaller in population than the Silesian Voivodeship. The smallest population difference is in the Moravian-Silesian Region, which is only four times smaller in population (**CHYBA! NENALEZEN ZDROJ ODKAZŮ.**). On the other hand, these are territories that have evolved consistently in important social attributes over the last more than twenty years. It is mainly a decrease in the own population, mainly due to the migration loss (Šotkovský, 2016). Since 2000, the Tritia region has reduced its population size by almost 400,000. At the same time, these areas are not only aging, but with a more significant predominance of senior citizens aged 65 and over the children's component (0-14 years). The age structure of the four regions studied thus has no significant effect on differences in life expectancy (Eurostat, 2020).

Table 2 – Basic information abou Tritia region

NUTS2 and NUTS3			Country	Area	Population (mil.)		Population change	Population change (%)
Name origin	Name English			(km^2)	2001	2019		
Moravskoslezský kraj	Moravian-Silesian Region	MSR	Czechia	5,427	1.269	1.189	-79,769	-6.3
Województwo Opolskie	Opole Voivodeship	OV	Poland	9,412	1.069	0.983	-86,374	-8.1
Województwo Śląskie	Silesian Voivodeship	SV	Poland	12,333	4.744	4.518	-226,632	-4.8
Žilinský samosprávný kraj	Žilina Self-governing Region	ŽSR	Slovakia	6,809	0.694	0.692	-2,572	-0.4
EGTC TRITIA		TR		33,981	7.776	7.381	-395,374	-5.1

Source: author (data from national statistical offices)

A comparison of four spatially and historically close regions using the life expectancy indicator provides an objective basis for the possibility of comparing them in assessing quality of life. Population loss is underlined not only by the fact that the local economy has shifted away from the mining and metallurgical industries, but also by the influence of their "peripheral" state position. We can thus perceive this fact as a fundamental reason for deepening their mutual cooperation.

2 Theoretical Knowledge in the Field of Life Expectancy

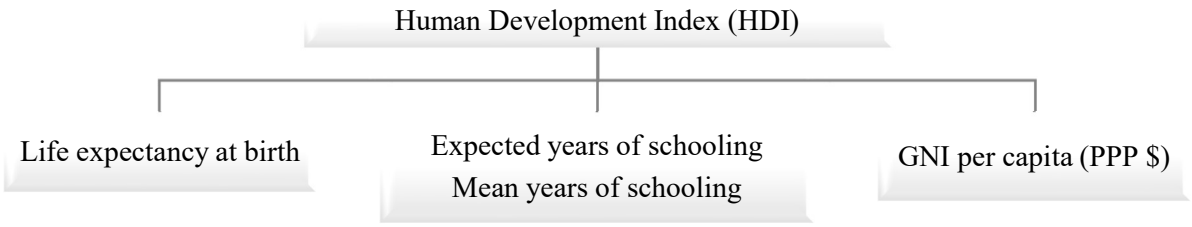
Following the order of extinction is not just a specific matter of demographic science. Monitoring the order of extinction in a particular population accompanied by calculations of the probability of death for each completed age can be included among the important social characteristics of human life since the second half of the 17th century. The main outputs of this type of analysis include the construction of mortality tables and thus the opportunity to gain knowledge about the so-called life expectancy. Due to demographically significant variations in the time course of the extinction course for men and women, mortality tables are often compiled separately for both sexes. In a deeper analysis of life expectancy, it is more appropriate to work with the life expectancy at birth indicator (e_0) separately for men and women (Weeks, 2021). If we add up the number of lives during a lifetime of a given generation, we get the number of years that the given generation will spend in total (Lx). Dividing this sum by the table number of births, we obtain an indicator of the average life expectancy at birth (life expectancy). This is the average number of years per child born in a given generation (1):

$$e_0 = \frac{\sum_{x=0}^{\omega-1} L_x}{l_0} \tag{1}$$

By using probabilities and modelling the mortality rates (Poston, Bouvier, 2017) of the tabular population, in addition to life expectancy, it is possible to calculate the probable life expectancy at birth (median death, age with probability of life equal to 0.5) and normal life expectancy (mode of death at a certain age, age of most common death. However, it is common to work with life expectancy, which is considered to be a more accurate description of people's life expectancy.

Life expectancy at birth at around 30 years was common in nineteenth-century Europe. Only for the most developed countries in Western Europe was this value probably 10 years higher. Around 1900, the life expectancy estimate was at the level of 50 years only in demographically developed countries, and by the end of the 20th century it had attacked the age limit of 75 years (Yaukey, Anderton, Lundquist, 2007, pp. 126 - 128). In the Czechia, it was 39 years for men and less than 42 years for women at the beginning of the 20th century, and at the end of the year it was already 71.5 years for men and 78 years for women. During the 20th century, there was an unprecedented increase in life expectancy for men and women. And it was during this period that this indicator was often used for quality of life analyses, for example as an important part of the HDI calculation.

Figure 2 – Life expectancy at birth and human development index



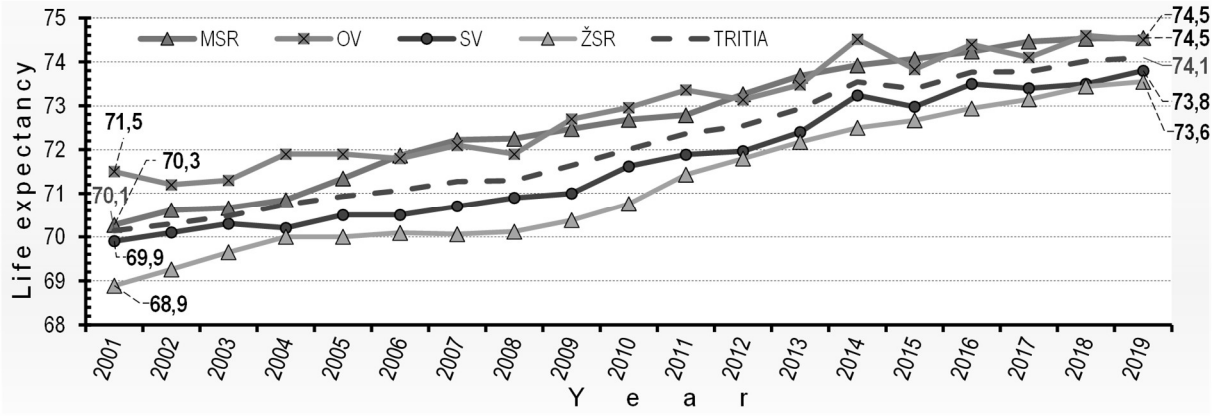
Source: author

Life expectancy is not just a demographic indicator. It is a comprehensive indicator that includes a number of significant influences on quality of life. It is no wonder, then, that it is part of many analyses of quality of life or efforts to empirically measure the standard of living of people in different regions of the world. This effort is very well seen in the construction of the human development index (HDI). The index is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living (FIGURE 2). The resulting value of the HDI as the geometric mean of normalized indices for each of the key dimensions of human development ranges from 0 to 1. The life of expectancy at birth is not only dimension about long and healthy life. The value of this health index is influenced by a number of factors, especially economic, health, social, environmental and, last but not least, political (United Nations Development Program, 2020). The Czechia achieves the best position according to the HDI indicator out of the three countries on whose territory the Tritia region extends. According to the latest UN report, in 2019 the Czechia was in 27th place out of a total of 189 countries in the world. Poland was in 35th place and Slovakia was in 39th place.

3 Differences in the Life Expectancy of Men in the Tritia Region and its Sub-Territories

Over the last twenty years, the life expectancy of men in the Tritia region has increased by a significant amount of 4 years in terms of assessing the male population (FIGURE 3). This fact also applies at the level of all three states, to which the subregions of the Tritia territory belong. The largest increase in life expectancy was recorded in Slovakia by 4.7 years, then by the Czechia by 4.3 years and the situation in Poland improved the least (by 3.9 years). Nevertheless, the growth in life expectancy in all four regions is lower than would be desirable due to the reduction in the differences in life expectancy between men and women in both the Tritia region and its sub-areas.

Figure 3 – Development of life expectancy of men in the Tritia region and its sub-territories



Source: author (data from national statistical offices)

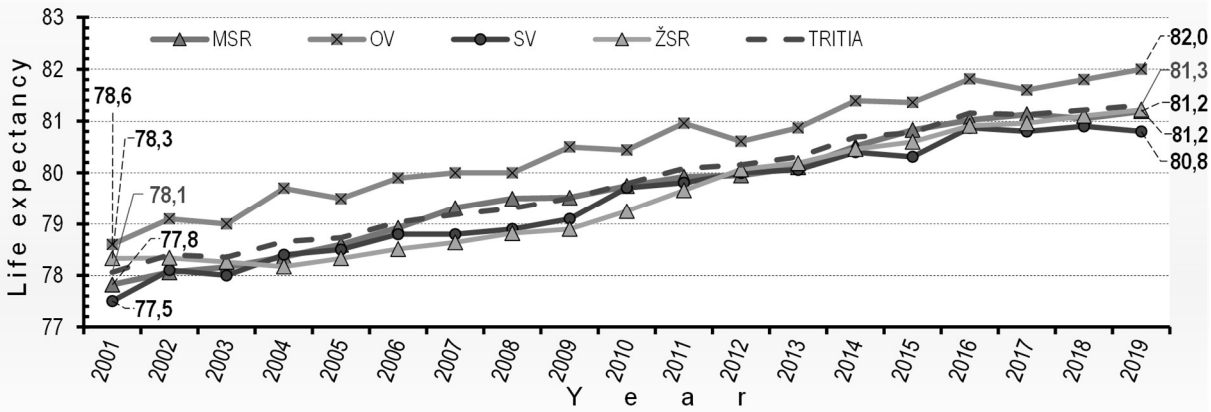
For the individual regions of the territory of Tritia, when assessing the life expectancy of men and its development over the last twenty years, we can emphasize the following moments:

- There was a reduction in differences in life expectancy between the monitored regions. At the beginning of the observed period, the difference was more than 2.5 years, now it is less than one year. At the same time, the difference in the indicator at the state level remains essentially the same (around two years).
- The long-term worst value of the indicator is reported by the Žilina Self-governing Region and the Silesian Voivodeship,
- In the long run, the best value of the indicator is shown by the Moravian-Silesian Region and Opole voivodships,
- In the last 20 years, the Moravian-Silesian Region (by 4.3 years) and Žilina Self-governing Region (by 4.7 years) recorded the highest absolute increase in life expectancy.
- The smallest increase in life expectancy was in the Opole Voivodeship (by 3.0 years), which at the beginning of the observed period exceeded the achieved value of other regions by more than 1.5 years.

4 Differences in the Life Expectancy of Women in the Tritia Region and its Sub-Territories

It is common knowledge in populations of more developed countries that women's life expectancy is always higher than men's life expectancy. Of course, this also applies to our four regions. In general, large differences in life expectancy by gender signal a number of problems with quality of life. Big differences are not desirable. And unfortunately, here in the population of the Tritia region, we must state that the difference in life expectancy between men and women in 2001 was 8 years old. Today, this difference is 7.2 years. But even that is a lot (**FIGURE 4**).

Figure 4 – Development of life expectancy of women in the Tritia region and its sub-territories



Source: author (data from national statistical offices)

The analysis of the long-term development of women's life expectancy for the individual regions of the Tritia area revealed several interesting issues:

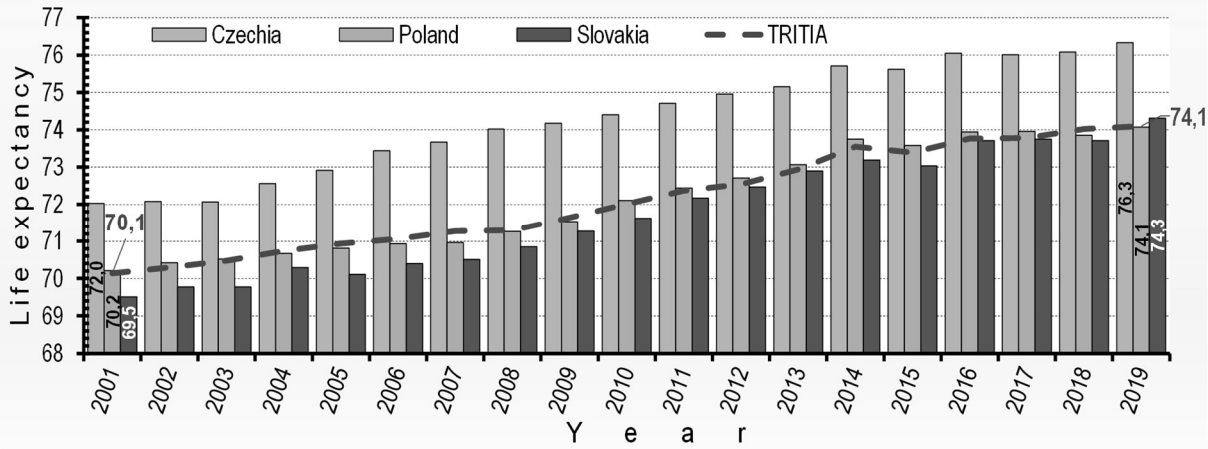
- Differences in life expectancy between the monitored regions do not change in principle. At the beginning of the observed period, the difference was only 1.1 years, now it is 1.2 years. At the same time, the difference in the indicator at the state level remains essentially the same (just over a year).
- The long-term worst value of the indicator is reported by the Silesian Voivodeship, the Žilina Self-governing Region and the Moravian-Silesian Region.
- In the long run, the best value of the indicator is shown by the Opole Voivodeship, where the only life expectancy of women reached the value of 82 years.
- Three regions (Moravian-Silesian Region, Opole Voivodeship, Silesian Voivodeship) had increases in life expectancy by almost 3.5 year over the last twenty years.
- The smallest increase in life expectancy was among women in the Žilina Self-governing Region, where the indicator increased by 2.9 years.

5 Conclusion

An analysis of the life expectancy of men in the Tritia region showed several points of interest:

- When comparing countries and their life expectancy (FIGURE 5), Slovakia had the worst position among the male population at the beginning of the observed period, so today it is Poland. However, the difference between the two countries is not large and their life expectancy is around 74 years. It is 2 years less than in the case of the Czech male population.
- As a very desirable trend we can mark a higher value of the growth of life expectancy of men than women in the observed period of the last twenty years. While men's life expectancy increased by an average of 4 years, women did one year less.
- The life expectancy of men in the Tritia region is essentially the same as the life expectancy of the male population in Poland and Slovakia. It is thus clear that the life expectancy of the Žilina Self-governing Region and the two Polish voivodships does not differ much from the national level.
- In the case of the male population of the Czechia and the population of the Moravian-Silesian Region, it is different than in other regions of Tritia. Men from the Moravian-Silesian Region live on average almost 2 years less. Therefore, this region is in the penultimate place according to the value of life expectancy in the Czechia. The best situation in the country is shown by the male population of Prague, which lives 4 years longer than the male population of the Moravian-Silesian Region.
- Overall, the Moravian-Silesian Region has held the thirteenth place out of fourteen Czech regions in the indicator of the life expectancy of men for a long time, at least since 2001.

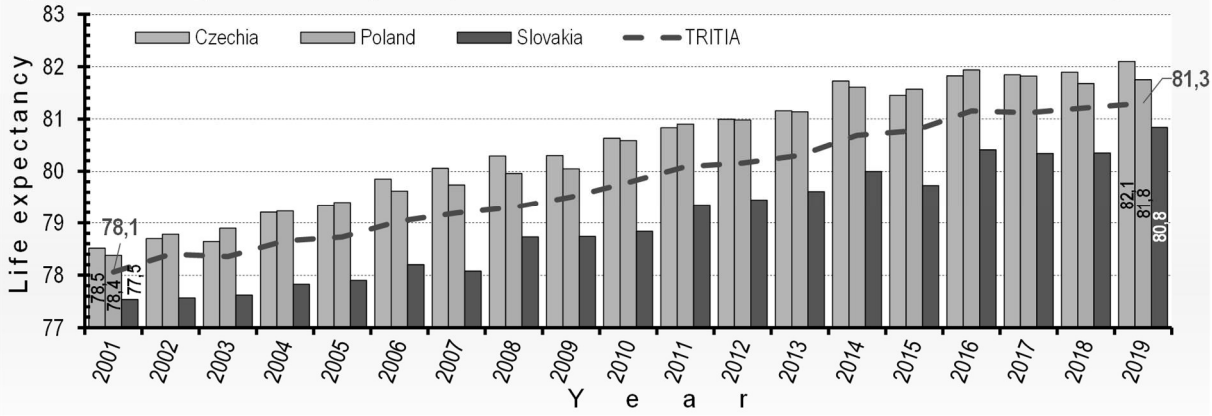
Figure 5 – Development of life expectancy of men in the Czechia, Poland, Slovakia and the Tritia region



Source: author (data from national statistical offices)

- In the case of the male population of Poland, the value of life expectancy of the Silesian Voivodeship is average, while another 7 voivodships out of the total 16 voivodships show a worse value.
- The Opole Voivodeship is above the Polish average and has long maintained its third place among sixteen Polish voivodships.
- The Žilina Self-governing Region is slightly below average in comparison with the life expectancy of men with the other seven Slovak regions. Three more regions show worse values.
- Comparing life expectancy for women in the Tritia region (FIGURE 6), we came to the following conclusions:
- When comparing countries and their life expectancy, Poland had the worst position in the male population, so in the case of women's life expectancy, it is Slovakia.
- If in 2001 women in the Tritia region lived almost 8 years longer than men, then in 20 years this gap has narrowed by almost 1 year. Nevertheless, the difference of 7 years in favour of women is still a high value.

Figure 6 – Development of life expectancy of women in the Czechia, Poland, Slovakia and the Tritia region



Source: author (data from national statistical offices)

- When comparing the life expectancy of women, we see that the value in the Tritia region is higher than in the Slovak population of women, but slightly lower than in the female population in the case of Poland and the Czechia.
- Differences at the state level in their female population are just over 1 year, which is a statistically significantly lower difference than in the male population.
- The Czechia has the highest life expectancy of women. The second in order is already Poland and with a significant distance of the population of women in Slovakia.
- In comparison with the Czech regions, the female population of the Moravian-Silesian Region is in 12th place, but at the best value achieved for women in Prague, it loses only 1.8 years, which is significantly less than that of the male population of the region.
- If we compare the life expectancy of women between sixteen voivodships, we see that the female population of the Opole voivodship is in the exact centre (7th place).
- The population of women in the Silesian Voivodeship is much worse off, which is today in the last place among Polish voivodships with a life expectancy value of 80.8 years. It is one year less than the Polish average.
- In the case of the population of women in Slovakia, the Žilina Self-governing Region is not doing badly at all. It shares the third place with a value of 81.2 years with the Prešov Self-governing Region, when only two regions show a better value: the Trenčín Self-governing Region and the Bratislava Self-governing Region.
- The population of women in the Žilina Self-governing Region reaches a value of half a year higher than the average for the whole of Slovakia.

References

[1] Database of the Czech Statistical Office (2021) [online]. Available from <https://vdb.czso.cz>

[2] Database of the e-Region (2021) [online]. Available from <http://analityka.eregion.wzp.pl>

[3] Database of the Polish Statistical Office (2021) [online]. Available from <http://swaid.stat.gov.pl>

[4] Database of the Slovak Statistical Office (2021) [online]. Available from <https://slovak.statistics.sk>

[5] European grouping of territorial cooperation TRITIA, Ltd. (2021) [online]. Available from <http://www.egtctritia.eu >.

[6] EUROSTAT (2020). *Database. Regional demographic statistics* [online]. Available from <https://ec.europa.eu/eurostat/data/database>.

[7] POSTON, D. L, BOUVIER, L. F. (2017). *Population and society.* Second ed., New York: Cambridge University Press. ISBN 978-1-107-04267-4.

[8] ŠOTKOVSKÝ, I. (2016). Comparison of the Population Development of Moravia-Silesia Region with Silesian and Opole Voivodeships. In Ardielli, E. (ed.). *Development and administration of border areas of the Czech Republic and Poland*. Ostrava: VŠB - Technical University of Ostrava, pp. 165 – 174. ISBN 978-80-248-3991-2.

[9] ŠOTKOVSKÝ, I. (2018). Ageing Process of Moravia-Silesia Region and Silesian and Opole Voivodeships. In Ardielli, E. (ed.). *Development and administration of border areas of the Czech Republic and Poland*. Ostrava. Support for Sustainable Development. Conference Proceedings. Ostrava: VŠB - Technical University of Ostrava, pp. 266 – 272. ISBN 978-80-248-4229-5.

[10] ŠOTKOVSKÝ, I. (2020). Migration Behaviour at the Level of Municipalities of the TRITIA Region. In: ARDIELLI, E. (ed.). *Proceedings of the 3rd International Scientific Conference Development and Administration of Border Areas of the Czech Republic and Poland – Support for Sustainable Development*, RASPO 2020. Ostrava: VŠB - Technical University of Ostrava, 2020, pp. 220-228. ISBN 978-80-248-4412-1. ISBN 978-80-248-4413-8 (on-line)

[11] UNITED NATIONS (2021). *Department of Economic and Social Affairs: The 17 Goals* [online]. Available from <https://sdgs.un.org/goals>

[12] UNITED NATIONS DEVELOPMENT PROGRAMME (2020). *Overview Human Development Report 2020. The next frontier Human development and the Anthropocene* [online]. New York: UN Development Programme. Available from http://hdr.undp.org/sites/default/files/hdr_2020_overview_english.pdf

[13] WEEKS, John, R. (2021). *Population: An Introduction to Concepts and Issues*. 13th. ed., Cengage Learning, Inc.

[14] YAUKEY, D., ANDERTON, D., L., LUNDQUIST J., H. (2007). *Demography: The Study of Human Population*. 3rd. ed., Long Grove: Waveland Press, Inc.

Comparison of Supporting and Advancing Talented Employees in the Czech Republic and Poland

Hana Štverková[1], Michal Pohludka[2], Katarzyna Czerná[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Business Administration
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
hana.stverkova@vsb.cz, katarzyna.czerna@vsb.cz,

[2]ZKV Career, s.r.o.,
Chomutovská 38/10, Ruzyně, 161 00 Praha, Czech Republic
michal@zkvcareer.com

Abstract

A critical asset of every prosperous business is its talented and adequate employees. Due to fluctuations in the market situation and unique changes in labour and product markets, a company's development depends on its human determinant. Without an adequate workforce, organizations would not succeed in the contemporary competitive environment on the global market. This paper deals with contemporary subjects of maintenance and development of talented employees to guide employees' need for functional training and create for them in a theoretical and practical sense an inspiring and motivating work environment at a theoretical and practical level in the context of cross-border international cooperation. From research, it can be declared that global corporations invest time and money in the search for and subsequent development of talented employees. The authors of this paper defined the basic rules and techniques used in global organizations to search for employee talent.

Keywords: *competitive advantage, global company, human potential, talented employees*

JEL Classification: *M12, M20, M53, M54*

1 Introduction

The world is experiencing a period of great transformation in all its aspects of life and will never be the same again. The business environment is changing, in which the only way to adapt, develop and reshape is to make full use of human capabilities. Employers will need to change their approach and ensure adequate human resources organization to gain and maintain human potential. The company aims at sustainable business, using the principles of Industry 4.0 and an orientation towards quality and qualified workforce.

While in the past, companies primarily needed access to capital for their growth, in recent years, the importance of human capital, in particular, has increased, and the need to have "talent" in the company has intensified. The decisive benefit of any successful company is its talented and qualified employees. Due to fluctuations in the business environment and unprecedented changes in the labour market and products, the development of society depends mainly on its human factor. Moreover, it is access to talent that will become the main competitive advantage in the coming period. Talents need to be cultivated and developed because the company has a precious asset in talent. It is necessary to know the value of this asset; we should know what needs to be done in order for this value to grow and to bring both an effect to the company in the results and benefits and satisfaction for the people. Failure to recognize significant talent in time or even demotivate a talented person and let him leave the company - should be classified as a serious transgression against managerial ethics and company values. Without a skilled workforce, companies would not succeed in the current competitive environment in the

global marketplace. The strategic goal of any organization should be to acquire and retain talented employees who contribute to the company's profitability and growth in the market and create a unique competitive advantage through their approach, competencies, and commitment. One of the possibilities for retaining qualified employees and at the same time for exchanging experiences and examples of good practice is also international cooperation, especially in border areas, where the phenomenon of traveling to work to a neighbouring state is visible, as well as a network trading partner.

This paper deals with current issues of support and development of talented employees to point out the need for practical training of employees and create for them in a theoretical and practical sense an inspiring and motivating work environment at a theoretical and practical level in the context of cross-border international cooperation. From observation and elimination induction, it can be stated that global companies invest time and money in the search for and subsequent development of talented employees. The authors of this paper defined the basic methods and techniques used in global companies to search for employee talent. The current issue of talent support and development is growing along with the Fourth Industrial Revolution.

2 Modern Trends in Personnel Management

Modern trends in personnel management are voluntary approaches that a company can implement to make working with people more efficient. These approaches bring benefits not only in the business-employee relationship but are implemented mainly for employees, who should be helped to become satisfied employees. One of the areas is corporate social responsibility, which should contribute to the sustainable development of society as a whole. Sustainable development has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. If nations are to consider long-term sustainability, sustainable development measures are needed. Sustainable socio-economic development is a crucial objective of the European Union's sustainable development strategy. This strategy aims to promote a prosperous, innovative, competitive, and eco-efficient knowledge-rich economy that provides a high standard of living and full and quality employment throughout the European Union. Another trend leading to the development of talents is work-life balance, which deals with reconciling work and personal life when trying to find a balance between work and personal life. However, balance cannot be approached by planning a certain number of hours for different activities. Equilibrium should be seen as a changing factor that will change over the years. It should be borne in mind that this balance is always determined individually and cannot be standardized, as it can change throughout a lifetime. The determination of this balance depends on several factors, including the priorities of an individual in life, the way of life, or the difficulty of hobbies (Tureckiova, 2004; Hasan and Saufie, 2021). The issue of work-life balance is mainly part of the social pillar of corporate social responsibility.

Talent management is of specific importance, and it is necessary to deal with talented and promising employees who have potential in the current dynamic changes in the market. Talent management is an approach to human resources intended to provide the company with sufficiently talented employees who are needed to achieve business goals. It also aims to guide, maintain and continuously develop (Armstrong, Taylor, 2015, p. 316). Talent management is focused on a small percentage of employees and is perceived as an opportunity that increases their employment in a company in an advantageous position (Hroník, 2007, pp. 97, 113).

2.1 Implementation of Talent Management

According to Bláha et al. (2013, p. 182), the implementation of talent management has several steps, which are included under this point. These include identifying critical roles, defining the need to acquire talent, identifying key competencies, creating an evaluation scale, identifying talents from internal/external sources, and creating the final talent pool. A necessary step is to identify the key roles, i.e., the positions, which, if vacant, threaten to disrupt the company and the company's success. The first step in identification is brainstorming and thinking about which roles are critical. The second step is to identify positions in the organizational structure critical in the event of a vacancy. It is then possible to analyse risks and identify critical roles. (Horváthová, 2011). Identification of crucial competencies means competencies suitable for employee success. Combinations of critical competencies are the main factors that differentiate a company from the competition and are essential for the success of the company. The specification of competencies should make it possible to define the direction of talent development so that it leads to the greatest possible benefit.

All competencies must be assessed according to the benefit to the company. After their determination, performance is evaluated, i.e., the current results achieved in the areas for which the employee is responsible. The following is a prediction of the potential where the employee can move in separate areas. (Bláha et al., 2013) The following is the identification of talents from internal and external sources - talents from internal sources are selected through regular evaluation, which most often uses the evaluation method according to set goals, assessment center, analysis of critical events. From external sources can be used job tests or competence

interviews (Folwarczná, 2010). To identify talented employees, co-workers are often used due to the perception of justice in selecting and facilitating subsequent cooperation (Forsyth, 2009).

The talent pool is the final step; it is about defining talented employees who are called talents. This group of talents can be further divided into top talents, talents, and possible talents. Top talents are employees with high performance and potential. Talent performance is high, but they do not have enough potential. Possible talents are employees with high potential but low performance. The company should set up a policy to show that anyone can become a talent if they meet the set criteria. To better manage talented employees, the company should decide which type of talent it needs - general, leadership, or technical (Horváthová, 2011).

For the development of talents and thus their retention, the company should offer the development of their strengths, a shift for the better in individual overall performance, with appropriate competencies, strengthen their motivation and enable career development. For talented employees, the company should offer development programs that are developed with their direct superiors. These programs should take the form of a comprehensive program for a specified group of talents and respect the individual needs of individual employees. Programs should be an extension of the standard development offer and care that an employee should generally receive. Development programs can provide various combinations of on-the-job or off-the-job development methods (Horváthová, 2011).

According to Hroník (2007), there are two types of programs in talent management - The trainee program and Talent development. In the Trainee program, participants become employees of the company for its duration, usually half to one year. A development plan is created for the participant. Successful graduates are offered further contact. Talent development is intended for people who have been working in the company for some time and need to find direction. Subsequent combinations of talent development program focus may arise - general (development of managerial skills), special (development of expertise closest to talent), international and local focus. For example, in both programs, methods of rotation, internships, or inclusion in the project are used. The deployment of talent leads to the placement of employees where they could make full use of their knowledge and skills. Entrust them with tasks that would shift their abilities (Barták, 2015).

Maintaining, using, and stabilizing talent leads to retaining (and stabilizing) a talented employee (Horváthová, 2011). The steps to retain employees are psychological rather than legal. Activities to retain employees are, for example, elements of sharing values and corporate vision, development of corporate culture, or an objective growth perspective (Branham, 2009). In order for a worker to want to stay in the company, the company should be an attractive employer, which is supported by these factors - the offer of exciting and well-appreciated work; opportunities for education, development, and career growth; offer of work-life balance elements; flexible work roles enabling the use of exceptional knowledge and skills of a talented employee, quality working conditions, environment and equipment, promotion of CSR, current appropriate remuneration adapted to the employee's life phase, and the company should provide employees with a sense of recognition, respect, and esteem (Horváthová, 2011).

According to Hroník (2007, p. 115), the difference between the development and use of talents is not sharply defined; the employee develops through projects, which is also its use. The performance of companies is mainly associated with human capital, i.e., glacier values. The glacier balance explains the relationship between human resources and organizational performance. Human resources should be seen as an asset that transforms resources into financial capital and fulfills business objectives.

2.2 Talent Support

Global companies are currently looking at employee training in a much broader context. Regardless of position and responsibility, every employee of the company has set their goals or KPIs. In most cases, they are set for the year ahead and are regularly checked and supported to meet them.

Almost every company currently has a talent support program, in which they offer opportunities for targeted development such as rotation within the company or the assignment of one-off tasks. Companies compete for talented people. For the needs of human resources, a model of three factors that make up talent has been designed: competence, or competence, commitment, and the need to contribute (Ulrich, 2010). Under the competency, it is possible to imagine the knowledge, skills, and values required to work in a particular area. Without commitment or proactivity, this knowledge and skills are not helpful. Recent research has shown that if work does not bring tangible benefits to the company and do not find meaning and purpose in work, then the competence and commitment to weaken, motivation weakens, and talent fades.

The approach of supporting talented individuals and their strengths has several significant positive effects on their own, eliminating the threats already described. The first is a high level of motivation. In most cases, there is a direct relationship between job satisfaction and talent. If people do what they enjoy and are unique/talented in

it, the activity gives them energy, and they are their promoters. Following this fact, the bleeding rate in these individuals is eliminated. That motivation is so strong and long-lasting that the financial side in salary and benefits is lagging.

According to Samanta and Eleni (2021), it is necessary to focus on talented experts, multiply the potential of talented individuals in combination with their strengths and use it in various job positions or Tailor-Made Talent Management Talentship Smart talent management, Accelerated talent management. These practices and concepts of talent management show that the perception of this issue is growing.

From the company's point of view, investing and supporting talented employees is critical. Mainly of medium and long-term nature. It creates its future experts, leaders, and specialists with a high degree of loyalty and motivation. Therefore, this program is fully integrated into the entire context of employee evaluation and development so as not to be affected by management turnover and changes in the company.

3 Material and Methods

A questionnaire survey was conducted among selected talents and HR professionals or managers to express the effectiveness of specific training and talent development methods on a scale from 1 to 5. The rating of 1 was highly effective, and five were utterly ineffective. Respondents in the Czech Republic and Poland were contacted, interviews were conducted with 50 HR professionals in each country, and 30 representatives of talented employees were also sought. Given that less than 1% of managerial positions are considered talents, this group of respondents is large enough, and the outputs are therefore sufficiently informative. The talent understood the method's effectiveness, especially the possibility of using the acquired knowledge and skills in practice and targeting the method on priority areas of their personal development. The research took place in small and medium-sized enterprises, especially in medium-sized ones, where they are more interested in talents than small enterprises.

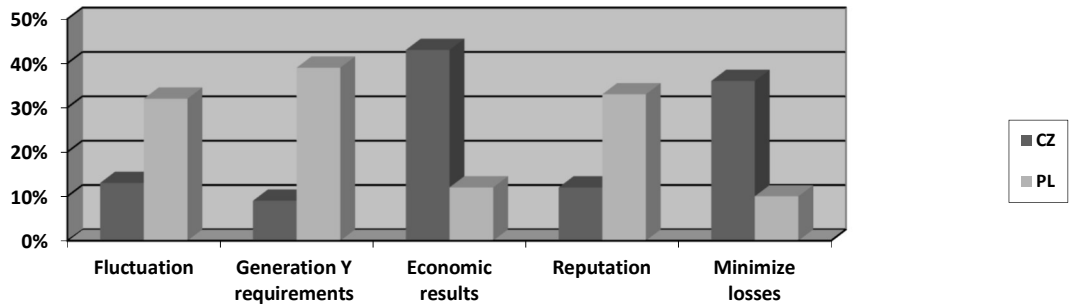
The research took place in two phases. In the first phase, a semi-structured interview was carried with HR professionals or representatives of the company's top management; the semi-structured interview aimed to determine what facts led the management to decide to develop talented employees and what benefits they expect from these steps. Data were obtained through questionnaires for talents and HR professionals (top management). The main goal of the questionnaire survey was to determine whether, according to the interviewees, the support and development of talent in companies is sufficient and relevant.

The partial goals were to find out for both talents and HR professionals which training and development methods they consider adequate. They assess whether the given method of development is effective and how they often identify the needs of development and education. The results of these surveys are compared both in terms of the perception of talents and HR and comparing the Czech Republic and PL.

4 Results and Discussion

The research confirmed that talented employees are more and more critical to employers. Fighting for them is the number one task in world management practice in both monitored countries (83% CZ, 89% PL). However, the reasons for deciding to structure work with talented employees in the company's field already varied from country to country, see Figure 1.

Figure 1 – The reasons for work with talents



Source: own research

In Poland, the most common reasons include the high rate of leaving talented employees, and thus the effort to retain them and the generation Y requirements themselves when starting work and an effort to create a reputation

as an attractive employer. On the contrary, in the Czech Republic, it is an effort to increase financial results, maintain market position, and minimize vacant vital positions.

It was also found that in Poland, working with talents is considered relevant less often than in the case of the Czech Republic, see Table 1.

Table 1 – Relevance of support and development of talented **workers.**

Country	**Talents**	**HR professionals**
CZ	45%	54%
PL	29%	43%

Source: own research

Furthermore, talented and HR professionals were asked what methods of education and development they considered effective, see Table 2.

Table 2 – Methods of education and development of talented workers

Methods/Groups	**Talents**		**HR professionals**	
	CZ	PL	CZ	PL
Coaching	54%	35%	46%	41%
Professional lecture	12%	19%	27%	34%
Workshop	30%	22%	27%	8%
Rotation	39%	12%	26%	33%
Mentoring	76%	87%	82%	78%
Internship	18%	32%	54%	65%
E-learning	48%	46%	31%	12%
Working on a project	34%	35%	36%	23%
Teamwork	15%	27%	53%	47%
Shading of managers	23%	19%	25%	39%
Management skills courses	55%	76%	14%	32%
Self-study	32%	29%	22%	33%
Self-development programs	73%	68%	78%	60%

Source: own research

Based on the answers, it can be stated that in Poland, to a certain extent, the perception of the importance and effectiveness of individual methods of training and development of employees differs from the perception of talents themselves. Mentoring and self-developing programs play an essential role in both groups. Talents also consider management skills courses (76%) or e-learning (46%) as important factors. On the contrary, rotation (12%) considers shading managers and professional lectures (both 19%) to be the least important. Compared to HR professionals, who consider internship (65%) or teamwork (47%) to be essential elements. On the contrary, they indicate the minor importance of e-learning (12%) and workshops (8%).

In the Czech Republic, both groups surveyed consider the most effective self-development program, mentoring, and to some extent also coaching. Talents consider professional lecture (12%), teamwork (15%), and internship (18%) to be the least effective. On the other hand, HR professionals consider it very effective (54%) and teamwork also (53%).

Based on the responses, it was found that soft skills training is necessary, especially in:

- communication,
- presentation,
- self-presentation
- skills, people leadership and leadership styles,
- motivation,
- negotiation,
- change management,
- decision-making and goal setting.

Talents receive training based on their own development needs; they will use the acquired knowledge. Coaching is a way of approaching one's development and the development of other people, not based on external management, but based on searching, finding, understanding, and using one's resources and possibilities. The mentoring goals are generally long-term in nature and relate primarily to the development of the mentee's career. However, a mentor can become a mentor to whom the mentee comes with his problems, and their relationship is firmly based on trust. The main priorities of talent development within corporate talent management based on talented employees' answers include the fundamental ten pillars, see Table 3.

Table 3 – The main priorities of talent development within talent management.

Priorities	**Talents**	
	CZ	PL
People leadership and motivation	53%	57%
Self-knowledge and changes in thinking	32%	39%
Knowledge of the company and relationships with colleagues	31%	30%
Assertive communication	30%	35%
Delegation	27%	28%
Verification of knowledge in practice	20%	29%
Career readiness	15%	20%
Completion of personal commitment	12%	10%
Education	10%	10%
Improving language skills	8%	6%

Source: own research

The three main priorities of talent development in the Czech Republic include the ability to lead and motivate people (53%), self-knowledge and change of thinking (32%), building interpersonal relationships within the company and its knowledge (31%), as well as assertive communication (30%). Only 8% of talents prioritize further education or improvement of language skills. After the same first two items in Poland, assertive communication appears in third place (35%). Verification of knowledge in practice (29%) is also more critical than delegation (28%). Talent priorities are, therefore, mainly leadership and communication skills and networking.

It is necessary to strengthen in talents a sense of belonging to the company, loyalty, and devotion, commitment. This in itself costs nothing, but it is a conscious and thoughtful way of communicating with this group.

5 Conclusion

The research showed noticeable differences between the understanding of effective talent management from HR professionals and talented employees themselves, in both countries, i.e., in Poland and the Czech Republic. The same points occurred, mainly monitoring and self-development programs in both groups of respondents, in priorities of talents, mainly leadership and communication skills and networking. The same points create the possibility of cross-border cooperation in the field of talent management. However, every healthy person has the potential to learn something and use it in practice to varying degrees. It is just how much energy someone spends on its development and application and how strongly they are intrinsically motivated to learn and improve constantly. His personal qualities and qualities either help him in this or complicate it even when he hinders it. Talent discovery is usually not a managerial task. No one has imposed this on managers, but capable managers know the need to discover and support talent, train successors, and develop the skills of their team. Indeed, less than 1% of managerial individuals who are allowed to develop in global companies appear in global companies, are supported and sent to training, and their abilities multiply. However, these individuals are the company's primary asset, and the top management is aware of this and therefore acquires shares in the company's options, and thus the management tries to motivate and maintain them in their company.

What prevents us from finding and supporting talent not only in the border area? The main brake element is conventional thinking, prejudices, and negative emotions (mainly envy or fear), which we put on our eyes, and through them, we perceive the world around us. In particular, it is possible to highlight some of the obstacles to

discovering talent. The first type of turbulent times is a lack of interest in people; we do not have time to get to know them, to understand them. We are not infrequent and close contact with them. We are inattentive; we are still in a hurry; we have our heads full of worries and stress. Then it quickly happens that we overlook a talented individual.

In a talented individual, we can see our competitor, who can endanger us. It may even be better than ours, and that is hardly acceptable to us. Talented people often differ from others in their thinking and actions. For example, a talented person can express himself by constantly criticizing something he comments on. This is often unpleasant for a superior, and it is no wonder that he is trying to silence such an individual or get rid of him. Tolerance to differences is sometimes rare in practice.

Society usually consider mistakes and errors to be a sign of negligence or incompetence. Sometimes, however, they can signal the effort of a talented individual to try something new in practice, experiment, and learn from mistakes. Sometimes we discover talent, but we want to keep it only for ourselves, for our department. People are not interested in being able to develop and apply in the broader context of the company, keep it under wraps. When discovering talents, a person's character is essential, namely the absence of fear and envy, the effort to selflessly help others and wish them success, to treat everyone honestly and fairly.

Discovering and developing talented people is one of the most challenging managerial tasks. A manager who performs this task well overcomes himself, his prejudices, and conventional, self-centered thinking. Discovering talents among employees, supporting them, and developing them - this requires managerial talent. If the manager discovers it and starts using it, he will become the administrator of the talent incubator. The company has a precious asset in talent. Human potential is the key to competitiveness and sustainable business.

The limitation of the study is that the answers were obtained mainly in medium-sized companies because, in small ones, they do not have enough resources to develop talent, and the rotation is automatic, as they stop more activities. The system in medium-sized companies is close to the system in global co-workers, limited to position management. The development of the business environment, globalization, labour shortages, new technological solutions, and many other factors bring changes for the company and the employees themselves. Speed of adaptation, taking measures to cope with the situation, and finding a suitable application are essential elements for staying on the market and finding success. Trends entering the corporate sphere should help the company address issues in access to human resources to address the company's needs in human resources of sufficient quality and lead to a more comfortable situation for employees in the company and increase their satisfaction. In companies, it is essential to employ people with an excellent professional profile and people with skills, team players with developed social skills with responsibility for the tasks and the role assigned to them. In the labour market, it is necessary to select determined, respect the quality of colleagues, appreciate the experience of colleagues as a contribution to their development, and pass on their experience to younger colleagues or newcomers. There is a need for talented professionals who can adapt to the team.it.

References

[1] ARMSTRON, M., TAYLOR, S. (2015). *Řízení lidských zdrojů – Moderní pojetí a postupy.* Praha: Grada Publishing.

[2] BARTÁK, J. (2015). *Aktuální problémy vzdělávání a rozvoje zaměstnanců v organizacích*. Praha: Wolters Kluwer Česká republika.

[3] BLÁHA, J.et al. (2013). *Pokročilé řízení lidských zdrojů*. Brno:Edika.

[4] BRANHAM, L. (2009). 7 skrytých důvodů, proč zaměstnanci odcházejí z firem : Jak rozpoznat jemné signály a jednat, dokud není příliš pozdě. Praha: Grada Publishing.

[5] FOLWARCZNÁ, I. (2010). *Rozvoj a vzdělávání manažerů*. Praha: Grada Publishing.

[6] FORSYTH, P. (2009). Jak motivovat svůj tým. Praha: Grada Publishing.

[7] HASAN, N. A., SAUFIE, N. H. (2021). The curvilinear effect of talent Management on financial and Innovation performance of SMEs. *International Journal of Management*. Vol. 12, No. 1, pp. 33-45.

[8] HORVÁTHOVÁ, P. (2011). *Talent management.* Praha: Wolters Kluwer Česká republika.

[9] HRONÍK, F. (2007). Rozvoj a vzdělávání pracovníků. Praha: Grada Publishing.

[10] SAMANTA, I., ELENI, P. (2021). Talent Management to Improve Employee Competence: A Qualitative Study. *Annals of Contemporary Developments in Management & HR.* Vol. 3, No. 1.

[11] TURECKIOVÁ, M. (2004). *Řízení a rozvoj lidí ve firmách*. Praha: Grada Publishing.

Activities and Barriers to Cooperation in the Territory of Border Regions of Poland and Slovakia

Juraj Tej[1], Roman Vavrek[2], Viera Papcunová[3]

University of Prešov
Faculty of Management, Department of Management
Konštantínova 16, 080 01 Prešov, Slovak Republic
tej@unipo.sk

VŠB - Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská 33, 702 00 Ostrava 1, Czech Republic
roman.vavrek@vsb.cz

Constantine the Philosopher University in Nitra/ Masaryk University
Institute of Economic and Management/ Department of Regional Economics and Administration
Tr.A. Hlinku 1, 949 74 Nitra, Slovak Republic/ Lipová 41a, 602 00 Brno-Pisárky, Czech Republic
vpapcunova@ukf.sk

Abstract

In terms of the size and shape of the Slovak territory, cross-border cooperation is an important opportunity for local development in the socio-economic area. Its impact on economic local and regional development cannot be questioned. The cooperation of municipalities on the Polish - Slovak border has deep historical roots. The aim of the paper is to evaluate the activities of cross - border cooperation on the Polish - Slovak border and also to identify barriers to such cooperation from the point of view of individual actors in the territory. The collection of input data was carried out through a survey. The respondents were entities on both sides of the border from the areas of social and economic life - local self-governments, state administration bodies, non-governmental organizations and some business entities. The results of the survey showed that a wide range of cross-border activities are implemented in the analyzed area, from traditional cultural and sporting events to activities related to education or the submission of joint projects. The actors in the territory identified mainly economic and legislative barriers to the development of cross-border cooperation. And within them, insufficient financial support or non-harmonized laws and regulations concerning cross-border cooperation.

Keywords: *activities, barriers, border regions of Poland and Slovakia, cross-border cooperation*

JEL Classification: *R110, R120, Z320*

1 Introduction

Cross-border cooperation is considered to be one of the most important elements in shaping civil society, for which the principle of subsidiarity and respect for human dignity are crucial. This cooperation is based in principle on the cooperation of border regions, as well as on transnational cooperation between regional and local governments and organizations representing border areas. There are two main aspects of the link between

cross-border cooperation and its impact on the development of border regions. First of all, these are the areas of cooperation implemented within the framework of cross-border programs, and secondly, the consequences of the implementation of cooperation from the point of view of the inhabitants of these regions (Batyk, Rzeczkowski, 2020).It also confirms Bruneckiene, Sinkiene (2015) who note that cross-border cooperation forms the basis for a cross-border network of interconnections, which enables cooperation between the regions of different countries, thus ensuring the sharing of experiences and thus becoming a tool for the acquisition and exchange of information. It therefore facilitates the development of general economic and non-economic exchanges. In addition, it provides an opportunity to coordinate infrastructure development on both sides of the state border. According to Zabielska (2020) this form of partnership to understood mainly through border relations and cooperation, serve to build such "openness". Partnerships based on personal bonds over time acquire formal structures as the consequence of the use of public resources designed to support cross-border exchanges and the practical effect of the experience of cooperation in terms of the use of these resources. On the other hand, as far as the duration of the partnership is concerned, the creation of a partner motivated to carry out cross-border cooperation is important. The atmosphere between the cooperating parties, as well as the approach of the surroundings, are also extremely important, especially in terms of supporting local and cross-border actors and the social perception of cooperation. Therefore, according to Scott et al., (2019) an active economic and social cooperation between border regions can be a successful tool for activating socio-economic life in these regions, the successful use of its potential and thus changes in economic growth. This can not only promote regional cohesion, but can also to contribute to overall national economic growth. Therefore, the competitiveness of border regions is a relative characteristic that determines the region's ability to compete with other regions, attract various resources to the territory and at the same time to be attractive for the population. All this can be achieved by identification, creation and subsequent use of competitive advantages (Kmet, Mayzner, 2017; Slavík, 2004).

Border regions are a special type of region, the specificity of their development is given by the periphery and functional dualism of the border, which connects the functions of barrier and contact. The contact function of the border affects the gradual development of cross-border cooperation as long as the effects resulting from the implementation of intergovernmental agreements are achieved Studzieniecki et al. (2016). Border municipalities, which are not connected to border crossings, remain below the border barrier function on the outskirts of the city, which limits the possibilities of economic diversification (Batyk, Rzeczkowski, 2020). These functions are not static, have a specific dynamic element. The dynamics of change is most often a characteristic of a boundary that serves as a barrier (Mezhevich, 2002). Given the high dynamics of these changes, it is necessary to have scientific and methodological tools to rapidly monitor transformation data and to limit possible negative effects on the economic activity of cross-border regions (Blandinieres, 2004). Evaluation of the interaction of cross-border regions in the different countries is very risky, because the regions often differ significantly, e.g. in the nature of its external relations, or depending on the degree of periphery in relation to the center of the state (Dementieva, 2000).

The border region represents the physical, political and economic space on both sides of the state border. In the narrower sense, these are the territories immediately adjacent to the state border, which have the greatest influence on the border regime, socio-economic order and political system of neighboring countries and have a special potential for the development of international cooperation (Stroeva et al., 2015). The issue of cooperation, in our case the border regions of Poland and Slovakia, lies primarily in the variability of the conditions in which these regions are located. All this depending on the original historical state of production and social structures, their transformational changes in the period of restructuring, austerity programs, foreign policy preferences or changes in foreign markets. The possibilities of the envisaged cooperation are to some extent conditioned by the potential of the country and the resulting functions. In Slovakia, efforts for economic development are focused, as in Poland, also on small and medium-sized enterprises, and in the recent period also on the area of inter-municipal cooperation. Other activities related to globalization and integration processes, as well as many other components of diverse spatial structures, also enter into business activities (Havrlant, 1999). For this reason, there is potential for their different spatial and functional delimitation by processes of purposeful regionalization, which will determine the possibilities arising from the potential of both countries. At the border of Prešov region with Poland, regions whose current problems are almost the same meet, but the conditions for a solution are different and the individual approaches are different. Apart from the natural components of the potential, the desired cooperation is also influenced by social, sociological, demographic and ethnic differences, but mainly economic, political and historical. Many areas are facing the same problems, but the issue of cooperation is rarely marked by competition in a limited market.

2 Material and Methods

The aim of the paper is to evaluate the activities of cross - border cooperation on the Polish - Slovak border and also to identify barriers to such cooperation from the point of view of individual actors in the territory. We

obtained information through a questionnaire survey in the two year – 1999 and 2019. The first survey was conducted in 1999, which was carried out on the initiative of the presidents of the Visegrad Four countries (V4) at the Faculty of Humanities and Natural Sciences of the University of Prešov in Prešov. The base of the survey was to evaluate the activities of cross-border cooperation on the Polish-Slovak border and also to identify barriers to such cooperation from the perspective of individual actors in the territory. The respondents were entities on both sides of the border from the areas of social and economic life, especially local self-governments located in marginal border regions, where there was a presumption of potentially more intensive mutual relations in the Prešov region. A total of 120 subjects on both sides of the border within 20 km participated in the survey. Subjects from all areas were addressed - state administration bodies, self-government bodies, non-governmental organizations and business entities (table 1). In 2019, the survey was conducted again, the results processed and compared with the results of the initially conducted survey. The selection of respondents was combined. We selected respondents at random, but we also used Snowball sampling method. The results were processed in MS Excel.

Table 1 – The structure of respondents

Subject	Number of subjects	% share
State administration bodies	5	4,16
Self – government bodies	50	41,67
Non – government organizations	14	11,67
Business entities	51	42,5
Total	**120**	**100**

Source: survey, own processing

Based on the knowledge of the country, its spatial context and socio-economic space, it is possible to state that the territories on both sides of the Slovak-Polish border are characterized by many bonds:

- historical development,
- political-strategic changes, especially after 1945,
- economic conditions which have been and are characterized by active tourism, logging, etc.
- ecological conditions - the same problems associated not only with the existence of national parks,
- territorial-technical conditions, e.g. neglected infrastructure on both sides of the border,
- cultural, social, socio-demographic and settlement conditions,
- administrative and legislative conditions that are linked to the permanent unification of territories (EU).

A similar analysis is given by Falťan (2004), who states that:

- it is a socio-economically problematic area of Slovakia (from the point of view of the unemployment rate);
- there is a low level of investment activity;
- increased attendance for work and abroad;
- The Tatra part of the territory has a significant economic potential in tourism;
- the territory has a demographically differentiated production capacity;
- the negative migration balance is in the districts of Bardejov, Svidník, Stará Ľubovňa;
- there is a significant problem with transport infrastructures.

3 Results and Discussion

In addition to identifying activities and barriers to cross-border cooperation, we also to characterize the history of such cooperation in this area.

3.1 History of Cross-Border Cooperation in the North of the Prešov Region

Cross-border cooperation on the Polish-Slovak border has deep historical roots. The territories on both sides of the border have always been marginal for both countries, which was reflected in the cooperation of the inhabitants. Based on the tax returns from the urban regulation of Maria Theresa of Spiš and Šariš stool, it can be seen that their inhabitants played an integrative role between Hungarian and Polish culture. The farmers' confessions attest to the fact that the municipalities and towns of the mentioned chairs had intensive and diverse economic and trade relations with Poland. The products of the rich Spiš manufactories (copper and iron products) were transported by the subjects of the Spiš towns by raft to the Polish side. In addition, they drove to Poland to sell tobacco, cloth, snails, nuts, cattle, etc. Wine, salt and "various goods" were exported from the Šariš stool, and the poles transported wood, canvas and building materials to the Slovak side (Udvari, 1977). The export of salt (from the mine in Solivar) to Poland is also reported by Butkovič (1978). So the multiculturalism

of the region has never been an obstacle to cross-border cooperation (Tej, 2004; Cieślik, Krasnodebski, 2002). Gregor Berzevici (1763-1822), a Hungarian lawyer and economist, a member of the Spiš nobility, was also an important implementer of cross-border cooperation in the 18th century on the territory of the mentioned capitals. For several centuries, his family traded mainly in Tokaj wine, which to drove from north along the old trade routes leading through Spiš to Poland (Derfiňák, 2002). In 1796, Gregor Berzevici made his way to the former territory of the Kingdom of Poland, which was one of the first attempts to establish interrupted trade contacts. His research and trade route with wine went through Krakow and Warsaw to Gdańsk. His mission was successful. Today, only a small circle of people already know about his efforts to economically raise the north of Hungary through business activities on the principle of cross-border cooperation. In the mentioned historical periods of Hungary, the business cooperation of the inhabitants (subjects and nobility) on both sides of the border was relatively sensitive. The support at that time was the situation that there was almost no border (in today's sense) and contacts between the inhabitants were not restricted in any way. Territories were often interdependent in the exchange of labor, not just in the exchange of products and raw materials. Marginal border areas played an important role in trade between Hungary and Poland at that time.

3.2 Results of the Survey

The results of the survey of cross-border cooperation activities pointed to a wide range of activities that are implemented in the examined area (table 2). Traditionally, cultural and sports activities carried out most often at the level of municipal self-government have the highest representation, which was stated by 31.10% of respondents. In second place, 16.80% of respondents mentioned tourism, a traditional activity that has deep and mass roots in this region. Other places in the percentage structure of 7.90 - 8.90 were education and qualifications, SMEs and rural development activities. Education and qualifications are currently declining, as all train connections in Slovakia (which have been active since the 18th century) have been canceled and which students have used the most. Other reported activities were relatively diverse, but their structural representation was low (5.50 - 0.50%). The order of these activities did not change significantly in 2019

Table 2 - Cross-border cooperation activities

Activity	**%**
Culture and sports	31,10
Tourism	16,80
Education, qualifications	8,90
Small and medium business	8,40
Rural development	7,90
Mutual employment	5,50
Information and advice	5,30
Third sector	4,70
Small projects	3,20
Transport infrastructure	3,10
Industry and trade	2,60
Other	0,50
Total	**100,00**

Source: survey, own processing

The analysis shows that a relatively rich portfolio of activities is being implemented in the border area. Most of the time, however, it is the so-called "small forms of cooperation". Both partners to benefit from these activities, as they are about maintaining old and building new relationships between the various actors in cross-border cooperation. These activities in their form are very difficult to ensure a significant shift in the economic development of the territory, but they provide a lot of positive in the social field and prevent further processes of marginalization of the territory and degradation in all areas.

Within the individual barriers, some subjects also mentioned specific problems, which they perceived as most significant within the individual groups (Table 3). The results show that within the economic barriers, the financing of cross-border cooperation, or economic instruments to support entrepreneurship in border areas, is

most perceived on both sides as the biggest barrier. Different models of public administration and the related organization of public administration and the competences of individual subjects of public administration in both countries were the basis of the presented legislative barriers. Although in the border area there is interest in the use of traditional forms of tourism, as well as interest in local cross-border trade, or rather small border traffic, which is caused mainly by price differences and generally better supply of consumer goods in Poland, respondents also mentioned organizational barriers to this cooperation. Most often, as an organizational barrier, all stakeholders mentioned underestimating the potential of border regions. Of the infrastructural barriers, the subjects on both sides of the border perceived the insufficient conditions for the development of individual modes of transport. In terms of administrative barriers, the subjects perceived as the biggest problem the preparation and administration associated with the creation and subsequent implementation of projects that allow them to implement activities in the field of cross-border cooperation.

Table 3 - Identified barriers within individual groups

Barriers	Slovakia	Poland
Economic	lack of loans and institutions that could provide greater financial support for the development of cross-border activities in the field of tourism	distrust and fear on the part of foreign investors to invest capital in the territory of the Slovak Republic
Legislative	insufficient sophistication of accounting and tax regulations concerning various forms of international cooperation insufficient support from legislation for municipalities and cities in the implementation of cross-border cooperation, different legal status of national parks on both sides of the border	different competencies and position of local self-governments in the Slovak and Polish Republic the absence of a law on trade relations in border regions, which results in a subsequent problem in concluding mutual contracts and agreements in all areas absence of flexible customs and tax regulations, customs duties and barriers (for example, when transporting souvenirs used for presentations across borders)
Organizational	underestimation of the potential of border regions and their insufficient material security difficulties in drawing up development projects cumbersome and lobbying decisions in the allocation of grants and the problem of funding from state funds, which are provided with a significant delay, often after the implementation of the action	insufficient regional information
Infrastructural	insufficient coverage of the territory by bus to border regions insufficient number of border crossings and their facilities, which limit economic, trade and tourist cooperation	absence of motorway connection congestion of communication networks near border crossings unsatisfactory road and rail transport
Administrative	relatively high financial demands as well as frequent failure of submitted projects	handling of administrative acts on the Polish side for applicants from Slovakia (licenses)
Other	significantly insufficient financing of Slovak national parks compared to national parks on the Polish side	the absence of systemic measures in the economic field that would allow the co-financing of various activities through common funds

Source: survey, own processing

The economic barriers that respondents consider to be a problem of cross-border cooperation are mainly the lack of financial resources, distrust of foreign investors, underestimation of the potential of regions, financial demands of development projects and their poor success, etc. Research between the Kaliningrad region and neighboring Polish regions, which operated in 2012–2016, confirms that economic activity, expressed in terms

of cross-border trade and tourism, is strongly dependent not only on the barrier function of the border, but also on policy decisions that determine imports and exports of certain groups of goods, currency fluctuations and other adverse factors (Batyk, Rzeczkowski, 2020). Different competencies of local self-governments on both sides of the border, non-harmonized laws and regulations concerning cross-border cooperation were identified by the respondents within the legislative barriers. The most common organizational barriers were identified e.g. absence of coordination of the development of cross-border cooperation, insufficient regional information, non-functioning of the Euroregion, etc. Insufficient communication network, lack of transport infrastructure (in the past missing border crossings, currently no train connection), absence of motorway, congestion of communication networks near border crossings (freight transport) were the most common infrastructural barriers perceived by respondents in the survey. Administrative barriers were perceived by respondents in the context of bureaucracy.

Table 4 - Change in the perception of barriers of cross - border cooperation

Barriers	The answers of respondents (%)		Change
	1999	2019	
Economic	34,44	38,17	↑
Legislative	21,22	24,91	↑
Organizational	14,21	12,33	↓
Infrastructural	11,39	17,31	↑
Administrative	11,75	4,75	↓
Other	6,99	5,53	↓

Source: survey, own processing

According to (Kmet & Mayzner, 2017) the evaluation of the competitiveness of a cross border region is specific, because on the one hand the region competes with other regions of one and the same country, on the other hand it competes with the border area of the neighboring region. The border region is the territory of the state, which borders the state border and performs special border functions, and therefore has special features. The main factors contributing to the specificity of the border are its geographical location and type. In terms of the relief of the landscape, there is a natural barrier in this area in the form of the High Tatras (Tej, 2003; Tej, Matlovič, Klamár, 2002). The area is currently an open contact zone (business and integration), which replaced the earlier form of the filter (partly fiscal and control function). Based on the knowledge of the situation, it can be stated that the potential of the northern border of the Prešov region is still insufficiently used. Today, cooperation is reflected not only in classical cross - border cooperation, but also in cooperation on both sides of the border in the form of Euroregions (Tej - Madzinová, 2004).

Compared to 1999 and 2019, the perception of economic and legislative barriers increased slightly and the perception of organizational and administrative barriers decreased (table 4). The financial crisis in 2019 had a significant impact on the change in the perception of economic barriers. Legislative changes related to the business environment, mainly on the Slovak side of the border, contributed to the worsened perception of legacy barriers. Accession to the EU has led to a reduction in the negative perception of organizational and administrative barriers. It is generally known that the possibilities of economic development in the analysed area are insufficiently used despite the richness of cultural, historical and natural monuments. The potential of tourism is great, its use is currently determined by the social situation of the inhabitants of border areas and the lobbying interventions of financial groups. The development of smaller and larger business activities within the cooperation of regional chambers of commerce is promising. Suitable natural conditions attract tourists from abroad for short and long stays. The rich cultural and sports traditions of the villages have their history and charm.

The most important solutions include investment incentives, managed urbanization in selected areas, building transport infrastructure and increasing the quality of connections, building a functional network of contacts, completing tourism infrastructure in the context of new forms of tourism. The most suitable of the new forms of tourism appear to be: gastronomic tourism, health (medical) tourism, adventure tourism, but also wedding tourism, film tourism with the offer of film festivals, tourism for the elderly and others.

4 Conclusion

The formation of cross-border contacts was in its initial period and usually even today the result of local or regional initiatives, which can be included among the "bottom-up" activities. This initiative must be supported by an appropriate legislative space and an appropriate policy initiative. In this context, it is important to strengthen the competences of local and regional authorities also in the area of concluding cross-border cooperation agreements. One of the possibilities is the introduction of the institute "partner city", which would make it possible to achieve a simpler regime when crossing state borders for representatives of local self-

governments with this status. The revitalization and use of the European Charter of Regional Self-Government can also help to remove some legislative barriers. In terms of the size and shape of the Slovak territory, cross-border cooperation is an important opportunity for local development of the socio-economic space. The survey pointed out the most common obstacles identified by the actors of cross-border cooperation on the northern border of the Prešov region and the changes in their perception. Based on the findings and experience, it can be stated that cross-border cooperation has deep historical roots in the territory of Prešov region and, with regard to its geographical location, a satisfactory potential. Its successful development therefore requires:

- increased qualification and demands in the field of sustainable development,
- completion of institutional mechanisms for further development of relations,
- stabilization of tourism areas and completion of modern infrastructure,
- socio-economic development of border areas in conjunction with rural development,
- prospective cooperation must be permanent and desirable.

Acknowledgements

This paper was created within the project "Performance evaluation of public service providers in the Czech Republic". Project registration number SP 2021/18.

References

[1] BATYK, I. M., RZECZKOWSKI, D. (2020). Cross-border cooperation at the external border of the European Union in the context of political, economic and social conditions: the case of the Polish-Russian neighbourhood. *Equilibrium*, Vol 15, pp. 833–871. https://doi.org/10.24136/eq.2020.036

[2] BLANDINIERES, J. P. (2004). Changing the fundamental productive and social paradigms. The transformation of the public sector in Europe. (EU experience), [online]. [cit.2021-04-01]. Available: http://www.recep.ru/files/documents/04_10_10_Blandinieres_par adigms_Ru.pdf

[3] BUTKOVIČ, Š. (1978). *Dejiny ťažby soli v Solivare.* Košice: Východoslovenské vydavateľstvo.

[4] BRUNECKIENĖ, J., SINKIENĖ, J. (2015). The Economic Competitiveness of Lithuanian-Polish Border Region's Cities: the Specific of Urban Shrinkage. *Equilibrium. Quarterly Journal of Economics and Economic Policy*. Vol. 10, pp. 133-149, DOI: http://dx.doi.org/10.12775/ EQUIL.2015.039

[5] CIEŚLIK, J., KRASNODĘBSKI, A. (2002). Kierunky przedsięwzięć modernizacyjnych zmierzających do poprawy konkurencyjności sektora rolno-żywnościowego wojwwództwa Małopolskiego. In: *Stály rozvoj regiónov: skúsenosti, problémy, perspektívy*. pp. 213 – 222.

[6] DEMENTIEVA, A. V. (2000). Competitiveness of international companies. *Marketing*, Vol.3, pp. 45-51.

[7] DERFIŇÁK, P. (2002). Gregor Berzevici a jeho pokusy o cezhraničnú spoluprácu. In *Stály rozvoj regiónov: skúsenosti, problémy, perspektívy*. pp. 133 – 139.

[8] FALŤAN, Ľ (2004). Euroregióny a regionálny rozvoj. In *Regionálny rozvoj Slovenska v európskych integračných kontextoch*. pp. 66 - 90.

[9] HAVRLANT, M. (1999). Problémy spolupráce v rozvoji přihraničních regiónů. In *Regionální spolupráce ´99*. pp. 61 - 65.

[10] KMET, B. E., MAYZNER, A. N. (2017). The Methodical Approach to the Evaluation of the Competitiveness of the Border Territories. *European Research Studies Journal*, Vol. XX, pp. 182–199. https://doi.org/10.35808/ersj/673

[11] MEZHEVICH, N. M. (2002). Regional economic policy of the Russian Federation: the impact of cross-border cooperation on traditional and new implementation mechanisms. St. Petersburg: Publishing house of St. Petersburg State University.

[12] SCOTT, J. W., CELATA, F., & COLETTI, R. (2019). Bordering imaginaries and the everyday construction of the Mediterranean neighbourhood: Introduction to the special issue. *European Urban and Regional Studies* Vol. 26, pp. 3–8. https://doi.org/10.1177/0969776418795208

[13] SLAVÍK, V. (2004). Cezhraničná spolupráca a euroregióny v SR – výskum ich doterajších aktivít. In *Regionálny rozvoj Slovenska v európskych integračných kontextoch*. pp. 91-109.

[14] STROEVA, O., LYAPINA, I., KONOBEEVA, E. AND KONOBEEVA, O. 2015. Effectiveness of Management of Innovative Activities in Regional Socio-Economic Systems. *European Research Studies Journal*, Vol. 18, pp. 63-67.

[15] STUDZIENIECKI, T., PALMOWSKI, T., KORNEEVETS, V. (2016). The system of cross-border tourism in the Polish-Russian borderland, *Procedia Economics and Finance*, Vol. 39, pp. 545—552.

[16] TEJ, J. (2003). Euroregion Tatras and possibilities of its development. *Acta Agraria et Silvestria. Series Agraria.* pp. 79 - 85.

[17] TEJ, J. (2004). Possibilities of cross-border co-operation in multicultural regions. In *The role of ethnic minorities in border regions : selected problems of ethnic and religious minorities*. pp.107 - 115.

[18] TEJ, J., MADZINOVÁ, R. (2004). The possibilities of transborder co-operation in United Europe (the case of euroregion Tatras). In: *The competition power of the European Union after the enlargement.*. pp. 475 – 482.

[19] TEJ, J., MATLOVIČ, R., KLAMÁR, R. (2002). Bariéry cezhraničnej spolupráce na juhu a severe Slovenska. In: *Stály rozvoj regiónov: skúsenosti, problémy, perspektívy*. pp.18 – 26.

[20] UDVARI, I. (1997). O poľských súvislostiach slovenských roľníckych priznaní v Šarišskej stolici v dobe Márie Terézie. In: *Obyvateľstvo Karpatskej kotliny I.* pp. 72 - 79

[21] ZABIELSKA, I. (2020). Cooperation, partnership and integration in the cross-border area: the role of borders and cross-border cooperation. *Ekonomia i Prawo*, Vol. 19, pp. 569 - 583. https://doi.org/10.12775/eip.2020.038

Factors Influencing Revenues of Shared Tax for Municipalities

Petr Tománek

VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
petr.tomanek@vsb.cz

Abstract

The paper focuses on the issue of the impact of budgetary allocation of taxes on the management of municipalities in the Czech Republic. The budgetary allocation of taxes for municipalities in the Czech Republic is based on the sharing of earned taxes between the state budget, regional budgets and municipal budgets. Tax sharing for municipalities is carried out on the basis of criteria of population, pupils and area of municipalities. Actual tax revenues for municipalities are affected by the rate of tax sharing, economic growth reflected in the size of taxes earned and other factors that are reflected in tax sharing revenues. The aim of the paper is to evaluate the effects of budgetary allocation of taxes on the economy of municipalities and to assess the main influences that were reflected in the size of revenues from shared taxes in municipal budgets in the period 2014-2020 and especially in 2020.

Keywords: *municipal budgets, shared taxes, tax*

JEL Classification: *H71*

1 Introduction

Revenues of municipalities from taxes through the rules of budgetary allocation of taxes for municipalities in the Czech Republic (BAT), form the main part of revenues of municipal management. The basic principles of the BAT rules have been set for a long time, however, in some years the portion in the sharing of municipal taxes have changed and there are other factors.

The existence of shared taxes for decentralized budgets makes it possible to assume a high stability of tax revenues for individual budgets. Shared taxes also reduce large disparities in tax revenue between individual budgets and make it possible to spread the risks of non-fulfillment of tax revenue between the state and local government (Peková, 2011), (Tománek, 2016).

Related to this is the issue of using the tax autonomy of municipalities within countries, or the issue of balancing of tax capacity in order to use a similar tax burden, which is closely linked to resources balancing within fiscal federalism (Blöchliger, 2011).

The aim of the paper is to evaluate the impacts of the BAT rules, focusing on shared taxes, on the management of municipalities and to assess the factors that have affected the revenues of shared taxes of municipalities in recent years. A partial goal is to assess the impacts of BAT for 2020 in relation to Covid-19. The method of solving the contribution is the analysis of tax revenues of municipalities in relation to the applied criteria. To achieve the objectives of the paper, data from the Monitor system of the Ministry of Finance of the Czech Republic are used.

The sharing of taxes between the state budget and decentralized budgets (municipalities and regions) includes two taxes, namely income tax and value added tax; but income tax breaks down to a total of six to seven parts when shared for municipalities (changes have taken place in some years). So mainly the revenues of these taxes affect the size of tax revenues for municipalities. However, in terms of the impacts of BAT on the management of individual municipalities, mainly the criteria are manifested here, on the basis of them the revenues to municipalities are distributed (for a more detailed description of the criteria, see e.g. Tománek, 2014 or Tománek

2017). Given that these criteria are applied within a defined range of resources, then, for example, the growth of the total size of claims of municipalities according to the criteria is reflected in a reduction in the size of revenue per unit of the given criterion. All these factors are then reflected in changes of the size of income of individual municipalities. The paper focuses on the evaluation of the overall impacts of the criteria used in the BAT on municipalities as a whole.

The focus of this contribution on shared taxes addresses only one part of the revenues of municipal budgets. Municipal revenues also include non-tax revenues, revenues from the sale of property and transfers. Many authors deal with the issue of tax and these other revenues and it is possible to refer, for example, to the publications of the authors Sedmihradská (2013, 2015), Toth (2011), Tománek (2014, 2017, 2019).

2 Methodology and Data

The budgetary allocation of taxes for municipalities in the Czech Republic fundamentally affects the revenues of municipal budgets. Tax revenues of municipalities, for example in 2019, accounted for 68% of total revenues of municipalities, while tax sharing accounted for 58% of total revenues of municipalities. This significant role of shared taxes shows the need to continuously monitor the development of these revenues and the impact on municipal budgets.

Municipal revenues from taxes are based on the principle of entrusted taxes, where the entire tax revenue collected in the municipality is the income of the municipality (in this way municipalities receive income from real estate tax and corporate income tax, where the legal entity is a municipality) and on the principle of tax sharing, where the national revenue of certain taxes is distributed to municipalities according to set criteria, which are linked to the concrete municipality. When sharing taxes for municipalities, the relevant volume of resources is created from the share on the national revenue of the relevant taxes. The development of the shares of municipalities in the revenue from nationally collected taxes, which are used for tax sharing, and the taxes entrusted are shown in Table 1. It can be seen that over the last 7 years there has been a change in the structure of tax revenue by cancellation of 30% municipal share on personal income tax from business and adjustment of shares of municipalities in the national tax revenue to 23.58% for value added tax and for personal income tax from dependent activities and the inclusion of gambling tax.

In addition to tax revenues based on the BAT Act, the tax revenues of municipalities include the gambling tax, which was created and provided to municipalities since 2017, and also tax revenues includes incomes from local fees, administrative fees and fees and payments in the area of the environment.

The BAT rules thus form the first set of factors that affect the size of tax revenues of municipalities, the second set of factors is the development of the economy in the form of revenue from individual taxes (including the impact of Covid-19) and the third set of factors from the point of view of individual municipalities are their own conditions, i.e. the specific size of the criteria for the concrete municipality. This paper focuses on the issue of shared taxes and follows the first and second set of factors.

The first set of factors is presented by criteria for tax sharing by municipalities, where the following criteria are applied:

- the number of employees in the municipality, where a share of 1.5% of the national revenue from the tax on dependent activities is distributed,
- number of inhabitants of the municipality, 10% of the volume of shared taxes is distributed,
- the number of children and pupils attending schools established by the municipality, 9% of the volume of shared taxes is distributed (2020),
- cadastral area of the municipality, 3% of the volume of shared taxes is distributed,
- the number of inhabitants of the municipality, adjusted by conversion coefficients and by coefficients of gradual transitions, determined in connection with the size category of municipalities, distributed is 78% of the volume of shared taxes (2020).

The first criterion is applied in relation to the distribution of the 1.5% share of personal income tax from dependent activity, and the other criteria are applied in relation to taxes in which municipalities participate in shares of national income, see Table 1.

Within the second set of factors, it can be stated that in terms of economic development, and thus the impact on the size of tax revenues of municipalities, the year 2020 had a special position where the crisis (Covid-19) led to negative economic growth (as opposed to annual economic growth in the period 2014 - 2019), which was reflected in a decrease in tax revenues for municipalities. However, the application of compensatory bonuses to entrepreneurs also had an impact on tax revenues, when on the one hand there was a refund of previously paid

personal income taxes from business to these entrepreneurs, but due to the lack of such refunded taxes there were used for this purpose also resources from personal income tax from dependent activity. In this context, however, the state provided a contribution to municipalities (which was reflected in the received transfers of municipalities), which were to eliminate the effects of the compensation bonus.

Table 1 - Overview of the development of the shares of municipalities on the national tax revenue in the period 2015 - 2020

Shares in %		**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Real estate tax		100	100	100	100	100	100	100
Corporate income tax (Corporation = municipality)		100	100	100	100	100	100	100
Personal income tax from business		30	30	30	0	0	0	0
Gambling tax			0	0	65; 30	65; 30	65; 30	65; 30
Shared taxes	Personal income tax from a dependent activities	1,5	1,5	1,5	1,5	1,5	1,5	1,5
	Personal income tax from a dependent activity	22,87	22,87	23,58	23,58	23,58	23,58	23,58
	Personal income tax from business (from 60%)	23,58	23,58	23,58	23,58	23,58	23,58	23,58
	Withholding tax on personal income	23,58	23,58	23,58	23,58	23,58	23,58	23,58
	Corporate income tax	23,58	23,58	23,58	23,58	23,58	23,58	23,58
	Value added tax	20,83	20,83	20,83	21,4	23,58	23,58	23,58

Source: Own calculation based on the Act of Budgetary Determination of Taxes No. 243/2000 Coll.

The third set of factors are the specific impacts on the budgets of individual municipalities, which reflect the specific conditions of individual municipalities, which in terms of each municipality is its population, cadastral area, number of children and pupils and number of employees.

The total values of the volume of individual criteria (the basis for determining the unit value of the relevant criterion) developed in the observed period in fact in all criteria with growth. From the point of view of the development of the total volumes of municipalities, it can be stated that in the monitored period 2014 - 2020 (see Table 2):

- the population grew (the change between 2014 and 2020 represented an increase of 1.7%),
- the number of children and pupils grew (the change between 2014 and 2020 represented an increase of 10.2%, however, this change also reflects the change in the weight of the criterion, when from 2018 the weight of the criterion was increased from 7% to 9%),
- the total calculated cadastral area grew (the change between 2014 and 2020 represented an increase of 0.6%),
- the number of employees grew (except for the period 2019/2020) (the change between 2014 and 2020 represented an increase of 15.6%).

The changes in the bases for the individual criteria developed differently for the individual criteria. The changes reflected the growth of the population of the Czech Republic. The number of children per pupil showed a more significant increase, which is related to the growth of the population, but probably also to the change in the age structure, while the proportions of changes in the number of pupils between private schools and schools established by municipalities may also manifest themselves here. The change in the number of employees mainly reflects the reduction in unemployment.

A change that does not seem logical is a change in the overall size of the cadastral territory, because this is the territory of the state as a whole, which did not increase its territory in the given period. However, the growth of cadastral territory has another reason here. It is related to the fact that the so-called calculated acreage is used to

calculate the values according to the above criteria, which reflects the size of the cadaster of individual municipalities, but there is a limit in the sense that only 10 hectares per inhabitant can be used, and thus in those municipalities, where this limit is exceeded, the acreage value decreases for BAT purposes. Thus, in some municipalities, this criterion depends on the number of inhabitants, where, for example, one municipality, even if it does not change its actual area, can increase its "area" for the calculation by increasing the population in this municipality.

Table 2 - Overview of total values for calculations of criteria used for tax sharing of Czech municipalities

Criterion (Czech Republic total)	2014	2015	2016	2017	2018	2019	2020
Population	10 510 547	10 536 433	10 553 843	10 578 820	10 610 055	10 649 800	10 693 939
Number of children and pupils	1 152 242	1 180 839	1 205 847	1 227 324	1 245 043	1 257 832	1 269 658
Cadastral area	7 622 318	7 623 235	7 667 232	7 667 500	7 667 307	7 668 879	7 668 795
Number of employees	4 717 489	4 926 441	5 066 487	5 242 520	5 406 922	5 497 210	5 455 670

Source: Decrees on the percentage share of individual municipalities in parts of the national gross revenue from value added tax and income taxes No. 186/2014, 213/2015, 272/2016, 276/2017, 192/2018, 219/2019, 358/2020

Based on the values of actual tax revenues and the values of the total claims of municipalities, the values attributable to the individual criteria were calculated. An overview of the values is given in Table 3. These values reflect both sets of factors, namely economic growth and the change in total values for the calculation of criteria. The stated values show a growth trend for all criteria in the period 2014 - 2019 and, conversely, a decrease in the period 2019/2020.

Table 3 - Unit revenues of shared taxes

Criterion (Czech Republic total)	2014	2015	2016	2017	2018	2019	2020
Yield per capita (thsd. of CZK)	1 266	1 297	1 424	1 573	1 757	1 911	1 787
Yield per 1 child / pupil (thousands of CZK)	8 084	8 103	8 723	9 492	13 476	14 566	13 549
Yield per 1 km^2 (thsd. of CZK)	52 371	53 796	58 794	65 116	72 945	79 635	74 774
Yield per 1 employee (CZK)	393	385	434	483	533	590	563

Source: Own calculation based on the Monitor and table 2.

3 Conclusions and Discussion

Within the BAT criterion - population - the total volume of tax revenues and the number of inhabitants are reflected in the value of income per capita; i.e. if the population increases with the unchanged volume of shared taxes, the allocation per capita will decrease. Which, in terms of the link to the financing of public services in municipalities, does not have a suitable link; it would probably be logical to increase tax revenues in proportion to the increase in population. In the period 2014/2019, the population increased by 1.3% and the yield increased by 50%.

However, the criterion of the number of inhabitants still appears in the second position within the BAT, where taxes are distributed depending on the number of inhabitants of municipalities, but yield per capita is adjusted by coefficients that are set for size groups of municipalities on the principle of size coefficient growth. This overall tendency, which manifests itself in general in all municipalities, then has other impacts in connection with changes in population, which depends on the size of municipalities. When dividing shared taxes according to size categories, municipalities are divided into groups, which are: Prague (as one separate group for which a coefficient of 4.0641 is used), the cities of Brno, Ostrava, and Pilsen (as the second group for which a coefficient

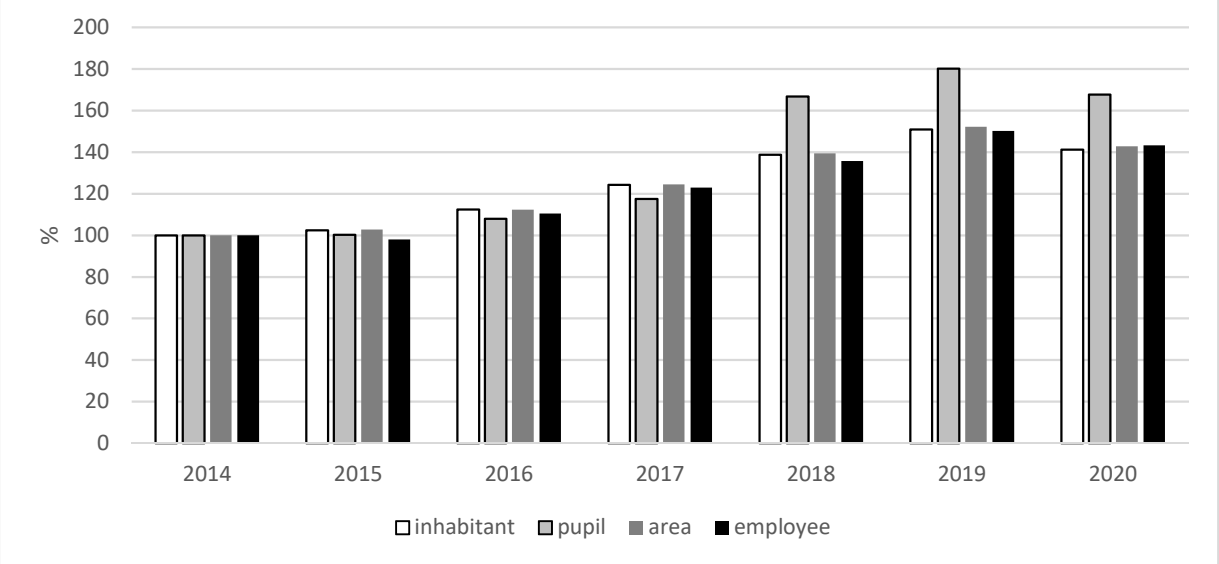
2. 2961is used) and other municipalities (these form the third group, where a coefficient of 1.0000 is used here). If there is a change in the number of inhabitants in the municipalities of the first and second groups, then this change will be reflected in the change of distribution, incl. the relevant coefficient. However, if there is a change in the population of the municipalities of the third group, then the change will always be reflected only with a coefficient of 1, although in the second step, coefficients greater than one are also used for distribution between these municipalities. This is due to the fact that when using the above coefficients, Prague and Ostrava, Brno, Plzeň have a certain specific position in this process of tax sharing.

Within the BAT criterion - the number of children / pupils - the volume of tax revenues and the number of children / pupils are reflected. However, between 2017 and 2018, there was a significant increase in income per child / pupil, which was mainly due to an increase in the original share of shared taxes from 7% to 9%, which represents an increase of 29% per child / pupil within unchanged volume of taxes. The change in income per child / pupil during 2014/2019 represented an increase of 80% while the number of pupils increased by 9%. This change in the share of shared taxes in the period under review thus significantly contributed to covering the costs of municipalities for education.

Within the BAT criterion - municipal area - it can be stated that the value of revenue per unit of municipality area changes according to tax revenues and according to changes in the area of municipalities (due to the criterion of included cadastral area); but in this connection there acts also the number of inhabitants of municipalities, where the area exceeds 10 hectares per capita. In terms of the impact of using the criterion of cadastral acreage, it is thus possible to divide municipalities into two groups. The first group consists of municipalities that do not exceed 10 hectares per capita in terms of area and the second group consists of those municipalities that exceed an area of 10 hectares per capita. For the first group, the income according to the above criterion is affected by the size of the total cadastral area of the state for the calculation of tax sharing, which in case of increasing population in municipalities of the second group also increases, and thus the value of tax revenue per unit of cadastral area decreases. In the second group of municipalities, if the number of their inhabitants grows, these municipalities receive an increased tax revenue in connection with the increased number of inhabitants. This conclusion shows that the method of applying the criterion of calculated cadastral area has different effects on municipalities.

Within the RUD criterion - number of employees - the tax revenue per employee is affected by the size of total tax revenues and the number of employees. In the period 2014/2019, the number of employees changed by 17%, while the tax revenue per employee increased by 43%. The increase in the above revenue per employee was braked by an increase in the total number of employees. However, a long-term problem with this revenue per employee is the size of the funds distributed in this way, which should help municipalities, especially in the case of increased commutes for work, to finance public services (e.g. urban transport); for these purposes, however, the stated value of share of tax per employee is low.

Figure 1 - Increments of tax revenues according to BAT criteria in% (year 2014 = 100%)



Source: Own calculation based on table 3

A comparison of the growth of tax revenues per unit of BAT criteria shows (see Graph 1) that the values of tax revenues per child / pupil increased the most during the observed period. However, this change in terms of time development began to manifest itself only from 2018, due to an increase of the share of this criterion, when until then, on the contrary, year-on-year changes were lower than for other criteria. The second largest growth can be traced in the area criterion (without the evaluation of 2020), then in the criterion of the number of inhabitants and in the fourth place is the criterion of the number of employees.

A separate part of the issue of the impacts of BAT on municipalities is the situation in 2020. In this year, there was a decline in tax revenues in connection with the crisis due to Covid-19. However, the effects of this crisis on municipalities were in some way compensated into municipal budgets in the form of contributions received by each municipality in relation to the population of the municipality, in the amount of CZK 1,250 per capita. However, these contributions were provided to municipalities without distinction, in the same size per capita, but on the other hand, shortfalls in revenues from shared taxes were not the same (per capita) for all municipalities. The reason is the different size of conversion coefficients and coefficients of gradual transitions, which are used in the calculation of taxes and whose basic impact can be expressed by the fact that these coefficients increase the income of municipalities per capita by increasing of the size category of municipalities. Thus, in contrast to the provided contribution per inhabitant without affecting the size of the municipality. In essence, we can compare this contribution with the application of the criterion of allocating shared taxes only according to population, which shows that in 2020 this contribution accounted for 70% of this amount.

Table 4 - Share of the contribution of municipalities to shared taxes in 2020

	Slověnice	**Stěbořice**	**Kopřivnice**	**Karviná**	**Ostrava**	**Praha**
shared taxes (CZK)	586845	21047872	291545467	728726886	7295949433	57873282856
population	36	1 490	21 851	52 128	287 968	1 324 277
contribution per capita (CZK)	1 250	1 250	1 250	1 250	1 250	1 250
Share: contribution / shared taxes (%)	7,67	8,85	9,37	8,94	4,93	2,86

Source: Own calculation based on the data from Monitor

The average shortfall in municipal tax revenues in 2020 compared to 2019 was about 6%. This outage was replaced to municipalities in the amount of CZK 1,250 / inhabitant. How this contribution contributed to cover tax revenue shortfalls is shown in Table 4. In tab. 4 there's shown 6 municipalities that were randomly selected as a sample of municipalities within individual categories of municipalities. Municipalities were selected from the categories used for tax sharing. The method of providing the per capita allowance shows that large cities such as Ostrava and Prague were relatively less covered by contribution which covered shortfall (about half less in Ostrava and about a third of values in Prague) than in other municipalities.

4 Conclusion

The aim of the paper was to evaluate the impacts of individual criteria that are used within the BAT in tax sharing. The evaluation monitored the period 2014-2020, when, however, the year 2020 interrupted the longer-term development trend due to the crisis (Covid-19). The paper evaluated the changes that took place in the period 2014-2020 in the unit values of the criteria used in tax sharing. It turns out that the criterion of the number of children / pupils underwent the biggest change, however, this change was connected with the modification of the BAT rules. Overall, the impacts of tax revenues according to individual criteria are both a reflection of the overall development in the volume of shared taxes but also the initial parameters on which sharing is based, such as the total population in the Czech Republic, the number of children and pupils, the cadastral area.

The year 2020 in connection with the crisis (Covid-19) had a special position on the impacts, as municipal tax revenues decrease. However, municipalities were provided with a population-based allowance to compensate for the loss of income; the more favorable impact of this contribution was for smaller municipalities.

The evaluated volumes of revenues from shared taxes, according to the criteria used, represent information for municipalities, which they cannot derive from the revenues of their budgets. These values are detectable only from calculations for the municipality as a whole. For municipalities, this information is important from the point of view that they can find out how these criteria work and to what extent their efforts for their municipality are reflected in its growth, in terms of population, number of employees or children, in their revenues of tax.

Acknowledgements

The article/paper was created within the frame of the TA ČR project TL01000145 "Methodological – Application Tools for Efficiency Financial Management of Territorial Structured Statutory City" and with financial support of the student grant project SGS No. SP2017/129 "Economic Factors Affecting the Ensuring of Public Services with Collective Consumption" on Faculty of Economics, Technical University of Ostrava.

References

[1] BLÖCHLIGER H., CAMPOS, J. M. P. (2011): *Tax Competition Between Sub-Central Governments*. OECS Working Papers of Fiskal Federalism, no.: 13, pages 46.

[2] PEKOVÁ, J. (2011): *Finance územní samosprávy. Teorie a praxe v ČR*. 1st ed. Prague, Wolters Kluwer ČR.

[3] SEDMIHRADSKÁ, L. ČALBA, A. (2013): *Budget accuracy in Czech municipalities and the determinants of tax revenue forecasting errors*. Ekonomická revue, 16(4): pp. 197-206.

[4] SEDMIHRADSKÁ, L. BAKOŠ, E. (2015): *Who applies the Real East Taxs Local Coefficient?* In: Theoretical and Practical Aspects of Public Finance. Prague, pp. 206-210.

[5] TOMÁNEK, P. (2014): *Personal Income Tax as a Stimulus Tax of Municipal Budgets.* In: Theoretical and Practical Aspects of Public Finance 2014. Prague, Wolters Kluwer, pp. 314-321.

[6] TOMÁNEK, P. (2016): *Influence of evolution of the tax revenues to the sharing of tax revenues of the state budget and municipal budgets.* In: Theoretical and Practical Aspects of Public Finance 2016. Prague, Oeconomia 2016. pp. 107 – 111.

[7] TOMÁNEK, P. a kol. (2017): *Komplexní analýza současného stavu financování regionálního školství v obcích.* Výzkumná studie SMS ČR, pages 86.

[8] TOMÁNEK, P. (2017): *Application of the criterion of the number of pupils in the budgetary allocation of taxes for municipalities.* In: Theoretical and Practical Aspects of Public Finance. Prague, pp. 163-168.

[9] TOMÁNEK, P. (2019): *Revenue Factors of City Districts of Territorially Structured Statutory City*. In: Theoretical and Practical Aspects of Public Finance. Prague, pp,135-140.

[10] TOTH, P. (2011): *Rozpočtové určení daní – možnosti standardizace vybavenosti obcí.* In: Teoretické a praktické aspekty veřejných financí. Praha, Vysoká škola ekonomická, pp. 1-12.

Sustainability and Efficiency of the Regional Supply of Retirement Homes Services in the Czech Republic

Iveta Vrabková[1], Eva Kovářová[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
iveta.vrabkova@vsb.cz, eva.kovarova@vsb.cz

Abstract

The aim of the paper is to evaluate using the DEA model and Malmquist index the technical efficiency and productivity retirement homes services in regions of the Czech Republic for the years 2015, 2018 and 2030. Analysis of the static technical efficiency cowers years 2015 and 2018 when the real data about the size of the elderly population and supply of retirement homes services are considered; and the year 2030 when the analysis deals with the predicted growth of this population size. Analysis relates to 14 regions of the Czech Republic because these self-governing territorial units are considered its guarantees. Research findings reveal that differences in regional supply of retirement homes services are related to differing efficiency when especially small regions are more efficient than the larger ones. Moreover, predicted growth of the elderly population will have an impact on the efficiency over time, but again with regional differences.

Keywords: *Bootstrap, DEA model, Efficiency, Malmquist index, Productivity, Retirement Homes, Social Services*

JEL Classification: *H41, H44, H55, C5, D24*

1 Introduction

Population ageing represents in developed countries one of the actual discussion topics. Although the geographical diversity in the shares of the elderly is obvious, this trend is thematized especially in socio-economic consequences of developed countries. Changes in age structure belong, inter alia, to objective determinants of the demand for professional social care because they are accompanied with the increased number of individuals dependent on others' help (Průša, 2015); respectively with the increased need of a care provided to individuals with reduced self-sufficiency because of their age (Vávrová and Dořičáková, 2016; Mertl, 2007). In this context, when discussions are usually led on increased public expenditures on this care and its availability in broader terms (Artlová et al., 2016; Kim and Lim, 2015; Bethencourt and Galasso, 2008).

Demographic trends of declining fertility and increasing life expectancy, leading to increasing share of the elderly population (defined as the population aged 65 and over), will be dramatized in the Czech Republic around the year 2030 when strong population group retires (Káčerová and Ondačková, 2015; Mertl, 2007). Only between years 2000–2018, respecting the OECD data, share of the elderly population in total population rose by 5.57% pp to 19.41% in Czech Republic, which means the highest increase compared to other post-communist central European countries, namely Poland (4.99 pp), Slovakia (4.35 pp) or Hungary (4.08 pp). Therefore, increase in demand for professional social and health care can be expected in the Czech Republic, which will put the pressure on the capacity of the professional care system.

Social care services for the elderly individuals represent important segment of the public sector in the Czech Republic. There, regional territorial self-governing units (13 administrative regions and the Capital City Prague) are responsible for the availability of these services because regional authorities are legally bounded to guarantee their supply in their regional territories (respecting the Social Services Act) throughout so-called social services net including authorized providers of social services suppling them in necessary range and type. Efficiency and

sustainability of the social care services are thus directly related not only to their supply, but also to the performance of the public administration on regional level.

Retirement homes represent the most frequent and natural social care services for the elderly when the individual and market demands for professional care are considered in the Czech Republic. They represent social care services of stay-in type. However, stay-in services for the elderly are gradually replaced with field social services, it means with services provided to the elderly in their natural environment (Sirovátka and Válková, 2017). In this term, Czech market of social services is comparable with the Swedish one (Meagher and Szebehely, 2013). Also, other trends of the Czech social services market are comparable to other European countries, especially when the capacity of social care services is related to actual needs (Wija et al., 2019). With respect to the analysis of the Czech Ministry of Labour and Social Affairs (MLSA), the capacity should be increased of 36% to reach the ideal situation. Therefore, it can be assumed that regional supply of retirement homes services, with respect to individual socio-economic conditions of Czech regions and size of their elderly population, is not efficient.

The aim of the paper is to evaluate using the DEA model and Malmquist index the technical efficiency and productivity of social services provided by retirement homes in individual regions of the Czech Republic for the years 2015, 2018 and 2030.

Efficiency of retirement homes services is considered static in relation to one year and dynamic in relation to trends (improvement, stagnation, decline) monitored between two specified years. Generally, efficiency is examined using the optics of output maximalization, in terms of the number of beds supplied in retirement homes related to the size of the elderly population. However, regional supply is constrained by the number of retirement homes and their capacity (number of beds), as well as by the total expenditures (public and private) spent to ensure this capacity.

Three research questions are formulated to meet the aim of the paper:

RQ1: What differences in efficiency of the supply of retirement homes services exist among Czech regions in analysed years?

Differences in supply efficiency are evaluated using the achieved values of technical efficiency calculated for analysed regions and years. Differences are assumed because of the different socio- economic environment in individual regions identified in data concerning the inputs (average costs per one bed reported by the retirement homes located in a region, number of beds in all retirement homes in a region, and regions' demographic structure).

RQ2: Is the productivity of the supply of the retirement homes services between years 2015 and 2018 affected mainly by the efficiency change, or by the frontier shift?

Productivity means dynamic conception of the efficiency. Supply of retirement homes services (output) is expressed by the offered number of beds in retirement homes per 1,000 inhabitants aged 65 and over in individual regions. Increasing size of the elderly population and insufficient capacity of retirement homes indicate stagnation or even decline in the productivity when the years 2018 and 2015 will be compared.

RQ3: What effect on the supply of retirement homes services in individual regions will have the increased size of the elderly population predicted for the year 2030?

Future growth of the elderly population is predicted by the Czech Statistical Office (2019). Impact of the increasing number of inhabitants aged 65 and over will be examined in relation to selected input variables observed for the year 2018.

2 Methodology

Evaluation of the supply of services provided by retirement homes in the Czech regions is based on the conceptualization of the public goods and the approach to the evaluation of their efficiency based on the principle of input-output productivity models (Porcelli, 2009; Dooren et al., 2010; Vrabková, 2019). In public sector, the Data Envelopment Analysis (DEA) and its variations including Malmquist index (MI) belong to the well-recognized methods of the evaluation of technical efficiency.

Evaluation of the technical efficiency of regional supply of retirement homes services based on the approach of DEA has been neglected in the Czech research space, although its common in other segments of public sector (health care, culture – libraries, universities, public administration). However, the use of DEA in the field of social care services is quite common in foreign literature. Such kind of DEA applications are presented for example by: (a) Luski and Givon (2007) dealing with nursing homes industry in Israel; (b) Chattopadhyay and Ray (1996) analysing the technical, scale, and size efficiency of individual nursing homes providing health care

to the elderly; (c) Kleinsorge and Karney (1992) showing the benefits of DEA for the internal decision-making; or by (d) Iparraguirre and Ma (2015) examining the self-reported quality of life in nursing homes. Emrouznejad and Yang (2018), who analyse the use of DEA in a sample of 10,300 papers published in expert journals during the period of years1978–2016, claim that the evaluation of efficiency based on DEA is less common in the field of social care than in the field of health care.

DEA approach to the evaluation of technical efficiency is chosen in relation to the aim of the paper and research questions specified above. Research deals with the supply of the retirement homes services defined for the 14 territorial self-governing units (13 administrative regions and Capital City Prague). Self-governing regions are considered the homogenous production units, called further as the *Decision-making units (DMUs)*, respectively DMU1–DMU14. Decision making units, respecting the DEA model theory, represent a set of units focusing on production of identical or equivalent effects, which are called outputs of these units (Coelli et al., 2005; Cooper at al., 2007). In presented research, output is defined by the number of beds offered in retirement homes per 1,000 inhabitants aged 65 and over in a region, when inputs are specified by the number of retirement homes, their capacity and average costs per one bed in retirement homes located in a region. Based on the testing of the appropriate input and output variables, two fundamental models are designed, and then efficiency and productivity are calculated using the output-oriented DEA models and Malmquist index. Finally, found results are analysed and interpreted.

2.1 Data Envelopment Analysis

Efficiency is calculated according to the CCR model using the Charnes-Cooper transformation, and it is transformed from the linear-fractional programming task into the standard programming one, and formulated as follows (1):

minimize $g = \sum_j^m v_j x_{jq,}$ (1)

on conditions $\sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk,}$ $k = 1, 2, \ldots, n,$

$\sum_i^r u_i y_{iq} = 1,$

$u_i \geq \varepsilon$ $i = 1, 2, \ldots, r,$

$v_j \geq \varepsilon,$ $j = 1, 2, \ldots, m.$

Efficiency calculation according to BCC model has compared to CCR model one additional variable in the objective function. This additional variable represents condition of convexity, and it is not restricted by condition of non-negativity. Calculation is formulated as follows (2):

minimize $g = \sum_i^m v_j x_{jq} + v,$ (2)

on conditions $\sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk} + v,$ $k = 1, 2, \ldots, n,$

$\sum_i^r u_i x_{iq} = 1,$

$u_i \geq \varepsilon,$ $i = 1, 2, \ldots, r,$

$v_j \geq \varepsilon,$ $j = 1, 2, \ldots, m,$

$v - free.$

Coefficient of efficiency g for both above formulated models is defined by the ratio of weighted sum of inputs and weighted sum of outputs, when such weights are searched to have the g greater than or equal to 1. Therefore, the efficient units have the value of the coefficient g equal to 1, and inefficient units greater than 1 (Cooper et al., 2007; Zhu and Cook, 2013, Jablonský and Dlouhý, 2015).

Degree of technical efficiency calculated using the CCR and BCC models creates the basis for the calculation of so-called *scale efficiency (SE)*, formulated by equation (3). Cooper et al. (2007) describe scale efficiency as the ratio of the DMU's efficiency calculated using the *CCR* θ^*_{CCR} and that one calculated using the *BCC* θ^*_{BCC}, when the degree of DMU's *SE* is, in the case of output-oriented model, greater than or equal to 1.

$$SE = \frac{\theta^*_{CCR}}{\theta^*_{BCC}}. \quad (3)$$

Decomposition of technical efficiency (4) enables to express so-called *pure technical efficiency (PTE)* and *scale efficiency (SE)*.

$$CCR\ \theta^*_{CCR} = \theta^*_{BCC} \times SE, \text{ or} \quad (4)$$

[*technical efficiency* (*TE*)] = [*pure technical efficiency* (*PTE*)] × [*scale efficiency* (*SE*)].

2.2 Malmquist Index

Fundamental DEA models do not allow to evaluate changes in efficiency over time. They estimate static technical efficiency. However, this shortage is solved by the *Malmquist index (MI)* and its decomposition. To evaluate the efficiency of *DMUs* over time, the Malmquist index was adjusted by Färe, Grosskopf, Lindgren and Ross who based their approach on DEA models, with the modification of the radial DEA models. For the dynamic evaluation of the technical efficiency (considering its changes over time), *MI* enables to recomposite it into two components (i.) changes of the *DMU*'s relative efficiency in relation to all other units; (ii.) production frontier shifts due to the changes in technology, (Cooper et al., 2007; Bogetoft, 2012; Zhu and Cook, 2013; Vrabková, 2019).

Output-oriented Malmquist index M_q, which calculates the changes in technical efficiency of the production unit q between times t and $t+1$, is formulated as follows:

$$M_q(y^{t+1}, x^{t+}, y^t, x^t) = E_q P_q, \tag{5}$$

Where E_q is the relative efficiency of the unit q related to other units between times t and $t+1$, and P_q describes the frontier shift due to the changes in technology between times t and $t+1$.

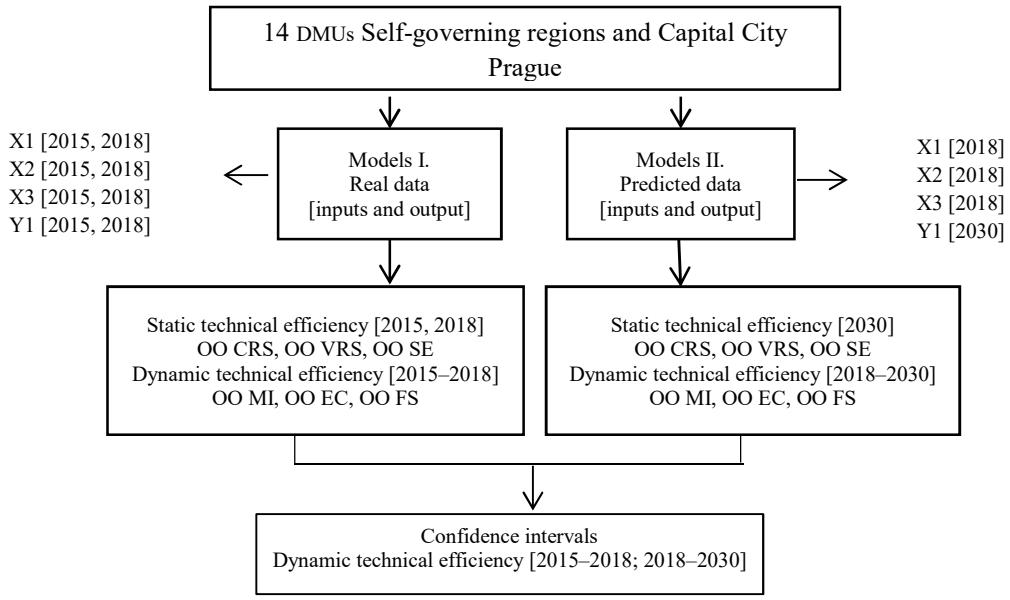
It is necessary to use some of the DEA models to solve the tasks with multiplied inputs and outputs. For example, above defined CCR model that assumes the constant returns to scale. Decomposition of the *MI* enables to formulate its two components *(efficiency change* and *frontier shift)*, when *MI = efficiency change* (E_q) x *frontier shift* (P_q). In the case of output-oriented *MI*, results are interpreted as follows: $MI_{(output)} > 1$ (improves), $MI_{(output)} = 1$ (remains unchanged, stagnated), $MI_{(output)} < 1$ (declines) productivity (Fried et al., 2008).

3 Description of the Chosen Models

Two types of output-oriented models (Models I. and Models II.) are formulated to evaluate the technical efficiency and productivity of 14 DMUs, see Fig. 1.

Models I. deal with real data for inputs and output (*X1*, *X2*, *X3* and *Y1*) for the years 2015 and 2018. Models II. deal with predicted data for the year 2030 when respecting the assumption that the volume of inputs will be the same for the year 2030 as for the year 2018, and the volume of output will change with respected to predicted growth of the elderly population in individual regions of the Czech Republic (DMU1–DMU14). Both models estimate static technical efficiency using the *CRS* (constant returns to scale), *VRS* (variable returns to scale) and *SE* (scale efficiency) of the output-oriented DEA model (*OO*); and dynamic technical efficiency and its decomposition to the *MI* (productivity), *EC* (efficiency change) and *FS* (frontier shift) using the output-oriented Malmquist index.

Figure 1 - Scheme of the research methodology



3.1 Data: Inputs and Output

Presented research is based on data withdrawn from the public databases of the Ministry of Labour and Social Affairs of the Czech Republic (MLSA), Czech Statistical Office (CSO), regional public authorities. Data are taken from at least two types of relevant sources, see Tab. 1. Relevance of data was discussed with expert representatives of the regional public authorities (representing the Moravian-Silesian Region and Olomouc Region), and with the representatives of the providers of retirement homes services (managers of public and charity organizations). Data accuracy was tested using the cross-check.

Table1 - Sources of statistical data concerning chosen parameters

Parameters	Data sources
Population 65^+ (elderly population) per a region	CSO, MLSA
Number of retirement homes per a region	Regions (regional social services nets), MLSA (register of social services providers)
Capacity (Number of beds) per a region	Regions (regional social services nets), MLSA
Cost per a bed per a region	Regions, MLSA

Source: own research

Exploratory analysis done for the chosen parameters is presented in Tab. 2. It is a matrix for 14 regions and 4 years (2015–2018), therefore, it contains set of 56 units (n=56). On average, one Czech self-governing region had 143.7 thousand inhabitants aged 65 and over (population 65^+); 37 retirement homes; 2.6 thousand beds; and average costs per a bed accounted for 28.3 thousand CZK. Median values are nearly equal to mean values, but the mode values of three parameters (*Size of the population* 65^+, *Number of retirement homes per a region*, and *Number of beds per a region*) indicate that data distribution is not symmetric in analysed sample.

Table 2 - Exploratory analysis

N=56	Population 65^+ per a region	Number of retirement homes per a region	Number of beds per a region	Average cost per a bed per a region
Mean	143 716.68	36.68	2 652.36	28 286.95
Median	118 291.50	35.00	2 515.50	27 607.00
Mode	54 097.00	24.00	814.00	21 386.00
Std. Deviation σ	61 086.20	17.00	1 185.14	4 301.77
Range	195 162.00	63.00	4 501.00	20 089.00
Minimum	54 097.00	14.00	814.00	21 386.00
Maximum	249 259.00	77.00	5 315.00	41 475.00

Source: own calculations and data processing

Details concerning the inputs (X1, X2, X3) and output data are presented for the years 2015, 2018 and 2030 in Table 2, when they are defined on the level of individual regions and with respect to the above specified statistical data as follows: *X1 number of retirement homes in one region*, *X2 number of beds in retirement homes in one region*, *X3 average cost per one bed for retirement homes*, and one output *Y1 number of beds offered per 1,000 elderly inhabitants*.

Table 3 - Basic statistical characteristics of the inputs and output

	Maximum			Minimum			Mean		
	2015	2018	2030	2015	2018	2030	2015	2018	2030
X1	71	77	77	14	16	16	35.4	37.5	37.5
X2	5 113	5 315	5 315	858	814	814	2 657.2	2 646.3	2 646.3
X3	29 743	41 475	41 475	21 386	28 011	28 011	24 903.2	33 008.7	33 008.7
Y1	26	23	19	10	11	10	20	18	15

Source: own calculations and data processing

In 2015, 496 retirement homes providing social care service for the elderly were registered with the capacity 37,200 beds. By the year 2018, their number increased to 525 with the capacity 37,048 beds. The Central Bohemian Region (DMU2) had the highest number of retirement homes (X1) and their capacity (X2) in both observed years. Karlovy Vary Region (DMU5) had the lowest ones. The average number of retirement homes

per one region increased by 2 between years 2015 and 2018. However, the average capacity measured by number of beds declined by 9 between the same years. MLSA reported that nearly whole capacity of retirement homes was regularly used in all regions.

The highest average costs per one bed in retirement homes was calculated for the Capital City Prague (DMU1) in both years. In the year 2015, the Zlin Region (DMU13) and in the year 2018 the South Bohemian Region (DMU6) had the lowest average costs. The average costs per one bed increased by 32.5 % (8,105 CZK) between years 2015 and 2018. Personal costs had the highest share in total average costs per one bed. During last five years, they increased by 50% for the personnel in direct care, and by 30 % for the other personnel (MLSA, 2019).

4 Results

4.1 Results of the Static Technical Efficiency

Technical efficiency of the supply of the retirement homes services (calculated as the *Number of beds per 1,000 inhabitants aged 65 and over*) was calculated for the 14 regions of the Czech Republic (DMU1–DMU14) using two types of models – Models I. (years 2015, 2018) and Models II. (year 2030), see Fig. 2. Both types of models were designed as the output-oriented ones with the constant returns to scale (*CRS*), then with the variable returns to scale (*VRS*), and also the scale efficiency (*SE*) was calculated. Results are summarized in Table 5, which shows the number of efficient units (with g=1), average rate of efficiency, its standard deviation and the best g value for all models. Average value of models' *SE* reveals for all years that the efficiency rate for all *CRS* models was slightly worse than that of the *VRS* models. However, this is the general assumption of the DEA models (Cooper et al., 2007; Bogetoft, 2012). The narrowest gap in values calculated for models with *CRS* and *VRS* are observed in the year 2015, when also the lowest value of standard deviation σ, and at the same time the smallest number of the 100% efficient units are reached.

Table 4 - Results of static technical efficiency for Models I. and Models II.

n=14	**Models I. 2015**			**Models I. 2018**			**Models II. 2030**		
	CRS	**VRS**	**SE**	**CRS**	**VRS**	**SE**	**CRS**	**VRS**	**SE**
g = 1	4	5	4	5	7	5	5	9	5
mean	1.292	1.230	1.046	1.252	1.163	1.068	1.248	1.148	1.083
median	1.143	1.087	1.047	1.086	1.005	1.048	1.090	1.000	1.052
σ	0.403	0.356	0.042	0.405	0.325	0.074	0.359	0.289	0.093
worst	2.362	2.215	1.132	2.381	1.994	1.223	2.164	1.840	1.319

Source: own calculations and data processing

Four grades of the efficiency scale (A–D) are derived from all results obtained for individual DMUs using Models I. and Models II.

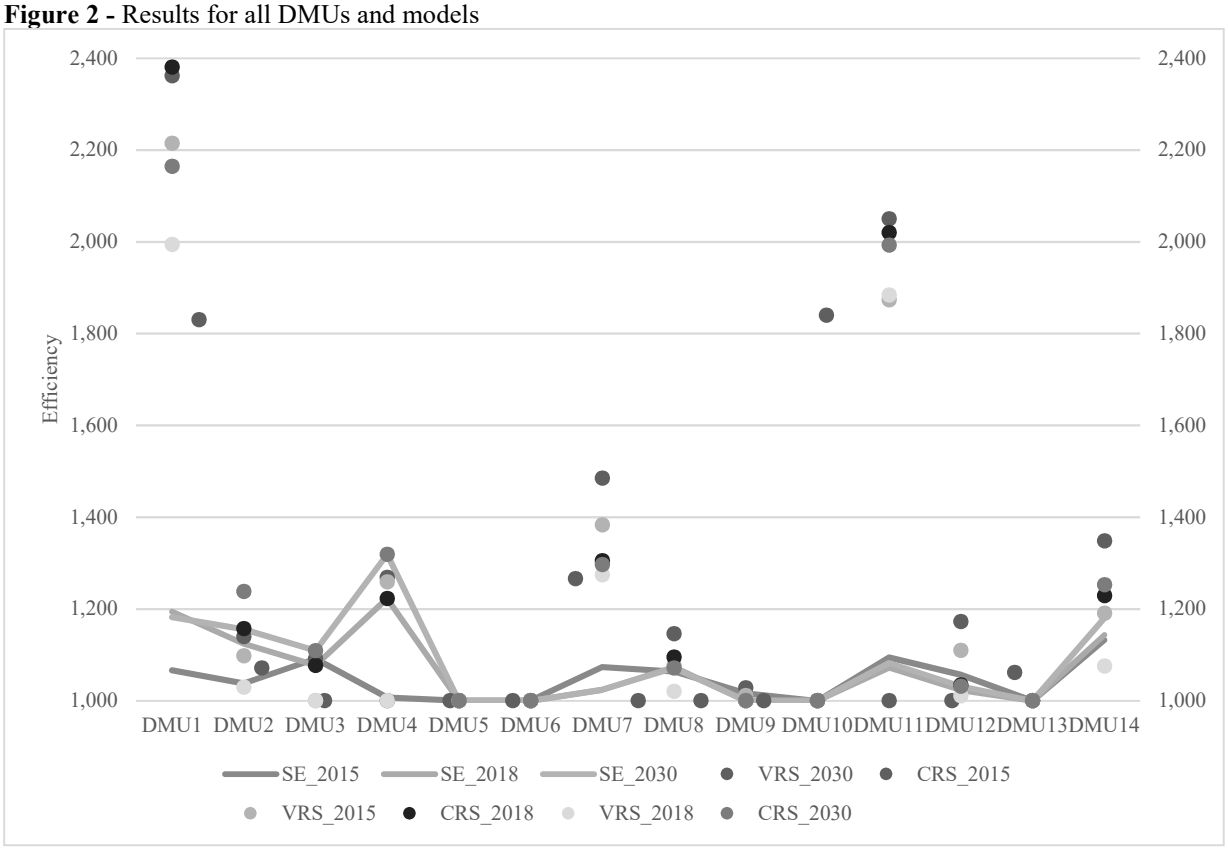
A. Fully efficient, when the condition g=1 was met for all models and years. This condition was met by four DMUs: DMU10, DMU6, DMU13, DMU5.

B. Slightly inefficient, when the condition $1.2 \geq g > 1.0$ was met for all models and years. This condition was met by five DMUs: DMU9, DMU12, DMU3, DMU8, DMU2.

C. Inefficient, when the condition $1.5 \geq g > 1.2$ was met for all *CRS* models and years. This condition was met by four DMUs: DMU14, DMU4, DMU7.

D. Strongly inefficient, when the condition $2.4 \geq g > 1.5$ was met especially for all *CRS* models and years. This condition was met by two DMUs: DMU11, DMU1.

Figure 2 - Results for all DMUs and models



Source: own calculations and data processing

Results of technical efficiency estimates, and its specification for the overall efficiency (*CRS*), pure efficiency (*VRS*) and scale efficiency (*SE*), see Fig. 2, enable to derive that regions with smaller population sizes are more efficient considering the supply of retirement homes services than more populous regions (especially the Capital City Prague and South Moravian Region). However, the efficiency is dependent on chosen inputs and output parameters.

4.2 Results of Dynamic Technical Efficiency

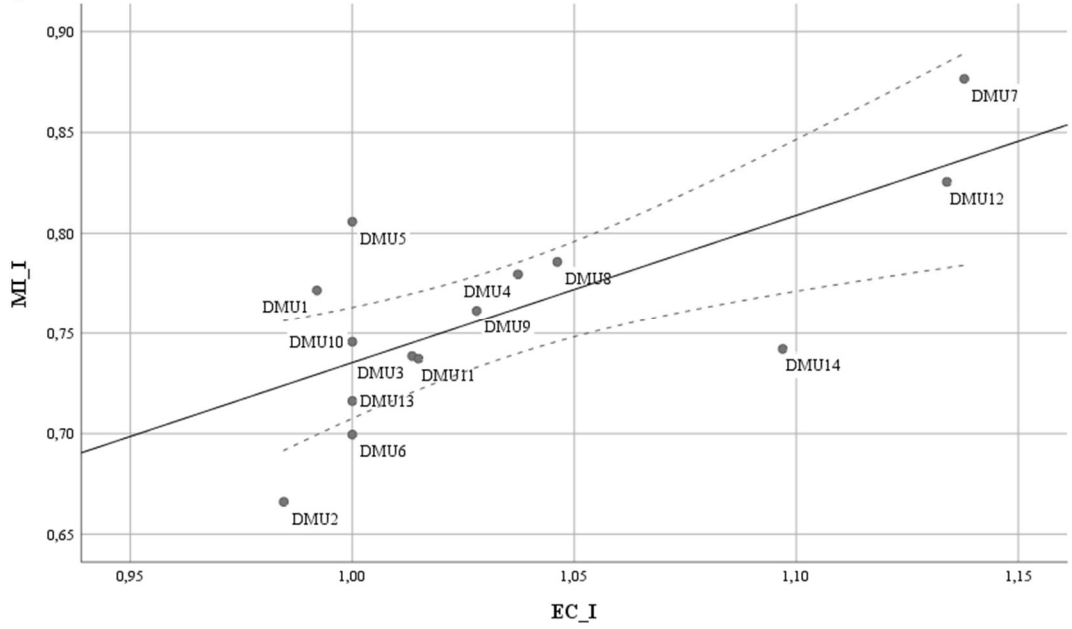
Dynamic technical efficiency for the Models I. shows achieved progress (improvement, stagnation, decline) of the productivity measured by *MI*; and its two components – *efficiency change* (*EC*) and *frontier shift* (*FS*) for the year 2018, when this year is compared with the year 2015. Results of individual DMUs are presented in Tab. A3 (see Appendix A).

Regions' productivity for the year 2018 compared to the year 2015 were improved on average by 24%. Improvement was affected by the frontier shift of inputs. However, regions' efficiency changes declined by 3%, which was affected by increased of the elderly population. All regions improved when the average rate of *MI* was 0.761. The most significant improvement was identified for two regions – DMU1 and DUM5. Improvement of all regions was affected by *FS*, when the average rate of *FS* accounts for 0.735.

Improvement in productivity (*MI*) of all regions was constrained by efficiency changes (*EC*), when *EC* stagnated in the case of five regions – DMU3, DMU5, DMU9, DMU13 and DMU14. Only two regions improved in *EC*, and seven regions even worsened in *EC*– DMU4, DMU6, DMU7, DMU8, DMU10, DMU11 and DMU13. The average rate of *EC* is 1.03.

In Model I., linear relation between the values of *MI* and *EC* is positive and very significant $r = 0.710$ ($\alpha = 0.001$). It means that if the *MI* increases, *EC* will increase, too, and vice versa. Interval (95 %) *CI* <0.157; *CI* = 0.929>. See Fig. 3.

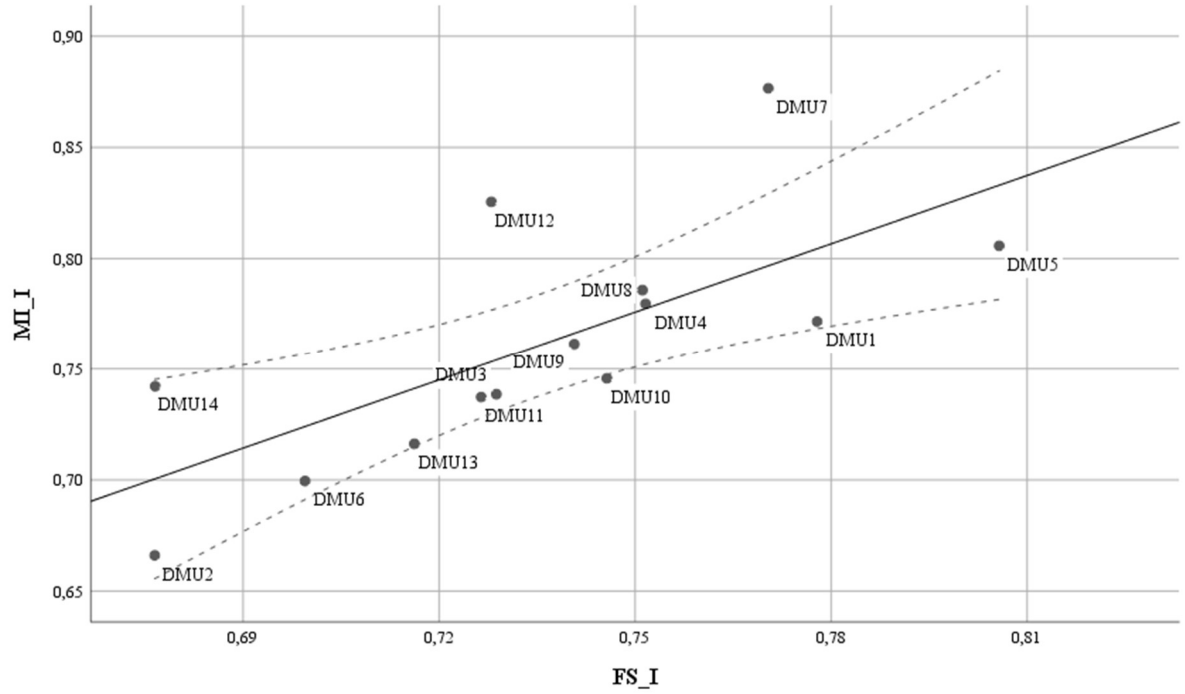
Figure 3 - Relation between *MI* and *EC* in Model I



Source: own calculations and data processing

Comparable to the relation between *MI* and *EC*, also the linear relation between the values of *MI* a *FS* is positive and very significant in Model I., when $r = 0.703$ ($\alpha = 0.001$). It means that if *MI* increases, *FS* will increase too, and vice versa. Interval (95 %) *CI* <0.415; *CI* = 0.928>. See Fig. 4.

Figure 4 - Relation between *MI* and *FS* in Model I.



Source: own calculations and data processing

Dynamic technical efficiency of the Models II. shows achieved progress (improvement, stagnation, decline) of the productivity (*MI*) and its two components – efficiency change and frontier shift for the year 2030, when this year is compared with the year 2018. Table A4 (see Appendix A) contains results for all DMUs.

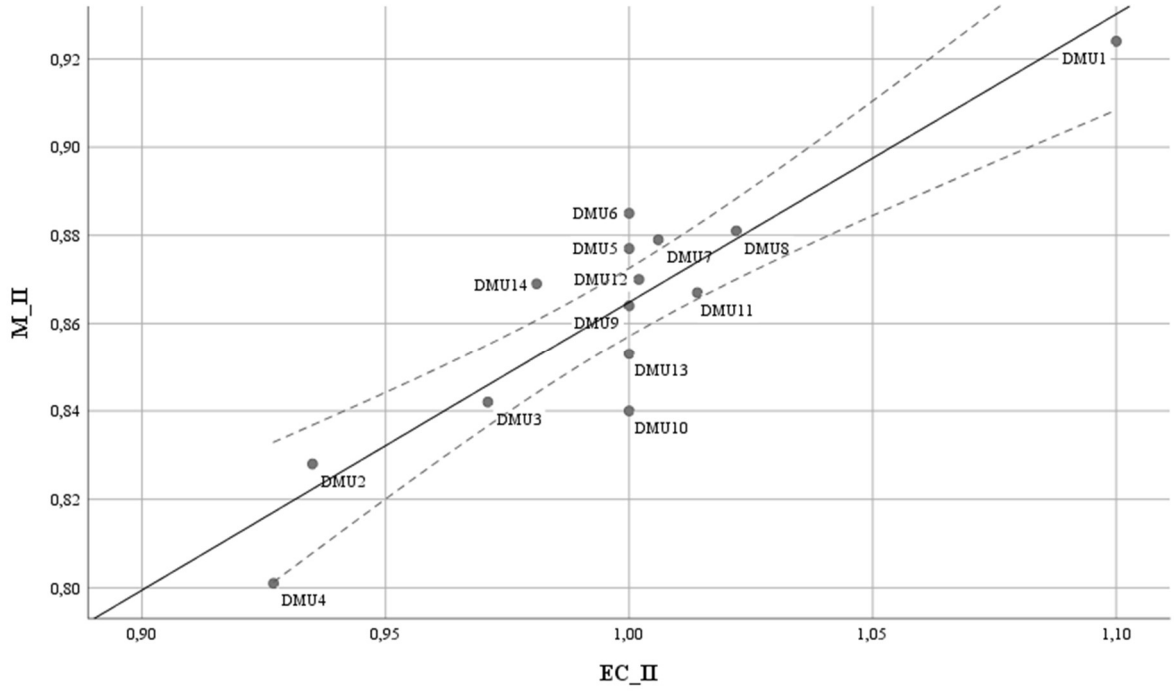
Regions' productivity for the year 2030 in relation to the year 2018 was improved on average by 14%. Improvement was affected by the frontier shift. Regions' efficiency changes stagnated, which was affected by

increased elderly population and declining number of beds in retirement homes in most regions. All regions improved their *MI*. The average rate was 0.863. Improvement of all regions was affected by *FS*, when the average rate of *FS* was 0.86.

Improvement of all regions is constrained by the first *MI* component – efficiency change (*EC*). *EC* stagnated in the case of fire regions – DMU5, DMU6, DMU9, DMU10 and DMU13. Only four regions improved slightly in *EC* – DMU2, DMU3, DMU3 and DMU14. Decline in efficiency is visible for region DUM1. Average rate of *EC* is 0.99.

In Model II., linear relation between the values of *MI* and *EC* is again positive and very strong $r = 0.901$ ($\alpha = 0.001$). It means that if the *MI* increase, the *EC* will increase, too, and vice versa. Interval (95 %) *CI* <0.555; *CI* = 0.966>. See Fig. 5.

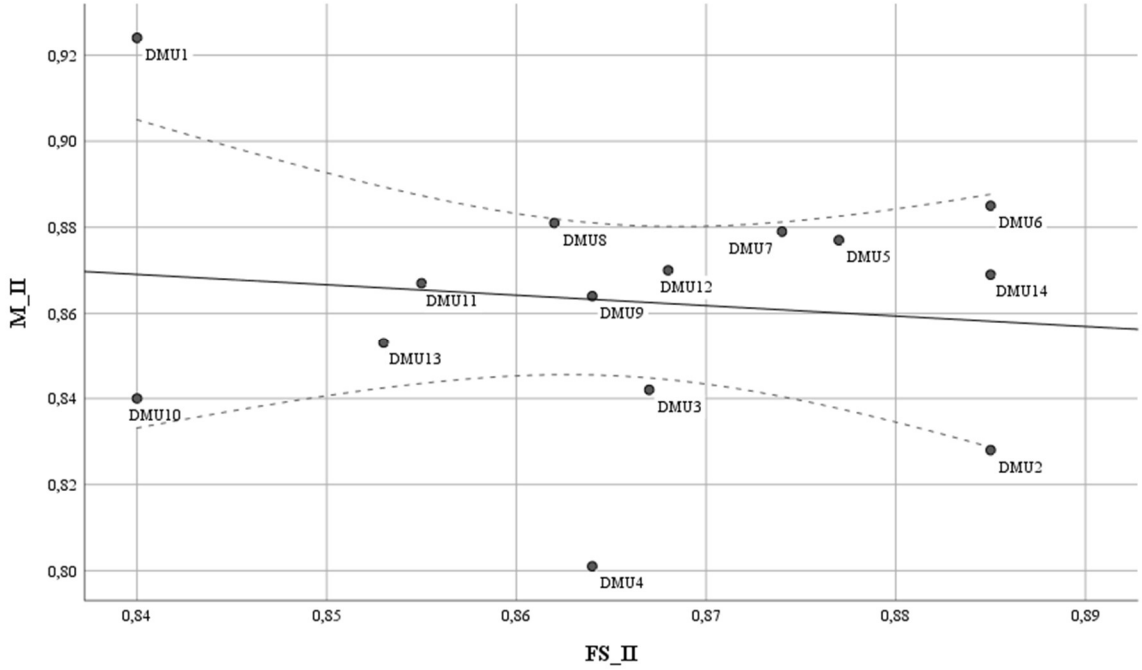
Figure 5 - Relation between MI and EC in Model II



Source: own calculations and data processing

However, linear relation between the values of *MI* and *FS* was not proved in Model II., which is visible in Fig. 6. Value of coefficient *r* accounts for 0.124, which means that increase of *MI* has not impact on *FS*, and vice versa. Interval (95 %) *CI* <-0.633; *CI* = 0.660>. See Fig. 6.

Figure 6 - Relation between MI and FS in Model II



Source: own calculations and data processing

5 Discussion

Discussion is focused on inductive interpretation of the above presented results with respect to the formulated research questions and current state of knowledge.

RQ1: What differences in efficiency of the supply of retirement homes services exist among Czech regions in analysed years?

Differences in efficiency of the reginal supplies of retirement homes services were detected for three observed years (2015, 2018, 2030). Average value of efficiency indexes, their standard deviation and number of the efficient units showed that the smaller differences were observed in Models II. dealing with predicted data for the year 2030. These findings are explained only with the dynamics of the growth of the elderly population in Czech regions. Increased size of this affected (reduced) volume of output (numbers of beds per 1,000 inhabitants aged 65 and over) in all regions, especially in regions with higher dynamics of the elderly population growth (the Central Bohemian Region, South Bohemian Region and Vysocina Region). These three regions were assessed as the slightly inefficient regions when the static technical efficiency is considered, and thus the declining volume of their outputs had positive impact on results of other regions.

Differences in efficiency enabled to create a scale defined by the achieved values of overall technical efficiency (*CRS*) of the supply of retirement homes services. Regions' ranking respecting this scale then revealed that four regions (with the small- and medium size of the whole population) were assessed as being fully efficient for all observed years. These regions were also defined as the regions having the average costs per one bed in retirement homes located in these regions below the average costs calculated for the whole Czech Republic (Usti Region had the cost lower by 15%, Zlin Region by 8%, Vysocina Region by 6% and Karlovy Vary Region by 2% than the Czech average). Moreover, Usti Region and Zlin Region had also the total number of beds in retirement homes higher than the average number calculated for the whole Czech Republic.

The Capital City Prague and South Moravian Region were identified as being strongly inefficient regions, when Prague was detected as being the extremely inefficient region. For this region, extreme values were observed for input as well as output variables. The average costs per one bed were higher there by 25% than the Czech average for the year 2018, and by 48% higher than the costs of Usti Region, which had the lowest costs compared to other regions.

With respect to above presented results, it can be claimed that differences in efficiency of regional supplies, identified using the output-oriented DEA models and their decomposition, were caused by differences in capacity of the retirement homes and average costs per one bed in these homes in Czech regions. Results were also affected by extreme inefficiency of the Capital City Prague, which was caused by very high average costs

per one bed and very small number of beds per 1,000 inhabitants aged 65 and over, when Prague is compared to other regions.

In general, discussions can be led when the efficiency and quality of the social care are compared. Higher quality is usually connected with higher costs of the facilities, which has effect on reduction of the facilities' efficiency, which is confirmed by Iparraguirre and Ma (2015). Objectively, improvement of the quality of the professional social care provided on stay-in base relates to declining number of beds in one room and declining number of clients servicing by one worker in direct care, (Sirovátka and Válková, 2017). However, efficiency and productivity depend also on the legal entity of the social care provider. Study of Garavaglia et al. (2011), who examined 40 retirement homes in Lombardi (Italy) for the years 2005–2007, showed that private providers partly subsidised from public budgets were more efficient than the public ones, when the efficiency was measured using the DEA models. Study explained that they can better use public subsidies, and they also use other sources of income.

RQ2: Is the productivity of the supply of the retirement homes services between years 2015 and 2018 affected mainly by the efficiency change or frontier shift, defined as the components of the Malmquist index?

Productivity results clearly showed that overall improvement of the productivity was affected by the component frontier shift, it means by the inputs parameters, that on average declined between years 2015 and 2018. It was founded that output efficiency declined for 7 regions, remained unchanged for 5 regions, and was improved for 2 regions between years 2015 and 2018.

Two factors explain reduced number of beds in retirement homes per 1,000 inhabitants aged 65 and over (supply of the retirement homes services) in the year 2018: demographic trend connected with the growth of the elderly population and institutional changes. The institutional changes relate to improvements in a care quality (declining number of beds per one room and thus declining capacity of retirement homes) and reorganization of some retirement homes to special care homes.

RQ3: What effect on the supply of retirement homes services in individual regions has the increased size of the elderly population in the year 2030?

If the unchanged inputs are considered, then the increased size of the elderly population will lead to the decrease in the efficiency of the supply of retirement homes services. It will be necessary to increase their capacity but increase respecting regional needs and differences will be necessary. It can be expected that the highest pressure will be put on the capacity in the South Moravian Region and Liberec Region, because of the currently insufficient capacity and predicted growth of the elderly population. Disquotable will be the situation in Prague when the insufficient capacity is considered.

Also, the future market demand for retirement homes services opens space for discussions. It cannot be assumed that all inhabitants aged 65 and over will need and demand retirement homes services. As it was explained above, retirement homes offered professional residential long-term car for the elderly who are not self-sufficient in their basic personal needs because of their health and age, which is reflected by social care allowances provided by state to individuals with reduced self-sufficiency that should be spend on social care. In 2018, the care allowances were granted to 24,753 inhabitants older than 65 years with reduced self-sufficiency (31% were males, 69% females). Total capacity of retirement homes offered long-term care only to 15% of such kind of inhabitants in the same year. Other inhabitants obtaining care allowances used different forms of formal or informal social care, depending of their preferences and services affordability (MLSA, 2019; Průša 2019)

6 Conclusion

Readiness of the supply of social care services for the elderly is one of the most discussed topics these days when the questions regarding the population ageing are asked. Attention is paid specially to costs/expenditures on professional social care, current capacity of the supply, which is guaranteed by the public authorities and co-financed from the public sources, and to current and future demand for these services. Due to population ageing and predicted increase in a share of the elderly population, evaluations regarding the efficiency of the supply of the social services for the elderly are actual, and they open space for serious analysis using appropriate methods.

In presented research, technical efficiency and productivity of the supply of retirement homes services was analysed for 14 regions of the Czech Republic and three years (2015, 2018, 2030). Above presented findings show that predicted growth of the elderly population by the year 2030 will affect the efficiency of the supply of retirement homes services in all Czech regions, but in different extent. Current system of social care services provided by the public and private retirement homes is sustainable in analysed years, but with regional specifics. Overall system needs to be improved in order to be ready for further population ageing that will objectively determine future demand for professional social care services (especially demand after the year 2030).

To cope with this further shift in demand for social care, Czech political authorities must solve current problems explained by Průša (2019). He says that the system of social services in the Czech Republic is not prepared to solve problems resulting from the population ageing. Many providers of social services face with the lack of the social workers; long waiting periods. At the same time field services provided on at-home base are not well-developed and support for the caregivers in families is not sufficient enough. It seems that also other European countries face with comparable problems. Buckner et al. (2013) observed similar situation of the elderly with reduced self-sufficiency in Northern England, not only because of insufficient capacity of the professional care, but also because of the insufficient number individuals providing informal care of their relatives. However, they introduced optimistic opportunities lying in technological progress (telecare, telehealth and ICT) and social enterprises.

Findings of the presented research open also space for further discussions and research because they reveal that the Czech market for social care services is not a typical market of public goods (it means market for goods with zero marginal costs, guaranteed availability of goods because of their financing or co-financing from public sources), although professional social care services are mainly provided on public basis. Presented analysis also shows the phenomenon of significant negative correlation between the supply of retirement homes services and average costs per one bed in these homes in Czech regions. It can be assumed that marketization and liberalization is rather a process typical for social care services markets in richer regions than the general trend of the social care services market defined by the frames of the whole Czech Republic.

References

[1] ARLTOVÁ, M., SMRČKA, L., VRABCOVÁ, J. and SCHÖNFELD J. (2016). The Ageing of the Population in Developed Countries – the Economic Consequences in the Czech Republic. *Economics and Sociology*, 9(2), 197–219, https://doi.org/10.14254/2071-789X.2016/9-2/14.

[2] BETHENCOURT, C. and GALASSO, V. (2008). Political Complements in the Welfare State. Health Care and Social Security. *Journal of Public Economics*, 92(3–4), 609–932, https://doi.org/10.1016/j.jpubeco.2007.06.005.

[3] BOGETOFT, P. (2012). *Performance Benchmarking. Measuring and Managing Performance*. New York: Springer. ISBN 978-1-4614-6043-5.

[4] BUCKNER, L., CROUCHER, K., FRY, G. and JASINSKA, M. (2013). The Impact of Demographic Change on the Infrastructure for Housing, Health and Social Care in the North of England. *Applied Spatial Analysis and Policy*, 6(2), 123–142, https://doi.org/10.1007/s12061-013-9090-y.

[5] CHATTOPADHYAY, S. and RAY, S. C. (1996). Technical, Scale, and Size Efficiency in Nursing Home Care: A nonparametric Analysis of Connecticut Homes. *Health Economics*, 5(4), 363–373, https://doi.org/10.1002/(SICI)1099-1050(199607)5:4<363::AID-HEC217>3.0.CO;2-1.

[6] COELLI, T., J., RAO, D. S. P., O´DONNELL, CH. J. and BATTESE, G. E. (2005). *An Introduction to Efficiency and Productivity Analysis.* New York: Springer. ISBN 978-0-387-25895-9.

[7] COOPER, W. W., LAWRENCE M. S. and TONE, K. (2007). *Data Envelopment Analysis: a Comprehensive Text with Models, Applications, References and DEA-solver Software*. Boston, MA Springer Science + Business Media. ISBN 978-0-387-45283-8.

[8] Czech Statistical Office (2019). *Populační prognóza ČR do r. 2050 – N.* [Retrieved 2020-08-11] Available at: https://www.czso.cz/csu/czso/populacni-prognoza-cr-do-r2050-n-g9kah2fe2x.

[9] Czech Statistical Office (2020). *Public Database*. [Retrieved 2020-08-11] Available at: https://vdb.czso.cz/vdbvo2/faces/en/index.jsf.

[10] DOOREN, W., BOUCKAERT, G. and HALLIGAN, J. (2010). P*erformance Management in the Public Sector*. London: Routledge. ISBN 978-0-415-37105-6.

[11] EMROUZNEJAD, A., YANG, G. (2018). A Survey and Analysis of the First 40 Years of Scholarly Literature in DEA: 1978–2016. *Socio-Economic Planning Sciences* 61 (1): 1–5, https://doi.org/10.1016/j.seps.2017.01.008.

[12] FRIED, H., LOVELL, C. and SCHMIDT, S. (2008). *The Measurement of Productive Efficiency and Productivity Growth*. New York, Oxford: Oxford University Press. ISBN 978-0195183528.

[13] GARAVAGLIA, G., LETTIERI, E., AGASISTI, T. and LOPEZ, S. (2011). Efficiency and Quality of Care in Nursing Homes: An Italian Case Study. *Health Care Management Science*, 14(1), 22–35, https://doi.org/10.1007/s10729-010-9139-2.

[14] IPARRAGUIRRE, J. L. and MA, R. (2015). Efficiency in the Provision of Social Care for Older People. A Three-stage Data Envelopment Analysis using Self-reported Quality of Life. *Socio-Economic Planning Sciences*, 49, 33–46, https://doi.org/10.1016/j.seps.2014.10.001.

[15] JABLONSKÝ, J. and DLOUHÝ, M. (2015). *Modely hodnocení efektivnosti a alokace zdrojů,* Prague: Professional Publishing. ISBN 978-80-7431-155-0.

[16] KÁČEROVÁ, M. and ONDAČKOVÁ, J. (2015). The Process of Population Ageing in Countries of the Visegrad Group (V4). *Erdkunde*, 69(1), 49–68, https://doi.org/10.3112/erdkunde.2015.01.04.

[17] KIM, H. B. and LIM, W. (2015). Long-term Care Insurance, Informal Care, and Medical Expenditures. *Journal of Public Economics*, 125(C), 128–142, https://doi.org/10.1016/j.jpubeco.2014.12.004.

[18] KLEINSORGE, I. K. and KARNEY, D. F. (1992). Management of Nursing Homes Using Data Envelopment Analysis. *Socio-Economic Planning Sciences*, 26(1), 57–7, https://doi.org/10.1016/0038-0121(92)90026-2.

[19] LUSKI, I. and GIVON, Y. (2007). Efficiency and Quality in the Nursing Home Industry: A DEA Approach. International *Journal of Interdisciplinary Social Sciences*, 2(3), 197–211, https://doi.org/10.3390/ijerph16122186.

[20] MEAGHER, G. and SZEBEHELY, M. (2013). *Marketisation in Nordic Eldercare: A Research Report on Legislation, Oversight, Extent and Consequences*. Stockholm Studies in Social Work 30. Department of Social Work, Stockholm University.

[21] MERTL, J. (2007). *Přístupy k hodnocení efektivnosti sociálních služeb v národním hospodářství: syntéza teoretických východisek a konceptů*. Praha: Výzkumný ústav práce a sociálních věcí. ISBN 978-80-87007-72-3.

[22] Ministry of Labour and Social Affairs (2020). *Registr poskytovatelů sociálních služeb*. [Retrieved 2020-02-01] Available at: https://www.mpsv.cz/registr-poskytovatelu-sluzeb.

[23] Ministry of Labour and Social Affairs (2019). *Analýza financování sociálních služeb*. [Retrieved 2020-08-01] Available at: https://www.mpsv.cz/documents/20142/1079648/Anal%C3%BDza%20financov%C3%A1n%C3%AD%20soci%C3%A1ln%C3%AD%20pr%C3%A1ce%20v%20p%C5%99enesen%C3%A9%20p%C5%AFsobnosti.pdf/8b4ed969-e776-398b-01d9-55b8bbfeabf2

[24] Ministry of Labour and Social Affairs (2018). *Statistická ročenka z oblasti práce a sociálních věcí 2018*. [Retrieved 2020-08-10] Available at: https://www.mpsv.cz/documents/20142/975025/Statisticka_rocenka_z_oblasti_prace_a_socialnich_veci_2018+%281%29.pdf/a060f8db-abcf-6713-e0d1-9da7f606b983.

[25] Ministry of Labour and Social Affairs (2016). *Národní strategie rozvoje sociálních služeb na období 2016-2025* [Retrieved 2020-08-13]. Available at: https://www.mpsv.cz/documents/20142/577769/NSRSS.pdf/af89ab84-31ac-e08a-7233-c6662272bca0

[26] Organization for Economic Co-operation and Development (2020). *Erdely population (indicator)*. [Retrieved 2020-08-10] Available at: https://data.oecd.org/pop/elderly-population.htm

[27] PORCELLI, F. (2009). *Measurement of Technical Efficiency. A Brief Survey on Parametric and Non-parametric Techniques*. Coventry: University of Warwick.

[28] PRŮŠA, L. (2015). Důsledky stárnutí populace na potřebu služeb sociální péče do roku 2030. *Demografie, revue pro výzkum populačního vývoje*, 57(3), 231–244.

[29] PRŮŠA, L. (2019). Who Cares for Our Seniors?. *Demografie*, 61 (1), 5–18.

[30] SIROVÁTKA, T. and VÁLKOVÁ, J. (2017). *Understanding Care Policies in Changing Times: Experiences and Lessons from Czech Republic and Norway*. Brno: Centre for the Study of Democracy and Culture, Masaryk University. 978-80-210-8566-4.

[31] VÁVROVÁ, S. and DOŘIČÁKOVÁ, Š. (2016). *Pseudosociální služby pro seniory v České republice: Výpomoc, nebo byznys?*. *Czech & Slovak Social Work*, 16(6), 109–125.

[32] WIJA, P., BAREŠ, P. and ŽOFKA, J. (2019). *Analýza sociálních a zdravotních služeb dlouhodobé péče v ČR.* Prague: Institut pro sociální politiku a výzkum. ISBN 978-80-907662-2-8.

[33] VRABKOVÁ, I. (2019). Models of static and dynamic technical efficiency of municipal libraries in the Czech Republic. *Socio-Economic Planning Sciences*, 68, 100646, https://doi.org/10.1016/j.seps.2018.09.001.

[34] ZHU, J. and COOK, D. W. (2013). *Data Envelopment Analysis: Balanced Benchmarking*. Lexington: CreateSpace. ISBN 978-1492974796.

Multi-Criteria Evaluation of Financial Health of Selected Hospitals According to TOPSIS Method

Iveta Vrabková[1], Ivana Vaňková[1]

[1]VŠB – Technical University of Ostrava
Faculty of Economics
Department of Public Economics
Sokolská tř. 33, 702 00 Ostrava 1, Czech Republic
iveta.vrabkova@vsb.cz, ivana.vankova@vsb.cz

Abstract

The evaluation of the financial health of health care providers is a crucial task as it influences the scope and structure of provided health care. It brings informational value for the management of the facility, as well as for their founders or establishers, but it is also related to the provision of health care. The overall objective of the health care system is to provide quality and accessible health care within the framework of legislative regulations and on the basis of rationality and efficiency of financial and non-financial resources. The aim of this paper is a multicriteria evaluation of the financial health of a set of 47 hospitals for the period of 2017-2019 according to the TOPSIS method. The selected sample of hospitals includes 41 % of public hospital care providers. The data had been tracked for three years and then averaged to minimize the impact of random one-time fluctuations that would affect the performance of the entities. The weights of the seven tracked financial indicators monitored were assigned in an integrated manner. As a result of the analysis, the ranking of hospitals according to financial health was determined using the TOPSIS method. The calculations did not confirm that the hospitals managed directly by the state would achieve the worst results - the results of these hospitals were differentiated a lot. The worst results were achieved by hospitals in the legal form of joint stock companies established by regions.

Keywords: *financial health of hospitals, financial statements, multi-criteria evaluation, TOPSIS method*

JEL Classification: *C44, H0, I10*

1 Introduction

The financial performance of hospitals is a special question that cannot be answered solely by economic arguments that are valid for commercial organizations, in the form of profits and losses. However, a positive balance between the requirements for the provision of health services (costs) and the social value of the services provided (revenues) is an important prerequisite for the sustainability of the quality and availability of hospital care in the public sector.

Hospitals are a key element in the health care system, that in the Czech Republic is characterised by the state exercising strong control by regulating price and volume. In this sense, the 2018 OECD Economic Surveys for the Czech Republic state that although the health system in the Czech Republic has managed to keep costs low, efficiency and quality have suffered due to asymmetric information between three types of actors: healthcare insurers, healthcare providers and the population or insured of the healthcare system. For this reason, the system lacks proper incentive mechanisms and price signalling, suggesting that there is considerable space for improving the efficiency and quality of the system. (MF ČR, 2019)

Hospital management in collaboration with the founder or establisher has the ability to actively influence the costs and revenues of hospitals so that hospitals provide necessary and quality health services to the region inhabitants. Thus, monitoring and evaluating the financial indicators of hospitals, who in aggregate tell about the

financial health of hospitals, is a prerequisite for achieving efficiency and effectiveness at an optimal level, regardless of the type of founder/establisher of hospitals.

The term "financial health of a hospital" has a specific economic content based on the achievement of specific values of (financial) indicators performance. Basically, the financial indicators detect whether a hospital has sufficient financial resources, is not over-indebted, pays its liabilities in a reasonable time, finances its fixed assets from long-term sources or invests in its assets adequately. The set financial indicators are also considered as suitable tools for management and auditors to evaluate or predict financial stress, (Hajdíková et al., 2018, Růčková 2019).

The aim of this paper is a multicriteria evaluation of financial health of selected hospitals according to the TOPSIS method, differentiated by legal forms and for the period of 2017-2019.

To support the objective, one research question (RQ) was set:

RQ1: Do hospitals set up as contributory organisations perform on a multi-criteria evaluation of financial health worse than hospitals set up as joint stock companies? QR1 is based on the results of the Financial Health Evaluation (HCI, 2019), who shows that the directly managed state organizations perform relatively worse than hospitals established by other entities, where, on the other hand, hospitals established by counties excel.

A number of authors deal with multi-criteria evaluation of hospitals in terms of the micro and macro level of the health sector. The core method for efficiency evaluation is Data Envelopment Analysis, that is focused on evaluating the technical efficiency of homogeneous production units according to selected models (e.g. Shrime et al., 2018; Kohl et al., 2019). A method for multi-criteria evaluation of variants is the TOPSIS method, that is based on selecting the variant that is closest to the so-called ideal variant and at the same time furthest from the so-called basal variant. The application of the TOPSIS method in the healthcare sector can be observed in the papers of e.g. Mic, Antmen (2019), Shafii et al. (2016), Rouyendegh (2019).

Mic, Antment (2019) evaluated the availability of regional hospitals in the Adana province according to the TOPSIS method. The authors expect the findings to be a very useful source for the competent health policy authorities decision making to ensure the availability of health care as one of the quality parameters. Shafii et al. (2016) used TOPSIS method to evaluate a questionnaire survey targeting patients of strategic hospitals to assess the quality of health services provided in selected hospital departments. The findings highlighted problems in the area of patient satisfaction. And the lowest rating (i.e. the worst) was given to the area of patient safety. In his article Rouyendegh (2019) evaluates the performance of hospitals in Turkey using DEA in combination with TOPSIS method. He uses this combination of multi-criteria methods to calculate and rank the productivity of 16 hospitals. The evaluation of healthcare performance at the macro level is discussed by Sielska (2019). The evaluation of European countries according to the defined indicators was performed using the TOPSIS method. The results showed that resources or health expenditure are crucial for the evaluation at this level of the health sector.

2 Material and Methods

In the Czech Republic, the development of the number of hospitals has been almost constant over the last decade. As of 31 December 2019, a total of 194 hospitals provided health services, of which 10 university hospitals, 144 acute care hospitals and 40 aftercare hospitals are registered. In terms of hospital founders/establishers, 114 hospitals are owned by public entities and 80 hospitals are founded by private entities. The hospital sector has undergone significant changes mainly as a result of the public administration reform. The change of hospital founders and property owners has generated huge discussions on the level of the individual regional governments. Subsequently, according to legal regulations, the regions transferred hospitals mainly to joint stock companies or allowed the sale of hospitals into private hands. Certain regions keep the hospitals as their contributory organisations (e.g. the Moravian-Silesian Region, South Moravian Region, Vysočina Region), while other regions allowed the change of their legal form (e.g. the Olomouc Region, Zlín Region, Pardubice Region) or the sale of hospitals. On the basis of their approved health care concepts, the regions outline the direction of citizens health care development for the coming years. However, it is necessary to understand that the global goal of a sustainable, accessible and quality health care system is economic optimisation, rationalisation of the provided care scope and stabilisation of health care staffing.

The object of the research is the financial performance of 47 hospitals (H1-H47) in the form of 7 financial indicators (see chapter 2.2). The evaluation is carried out according to the TOPSIS method (see chapter 2.1). Data for the calculation of financial ratios were obtained from the annual reports of the hospitals for the years 2017-2019 (from the financial statements section).

The definition of hospitals according to legal forms (founders/establishers) is shown in Table 1. The hospitals are listed by name in Annex. From Table 1 it is clear that 29 of the evaluated hospitals have the legal form of a

contributory organisation (A, B and C) and 18 hospitals are joint stock companies founded by the regions of the Czech Republic (D).

Table 1 - Hospitals evaluated

Organisational form	Label	Quantity	Hospitals
Contributory organisations of the state	A	8	H9, H10, H16, H17, H38, H45, H46, H47
Contributory organisations of regions	B	19	H1, H2, H3, H4, H5, H6, H7, H11, H12, H13, H 14, H15, H18, H19, H20, H21, H22, H23, H41
Contributory organisations of municipalities	C	2	H8, H24
Joint stock companies of the Region	D	18	H25, H26, H27, H28, H29, H30, H31, H32, H33, H34, H35, H36, H37, H39, H40, H42, H43, H44

2.1 Technique for Order of Preference by Similarity to Ideal Solution

The TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method is one of the Multi Criteria Decision Making methods. The purpose of the TOPSIS method is to select the variant that is closest to the ideal variant and farthest from the basal variant. (Vavrek, 2020, Vrabkova et al, 2021)

The calculation procedure using the TOPSIS method can be described in the following steps:

1) creation of a matrix D, in that the alternatives are ranked according to relevant and predefined criteria,

2) construction of the normalized criterion matrix that is then used to calculate the normalized values according to formula (1):

$$r_{ij} = x_{ij} / \sqrt{\sum_{j=1}^{j} x_{ij}^2} \tag{1}$$

where x_{ij} = the value of the j-th criterion achieved by the i-th alternative;

3) multiplying by the weights of the respective criteria, according to relation (2):

$$v_{ij} = w_{ij} . r_{ij} \tag{2}$$

where v_{ij} = weighted normalised value and w_{ij} = weight of the criterion;

4) determination of the ideal variant H_j and the basal variant D_j, according to relation (3):

$$H_j = \max(w_{ij}), D_j = \min(w_{ij}) \tag{3}$$

5) calculating the distance of the variants from the ideal variant and the basal variant, according to (4):

$$d_i^+ = \left[\sum_{j=1}^{k} (w_{ij} - H_j)^2, \right]^{1/2}, \quad d_i^- = \left[\sum_{j=1}^{k} (w_{ij} - D_j)^2, \right]^{1/2} \tag{4}$$

6) calculating the relative distance from the basal variant, according to (5):

$$c_i = \frac{d_i^-}{d_i^- + d_i^+} \tag{5}$$

where c_i is an indicator of the relative distance from the basal variant.

The resulting values of c_i are in the interval <0, 1>, where 0 represents the basal variant and 1 represents the ideal variant. The variants are then ranked according to the values of c_i from highest to lowest, resulting in a complete ranking of the evaluated variants (Jablonský, Dlouhý, 2015).

According to the TOPSIS technique, an important step of the entire calculation is the determination of the weights of the criteria, that reflect the relative importance of each criterion. The weights can be determined, for example, through the ranking method, the scoring method, the Saaty method or the Fuller's triangle (Jablonský, Dlouhý, 2015). Vavrek (2020) states that the weights of criteria can be set in subjective, expert, objective or integrated way (a combination of the first and the second approach).

The weights of those seven studied financial indicators were assigned in an integrated way (see Table 2). The expert estimation was determined taking into account the methodology of previous research, especially HCI (2019) and consultations and interviews with hospital management during March 2021 (Fakultní nemocnice Ostrava, Nemocnice Karviná-Ráj). The weights of the financial health criteria were determined on a 0-1 scale, with 0 indicating the lowest weight and 1 the highest weight.

2.2 Financial Indicators

As already mentioned, financial analysis provides an overview of the financial health of an economic entity and is essential for the management, the owner (investor) and the creditors of hospitals. The selected financial indicators (see Table 2) answer essential questions, namely whether the hospital has sufficient funds to pay its liabilities; is not indebted; pays its liabilities in a reasonable time; finances fixed assets from long-term sources; or can adequately remunerate its staff.

The examined indicators are calculated according to the following formulas (6-12):

Quick liquidity = (current assets-inventories) / current liabilities (6)

Current liquidity = current assets / current liabilities (7)

Total indebtedness = external resources net of reserves / total assets (8)

Liability turnover time = current liabilities / sales / 365 (9)

Asset structure = (equity + reserves + long-term liabilities) / fixed assets (10)

Investment activity = net fixed assets / gross fixed assets (11)

Average wage (CZK) = labour costs / average recalculated number of employees (12)

Table 2 - Financial indicators

Financial Indicator (FI)	Weight (FI)	Characteristics (FI)	Recommended Value (FI)	Average Value FI (n=47) 2017-2019
FI_1 prompt liquidity	0.15	Max.	>1,0	1.27
FI_2 current liquidity	0.15	Max.	>1,5	1.41
FI_3 total indebtedness	0.15	Min.	0,3-0,6	0.34
FI_4 turnover time of liabilities	0.15	Min.	0	73.21
FI_5 asset structure	0.10	Max.	<1,2	1.20
FI_6 investment activity	0.10	Max.	<0,7	0.53
FI_7 average wage (monthly in CZK)	0.20	Max.	x	40 432

3 Results: the TOPSIS Model

The results of calculations according to the TOPSIS model (c_i values), that express the distance from the basal variant, respectively the ideal variant <0, 1>, are presented in Table 3 and in Figure 1. These results show that the average value of c_i is 0.61, the confidence interval sets the upper (0.64) and the lower limit (0.58) of the average value of c_i.

Table 3 - Analysis of the calculation results according to the TOPSIS method

c_i	Statistic	Bootstrap			
		Bias	Std. Error	95 % Confidence Interval	
				Lower	Upper
Mean	0.610	0.001	0.014	0.583	0.640
5 % Trimmed Mean	0.599	0.002	0.014	0.576	0.630
Median	0.575	0.005	0.020	0.552	0.627
Variance	0.010	0.000	0.003	0.005	0.018
Std. Deviation	0.101	-0.002	0.017	0.067	0.132
Interquartile Range	0.14	-0.01	0.02	0.09	0.16
Skewness	1.706	-0.212	0.506	0.453	2.401
Kurtosis	3.916	-1.083	2.379	-0.787	8.477

The positive coefficient of kurtosis indicates that most of the random outlier values (H45 and H12) lie close to its upper limit (upper) of the mean. The negative kurtosis indicates (-0.79) that the distribution is more uniform and its density curve is slightly flatter than in case of the normal distribution. Also, the skewness results indicate that the file differs from the normal distribution – the positive kurtosis of (0.45, 2.4) indicates that most values of the random variable lie close to its mean and the unlikely outliers have the main influence on the variance.

Table 4 - Rank of hospitals according to method TOPSIS (c_i)

	Rank	Hospitals		Form	c_i
Highest	1	H47	Všeobecná fakultní nemocnice v Praze	A	1.00
	2	H12	Nemocnice Jihlava	B	0.86
	3	H9	Fakultní nemocnice Brno	A	0.78
	4-5	H14	Nemocnice Třebíč	B	0.76
	4-5	H15	Nemocnice Nové Město na Moravě	B	0.76
Lowest	43-45	H38	Fakultní nemocnice Hradec Králové	A	0.52
	43-45	H41	Nemocnice Jablonec nad Nisou	B	0.52
	43-45	H1	Nemocnice Znojmo	B	0.52
	46	H29	Nemocnice České Budějovice	B	0.51
	47	H4	Nemocnice Výškov	D	0.48

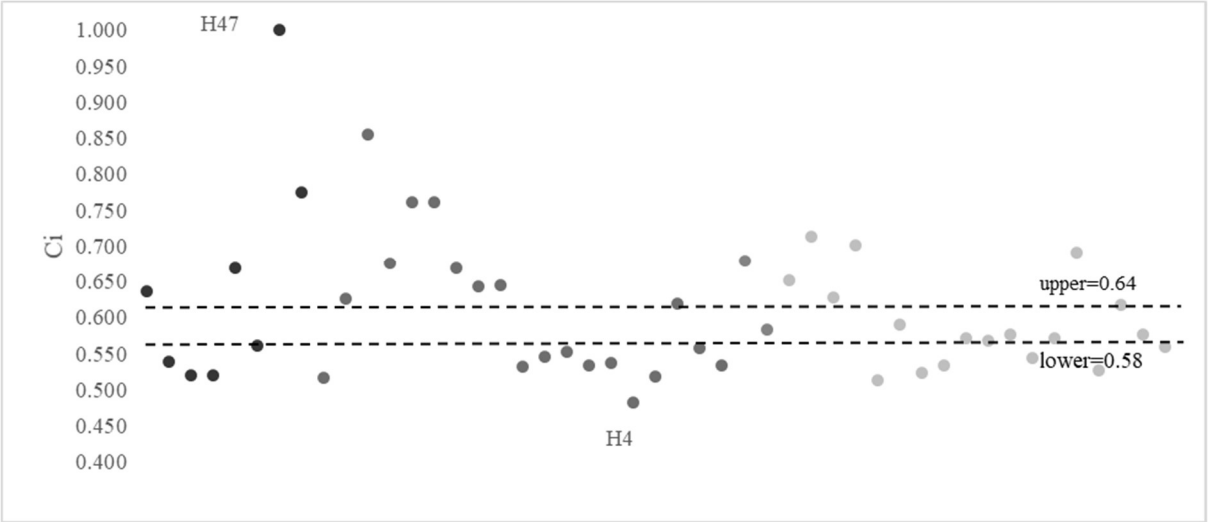
The graph in Figure 1 and Table 4 shows the individual results of the calculation of c_i according to the TOPSIS model. Table 4 shows the ranking of the first and last five places. The best is the H47 – Všeobecná fakultní nemocnice v Praze; and the worst results were achieved by the hospital established by the South Moravian Region, the H4 – Nemocnice Výškov.

The graph in Fig. 1 shows the individual results of c_i calculation by legal forms of hospitals:

- the type A hospitals, 8 in number, are marked red in the graph, the average c_i (A) = 0.65;
- the type B hospitals, 19 in number, are marked blue in the graph, average c_i (B) = 0.61;
- the type C hospitals, two in number, are marked green in the graph, average c_i (B) = 0.63;
- the type D hospitals, 18 in number, are marked yellow in the graph, average c_i (B) = 0.59.

Furthermore, the evaluation shows that 20 hospitals (43 %) achieve their c_i value at or above the upper limit of the average. There are 23 hospitals (48 %) achieving their c_i value at and below the lower limit of the mean. Four hospitals (9 %) have average c_i results. The graph in Figure 1 also shows that the type D hospitals (regional joint stock companies) achieve the worst but most balanced results. The largest differences in results are among contributory organisations of the state (university hospitals).

Figure 1 - Distribution of hospital c_i results (H1-H47) by legal form



4 Conclusion

The financial health of hospitals is an indicator of both the sustainability of the hospital care availability in the Czech Republic regions and the economic performance of hospitals that relies on the ability of hospitals to meet their financial obligations to both suppliers and employees.

The paper evaluates the financial health of 47 hospitals for the period 2017-2019 according to the TOPSIS method. The multi-year period minimizes the impact of random fluctuations in the monitored indicators, which provides a more realistic view of the financial situation of hospitals. The evaluation criteria consist of seven financial indicators that are generally used to evaluate the financial performance of organizations - quick liquidity ratio, current liquidity ratio, total indebtedness, liability turnover time, asset structure, investment assets, and average wage.

The results according to the TOPSIS model and their subsequent statistical analysis show that the top five (11 %) hospitals have their c_i scores in the interval of <0.76, 1> and can be considered as outliers (above the upper limit) from the average of the overall results. Most of the evaluated hospitals (89 %) have their financial health outcomes in the interval of <0.48, 0.71> with no significant outliers.

In terms of the legal forms of hospitals, it cannot be confirmed that hospitals established by the state (type A, university hospitals) show the worst financial health results. Rather, the mean value of c_i is here the highest from the evaluated file, namely 0.65. However, type A hospitals also show very differentiated financial health outcomes - they are among the best and also the worst hospitals. On average, the worst outcomes in financial health (c_i =0.59) are shown by the type D hospitals (regional joint stock companies).

Acknowledgements

This paper was supported by project SGS No. SP2021/67, International Evaluation of the Performance of Health and Social Services with a Focus on the Application of Multicriteria Methods, Faculty of Economics, VSB – Technical University of Ostrava.

References

[1] HAJDÍKOVÁ T., JÁNSKÝ J., BEDNÁŘOVÁ M. (2018). Assessing the Financial Health of Hospitals Using a Financial Index. In: Bem A., Daszyńska-Żygadło K., Hajdíková T., Juhász P. (eds) *Finance and Sustainability.* Springer Proceedings in Business and Economics. Springer, Cham. https://doi.org/10.1007/978-3-319-92228-7_4.

[2] HCI (2019). *Hodnocení finančního zdraví nemocnic v České republice v roce 2019 z údajů hospodaření za rok 2018*. [online]. [cit.2021-03-7]. Available from: http://www.hcinstitute.org/userfiles/files/TZ_hodnocen%C3%AD%20finan%C4%8Dn%C3%ADho%20zdrav%)C3%AD%20nemocnic%202019.pdf

[3] JABLONSKÝ, J., DLOUHÝ, M. (2015). *Modely hodnocení efektivnosti a alokace zdrojů.* Praha: Grada Publishing.

[4] KOHL, S. et al. (2019). The use of Data Envelopment Analysis (DEA) in healthcare with a focus on hospitals. *Health Care Management Science,* 22 (15). http://dx.doi.org/10.1007/s10729-018-9436-8

[5] MFČR (2019). *Hospodářské přehledy OECD 2018. Česká republika.* Zlepšení systému zdravotní péče v České republice. [online]. [cit.2021-03-20]. Available from: https://www.mfcr.cz/cs/aktualne/tiskove-zpravy/2018/oecd-zverejnilo-hospodarsky-prehled-cr-2-32423

[6] MIC, P., ANTMEN, F. Z. (2019). A Healthcare Facility Location Selection Problem with Fuzzy TOPSIS Method for a Regional Hospital. *European Journal of Science and Technology,* 16:750-757. http://dx.doi.org/10.31590/ejosat.584217

[7] ROUYENDEGH, D. B. (2019). Performance evaluation of healthcare: A pilot case study. *Journal of Perioperative & Critical Intensive Care Nursing*. ISSN: 2471-9870

[8] RŮČKOVÁ, P. (2019). *Finanční analýza: metody, ukazatele, využití v praxi.* Praha: Grada, 2019. ISBN 978-80-271-2633-0.

[9] SHAFII, M. et. al. (2016). Assessment of Service Quality in Teaching Hospitals of Yazd University of Medical Sciences: Using Multi-criteria Decision Making Techniques. *Public Health Res Perspect*, 7(4): 239-247. https://doi.org/10.1016/j.phrp.2016.05.001.

[10] SHRIME, G. M., MUKHOPADHYAY, S., ALKIRE, C. B. (2018). Health-system-adapted data envelopment analysis for decision-making in universal health coverage. *Bulletin of the World Health Organization;* 96:393-401. http://dx.doi.org/10.2471/BLT.17.191817

[11] SIELSKA, A. (2019). Comparison of Healthcare Performance and its Determinants in European Countries Using the TOPSIS Approach. Warsaw Forum of Economic Sociology 10:2(20).

[12] VAVREK, R. (2020). Regression Analysis as a Part of Spatial Assessment based on Multi-Criteria Approach. In Proceedings of the 3rd International Scientific Conference *Development and Administration of Border Areas of the Czech Republic and Poland*. pp. 239-244.

[13] VRABKOVA, I. et al. (2021). Determination of gaps in the spatial accessibility of nursing services for persons over the age of 65 with lowered self-sufficiency: Evidence from the Czech Republic. *PLOS ONE*, 16 (1). http://dx.doi.org/10.1371/journal.pone.0244991

Appendix

Hospitals (H1-H25)		c_i	Hospitals (H26-H47)		c_i
H1	Nemocnice Znojmo	0.516	H26	Kroměřížská nemocnice a.s.	0.713
H2	Nemocnice Břeclav	0.645	H27	Uherskohradišťská nemocnice a.s	0.627
H3	Nemocnice Ivančice	0.537	H28	Vsetínská nemocnice, a.s.	0.700
H4	Nemocnice Výškov	0.481	H29	Nemocnice České Budějovice, a.s.	0.513
H5	Nemocnice Kyjov	0.618	H30	Nemocnice Jindřichův Hradec	0.589
H6	Nemocnice TG Hodonín	0.558	H31	Nemocnice Písek, a.s.	0.522
H7	Nemocnice Blansko	0.533	H32	Nemocnice Prachatice, a.s.	0.532
H8	Úrazová nemocnice v Brně	0.582	H33	Nemocnice Strakonice, a.s.	0.571
H9	Fakultní nemocnice Brno	0.775	H34	Nemocnice Tábor, a.s.	0.567
H10	Fakultní nemocnice u sv. Anny v Brně	0.636	H35	Oblastní nemocnice Náchod, a.s.	0.575
H11	Nemocnice Havlíčkův Brod	0.626	H36	Oblastní nemocnice Jičín, a.s.	0.544
H12	Nemocnice Jihlava	0.855	H37	Oblastní nemocnice Trutnov, a.s.	0.570
H13	Nemocnice Pelhřimov	0.675	H38	Fakultní nemocnice Hradec Králové	0.519
H14	Nemocnice Třebíč	0.761	H39	Nemocnice s poliklinikou Česká Lípa, a. s.	0.690
H15	Nemocnice Nové Město na Moravě	0.760	H40	Krajská nemocnice Liberec, a.s.	0.527
H16	Fakultní nemocnice Olomouc	0.537	H41	Nemocnice Jablonec nad Nisou, p.o.	0.517
H17	Fakultní nemocnice Ostrava	0.519	H42	Nemocnice Pardubického kraje, a.s.	0.617
H18	Nemocnice Karviná-Ráj	0.668	H43	Krajská zdravotní, a.s.	0.576
H19	Nemocnice s poliklinikou Havířov	0.642	H44	Oblastní nemocnice Kolín, a.s.	0.559
H20	Sdružené zdravotnické zařízení Krnov	0.531	H45	Nemocnice na Bulovce	0.668
H21	Nemocnice Třinec	0.545	H46	Nemocnice na Homolce	0.560
H22	Nemocnice Frýdek-Místek	0.552	H47	Všeobecná fakultní nemocnice v Praze	1.000
H23	Slezská nemocnice v Opavě	0.532		x	
H24	Bohumínská městská nemocnice, a.s.	0.678		x	
H25	Krajská nemocnice T. Bati, a.s.	0.651		x	

Security and Sustainability of the Ostrava Region

Hana Vykopalová

VŠB – Technical University of Ostrava
Faculty of Safety Engineering
Department of Security Services
Lumírova 630/13, 700 30 Ostrava – Výškovice, Czech Republic
hana.vykopalova@vsb.cz

Abstract

The publication deals with issues of sustainability of living space and perception of safety in urban space with the presence of brownfields, ie a neglected environment or unused buildings and structures that have lost their original meaning and purpose. It deals with urban planning and the use of residential units, their spatial arrangement in order to fulfill social, relaxation and work functions and at the same time meet safety criteria. As an example of the development of an industrial city with elements of sustainability, attention is focused on Ostrava and the Ostrava region, which is undergoing transformations of industrial sectors due to the slowdown in coal mining and metallurgical industry. This step is also associated with a change in the original professional composition of the population, the emergence of unemployment and crime. This is the reason for the departure of the population from this region and the emergence of the so-called "shrinking city". Therefore, all available sustainability options for this region are being sought. These include the so-called gentrification of unused and unmaintained buildings and identifying the causes of crime. Another element of the region's sustainability is the possibility of cross-border cooperation between regions with similar issues, especially in Poland and Germany, which have historically linked issues related to coal mining and manufacturing and have a number of common characteristics. The research part focuses on identifying feelings of safety and fear of crime in the main center of this region, which is Ostrava. A questionnaire survey and cluster analysis was used, which focuses on specific parts of the city (city districts) with dominant housing development and related crime. The aim of the paper is to point out the processes of transformation of the original historical centers, which are undergoing industrial transformation accompanied by social, economic and population changes, and the importance of security and sustainability.

Keywords: *crime, safety, sustainability, urbanism, urban shrinkage*

JEL Classification: *J28*

1 Introduction

Sustainable development issues have been relevant since the early 1970s, when society's attention began to focus on environmental, social and economic aspects. The concept of sustainable development is beginning to be promoted in all areas of human life in the form of creating balanced relationships "*for a favorable natural environment, for economic development and for community cohesion*" and is thus defined in a number of legislative documents such as the Building Act, § 18, paragraph 1. The human factor and its educational, economic and social potential becomes an important element in the sustainability process. The prosperity of a company is influenced by economic and ecological aspects, including the perception of the safety of the living space. An integral part of sustainability is security as protection of the system from threats and risks. Recently, there has been a concentration of population in large cities, so sustainability is largely related to urbanism and

feelings of safety. As an example of sustainability, in this sense, the Ostrava region is chosen and Ostrava as the main center of this region.

2 Urbanism and Sustainable Development

Sustainable development of the selected area is also related to urbanism and safety. The basic mission of urbanism is to plan and research the environment for the purpose of development and optimal use of settlements (cities, villages) into socially functional and sustainable units. In order for cities and their spatial arrangements to fulfill their social, relaxation and work functions, they must also meet security criteria. The Chicago School has been one of the first to deal with the importance and development of cities as residential centers since the middle of the 20th century. Its sociology of the city applied an ecological approach to the analysis of cities and referred to urbanism as a "way of life". The theory of ecology of the city was based on a comparative approach of adaptation of plants and animals to the surrounding environment, where organisms are distributed in space so as to create a mutual balance between individual species. According to this theory, the emergence of cities is also influenced by natural and spatial conditions. It was thus the first theory pointing to sustainable development in the field of urbanism. The Chicago school was one of the first to point out safety criteria. She dealt with semarginality, ethnic segregation, crime, juvenile delinquency, alcoholism, drug addiction, mental illness and other socially pathological phenomena occurring in urban areas. The high increase in crime in cities was the cause of the theory of social disorganization trying to explain the processes of organization and reorganization of the city as active elements affecting the social integrity and cohesion of the population. This theory pointed to three causes influencing crime rates: low economic status, high residential mobility, and ethnic heterogeneity (Walker 2009). The low economic status was monitored on the basis of the number of applicants and paid social benefits, average rental prices and the number of houses and flats in which subtenants live. Residential mobility represented the physical condition of the locality (abandoned dwellings, vacant dwellings, population migration, etc.). Gradually, urban spaces and the nature of crime were monitored and the impact of the place on the perpetrators was examined. Among the most important are theories focused on the elements of environmental design of the environment. They are based on the view that crime is not randomly distributed, but is influenced by the nature of the place (Newman 1972, Herbert and Hyde 1985). The sustainability of public spaces follows the concept of "Soft City", where relationships and places friendly to people are at the forefront, it is about building a city that is "*living, organic and soft*" (Sim 2019, p. 207).

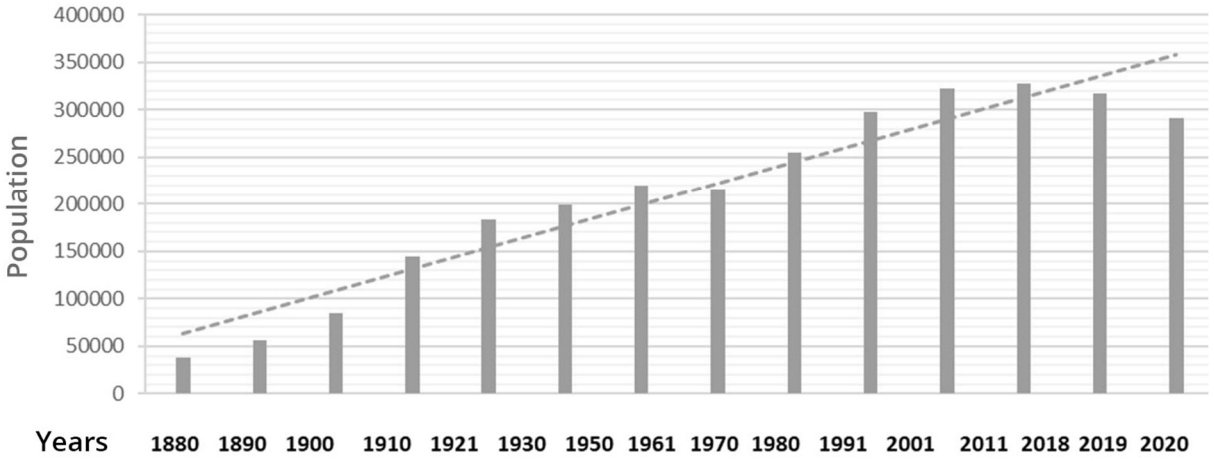
3 Sustainability and Historic Industrial Centers

The expansion of the industry in the form of coal and ore mining and the construction of smelters was oriented in Europe until the middle of the 18th century. Among the largest mining centers of the time was the Ruhr in Germany and Poland, near the town of Jaworzno. Coal mining was followed by the construction of smelters and other heavy processing industries. This is how large industrial centers with very similar characteristics were created all over the world: the expansion of the labor force into mining and quarrying and metallurgy, the building of workers' colonies, the building of industrial transport infrastructure, the concentration of population in industrial centers and one-sided career guidance. The expansion and development of these industrial centers in Europe and America lasted approximately 200 years, followed by a relatively sharp decline to a decline in this activity. Among the most famous industrial centers with these characteristics in Europe are cities in the Ruhr area, such as Essen, Halle, etc. In history, Poland was one of the largest coal producers in Europe and cities with these characteristics can be found in the Upper Silesian and Lublin basins. Among the major European producers in coal mining were also Bulgaria, Slovenia, etc. In all these countries, comparable structural socio-economic urbanization processes took place. The Czechia is among the average in terms of coal mining and metallurgical industry in Europe. Important centers of coal mining, metallurgical or engineering industry included Ostrava, Kladno and Most. All cities with reduced or terminated mining and metallurgical activities are undergoing gentrification, which is the overall revitalization of vacant houses and neighborhoods for high-income residents, which takes place at the same time as the provision of adequate civic amenities. Gentrification thus increases the value of the place, but usually forces the indigenous people to move out because they cannot afford high rents (Giddens 1999). Cities are constantly evolving in relation to economic, political and social change. There are a number of theories about the transformation of cities and their development. Some of the theories are based on a linear evolutionary view, with each city destined for growth, stagnation, and decline or extinction (Mumford

1961), while other theories emphasize the importance of their economic and social structure and income level (Van den Berg 1982). Theories of urban cycles follow the development and changes of urban neighborhoods with respect to the income structure of the population and other demographic elements (Champion 2001; Ogden and Hall 2000). In Europe, urban decline is particularly pronounced in the former industrial regions of Great Britain, France and Germany, which have had to cope with the consequences of deindustrialisation (Dale 2002; Bontje 2004). Recent urban research points to the effect of shrinking cities and regions as a result of globalization, deindustrialisation and demographic change, including changes in economic and regional policy. Shrinking cities must seek and offer new potential towards sustainable city and region.

From the point of view of historical industrial development, Ostrava has been experiencing its greatest expansion since about the middle of the 19th century, when railways were built as a result of the expansion of coal mining and the development of the metallurgical industry. At the same time, internal transport infrastructure, hospitals, schools, workers' canteens, etc. are being built. This expansion, including the influx of inhabitants, lasts until approximately the end of the 20th century, when coal mining and metallurgical production began to decline Abandoned complexes of metallurgical and mining production are now gradually undergoing restructuring and some of them have been declared national cultural monuments and serve cultural and educational purposes. The process of restructuring unused and neglected buildings, which have lost their original significance, is a time-consuming and financially demanding matter and is associated with an increased incidence of crime and reducing the feeling of safety of inhabitants. Unused and neglected buildings and public spaces are referred to as brownfields. Their increased incidence is recorded in industrial areas. Despite the gradual revitalization of brownfields, *„the city of Ostrava registers about 80 brownfields covering 20 km^2“* (Polar.cz), which are mostly unused and abandoned buildings of an industrial character. Due to the historical concentration of industry in the city center, these brownfields are located close to the city center, which is attractive for investors, but also a security risk. After the onset of coal mining and metallurgical industry at the beginning of the 21st century, there is an outflow of population from Ostrava, unemployment is rising, the average age of the population is increasing, the economic situation of households is deteriorating and residential segregation and the emergence of excluded localities. Ostrava is becoming a shrinking city. Since 2010, programs have been launched aimed at supporting excluded families, promoting equal access to education, etc. Cooperation is being established with cross-border partners in Poland facing similar conditions. Non-governmental non-profit organizations (clusters) associating entities and individuals are established "*with the aim of coordinated and sustainable development of cluster initiatives and development of cluster policy in the Czech Republic based on concentration of knowledge, experience and expertise to strengthen the competitiveness of the Czech Republic*" (NCA.cz). „*From this point of view, there is significant cooperation with cities located in the Upper Silesian Industrial Circuit (GOP), which is one of the largest in Poland, with areas such as Upper Silesia, Javorno and Doubravská Basin. GOP is an area with a huge concentration of industry, which includes: mining industry (about 50 active coal mines), metallurgical industry (about 17 active iron smelters and 8 non-ferrous metal smelters), etc.“* (MPO.cz). An important cooperation between the Ostrava region and the border areas is the Polish Days in Ostrava, organized with the support of the Ministry of Foreign Affairs of the Czech Republic and a number of important institutions focused on the transformation of these regions and issues of mutual relations.

Figure 1 - Development of the population of Ostrava depending on the development of industry



Source: ČSÚ, available from: https://www.czso.cz/csu/xt/obyvatelstvo-xt

4 Research, Research Methods and Results

Research into the feelings of safety in industrial cities and brownfields is becoming one of the current issues in connection with their transformation and economic transformation. Feelings of safety in these cities are strongly influenced by history, traditions and the connection of the inhabitants with the character of places and public spaces. The demographic structure of the population, age and traditions of families also play an important role here. These issues are closely related to the nature of housing and the type of housing construction (prefabricated housing estates or family houses, the city center or local areas). Research on perceptions of crime concerns is regularly carried out by various institutions, such as city councils and the police. A crime map is publicly available, through which it is possible to find out online the occurrence of spatial crime and the crime index in the city in the Czech Republic on the basis of a map portal (mapa kriminality.cz).

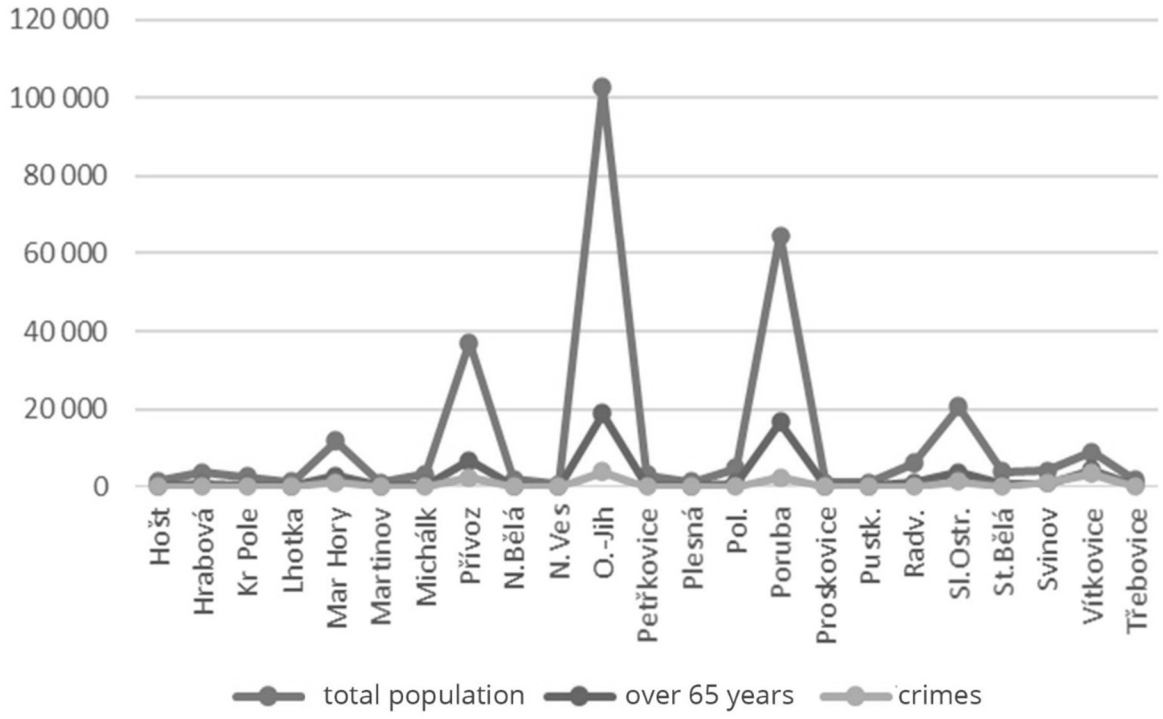
The current research survey was conducted in the form of CAWI (Computer Assisted Web Interviewing) online in the period January-February 2021, with the participation of 152 anonymous respondents aged 18-65 years, with an average age of 48 years, with an average gender balance, with residency to the studied areas, ie from the central parts of the city as well as from more distant city districts. Data analysis was performed using the statistical software SPSS (Statistical Package for the Social Sciences), which is the most widely used analytical system on the PC for applications in marketing, science and research, etc. Most often used for summarizing data management and scientific analysis, financial analysis, creation of decision models and analysis and prediction of time series (IBM.cz).

The data from each questionnaire were entered into the SPSS matrix and then the questions were evaluated and summarized.Among the most threatening feelings of safety were high crime (25%), the presence of casinos and restaurants (21%), the movement of people in public under the influence of addictive substances (14%), the incidence of excluded localities and dormitories (13%), neglected environment and occurrence of brownfields (12%), unoccupied dwellings, especially in panel construction (7%). The remaining third of respondents feel concerned about the place of residence near the excluded localities, another third perceive unoccupied flats in the place of residence as a threat and in a way panel construction is perceived as more risky than individual due to greater anonymity and higher crime. Women generally expressed a higher risk of crime than men. Significant correlations between the age of the respondents were not confirmed. To assess the degree of threat of crime according to the nature of housing construction, the method of cluster analysis was chosen. A cluster analysis model was created from 23 Ostrava city districts, by which the individual city districts were organized into a total of 6 groups of city districts, from the most risky areas to the least problematic ones. The most risky from the point of view of the threat of crime were evaluated urban districts with a predominant housing estate panel construction in front of districts with a dominant individual construction and thus also with a smaller incidence of games and restaurant facilities and other socially pathological phenomena. The central parts of the city were

also perceived as high-risk, there are the original historic buildings, which previously served the heavy and processing industries (blast furnaces and coke ovens), which underwent only partial revitalization and gentrification.

The main starting point of cluster analysis is the so-called physical conditions for the emergence of socially pathological phenomena. The most important criteria include the density of housing, pollution, the density of traffic routes and the proximity of browfields, ie obsolete and unused urban spaces and buildings, but also the age structure of the population. These criteria are most met by city districts with a high density of housing panel construction from the early 80's, which is the entire city district of Ostrava-South, Ostrava-Poruba, partly Silesian Ostrava and Přívoz. Densely populated areas with original housing construction include Mariánské Hory, Vítkovice and Michálkovice, which are also located in relatively close proximity to various types of brownfields. All these localities are largely inhabited by the original population and at the same time with a high incidence of crime. These areas pose potential security risks due to the natural decline of the population, the increase in crime and the emergence of maintenance-free uninhabited areas. Industrial restructuring and relatively high unemployment, causes migration to other regions and the original population is aging and has different requirements for the use of residential and public spaces.

Figure 2 - Model of cluster analysis according to the total population, population over 65 and crime



Source: Otevřená společnost, o.p.s. *Mapa kriminality.* © 2021, [online], Available from: https://www.czso.cz/csu/xt/obyvatelstvo-xt

5 Conclusion

A number of global studies and research reports address the issues of security risks and the sustainability of cities, which in the past were important industrial centers and are now in the process of deindustrialisation and shrinking. An example is a comparative study of Ostrava and the Ostrava region with the town of Halle in the Ruhr. This comparative study of the development of both cities examines the causes of socially pathological phenomena and ways of gentrification of buildings and public spaces so as to reduce the anonymity of large housing estates and reduce the number of unoccupied flats, which are a source of crime. The original prefabricated housing construction, which was created to expand the workforce in the industrial center, has lost its significance today and appears to be a security issue. Ways and new possibilities of using buildings and

spaces are being sought (Baum 2014). According to crime statistics, Ostrava and the Ostrava region, after Prague as the largest city in the Czech Republic, are among the cities with the highest crime, which has an increasing tendency. "*The most common are violent, moral and property crime (burglary, simple theft and others)"* (MV CR.cz 2019). High unemployment, crime and thus the declining economic level of families are the reasons that lead to a decline in population and shrinkage of the city. Ways are being sought for the sustainability of the city and its transformation from an industrial city to a city of cultural traditions and services for the inhabitants. Other cities that have undergone industrial development in history are also following this path, they are affected by the effect of shrinkage and economic downturn. An important aspect in this process is the set system of urban policies and adherence to the principles of urban policy and an integrated approach to urban development.

References

[1] BAUM, D., VONDROUŠOVÁ, K., TICHÁ, I. (2014). *Charakteristika sociálně prostorové segregace ve srovnání dvou měst (Halle - Ostrava).* Vyd. 1. Ostrava: Ostravská univerzita v Ostravě, s. 42-43, ISBN 978-80-7464-491-7.

[2] BONTJE, M. (2004). Facing the Challenge of Shrinking Cities in East Germany: The Case of Leipzig. *Geojournal.* 61,13-21.

[3] CHAMPION, A. (2001). A Changing Demographic Regime and Evolving PolycentricnUrban Regions: Consequences for the Size, Composition and Distribution of City Populations. *Urban Studies.* 38 (4):657-677.

[4] ČSÚ.cz, *Obyvatelstvo*. © 2020, [online]. [cit.2021-05-15]. Available from https://www.czso.cz/csu/xt/obyvatelstvo-xt

[5] DALE, B. (2002). An Institutionalist Approach to Local Restructuring: The Case of Four Norwegian Mining Towns. *European Urban and Regional Studies.* 9 (1):5-20.

[6] GIDDENS, A. (1999*). Sociologie.* Praha. Argo. ISBN 80-7203-124-4.

[7] HERBERT, D. T., HYDE, S. W. (1985). Environmental criminology: testing some area hypotheses. *Transactions of the Institute of British Geographers, 10, 259-274.*

[8] IBM.cz, *SPSS software.* © 2020, [online]. [cit.2021-05-10]. Available from https://www.ibm.com/analytics/spss-statistics-software

[9] MPO.cz, www.praha.trade.gov.pl © 2021, [online]. [cit.2021-05-10]. Available from PPE_PL_20120711_133644_d__le__it__j_____pr__myslov___okruhy_polska.pdf

[10] MUMFORD, L. (1961). *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace and World.

[11] MV ČR.cz *Statistiky criminality,* © 2020, [online]. [cit.2021-05-10]. Available from https://www.mvcr.cz/clanek/statistiky-kriminality-dokumenty.aspx

[12] MV CR.cz, *Zpráva o situaci v oblasti vnitřní bezpečnosti a veřejného pořádku na území České republiky v roce 2019* . © 2020, [online]. [cit.2021-05-10]. Available from https://www.mvcr.cz/clanek/statistiky-kriminality-dokumenty.aspx

[13] Národní klastrová asociace (NCA) *Přínosy NCA, Zahraniční spolupráce.* © 2021, [online]. [cit.2021-04-15]. Available from https://nca.cz/obsah/polskcesky-klastr-udrzitelneho-rozvoje/

[14] NEWMAN, O., (1972). *Defensible Space: Crime Prevention through Environmental Design.* New York, NY: Macmillan.

[15] OGDEN, P., HALL, R. (2000). Households, Reurbanisation and the Rise of Living Alone in the Principal French Cities. *Urban Studies.* 37 (2):367-390.

[16] Otevřená společnost, o.p.s. *Mapa kriminality.* © 2021, [online]. [cit.2021-05-10]. Available from www.mapakriminality.cz

[17] Polar.cz *Ostravský magistrát zveřejnil mapu brownfieldů na území města.* © 2021, [online]. [cit.2021-04-15]. Available from https://polar.cz/zpravy/ostravsko/ostrava/

[18] Polský Institut Praha. *Polské dny v Ostravě.* © 2021*,* [online]. [cit.2021-05-10]. Available from https://www.polske-dny.cz/

[19] SIM, D. (2019). *Soft city: Building density for everyday life.* Washington: Island Press.

[20] VAN DEN BERG, L. , DREWETT, R., KLAASSEN, L. H., ROSSI, A., VIJVENBERG, C. H. (1982). *A Study od Growht and Decline*. Urban Europe, 1. Pergamon Press. Oxford.

[21] WALKER, J. T. (2009*). Social Disorganization Theory.* In: Miller, M. J. (Ed.): 21st Century Criminology: a Reference Handbook. Thousand Oaks, California: Sage, s. 312-323.

[22] Zákon č. 183/2006 Sb. o územním plánování a stavebním řádu (stavební zákon) ve znění pozdějších předpisů.

PŘEKRAČUJEME HRANICE
PRZEKRACZAMY GRANICE
2014—2020

EVROPSKÁ UNIE / UNIA EUROPEJSKA
EVROPSKÝ FOND PRO REGIONÁLNÍ ROZVOJ
EUROPEJSKI FUNDUSZ ROZWOJU REGIONALNEGO

The conference was realized and co-financed from the project CZ.11.3.119/0.0/0.0/16_013/0001981 „Rozvoj kompetencí a zlepšení uplatnitelnosti vysokoškolských studentů na trhu práce v oblasti služeb veřejného sektoru“ that was co-financed from the sources of EFRR within the programme INTERREG V-A Česká republika – Polsko through the Fund of microprojects 2014 – 2020 of the Euroregion Silesia.

Author:	Collective of authors
Department, Faculty:	Department of Public Economics, Faculty of Economics, VŠB – Technical University of Ostrava
Title:	DEVELOPMENT AND ADMINISTRATION OF BORDER AREAS OF THE CZECH REPUBLIC AND POLAND – SUPPORT FOR SUSTAINABLE DEVELOPMENT. Conference Proceedings of RASPO 2021.
Editor:	Ing. Eva Ardielli, Ph.D. Ing. Eva Molnárová
Place, year, edition:	Ostrava, 2021, 1st edition
Pages:	288
Published:	VŠB – Technical University of Ostrava, 17. listopadu 15/2172, 708 33 Ostrava-Poruba
Printed:	ZEMAN ART s.r.o., Samaritánská 3192/12, 700 30 Ostrava-Zábřeh
Number of copies:	80

NOT FOR SALE
ISBN 978-80-248-4526-5
ISBN 978-80-248-4527-2
On-line