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ADAM P. BALCERZAK
ILONA PIETRYKA

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The sense of health security among healthcare professionals during the COVID-19 pandemic

JEL Classification: *A11; A14; B16*

Keywords: *sense of health security, healthcare professionals, COVID-19 pandemic*

Abstract

Research background: The sense of health security is an important element of employees' functioning in the time of pandemic. However, it should not be perceived only in psychological or sociological contexts. In the field of organisation management, a lack of the sense of security may result in delayed decisions or none of them, which is a vital issue for healthcare professionals who act under the pressure of time and responsibility for human health and life. There is a high probability of getting infected among healthcare professionals while they are key workers in view of the fight with the pandemic and its effects. Moreover, they can hardly be replaced due to their unique qualifications and limited numbers of these professionals in the labour market. Their loss or illness-related exclusion from work seriously disrupts functioning of healthcare institutions. Hence, creation of a work environment that supports the sense of security in the workplace is essential.
Purpose of the article: The purpose of this article is to present healthcare professionals' opinions on their sense of health security in relation to their jobs in the pandemic situation and to assess effectiveness of the work environment management.
Methods: The research was conducted in December 2020 on a representative sample of healthcare professionals with the aim to identify their opinions on functioning in the workplace during the COVID-19 pandemic. For the research purposes, the CATI technique was applied with a Likert scale-based questionnaire.
Findings & value added: The research findings outline the work environments of healthcare professionals during the second wave of COVID-19 pandemic in Poland and their effects on the sense of security. Due to the period of the research conduct,

its results have a unique quality and enable depicting the current situation and problems of the medical community as a result of the COVID-19 pandemic.

Introduction

The term "safety culture" was first formulated by the Atomic Energy Agency in the report related to the nuclear accident in Chernobyl (Mearns & Flin, 1999). The safety culture is perceived as a subtype of the organisational and social culture and it is understood as overall collective activities using organisational and inter-organisational practices to protect individual employees and the entire work environment (Gherardi & Niccolini 2000).

Involvement of the managing staff and employees in activities related to safety in the workplace is the key factor for this culture shaping (Benčiková et al., 2020). It can be assessed based on attitudes and behaviours of members of a specific organisation that depend on the accepted system of values and beliefs as well as compliance with legal standards (Lousada et al., 2020). The term "safety culture" is defined in various ways and it is frequently associated with the employees' sense of security (Glendon & Stanton, 2000). Often it is based on a subjective employee's feelings about work conditions, e.g. the sense of work safety, including health security.

The analysed group of issues is treated in a specific way in the case of healthcare professionals' functioning in the workplace (Laudanski et al. 2020), especially in view of the specific COVID-19 crisis faced by Poland and the whole world. All weaknesses of the healthcare system in terms of human resources and organisation have been clearly exposed in the time of COVID-19 pandemic (Rypicz et al. 2020). This occupational group, playing a key role for health security at the national level and being at a particular risk of coronavirus infection due to their job activity, has been a subject of many analyses and debates over the past few months.

Along with the announcement of COVID-19 pandemic and depending on the healthcare professionals' employers, specific procedures were defined in each institution based on: the Act of 5 December 2008 on the Prevention and Control of Infections and Infectious Diseases in Humans (Journal of Laws of 2019, item 1239 as amended), the Act of 14 March 1985 on the Sate Health Inspectorate (Journal of Laws of 2019, item 59 as amended) as well as detailed acts and regulations concerning functioning of individual state sectors. These procedures, developed by the institutional management bodies, are adjusted to the tasks, needs and potentials of individual organisations and therefore, their comparative assessments are difficult. However, the sense of security falls into a subjective category, and

regardless of the type of organisation that employs healthcare professionals commonly exposed to the contact with infected or diseased individuals, we feel entitled to compare their opinions.

The purpose of the article is to present results of the research concerning healthcare professionals' opinions on their sense of health security in relation to their jobs in the pandemic situation and to assess effectiveness of the work environment managing strategies implemented by employers. The research was conducted immediately after the November peak of infections in Poland in 2020. Thus, the respondents' replies not only enable assessment of their subjective feelings about the situation but also show how Polish healthcare employers managed to function under the serious crisis conditions.

Research methodology

The research findings presented here are part of a nationwide quantitative research of healthcare professionals, conducted within the project titled "Research on healthcare professionals' opinions on their functioning in the workplace during the COVID-19 pandemic". It was carried out in December 2020 together with the specialist external company DRB Polonia.

Considering the analysis of the sense of security at work, the following assumption was made: the COVID-19 situation has influenced the sense of job-related security among all healthcare professionals.

For the project, the following research question was formulated: How do the surveyed healthcare professionals assess their sense of security at work in the context of functioning of healthcare institutions during the crisis resulting from the COVID-19 pandemic in Poland?

The research was conducted by means of quantitative methods using the Computer Assisted Telephone Interviewing (CATI) technique. The research population consisted of health professionals classified according to Statistics Poland (Główny Urząd Statystyczny, GUS). A randomly selected representative sample of healthcare professionals N=834, determined based on the GUS 2018 Report, was enrolled into the study with the following assumptions:

- research population of healthcare professionals: 400,986;
- proportion of population: 0.5;
- confidence interval: 95%;
- maximum error: 5%.

The research sample was selected for representativeness of the research population in terms of specific occupational groups as per the GUS classification: physicians, dental practitioners, pharmacists, nurses, midwives, physiotherapists, laboratory technicians, paramedics.

A research instrument to be used was a standardised questionnaire comprising closed questions and statements. A Likert scale was applied for the answers (called the Likert scaling technique) which ensures that relative intensities of various answers are determined. This is an own research instrument (questionnaire) which was developed by the research team members i.e. the employees of the Department of Management Psychology, Sociology and Communication, Faculty of Management, Częstochowa University of Technology.

To process the research results, the STATISTICA programme was applied. Significance of differences in the analysed variables was assessed with the use of non-parametric tests: U Mann-Whitney, Kruskal-Wallis (alternative to ANOVA) and chi-square.

While preparing the research methodology, no research hypotheses were formulated due to the unprecedented nature of the investigated phenomenon and the ongoing pandemic situation as well as no available literature. However, for the purposes of result analyses, a series of statistical hypotheses were developed concerning significant differences in the responders' statements due to their features and the characteristics of the employers. The hypotheses were verified by means of the above statistical tests to ensure rejection of the null hypothesis of no significant differences and to confirm the alternative hypothesis of difference significance.

Results

The surveyed were asked for an overall employer assessment in terms of dealing with the situation of COVID-19 crisis regarding the workplace safety. Most of the respondents positively assessed their employers and 34.37% believed they were coping rather well with functioning under the pandemic conditions. An equal rate of the surveyed expressed a very good opinion on their employers. Negative opinions were expressed by 10.93% of the participants.

In the next step, the respondents presented their opinions on specific procedures and measures taken in the workplace that affected their personal and subjective sense of security. The subjects of assessment were as follows: availability of disinfectants, access to personal protective equipment (masks, clothing, disposable gloves etc.), organisation of workspace (sluic-

es, isolation rooms etc.), access to knowledge and information about COVID-19, access to knowledge and information about current legal regulations, patients' management procedures and handling other situations in the workplace.

Since the pandemic beginning, all types of organisations have devoted a particular attention to availability of disinfectants and personal protective equipment as primary ways of fighting infections. These measures were important for work safety in the healthcare institutions even before the pandemic. During the first, spring pandemic wave, there were temporary shortages of these measures resulting from their insufficient supply. During the second, autumn wave, these market difficulties were not observed but the number of infections significantly increased (including cases that required hospitalisation) along with the seasonal flu infections growth. Rapidly growing numbers of infections were reported since October 2020 to reach their seven-day average peak of 25,615 cases in November. In these conditions, consumption of disinfectants and personal protective equipment markedly increased and their availability became a very important issue for the employees' sense of security.

Considering availability of disinfectants, the respondents declared mostly positive perceptions in terms of the sense of security: as many as 46.35% and 29.42% of them assessed it as high or rather high, respectively, while only 8.85% of the surveyed presented negative or rather negative opinions. There was a very similar, although less definitely expressed, distribution of the employees' views regarding the access to personal protective equipment. The sense of security was assessed as high or rather high by 40.88% and 31.51% of the respondents, respectively. The rate of poor opinions regarding the sense of security was 8.33%.

Functioning in the pandemic situation required reorganisation of both the work processes and the working space by employers. For healthcare organisations, important issues to be tackled are patients' protection and prevention of hospital-acquired infections on one side and protection of healthcare professionals themselves on the other side. The period of October, November and December clearly revealed weaknesses of the Polish healthcare system in terms of human resources necessary to secure functioning of organisations. Staff shortages, frequently resulting from the SARS-CoV-2 infections, paralysed operations of many healthcare institutions. Nevertheless, the equal numbers of respondents assessed their sense of security as high (30.20%) or rather high in the context of work space organisation. Compared to the previous questions, however, the rates of negative replies (badly or very badly) slightly increased to reach 11.46%.

The spring pandemic wave in 2020 and its negative reception mostly resulted from the lack of knowledge about the virus itself, treatment procedures, organisation of work processes for healthcare professionals, inadequacy of the legal regulations in view of the situation and a broadly defined information chaos. The autumn growth of infections was faced by healthcare professionals armed with entirely different knowledge about the virus and the medical procedures intended to fight it. On the other side, the growing number of infected patients and, even more importantly, of hospitalisations and deaths made the Polish healthcare system reach its limits. Many reorganisations of the system that aimed to address the pandemic issues led to its disorganisation. In view of these chaotic conditions, the respondents' replies seem optimistic when it comes to assessment of their sense of security regarding the access to knowledge and information about COVID-19: mostly high (41.41%) or rather high (30.47%). Only 6.25% of the respondents expressed negative opinions on the issue. In the context of the access to knowledge and information about the current legal regulations, the survey results were slightly worse: 35.68% and 32.81% of good or rather good opinions. Lack of the sense of security in this area was declared by 9.89% of the respondents.

The surveyed also expressed positive opinions on the patient management procedures. Here, the majority of respondents assessed their sense of security as high or rather high (40.36% and 29.68%, respectively), while 8.07% of them perceived it as low or rather low. Similar results were observed for the procedures in the other workplace situations where good or rather good grades were given by 38.02% and 32.55% of the surveyed, respectively. Only 8.59% of them perceived their sense of security as low or rather low.

Other optimistic respondents' replies were observed for the question if they were currently satisfied with the job. Despite the undoubtedly difficult situation of the healthcare system and the struggle with pandemic consequences, as many as 32.81% and 36.45% of the surveyed chose the answer "definitely yes" or "rather yes", respectively.

The analysed respondents' sense of security should also be viewed in the context of the risk of their exposure to the coronavirus infection. Most of the participants gave the "yes" answer to the question if they thought the risk of them being exposed to the SARS-CoV-2 infection is high. 24.22% and 30.47% of the respondents declared "definitely yes" and "rather yes", respectively, and 15.36% of them did not perceive it as high.

While analysing the structure of the respondents' replies in terms of particular security indicators, it can be assumed that the situation in the workplace does not significantly disturb their subjective feelings. Certainly, it

should be emphasized that about one-third of the surveyed presented a neutral attitude to each analysed indicator. A certain disturbance is the structure of the answers to the next question that is a kind of "testing" query: Do you feel safe in your workplace during the COVID-19 pandemic? A definitely positive answer was only expressed by 11.97% of the respondents. 34.47% of the surveyed selected the "rather yes" answer. A lack of the sense of security was declared by 22.39% of the participants.

Discussion

Such a structure of the answers may suggest that the surveyed healthcare professionals feel relatively safe, particularly in the aspects related to the working conditions that are to be secured by the employer. There are interesting replies regarding the access to knowledge and information about the virus and the infection-protective measures. The healthcare professionals seem to believe that the employers will make every effort to protect their employees from the risk of infection. Thus, the last discussed question with the answers suggesting a decreased sense of security should rather be associated with the nature of the virus itself – its unpredictability and a high level of infectiousness. The virus as such can penetrate into the body not only through contacts with patients (who are subject to well-defined and restrictive procedures), but also via contacts between co-workers (their non-professional environments) being trusted by their colleagues to a far higher extent, which leads to easier negligence of precautions.

A question that confirms this way of reasoning is the one about a lack of control over the situation in the workplace. Most of the respondents' replies were positive with 11.19% and 23.38% of the "definitely yes" and "rather yes" answers, respectively. 28.12% of the surveyed did not declare a loss of control over the workplace situations.

The in-depth analysis of difference significance revealed interesting regularities concerning the scores provided by the respondents from dedicated centres and non-COVID hospitals. In many areas of the sense of security, opinions of the employees from dedicated centres were less favourable compared to the other hospital employees. However, this is a reasonable regularity as these professionals almost only work with infected (or recovering) patients so the probability of infection is potentially much higher. In addition, they frequently witness directly or indirectly SARS-CoV-2 infection-related patients' deaths. Such situations trigger the growth of both natural sense of insecurity and stress associated with everyday work duties. The procedures aiming to protect from infection in COVID hospitals

and being related to restrictive cleanliness, sterility and necessary protective clothing result in everyday alertness but also in accustoming to work in the environment exposed to high health risks.

The analysis of findings leads to interesting considerations about functioning of healthcare professionals and their employers in the situation of COVID-19 pandemic. Firstly, there are no significant differences in replies regarding both the overall sense of security and its individual aspects between the employees belonging to specific occupational groups. Apparently, opinions of the surveyed are shaped to a higher extent by psychological, social and employer-related factors than by the specificity of a profession itself. Here, the opinions were mostly influenced by such indicators as the form of employment or the type of employer as well as by social factors e.g. gender, having children or staying with persons being at a particularly high risk of infection (the elderly or chronically ill patients).

While analysing the hospitals which were most frequently found at the top of press and media releases during the research period (mainly due to negative situations), definitely worse scores regarding the sense of security were observed among the participants working in COVID centres compared to the other hospital types. Certainly, this regularity primarily results from everyday work with infected patients. As a consequence, these employees are particularly afraid of getting infected in the workplace – even more than in non-professional situations.

Conclusions

The above research findings demonstrate a rather positive situation of the healthcare professionals in terms of their sense of health security in the workplace associated with the COVID-19 pandemic. In the analysis of respondents' replies, the variety of occupational groups represented by healthcare professionals participating in the study and the levels of their exposure to the risk of coronavirus infection should be taken into account as the opinions of nurses from dedicated departments and of pharmacists who work in a relatively safe environment are combined here. However, despite the internally diverse healthcare professional groups, their replies confirm in general that employers are well prepared in the aspect of workplace safety securing.

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Is the China's export of services to the EU a threat (challenge) to the intra-EU trade in services?

JEL Classification: *F14; F15; L80; O14*

Keywords: *trade in services; China; EU Internal Market; service mapping, RSCA*

Abstract

Research background: The developed economies are perceived as the main players in trade in services, however, some fast-growing emerging markets, including China, have also become prominent actors. The growth that the Chinese economy experienced over recent years brought it to the position of the EU's second-biggest trading partner with the EU being China's the biggest trading partner.
Purpose of the article: The aim of the paper is to answer the question if the China's Export of Services to the EU a Threat (Challenge) to the Intra-EU Trade in Services.
Methods: To this end we analysed Chinese position in trade in the EU Internal Market.
Findings & Value added: We found out that China is a strong competitor in selected categories of services, and the European service providers should be aware of a strong and increasing competitive pressure that may disturb their position in the EU market in favour of Chinese competitors.

Introduction

In last decades the importance of services in international trade has been growing steadily. Up-till now, developed economies were perceived as the main players in trade in services. However, last years have brought a change when some fast-growing emerging markets, including China, have also become prominent players. For China, a new era in international trade began when the country joined the WTO, and as a result a systematic growth of the importance of China in trade in services worldwide can be observed (Zhou, Feng 2017). One of the addressees of the Chinese expansion is the European Union. This destination is important to China as the economic fundament of the EU rests on the concept of the Single Market (Internal Market) as an area without internal frontiers and with the free movement of goods, services, workers, and capital. However, the services market in the EU is still highly fragmented, especially for the services which are not directly regulated at the EU level (i.e., business services or financial services). But this fragmentation does not seem to hinder the development of trade in services between the EU and China as the intensification of this trade between these two partners is growing steadily over the years.

Given the aforementioned remarks, the aim of the paper is to answer the question if the China's Export of Services to the EU a Threat (Challenge) to the Intra-EU Trade in Services. To this end we examine the patterns in intra-EU exports and China's exports to the EU service receivers, as well as China's position in trade in services in relation to the EU Member States in the period of 2010-2018. To assess the potential trade position, we apply the Revealed Symmetric Comparative Advantage Index (RSCA) and Lafay's index (LFI) to the mapping product/service method.

After the literature review, we present our methodology and data, including state of art mapping in types of services in which China might be an important competitor. Then, we discuss the result of our and present concluding remarks.

Literature review

There is a wide range of literature on China's international trade in services and in all publications their authors argue that China's potential in the service sector is growing and therefore China's role in trade in services will be steadily increasing (Zhou, Feng 2017). Thus happens due to range of determinants including globalisation, advancement in technology, liberalisa-

tion of regulations, and changes in consumer preferences towards goods and services (Tang, Zhang and Findlay 2014, Ambroziak 2018).

One of the main goals of China's expansion goals is to connect China with Europe as the world's largest and richest consumer market, what as suggests Ploberger (2017), creates challenges as well as opportunities of the EU Internal Market. So at the same time, from the European perspective, China might be perceived as an attractive partner for economic cooperation, as well as a competitor, who has been many times accused of unfair practices.

As Holslag (2017) noted, China's share in trade in services markets grows spectacularly in countries situated along the New Silk Road and becomes a major challenge or even a threat to European countries. Therefore having that in mind, the EU Member States should be aware of the rise of a strong competitor in sight, even though the EU tends to strengthen services sector and trade in services within the Internal Market (Freeman 2017).

Research methodology

Our hypothesis is, based on the previous research (Tang, Zhang and Findlay 2014) that China might be perceived as a strong competitor for the intra-EU trade in selected services concerning low-end service tasks, which are less productive, use relatively low-skilled labour, and are less knowledge- and capital-intensive.

In order to grasp China's position in the trade in various categories of services with the EU against the intra EU-28 trade in services we decided to take into consideration two key indices as the comparative advantage and net trade position. As for the measure of relative comparative advantage in exports, the best-known and the most widely used indicator is Balassa's (1965) Revealed Comparative Advantage (RCA) index, which might be used also for analysing trade in services (Stefaniak-Kopoboru and Kuczewska 2016). Although we decided to apply the Revealed Symmetric Comparative Advantage (RSCA) index proposed by Dalum et al. (1998) with its neutral point at 0. So for index above 0, the country is identified as having a comparative advantage in exports, while for the index below 0 as a country with a comparative disadvantage. The used formula is as follow:

$$RSCA^{i}_{inEUex;j} = \left[\frac{\left(x^{i}_{inEUex;j} \Big/ \sum x^{i}_{inEUex;j}\right)}{\left(x^{EU}_{inEUex;j} \Big/ \sum x^{EU}_{inEUex;j}\right)} - 1\right] \Bigg/ \left[\frac{\left(x^{i}_{inEUex;j} \Big/ \sum x^{i}_{inEUex;j}\right)}{\left(x^{EU}_{inEUex;j} \Big/ \sum x^{EU}_{inEUex;j}\right)} + 1\right]$$

where:
$x^{i}_{inEUex;j}$ – value of exports of service *j* of a country *i* to the EU Internal Market;
$x^{EU}_{inEUex;j}$ – value of exports of service *j* within a reference group (EU Internal Market).

As the RSCA index focuses on the relative export performance neglecting net trade flows and intra-industry trade, in order to grasp trade in both directions (exports and imports), we applied the Lafay index (1992) in order to evaluate China's net trade position in relation to intra-EU trade in services. It is defined as:

$$LFI^{i}_{inEU;j} = 100\left(\frac{x^{i}_{inEU;j} - m^{i}_{inEU;j}}{x^{i}_{inEU;j} + m^{i}_{inEU;j}} - \frac{\sum(x^{i}_{inEU;j} - m^{i}_{inEU;j})}{\sum(x^{i}_{inEU;j} + m^{i}_{inEU;j})}\right)\frac{x^{i}_{inEU;j} + m^{i}_{inEU;j}}{\sum(x^{i}_{inEU;j} + m^{i}_{inEU;j})}$$

where:
$x^{i}_{inEUex;j}$ – value of exports of service *j* by a country *i* to the EU Internal Market,
$m^{i}_{inEUex;y}$ – value of imports of service *j* by a country *i* from the EU Internal Market.

Generally, positive values of *LFI* indicate the existence of comparative advantages in a given product/service, while negative values point to disadvantage (de-specialisation) in this product or service. Therefore, we assumed that LFI>0 indicates reliance on exports which contributes to a better results than in the reference group, while LFI<0 indicates results worse than in the reference group.

To be able to simultaneously observe changes and final values of the aforementioned two indices, we used the 'product mapping' concept developed by Widodo (2009). However, in our research it was modified by using the RSCA and Lafay's indices instead of, respectively, RCA and Trade Balance Index applied in the Widodo's original concept. To this end, we distinguished four main groups of services using various results for the RSCA and LFI, what allowed us to find out in which types of services China can be seen as a strong competitor to the European Union.

Group A consists of services for which a country has both: comparative advantage (export specialization) and net export achieving better results than in a reference group, in this case than an average for the intra-EU trade. Group B consists of services for which a country has got a comparative advantage, but the net exports results are worse than in a reference group. Group C comprises services for which a country's position in net exports is better than in a reference group even though no comparative advantage exists for these services. The last group includes cases of the worst trade position when a country suffers from a comparative disadvantage and its worst reference position.

Data on exports used in the paper come from the Eurostat database and are presented according to the Eurostat balance of payments services classification. We distinguished 11 main categories of services, with some subcategories for 'Other business services'. Additionally, we adopted a specific approach to transport services (excluding them from country mapping analysis) as the EU and China specialise in different modes of transport (road and sea transport respectively).

Results

Since 2010 the share of China's exports to the EU service buyers has been permanently increasing, but as the service sector is very heterogeneous, its overall appraisal might be misleading and therefore it should be examined on a case by case basis separately for each type of services and cooperation within the EU.

Having applied aforementioned Widodo (2009) concept to China's exports of services to the EU we found out that for years 2010-2018 China enjoyed a favourable trade position (Position A) in four main categories of services: 'Manufacturing services on physical inputs owned by others', 'Maintenance and repair services', 'Transport,' and 'Other business services' (Table 1). As for other categories of services, China is mostly having comparative disadvantage in trade worse than as the average for the EU as a reference group, however, positive changes are observed in construction services for 2018.

When examining the sub-categories of 'Other business services', three cases can be distinguished:

1) China had a comparative advantage and a better trade position for nearly the whole period regarding 'Research and development services' and 'Business and management consulting and public relations services'

2) China was having the worse trade position comparing to the reference group, additionally having a comparative disadvantage for 'Architectural services' and 'Engineering services'
3) China had a good trade position in trade in services to its EU customers over the analysed period having a comparative disadvantage in 'Legal services' and 'Accounting, auditing, bookkeeping, and tax consulting services'.

Discussion

Trade in services between China and the European Union is growing rapidly in terms of volume and scope. China has become a competitor to the European service providers in a few categories of services. On the basis of our research we could formulate following explanations.

The economic position of China in the world and global trade has substantially changed in recent years As Chinese companies secured themselves a strong position in the developing economies, they shifted towards more developed markets. The EU Internal Market is perceived as the richest and the biggest, which makes it an object of great interest to Chinese private and public sector businesses.

Chinese service providers are seeking new markets abroad and are being encouraged by the policies pursued by the Chinese government and different forms of trade incentives, including financial support. This especially refers to construction, engineering, dredging and transportation, as well as to new services, such as financial, shipping, and airline services, as well as different types of business services.

With regard to modern services: 'Research and Development Activities', China's investment in this sector has grown remarkably over the past two decades and it is now the second largest performer in the world in terms of R&D spending. Additionally, the quality of R&D resources, indigenous scientific capacity, as well as access to the universities and research institutions make China an increasingly attractive location for research activities of multinational companies, including the European ones. Having all of the above in mind, as well as Chinese policies of "brain circulation" and fostering FDIs focused on technology transfers, as well as supporting innovation and technology development, make us believe that in the near future China will become a worldwide leader in trade in R&D services. That should be taken into account by the EU countries and institutions in the context of their technology and innovation policies.

Moreover, the growing attention of Chinese companies paid to the European market goes hand in hand with the state offering cheap financing, low production and labour costs, eagerness to learn and pick up ideas and technologies, as well as building parts of projects in China. At the same time, there are also unfair practises that can be listed. All these actions allowed China to become a net-exporter of construction services to the European market in recent years. Therefore, competing with Chinese contractors requires a specific strategy from the European construction services providers.

Finally, the growth of exports in services rests on several factors. China's comparative advantage results from its factor endowment abundance of relatively low-cost labour and other low-cost production resources, especially overproduction of steel, that might be used for construction services. Those factors suggest that China's trade in services is based on traditional labour- and resource-intensive services, such as transportation or manufacturing ones. However, China's attitude towards services is changing which strongly affects the picture of Chinese trade. High investments in new technologies, science and innovation, eagerness to learn new methods, acquire high-tech knowledge, as well as increasing levels of investment (FDI) in developed markets such as the EU and US bring in the strengthening of China's position in trade in more sophisticated services, such as business services, especially R&D services or business and management consulting, and public relations services.

Conclusions

China is one of the biggest competitors in the world to the EU. Until today, we could expect that Chinese companies can place only their cheaper goods in the EU Internal Market, while the European companies could achieve a higher competitiveness by offering goods in tandem with services. However, things change rapidly. On the basis of our research, we found out that China is becoming a strong competitor in the EU Internal Market in four types of services which, by their characteristics, confirm the servitization approach taken by Chinese manufacturers and service providers. China has the revealed comparative advantage and is a net exporter to the Internal Market in services directly linked to new models of economic activities ('Manufacturing services on physical inputs owned by others', 'Maintenance and repair services' and in 'Other business services', especially in 'Research and development'), as well as in services related to economic activities in China ('Transport' or 'Business and management consulting

and public relations services'). Additionally, having still comparative disadvantage, China is gaining a new position of a net exporter in 'Construction services.'

As the service sector is highly heterogeneous, the strength of China's exports into the EU Internal Market varies in different types of services, which could be the subject of further research. Moreover, it seems that further studies should focus on the question where these transactions take place whether services are offered to the EU customers (businesses and individuals) in the Internal Market or are they offered to the European buyers operating in the Chinese market.

Presented above phenomenon can be a big challenge for both: the EU industry manufacturers, as well as service providers, who can be losing their shares in the EU market to the Chinese competitors. Therefore, it seems, the EU Member States should be aware of a strong competitive pressure from Chinese service providers (exerted by both cross-country and FDI modes).

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Annex

Table 1. China's position in intra EU trade in services in terms of RSCA and trade-balance

		2010	2018	Change
Manufacturing services on physical inputs owned by others	RSCA	-0.49	0.50	↑ 0.99
	LFI	-0.20	4.01	↑ 4.21
Maintenance and repair services n.i.e.	RSCA	-0.23	0.38	↑ 0.61
	LFI	-0.19	0.95	↑ 1.14
Transport	RSCA	0.38	0.34	↓ -0.04
	LFI	7.47	5.30	↓ -2.17
Travel	RSCA	-0.25	-0.42	↓ -0.17
	LFI	-0.13	-5.22	↓ -5.09
Construction	RSCA	-0.19	-0.18	↑ 0.01
	LFI	-0.21	0.17	↑ 0.38
Insurance and pension	RSCA	-0.22	-0.08	↑ 0.14
	LFI	0.14	0.70	↑ 0.56
Financial services	RSCA	-0.81	-0.81	↑ 0.00
	LFI	-0.79	-0.47	↑ 0.32
Charges for the use of intellectual property	RSCA	-0.49	-0.62	↓ -0.13
	LFI	-4.03	-6.43	↓ -2.40
ICT	RSCA	-0.46	-0.47	↓ -0.01
	LFI	-3.43	-3.74	↓ -0.31
Other business services	RSCA	0.18	0.16	↓ -0.02
	LFI	1.64	5.01	↑ 3.37
Research and development	RSCA	*0.45*	*n.a.*	
	LFI	*1.68*	*n.a.*	
Legal	RSCA	*-0.05*	*n.a.*	
	LFI	*0.04*	*n.a.*	
Accounting, auditing, bookkeeping, and tax consulting services	RSCA	*-0.03*	*n.a.*	
	LFI	*0.18*	*n.a.*	
Business and management consulting and public relations	RSCA	*0.14*	*n.a.*	
	LFI	*1.00*	*n.a.*	
Architectural	RSCA	*-0.43*	*n.a.*	
	LFI	*-0.46*	*n.a.*	
Engineering	RSCA	*0.04*	*n.a.*	
	LFI	*-1.27*	*n.a.*	
Personal, cultural, and recreational	RSCA	-0.59	-0.75	↓ -0.16
	LFI	-0.16	-0.27	↓ -0.11

n.a. – data not available According to Widodo:

Group A	Group B	Group C	Group D

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The influence of EU investment on member states' innovation performance

JEL Classification: *O38; O52; B40*

Keywords: *innovation performance; national innovative capacity; EU investment*

Abstract

Research background: Seeking to ensure competitiveness in the global market, the EU is constantly improving its innovation policy. Compared to other EU initiatives, the Framework Programs for Research and Innovation (FPs) act as the main instrument with the longest history and the largest budget to boost member states' innovation performance. Despite the initial presumptions that these financial inflows should bring positive and constructive effects, the results significantly diverge across the countries with highly uneven and incoherent progress. Therefore, complex and reliable tools must be adopted to evaluate the long-term influence of EU investment and the reasons which distort the innovation performance in separate member states.

Purpose of the article: The purpose of this article is to evaluate the influence of EU investment on its member states' innovation performance by using a redeveloped national innovative capacity framework and including technological, non-technological and commercial innovative output.

Methods: Panel unit root tests were used to assess the time series stationarity. Autoregressive distributed lag models helped in calculating the long-term influence of EU investment on member states' innovation performance. Finally, by employing dummies, it was analysed how this influence varied over time and across different countries.
Findings & Value added: The findings provide evidence that EU investment exerts positive long-term influence on the technological innovative output proxied as total, business and higher education institutions' patent applications as well as product and process innovations. The effects were also positive on trademarks and marketing, and organisational innovations. However, small but negative influence was found in the case of patent applications by the government sector and the exports of hi-tech products and knowledge-intensive services. These insights may serve in the designing process of the specific instruments and the future innovation policies, which would bring the maximum benefit for the society and economy.

Introduction

Though the emphasis on the innovation-based growth and R&I targeting in Europe is strong, in 2020, the innovation gap separating EU from the best innovators in the world – Japan, Canada and Australia – has increased. Moreover, the innovation performance visibly differs across the countries with highly uneven and incoherent progress (European Commission, 2020). Having these challenges in mind, complex and reliable tools must be adopted to evaluate the magnitude of the influence of EU investment.

The aim of this article is to evaluate the influence of EU investment on its member states' innovation performance by using a redeveloped national innovative capacity framework and including three forms of innovative output: technological, non-technological and commercial one.

The main parts of the article are research methodology, results, and conclusions. The first section is devoted to the development of a methodology for the assessment of the influence of EU investment on the member states' innovation performance. The results section involves the implementation of the empirical model and empirical evaluation. The last section of this article is devoted to the summary of findings.

Research methodology

A conceptual model for the evaluation of the influence of EU investment on the member states' innovation performance is illustrated in Figure 1. The motivation of this model is based on the original national innovative

capacity (NIC) framework by Furman et al. (2002), approved and still used in the works of many scholars (e.g., Azagra-Caro & Consoli, 2016; Santana et al., 2015).

However, due to a fast-changing nature of innovation, the original model was considerably modified by including additional elements to the initial dimensions of 1) common innovation infrastructure, 2) cluster-specific environment for innovation and 3) quality of the linkages and supplemented by such dimensions as international economic activities, diversity and equality, legal and political strength. Since at current form, it is applied to the situation in the European Union, the variable of EU investment is as well added in the model (see Figure 1).

According to Meissner et al. (2017), Halkos & Skouloudis (2018) and De Liso & Vergori (2017), innovation is much more than technology, thus there cannot be one single adequate measurement to capture its multiplicity of features. Therefore, for the output indicators of national innovation performance, it was decided to represent three groups of innovative outputs instead of using only patents:

1. Technological innovative output (i.e., various forms of patent applications and SMEs introducing product and process innovations);
2. Non-technological innovative output (i.e., trademark and design applications along with SMEs introducing marketing or organisational innovations);
3. Commercialisation of innovation (i.e., innovation sales and exports of high-tech products and knowledge-intensive services).

Figure 2 represents an empirical research scheme for the evaluation of the influence EU of the investment on the innovation performance of the member states. The panel dataset for 28 EU countries was compiled with the most recent available data from 2000 to 2018 (*note: since the United Kingdom left the Union only on February 1, 2020, it was included in the analysis*). The data were processed by using the year 2019 version of Microsoft Excel and the Statistical Data Processing Package SPSS, version 21.0, whereas statistical and econometric analysis was performed by using EViews 11 University Edition for Windows.

Results

The influence of EU investment on the member states' national innovation performance expressed by the technological innovative output

The results indicated in Table **Table 11**1 show that EU investment had small but positive influence on total national patent applications (long-run multiplier (LRM): 0.03)), patent applications by the higher education sector (LRM: 0.08), and the introduction of new or significantly improved products and processes by SMEs (LRM: 3.22). Long-run multiplier shows the effect on E(Yt) of a maintained unit increase in Xt for all the included periods. This means that if EU investment is permanently increased by one unit, then, after 7 years, total national patent applications will have changed by 0.03 units, after 6 years, applications by higher education sector will have changed by 0.08 units, and, after 7 years, product and process innovations will have changed by 3.22 units.

The most significant positive influence of EU FPs was captured when evaluating patent applications by the business sector (LRM: 15.45). The results of these favourable effects on enterprises might reflect the benefits of growing and more substantial focus on them in the EU R&I policy.

On the other hand, there is small but negative short-term influence of EU investment on patent applications by the government sector (LRM: -0.12). One of the assumptions which might explain this result can be related to the regulation quality of governments and the practical distribution of EU investment for innovation. As the public sector is usually characterised as less efficient than the private sector, illogical investment decisions, political unconcern, and even low qualification in project management can influence the degree of capabilities to use this money efficiently.

The influence of EU investment on the member states' national innovation performance expressed by the non-technological innovative output

Although at the core of the EU R&I policy strong concentration on the technological output is still observed, it was expected that, with the general level of innovativeness, EU member states would also experience the positive influence on the non-technological innovative output. As Table 2 demonstrates, there is strong positive influence of EU investment on trademark applications (LRM: 25.99) as well as positive but less strong influence on the introduction of new organisational or marketing innovations (LRM: 0.61).

Nevertheless, the results show a small negative effect on design applications (LRM: -0.94). One of the assumptions why the influence is negative can be related to the topics, aims and objectives of the funded projects. If the results are constantly oriented to other types of intellectual property (e.g., trademarks or patents), it might be the reason why the empirical model shows negative influence on design applications.

The influence of EU investment on the member states' national innovation performance expressed by the commercial innovative output

EU countries endure the so-called European paradox of the successful promotion of R&D inputs but the inability to transform these results into commercial benefits (Radicic & Pugh, 2017). Therefore, it was decided to empirically test whether EU investment has long-term influence on the member states' national innovation performance expressed by the commercialisation of innovation.

The results in Table 3 indicate that EU investment does not have significant influence on the sales of innovations. Moreover, it has small but negative long-term influence on the exports of hi-tech products (LRM: -0.23) and knowledge-intensive services (LRM: -0.47). Several of the assumptions why the analysis presents this kind of results might be that the member states encounter the 'crowding-out effect' of the EU Framework programmes, or else the investment simply targets other points of the innovation performance. Further underlying factors may be related to the different influence of EU FPs over time or beneficiaries' NIC. As these results represent the tendencies for the entire region, the following steps of the empirical analysis will help in looking at a closer picture.

EU investment influence disparities between different programming periods

By using OLS regression models and including dummies for separate Framework programmes (see Figure 2), a comparison was made. It is important to note that, due to lack of data of dependent variables, patent_gov was not included in the analysis since it was impossible to compare the results during more than one programming period. For the same reason, there was no opportunity to check the results of the influence of all individual FPs on dependent variables. The abbreviation for 'not available' in the tables – n.a. – indicates this issue.

Regardless, to begin with the technological innovative output, there was no difference in the influence between the individual FPs on the product and process innovations (see Table 4). Further results indicate that only the financial flows from the FP6 were effective in achieving positive results (influence respectively on patent applications: 0.229*; on patent applica-

tions by higher education sector: 0.049**). Moreover, in comparison with FP6, FP7 had a negative effect on the total patent applications (as well as H2020), patent applications by the business sector, and applications by the higher education sector.

These results may have at least a twofold explanation. The first explanation could be related to the already mentioned crowding-out effect, when firms and institutions accustom themselves to long-term subsidisation and lose the incentives for the search of efficiency. Another implication could be connected to the fact that each of the programming periods had more and more beneficiaries, both looking from the point of view of the participant institutions and of the countries which joined the EU in 2004, 2007, and 2013. Due to historically having lower national innovative capacity to produce technological innovation, EU-13 countries are likely to distort the final results of the influence of EU investment.

Continuing with the non-technological innovative output, the results indicate that there were no differences between the influence of FP7 and H2020 on the trademark and design applications. It is important to note that H2020 had positive effects on marketing and organisational innovations if compared to FP7. One of the assumptions why H2020 manifests optimistic outcomes is that the current programme is providing a substantially bigger budget for SMEs and is strengthening the role for social sciences and humanities thus promoting non-technological forms of innovation.

Lastly, for the national innovation performance of the member states which is presently expressed by the commercialisation of innovation, there were no differences captured between the influences of individual Framework programmes.

EU investment influence disparities across the member states

As it was indicated in the previous steps of the empirical analysis, the final influence of EU investment can be affected by the individual country environment and conditions which determine the national level ability to carry out innovative activities and to create innovations. The stepwise regression model was used in order to find out the member states which experience different influence of EU investment if compared to the influence on the entire region (key statistics are presented in Table 5 – Table 7).

Table 5 presents evidence that, throughout the analysed time period, the influence of EU investment on the total patent applications was negative in Finland (-0.69*) and Germany (-2.20***), while it was positive in Luxembourg (0.33**). Continuing with the business patent applications, negative effects were captured in Sweden (-4.48***), Denmark (-3.42***) and Aus-

tria (-2.47***), which means that even though the general long-term influence on the whole European Union was positive (LRM: 15.45), these specific countries experienced the opposite effect.

Further results indicate that more prominent negative influence of EU investment on government patent applications, if compared to the whole region (LRM: -0.12), was experienced by the Netherlands (-0.66***), France (-1.02***), and Finland (-0.29***). In addition to this, Belgium underwent a negative effect on patent applications filed by higher education institutions (-0.32***), while the long-term influence on the region was small but positive (LRM: 0.08). The final analysed indicator of the technologic innovative output is product and process innovations. It has already been proven that, in this context, EU FPs showed positive long-term influence for the entire EU (LRM: 0.11) but, as the results in Table 10 demonstrate, the investment had even higher effect on particular countries: Lithuania (2.34**), Portugal (0.72***), Greece (0.72***), Finland (0.32**), and Estonia (0.78***).

Table 6 illustrates the disparities of the influence of EU investment across the member states when national innovation performance is expressed as non-technological innovative output. In the context of design applications, the entire European Union was influenced uniformly, without any differences across the countries. On the contrary, the influence on Cyprus (4.21***) and Malta (15.92**) trademark applications was positive but smaller if compared to the general long-term influence (LRM: 25.99). Finally, a contrasting result was captured on the marketing and organisational innovations in the Czech Republic (-1.52*) because the long-term influence of EU investment was small but positive for the whole region (LRM: 0.61).

Results in Table 7 show that, throughout the Union, there were no disparities in terms of the influence of EU investment on exports of knowledge-intensive services. On the other hand, even though the general long-term influence on the exports of high technology products was negative (LRM: -0.47), the United Kingdom felt the opposite positive effect (0.32**). It is important to note that the variable of sales of innovation was not included in the analysis since no influence of EU investment – neither short nor long term – was found in the 5th step of our empirical analysis, see Table 3.

Conclusions

Overall, this article expands the findings of scientific literature on the evaluation of the influence of EU investment regarding the innovative output additionality at the member state level. The proposed alternative methodology allows assessing the overall long-term influence of EU investment. At the same time, by including all the EU Framework Programmes for research and innovation since the launch of the Barcelona target, the conceptual model and an empirical research scheme help to calculate the fluctuations in influence at different programming periods and member states. Finally, the analysis includes not only the substantially more used 'traditional' industry innovation indicators (i.e., patents as well as product and process innovations), but also the service sector-based and non-technological forms of innovations (i.e., trademarks, designs, marketing and organisational innovations) as well as the commercialisation of innovation (i.e., innovation sales, exports of high-tech products, and knowledge-intensive services).

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Annex

Table 1. Long-run multiply of EU investment influence on the innovation performance of member states: Technological output

Long-term influence of EU investment / Innovative output	Positive	Negative	No influence/ Insignificant
patent	0.03	-	-
patent_bus	15.45	-	-
patent_gov	-	-0.12	-
patent_higher_ed	0.08	-	-
smes_pp	3.22	-	-

Table 2. Long-run multiply of EU investment influence on the innovation performance of member states: Non-technological output

Long-term influence of EU investment / Innovative output	Positive	Negative	No influence/ Insignificant
trademark	25.99	-	-
design	-	-0.94	-
smes_mo	0.61	-	-

Table 3. Long-run multiply of EU investment influence on the innovation performance of member states: Commercialisation of innovation

Long-term influence of EU investment / Innovative output	Positive	Negative	No influence/ Insignificant
inno_sales	-	-	X
exports_hitech	-	-0.23	-
exports_kis	-	-0.47	-

Table 4. Influence of individual EU Framework programmes on the innovation performance of member states

EU FP / Innovative output	FP6	FP7	H2020	F-stat.	Adjusted R^2
patent	0.244*	-0.342***	-0.299**	0.000	0.998
patent_bus	0.271	-0.554*	n.a.	0.000	0.953
patent_higher_ed	0.049**	-0.052**	n.a.	0.000	0.877
smes_pp	n.a.	0.012	-0.016	0.000	0.974
trademark	n.a.	0.346	-0.224	0.000	0.973
design	n.a.	-0.247	0.079	0.000	0.978
smes_mo	n.a.	-0.020	0.080**	0.000	0.976
inno_sales	n.a.	0.005	-0.005	0.000	0.906
exports_hitech	-0.016	0.027	0.020	0.000	0.914
exports_kis	n.a.	-0.021	-0.002	0.000	0.982

Table 5. EU investment influence disparities across the member states: Technological innovative output

Technological innovative output	Significant differences of estimates for the whole region	Adjusted R^2
patent	FI: -0.69*; LU: 0.33***; DE: -2.20***	0.99
patent_bus	SE: -4.48***; DK: -3.42***; AT: -2.47***	0.96
patent_gov	NL: -0.66***; FR: -1.02***; FI: -0.29**	0.87
patent_higher_ed	BE: -0.32***	0.87
smes_pp	LT: 2.34**; PT: 0.72***; EL: 0.72***; FI: 0.32**; EE: 0.78***	0.97

****p<0.01 **p<0.05 *p<0.1*

Table 6. EU investment influence disparities across the member states: Non-technological innovative output

Non-technological innovative output	Significant differences of estimates for the whole region		Adjusted R^2
	YES	*NO*	
trademark	CY: 4.21***; MT: 15.92***	-	0.98
design	-	X	0.97
smes_mo	CZ: -1.52*	-	0.97

****p<0.01 **p<0.05 *p<0.1*

Table 7. EU investment influence disparities across the member states: Commercialisation of innovation

Commercialisation of innovation	Significant differences of estimates for the whole region		Adjusted R^2
	YES	*NO*	
exports_hitech	UK: 0.32**	-	0.94
exports_kis		X	0.98

****p<0.01 **p<0.05 *p<0.1*

Figure 1. Conceptual model for the evaluation of the influence of EU investment on the innovation performance of member states.

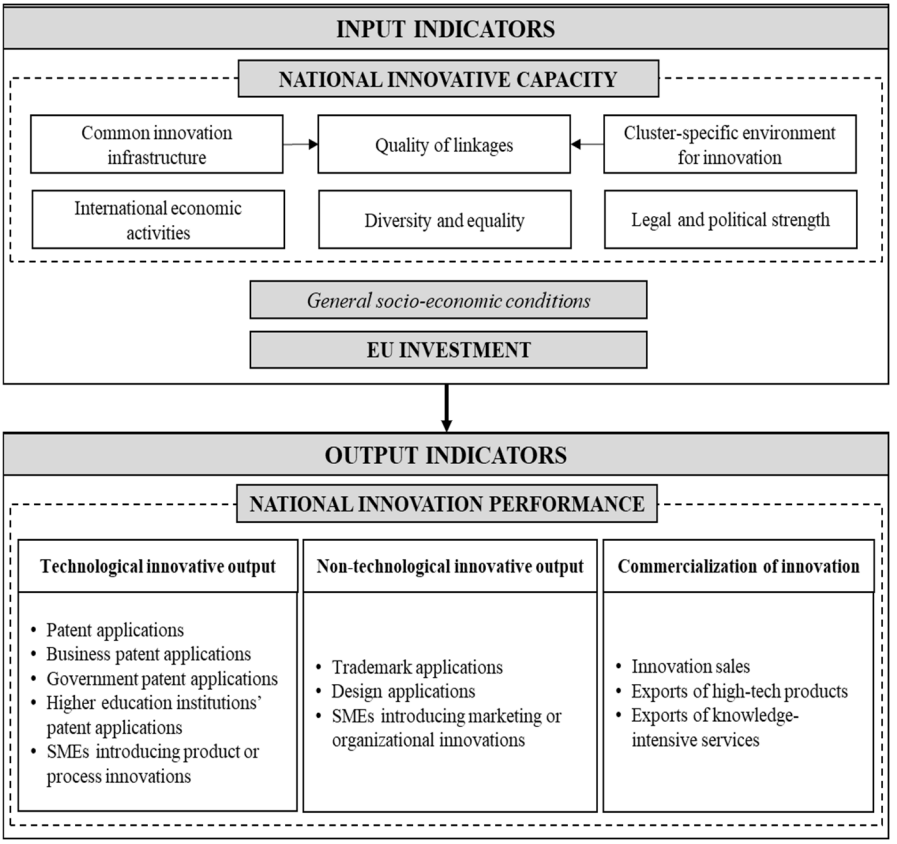
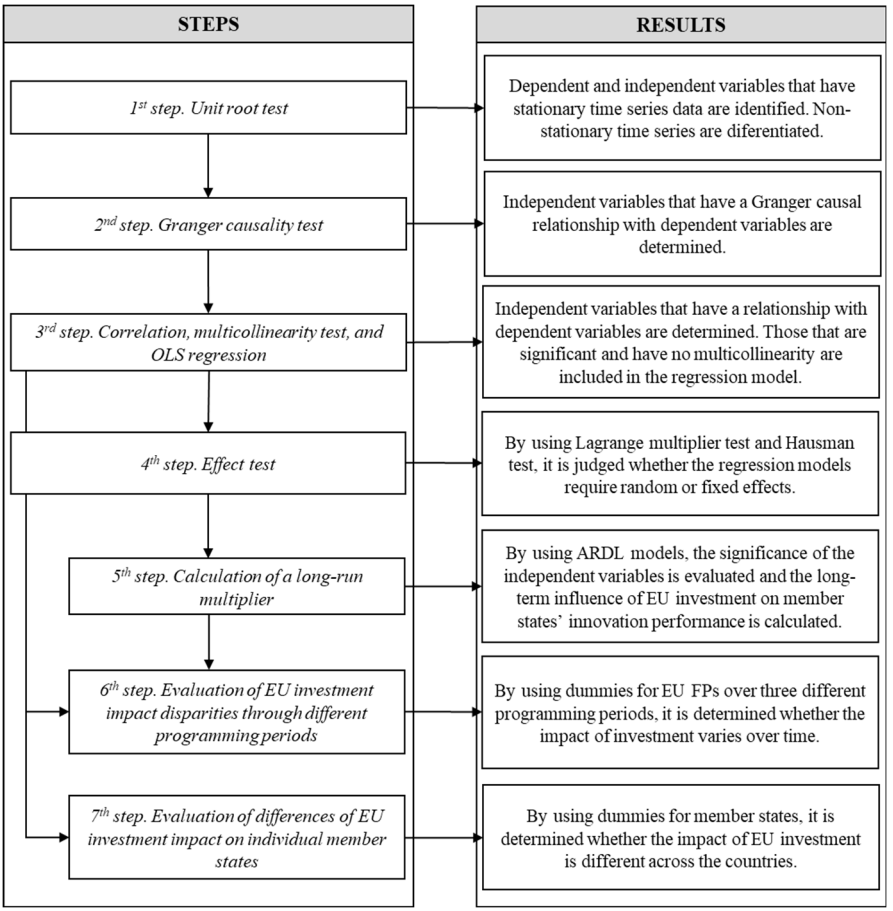


Figure 2. Empirical research scheme for the evaluation of the influence of EU investment on the innovation performance of member states.



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Creation of international networks: geographies of mergers and acquisitions in the energy sector

JEL Classification: *G34; N1; D2; O1*

Keywords: *M&A; energy sector; international networks; sustainability.*

Abstract

Research background: Developments, trends, business climate, conditions, factors influencing the geography and results of mergers and acquisitions (M&A) in the energy industry are explored in this research. M&A enable the involved companies not only to maintain, but also to strengthen their competitiveness in the market. In the short term, seeking external growth and enhancing the firm's value through M&A affect the growth not only of the firms involved but also of the entire sector. In the long term, M&A play an important role in achieving sustainable growth and innovation in the energy sector. Energy companies have expanded through M&As, reorganization, and outsourcing, and the industry value chain has undergone structural changes. M&As make the energy industry more concentrated.
Purpose of the article: The purpose of the paper is to investigate and analyze 22.458 global M&A con-ducted in the energy sector during 1995-2020 with special focus on geographies and creation of international networks during M&A events.
Methods: Based on previous studies and dataset of M&A events gathered over Thomson Reuters database, authors conduct a structured literature review and descriptive statistical analysis aimed to critically discuss and evaluate international networks and geographies in the energy sector. The research is carried out as a structured assessment of past literature. The findings from scientific articles and

studies by various scholars are being categorized, grouped and summarized to discern a me-ta-analytic view of the work carried out to date.
Findings & Value added: This paper analyses 22.458 global M&A conducted in the energy sector during 1995-2020 and adds value in understanding international M&A behavior of countries from a geographical, globalization and geopolitical perspective.

Introduction

Energy industry is critical for developments of global economy since energy is key input to various economy sectors. Mergers and acquisitions (hereinafter "M&A") have become a common tool used by many companies in the pursuance of business growth and shareholder value creation. Even though popularity of scope of M&A researches have been increasing 1970s, Zollo & Meier (2008) and Bettinazzi & Zollo (2017) recognize that studies of post-acquisition performance remain one of the most relevant fields of research in corporate finance and strategic management and corporate finance.

Considering energy firms operate and dominate energy development, processing, transportation, and trade worldwide, study by May (2015) recognize that energy companies are an important group that plays a key role in shaping the global economy and politics. Value and significancy of the sector is further evidenced by rankings of the Fortune Global 500. According to rankings of 2020, among top largest companies based on their operating income, 6 are energy companies: Sinopec Group (407 billion USD), State Grid (383 billion USD), China National Petroleum (379 billion USD), Royal Dutch Shell (352 billion USD), Saudi Aramco (329 billion USD), BP (282 billion USD).

Guo et al. (2021) recognize that there have been many large-scale M&A globally with no exception in the energy industry. Study by Martynova & Renneboog (2008) recognize that M&A make the energy industry more concentrated. Bridge (2008) further add to the discussion that entire energy industry chain is a typical producer-driven chain, in which the major production units are large oil companies. When analysing M&A in the energy industry, it shall be observed that M&A dispose both commercial and geopolitical attributes. This is circumstanced by strategic nature of energy resources, in which they are not only commodities, but also strategic natural resources.

Increasing trends of cross-border M&A raises question whether geographical distance play a role in establishing pattern of M&As. From this

perspective, Rodrıguez-Pose & Zademach (2003) notice that a large vast amount of theories deal with the increasing concentration of economic activities. Considering growing urbanisation of corporate control, geographical distance is often defined as irrelevant or merely attributed a minor role. Already several decades ago geographical distance has become easily superseded by technological progress in telecommunications and by deregulation. Hence, M&A occur in a world which has no boundaries.

Salvi et al. (2018) define green premium and the premium that acquiring companies are accepting to pay in order to acquire or merge with a target firm that is involved in sustainable activities. From this perspective, companies with higher environmental and sustainability standards are often viewed as less vulnerable and more promising to create value. Advantages of "green" activities are supported by Bettinazzi & Zollo (2017) who identified a positive relationship between stakeholder's oriented firms and M&A performance.

Access to intangible assets are being defined as driving forces of M&A considering know-how, knowledge is critical organizational resource and creates basis for the development of organizational capabilities. In this line, term of intangible assets include human capital, customer capital, organization capabilities, innovations, processes, structural capital.

Geopolitical issues stimulate international companies to reassess the risks and benefits of overseas investments. Among others, large oil price fluctuations caused by major geopolitical events, oil and gas asset disposal caused by regional conflicts in Venezuella or Middle East affects effects of M&A. Guo et al. (2021) summarizes that geopolitical issues shall be addressed in any framework of geographical analysis considering their significance.

Technology developments, globalization, deregulation, industry dynamics, economic tensions and economic landscape influence M&A in the energy industry. Geographic analysis has long been used for oil companies M&As, and increasingly, economic geographers are working within the boundaries of management and international business scholarship. Reddy & Xie (2017) pursued geographic-based view of energy strategy and focused on cross-border M&As and their geographic characteristics. In their explanations of volume and value of transactions in home and host countries present, authors introduce a comprehensive framework, including resources, markets, and institutions.

Our research recognizes that global energy production, processing and consumption are often geographically and physically dislocated, whereas M&A conducted by international energy company will inevitably affect relationships between different countries and networks. Therefore, purpose

of our research is to conduct and analysis of global geographies of M&A in the energy sector. Our research raises following questions:

- What are geographical features and attributes of M&A?
- What developments and trends have been experienced by the energy industry M&As during 1995-2020?

In our research we have carried out a structured assessment of past literature. Furthermore, we have analysed sample of global energy industry M&A deals which have occurred during the period 1995-2020.

The remainder of our paper is organized as follows. In the literature review we discuss existing studies on energy companies M&A transactions. Research methodology section introduces to the data and methods used. In the results section of the paper we analyse global energy M&A deals which are further discussed in the "Discussion" section. Concluding remarks together with directions for future research finishes are presented.

Research methodology

Our sample of M&A in the energy industry is drawn from DataStream 5.1 database by Thomson Reuters which provides comprehensive M&A data and various deal characteristics (e.g. announcement and completion date, deal value, bidder and target company specific information (e.g. size, listing status of the target, geographical scope, industries companies are active in, etc.). Specifically, we have analyzed sample of global M&A deals which have occurred during the period 1995-2020.

Following selection criteria were established in order to gather representative sample when working with DataStream 5.1 database:

1. Time period: 01/01/1995-31/12/2020.
2. Form of the deal: acquisition, merger, buyback.
3. Industry: energy (specified by target ant acquires primary SIC codes)
4. Origin of the target and bidder is known: any region.
5. Current deal status: completed

Dataset of 22.428 M&A deals with total value exceeding 7,016 trillion USD allows to capture key trends of M&A geographies in the energy sector. The sample is extensive enough to reflect the characteristics of energy M&As and global energy industry in the past 25 years.

Results

Figure 1 provides global annual deal value (in million USD) and number of M&A in the energy industry. According data, several observations may be retrieved. 22.428 M&A worth 7,02 trillion USD have been completed during 1995-2020. Secondly, annual deal value and volume of M&A has fluctuated remarkably. On the one hand number of deals has been relatively stable from 1995 to 2001 (702 deals per year). On the other hand, value of annual deals has increased by over 394 percent (from 46 billion USD in 1995 to over 230 billion in 2001) leading to average deal size increasing from 82 million USD to 317 million USD. Value of deals has been the lowest from 2002-2004. However, number of deals per year has doubled in the period from 2002 to 2008. Peak of the annual deal value has been reached in 2007 and exceeded 414 billion USD. Similar annual M&A values have been experienced in 2013 (409 billion USD) and 2017 (403 billion USD).

Further sample of M&A is broken down into various geographic regions. Figure 2 breaks down total global deal value (in million USD) between various countries. According data, acquiring companies from United States, Canada, United Kingdom, China and Russian Federation are most actively conducting M&A and have completed deals in total values $2.943.977,38 (42%); $ 808.802,16 (12%); $528.307,09 (8%); $433.163,70 (6%); $306.141,91 (4%) respectively. Therefore, it may be concluded that 72% of M&A values are being completed in 5 countries: United States, Canada, United Kingdom, China and Russian Federation.

Figure 3 breaks down total global M&A volume in the energy industry between various countries. According data, acquiring companies from United States, Canada, China, United Kingdom, and Australia are most actively conducting M&A and have completed 8.309 (37%); 4.401 (20%); 2.009 (9%); 1.745 (8%); 1.575 (7%) M&A deals during 1995-2020. Therefore, it may be concluded that 80% of M&A deals are being completed in 5 countries: United States, Canada, China, United Kingdom, and Australia.

While M&A market was relatively stable and active in United States, Canada and United Kingdom, significant and remarkable structural changes are observed in China. Figure 4 provides annual deal value (in million USD) and number of M&A in Chinese energy industry. First of all, it shall be observed that total value of Chinese M&A have increased from single deal in value of 37,5 million USD completed in 1995 to 137 deals in total value exceeding 72 billion USD in 2020. From historical perspective, M&A activities were relatively passive till 2004. Tremendous expansion has been experiencing since 2009. Record year has been experienced in

2016 when total number of 220 M&A deals in total value exceeding 68 billion USD have been completed.

Figure 5 distinguishes between domestic and cross-border M&A. Data supports that about 70% of total M&A are domestic. On average 30% of the deals have been cross-border and involved acquiring and target firms from different countries. However, there are several outliers. Crossborder M&As constiuted even 78%, 71%, 66%, 61% and 58% in Switzerland, Netherlands, Italy, Germany and France respectively. On the other hand, domestic M&A are most present in the United States (79%), Brazil (78%), China (75%) and Canada (72%).

Figure 6 provides insights into diversifying vs. consolidating M&A in the energy industry. Our results indicate several trends from this perspective. Firstly, out of 22.428 M&A deals completed during 1995-2020, 65% of the deals were diversifying and 35% consolidating. Secondly, there are differences between companies which pursue diversifying and consolidating M&As. In this line, even 98% and 97% of the deals conducted in China and Canada respectively have been consolidating. On the other hand, 86%, 79%, 79% of the deals in Switzerland, Germany and Spain have been diversifying.

Conclusions

This paper analyzed global M&A conducted in the energy sector during 1995-2020 and discussed existing studies on energy companies M&A transactions. Industry M&A are deeply reshaping the structure of the market. 72% of M&A values are being completed in 5 countries: United States, Canada, United Kingdom, China and Russian Federation. Similarly, 80% of global M&A deals during 1995-2020 have been completed in 5 countries only: United States, Canada, China, United Kingdom, and Australia. Our paper draws attention to significant developments and remarkable structural changes in China.

We do acknowledge some limitations which may open up new research questions for future research. As our study misses statistical application in our exploratory research, there is a need to further test hypotheses and validate test results. Furthermore, in our study we have focused on acquiring countries rather specific companies and have considered outgoing M&A only. Therefore, it would be appealing to perform a future study and focus on a narrower region or a particular set of most active acquiring or merging companies in the industry. Despite this, we believe our geography-based perspective helps energy and management scholars and practitioners to

enhance understanding international M&A behavior of countries from a geographical and globalization perspective.

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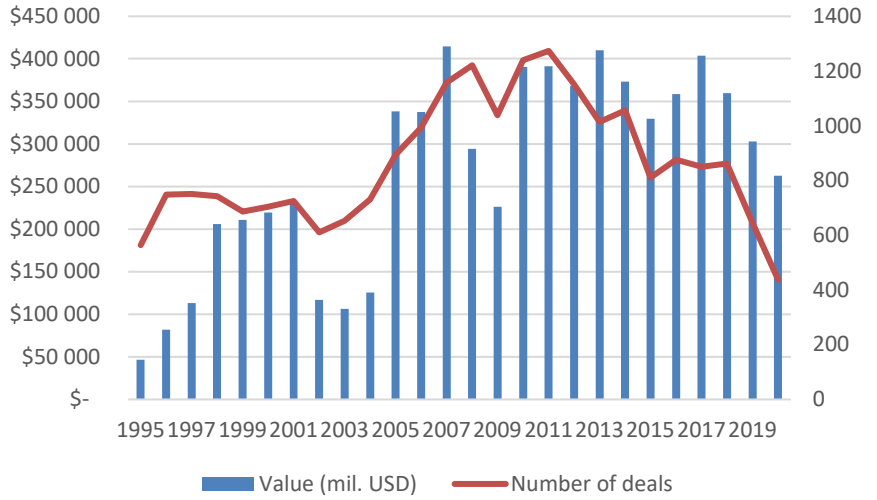
Annex

Table 1. Expected effects of M&A in the energy industry

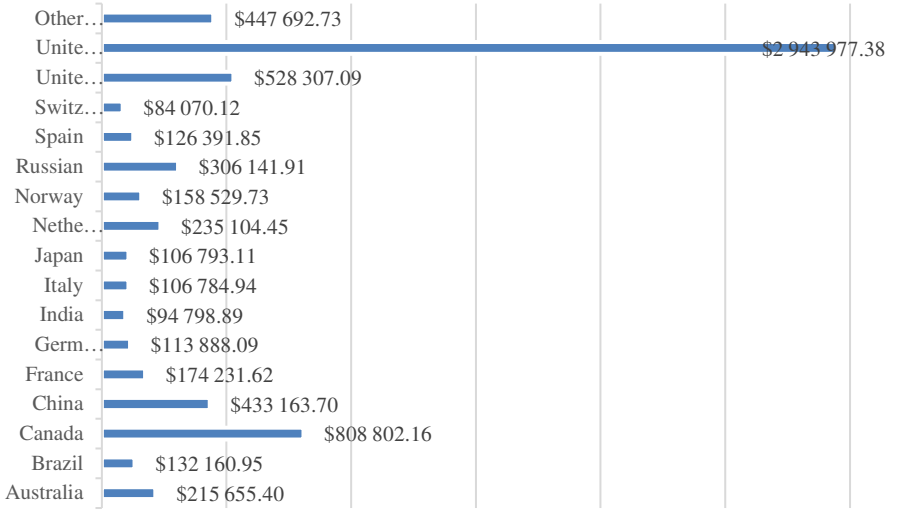
		Homogeneous M&A	Heterogeneous M&A
Synergy	Operational synergy	+	
	Financial synergy	+	+
Increased market power		+	
Risk diversification			+
Green premium			+
Access to intangible asset		+	+

Figure 1. Annual deal value and volume of energy industry M&A market worldwide



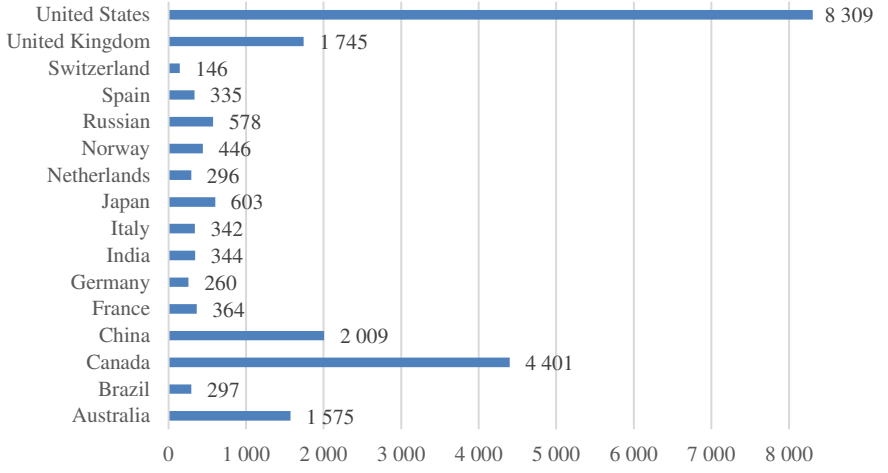
Source: own calculations based on DataStream 5.1.

Figure 2. Total deal value of energy industry M&A in various countries (1995-2020)



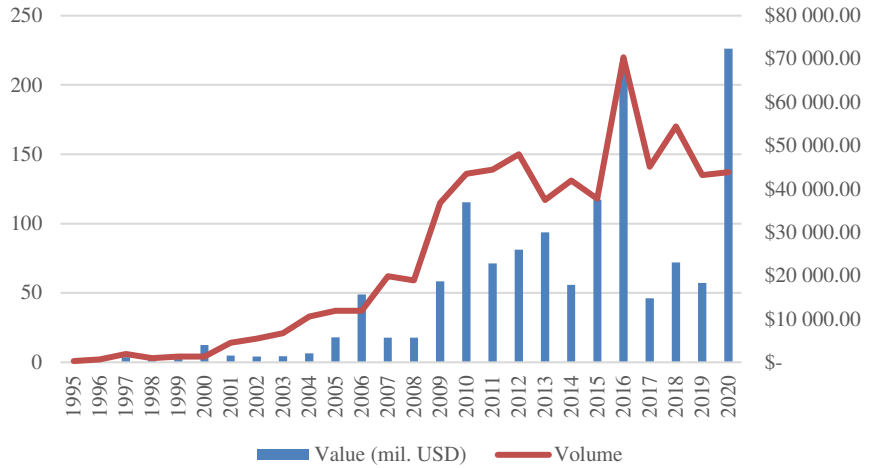
Source: own calculations based on DataStream 5.1 (in mil. USD).

Figure 3. Total volume of energy industry M&A in various countries (1995-2020)



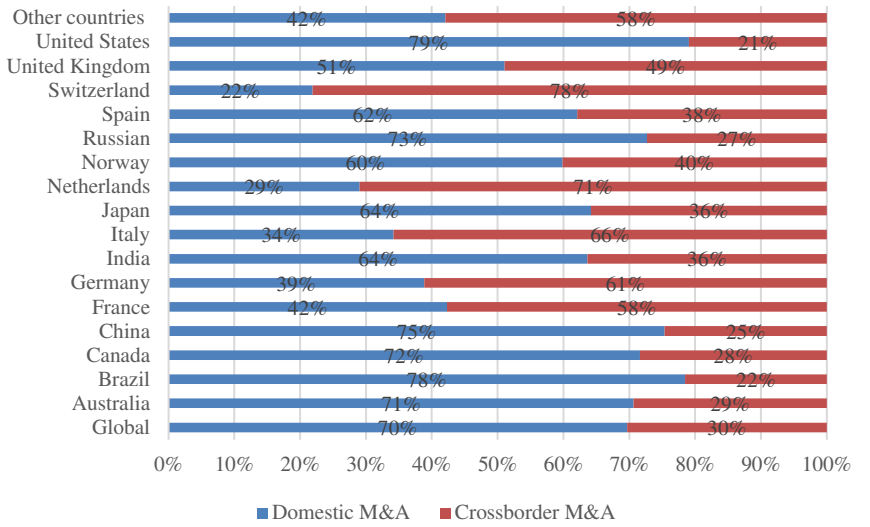
Source: own calculations based on DataStream 5.1.

Figure 4. Annual deal value (in million USD) and number of M&A in Chinese energy industry during 1995-2020



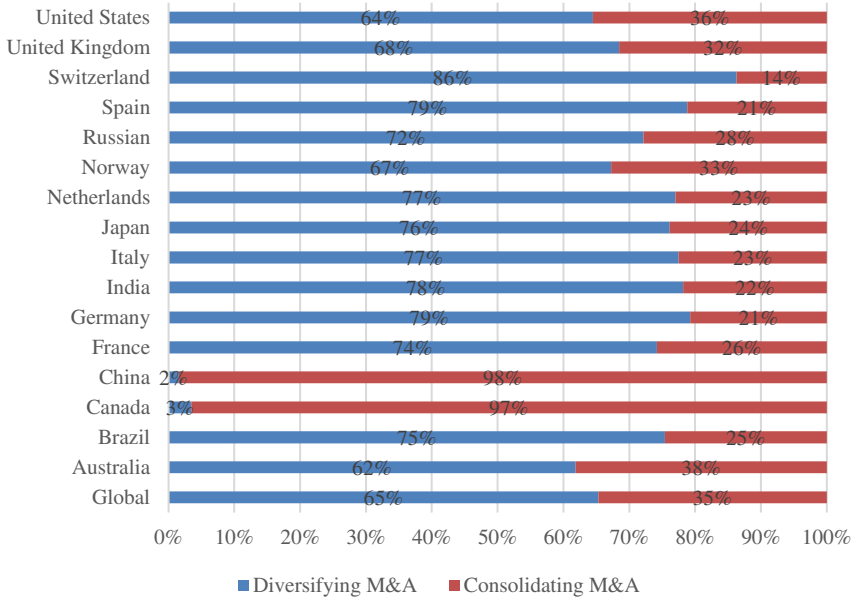
Source: own calculations based on DataStream 5.1.

Figure 5. Distribution between domestic and cross-border energy industry M&A during 1995-2020



Source: own calculations based on DataStream 5.1.

Figure 6. Distribution between diversifying and consolidating energy industry M&A during 1995-2020



Source: own calculations based on DataStream 5.1.

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Plastic waste in the EU as a lost raw materials

JEL Classification: *Q53, Q57, Q5*

Keywords: *plastic waste, circular economy*

Abstract

Research background: Plastic is one of the world's most-used materials. Unfortunately, its wide-spread use is also connected with a large amount of waste. The biggest challenge seems to be huge and still growing share of plastic waste which it is not reused. On the one hand, this situation has negative impact on the environment, on the other it entails financial losses (a loss of a valuable secondary raw material). The EU is taking action to implement an ambitious waste policy but so far plastic waste is to a great extent a lost raw material.
Purpose of the article: to indicate the scale of losses in EU in one of the key waste streams - plastic waste. Attention is focused on the main problem related to the implementation of the circular economy and reflected in the low recycling rate of valuable secondary raw material - plastic waste.
Methods: statistical and intuitive. The considerations in this paper are based, to a great extent, on literature on the subject-matter and secondary data. Statistics were delivered from reports and databases: Eurostat, PlasticsEurope (associations representing plastics producers), The Ellen MacArthur Foundation (a charity working with business, government & academia to build a framework for a CE).
Findings & Value added: EU seems to be only at the beginning of an economic transformation towards plastics' circularity. The construction of the recycling indicator (as % of collected plastic waste) does not fully show the problem of low efficiency in managing a valuable resource which is plastic waste. The value added of this article is also a sectoral approach which shows the origin of plastic waste and the way of its treatment depending on the sector.

Introduction

Contemporary economy relies heavily on natural resources. They are essential for the production of one of the most widely used materials in the world - plastics. Global plastic use has increased rapidly, from almost zero in 1950. to 368 million tonnes in 2019. It is projected this number would double to over 800 million tonnes per year by 2050 (PlasticsEurope, 2020). Plastics are an extensive family of different materials with specific characteristics and applications in numerous sectors (more than 30 types of plastics are in common use). Unfortunately, due to the prevalence of plastics, their production involves increasing volumes of fossil fuels and causes significant CO2 emissions. But the biggest challenge seems to be huge and still growing share of plastic waste which it is not reused (EMAF, 2017). On the one hand, this situation has negative impact on the environment, on the other it entails financial losses (a loss of a valuable secondary raw material). The European economy is still pre-dominantly based on a linear model where products are produced, used and disposed or incinerated, often after a short, single use. It means that significant amounts of a raw materials are lost through inefficient waste management practices. The EU is taking action to implement an ambitious waste policy and the Circular Economy Framework but so far the effects are not satisfactory. In order to fully deliver on their potential, it is necessary to solve many problems related to plastic waste. These problems vary according to the sector and the type of plastic.

The purpose of this article is to indicate the scale of losses in EU in one of the key waste streams - plastic waste. Attention is focused on the main problem related to the implementation of the circular economy and reflected in the low recycling rate of valuable secondary raw material - plastic waste. This paper uses both a general approach and sectoral one - which shows the origin of plastic waste and the way of its treatment depending on the sector.

Research methodology

Statistical and intuitive methods are used in this work. The considerations in this paper are based, to a great extent, on literature on the subject-matter and secondary data. The train of thought is characterized by a deductive nature where an argument is the output of research related to the issue of plastic waste. The statistics are mainly derived from Eurostat, PlasticsEurope (associations representing plastics producers), The Ellen Mac-

Arthur Foundation (a charity working with business, government & academia to build a framework for a circular economy). The main hypothesis is that EU seems to be only at the beginning of an economic transformation towards plastics' circularity. The construction of the recycling indicator (as % of collected plastic waste) does not fully show the problem of low efficiency in managing a valuable resource which is plastic waste. The added value of this article is also a sectoral approach which shows the origin of plastic waste and the way of its treatment.

Results

More than 30 types of plastics are in common use. Although the plastics industry is very complex, four main value chains (packaging, buildings and construction, automobiles and electronics) and six plastics types constitute more than three-quarters of all plastics demand in EU. Even though most plastics thus are recyclable, actual effective plastics recycling rates in the EU are very low (tab. 1).

The reasons for this are varied depending on the sector and the type of plastic.

The single largest end-use market for plastics is packaging (39,6% of plastic use). A characteristic of the packaging products is, that after a short use time, it ends up as waste. That is why about 62% of plastic waste is due to the use of packaging material, mostly by the food and beverage industry. Unfortunately, only 42% of the packaging waste collected is recycled, 40% incinerated with energy recovery and 18% disposed in landfills (Eurostat, 2021). Three main factors hinder recycling in this sector: (1) at technology level: only a few times recyclability of plastic packaging (due to material degradation); (2) at consumer level: difficulty in sorting of different plastic types and the contamination from use; (3) at the level of the recycling process: lack of technology to facilitate sorting different plastic polymers (plastic packaging products consist of more than one polymer type which must be recycled in different ways) (Hestin, 2015; Material Economics, 2018).

Building and construction is the second biggest market for plastics in Europe, representing about 20,4% of the overall demand. The generated amount of plastic waste in this sector corresponds to only 6% of all plastic waste (which is due to the long service life of plastics used in this segment; Eurostat, 2021). What makes recycling difficult is that construction products consist of several materials often attached through gluing, making the separation of materials for recycling difficult. A specific challenge is also

the identification of the plastic material polymers. Only a few plastic products (for example PVC windows or tubes) are identified as suitable for recycling (of which PVC has the highest recycling rate of 32%). In total, only 24% of plastic waste from building and construction sector is being recycled, 43% incinerated with energy recovery and 33% landfilled (PlasticsEurope, 2020).

The sector with the third highest demand for plastics is the automotive industry (9,3%). Plastic waste from this sector accounts for about 5% of all plastic waste. Plastics in automotive applications are heterogeneous, have strong connections to other plastics, and are thus difficult to liberate for recycling. Materials are often contaminated or they contain hazardous substances (especially brominated flame retardants). The result is that only some plastics easily separable from products are mechanically recycled to new raw materials. The plastic fraction (excluding bumpers, fuel tanks and batteries) ends up in the light fraction of the shredder waste (which is a mix of plastics, rubber, wood and other non-metal residuals and usually contains around 30% of plastics) (Miller, 2014). In 2016, 40% of shredder waste was landfilled, 31% incinerated with energy recovery and 29% recycled (Eurostat, 2021).

The fourth largest market for plastics is electrical and electronic equipment (demand at the level of 6,2%). The plastic waste generated in this industry accounts for 4% of all plastic waste. Recycling plastic waste from this sector is quite complicated. This is because the main focus is on metal recovery and plastics waste is used as fuel in the metal recovery processes. Besides, a lof of electric and electronic equipment are the low weight and small size devices. Therefore they are often stored in homes or to some extent misplaced with municipal waste. Plastics from vacuum cleaners, coffee machines and old TV casings are best suited for recycling. They do not contain many types of polymers and have a low content of hazardous substances unlike polymers used for computer, electronics and electrical equipment. Vlugter (2017) claims that there are three main factors hampering the closed loop recycling of plastics in this sector: the scale and ineffectiveness of collection activities, the lack of a market for recyclates and the limited skills and collaboration between value chain partners.

Technically, regardless of the sector generating the plastic waste, three main factors inhibit the production of high-quality secondary plastics (Material Economics, 2018):

- mixed and contaminated flows. It is needed both to separate plastics into streams of single plastics types and from other matter. This is not conducive to both the product design and collection systems, which mix or fuse different types of plastics, add other materials such as paper or

metal;
- additives contaminating plastics (like colourants, stabilisers, flame retardants) which are difficult to trace or to remove;
- contamination by the substances they held.

Overall in the EU, about 29 million tons of all post-consumer plastic waste is collected for treatment, which constitutes 49% of plastics production. 32,5% of those collected plastics is recycled, compared with 25% of plastics landfilled and 42,5% recovered for energy. Over the years, recycling and energy recovery rates have increased (since 2006, the amount of plastic waste sent to recycling has doubled, and for energy recovery increased by 77%) while the share of plastic waste going to landfills has decreased (by 44%). Differences in performance between countries are, however, still high. Recycling rates range between around 40% (Sweden) and 20% (Bulgaria). The highest energy recovery rate is observed in Austria (72%) while the lowest one in Greece (1,2%). Landfilling of plastic waste is the biggest problem in Greece, Malta and Cyprus (around 23%) meanwhile Austria and the Netherlands completely eliminated it (PlasticsEurope 2020, Eurostat 2021). These varied results can be explained by differences in collection schemes, available infrastructure and consumer behavior. On average, 52% of all post-consumer plastic waste is collected via mixed waste collection schemes. Unfortunately, the recycling rate of plastic from this type of collection is very low. This rate is more than 10 times higher if waste is collected selectively (tab. 1).

Great attention should be paid to the interpretation of the EU official plastic waste recycling rate (which was 32,5% in 2019). When looking at figures on production of plastic and waste generation volumes, one could ask where the remaining volumes of plastic are ending up (Figure. 1).

When one excludes the exported and treated trash, a significant volume of plastic waste is still unaccounted for. Plastic waste seems to be hidden in untracked trade flows and in illegal landfills (trashout.ngo, 2021). Thus, the EU average recycling rate of 32,5% for plastic waste refers only to the waste collected and registered (plastics streams collected for recycling are highly contaminated and mixed, so only some 60% of this volume is actually recycled). It has been estimated that less than 5 million tonnes of plastic waste, which is less then 10 per cent of the plastic demands, ends up being recycled. As a result, only 6% of new plastic materials are derived from recycled plastics. Pic. 1 shows the actual level of recycling in the EU (Material Economics, 2018; Plastics Europe, 2018).

There is also another challenge to deal with in the EU – export of plastic waste to third countries (Figure 2).

By 2017, China was the greatest receiver of European plastic waste exports (EU shipped there 60% of plastics collected for recycling). Export of plastic waste have decreased in 2018 (by 37% from 2015). This reduction is due China's ban on the import of 24 categories of waste. Unfortunatelly, European plastic waste has been directed to other countries such as Malaysia (currently, the greatest receiver of European plastic waste exports), Turkey, Indonesia and Vietnam. EU countries sell their plastic waste to developing countries because it is easier and cheaper. A lot of valuable waste is thus irretrievably lost (putting additional pressure on local ecosystems in host countries and causing CO2 emissions during transport). „Waste-tourism" is therefore incompatible with rational management of secondary raw materials.

Numerous studies and analyses highlight barriers to achieving a circular economy in the plastic, as well as in other economic sectors (Dijkstra et al. 2020; Bourguignon, 2017): (1) high up-front investment costs and risks in the transformation process; (2) complex international production and consumption supply chains; (3) lack of support for scaling up circular models; (4) difficulties in business-to-business cooperation; (5) inadequate knowledge and capacity for implementation; (6) uncompetitive circular products because subsidies encourage the linear production and use model; (8) lack of consumer awareness. Moreover, existing frameworks that assess material circularity are inexact (basic indicator which is recycling rate refers only to the waste collected and registered) and insufficient (a lack of qualitative goals) which makes it difficult to measure the contribution of recycling to sustainable resource management. The result is that in EU large fractions of valuable resources are lost during waste management because of inefficient waste collection, consumer behavior and a lack of awareness, market-related aspects, technological barriers, design complexities and the hazardous nature of embedded materials.

Conclusions

Since 2006, plastic waste recycling rate in EU has doubled, energy recovery rate has increased by 77% while the share of plastic waste going to landfills has decreased by 44%. The positive trend towards circularity in EU is therefore visible, however collected plastic waste accounts only for about 49% of plastic production. 32,5% of those collected plastics is recycled, compared with 25% of plastics landfilled and 42,5% recovered for

energy. It means that less than 10 per cent of the plastic demands, ends up being recycled. As a result, only 6% of new plastic materials are derived from recycled plastics. Too much plastic waste is still landfilled and exported outside the EU. Plastic waste are also hidden in untracked trade flows and in illegal landfills. The EU is then losing a valuable resource which is plastic waste. This situation also causes unnecessary losses of fossil fuels and CO2 emissions in the production of new plastics.

Although the plastics industry is very complex, four main value chains (packaging, buildings and construction, automobiles and electronics) and six plastics types constitute more than three-quarters of all plastics demand in EU and generate four fifths of their waste. The reasons for low recycling rates of plastic waste are varied depending on the sector and the type of plastic. Technically, regardless of the sector generating the plastic waste, three main factors inhibit the production of high-quality secondary plastics: mixed and contaminated flows, additives contaminating plastics which are difficult to trace or to remove and contamination by the substances they held.

Despite numerous legislative actions, the EU seems to be only at the beginning of an economic transformation towards circularity. Main barriers to achieve it are: (1) high up-front investment costs and risks in the transformation process; (2) complex international production and consumption supply chains; (3) lack of support for scaling up circular models; (4) difficulties in business-to-business cooperation; (5) inadequate knowledge and capacity for implementation; (6) uncompetitive circular products because subsidies encourage the linear production; (8) lack of consumer awareness.

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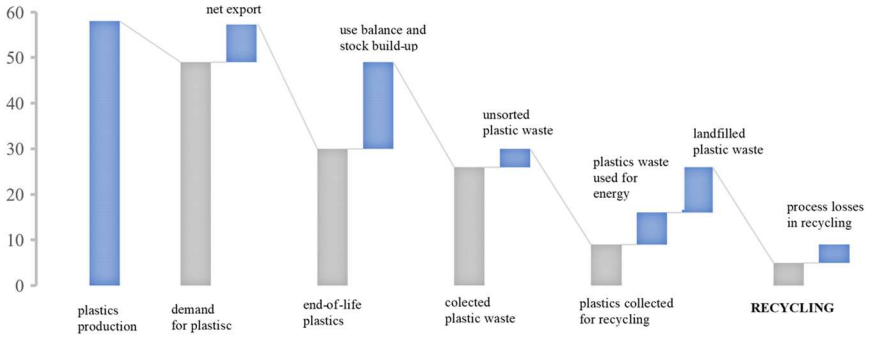
Annex

Table 1. The origin, collection and disposal of plastic waste

the origin of plastic waste (main sectors)	**the way of collection**	**the way of disposal**
Total collected post-consumer plastic waste (29 millions tons): - packaging: 61% - building and construction: 6% - automotive: 5% - electrical and electronics: 6% - agriculture: 5% - houseware, leisure, sports: 4% - others: 13%	mixed collection: 52%	recycling: 6% energy recovery: 57% landfill: 37%
	selected collection: 48%	recycling: 62% energy recovery: 27% landfill: 11%
⬇		
treatment of end-of-use plastics in 3 main sectors (% of plastic demand)		
packaging - not collected/stock: 21% - landfill: 25% - energy recovery: 22% - yield losses: 13% - recycled: 19%	**building & construction** - not collected/stock: 76% - landfill: 8% - energy recovery: 9% - yield losses: 3% - recycled: 5%	**automotive** - not collected/stock: 47% - landfill: 30% - energy recovery: 5% - yield losses: 11% - recycled: 6%

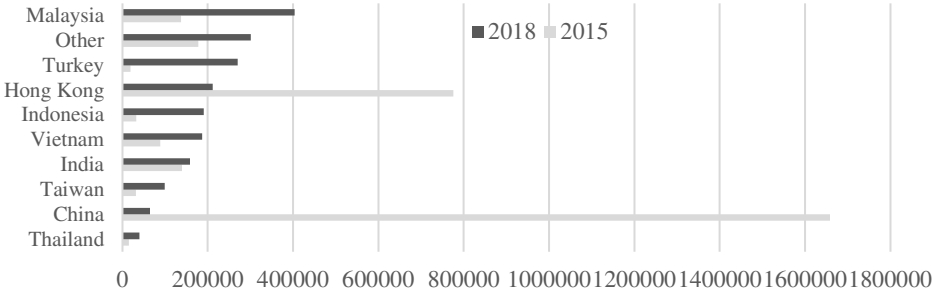
Source: own based on (PlasticsEurope 2018, 2020; Eurostat 2021).

Figure 1. Plastic waste volumes in Europe (mt per year)



Source: own based on (Material Economics, 2018; Plastics Europe, 2018).

Figure 2. Volume of plastic waste exported from the EU in 2015 and 2018, by receiving country (tones)



Source: own based on (Eurostat, 2021).

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The economic impact of the COVID-19 pandemic in border regions

JEL Classification: *F02*

Keywords: *border regions; cross-border cooperation; COVID-19 pandemic; crisis processes*

Abstract

Research background: In the article, methods and tools for analysis crisis phenomena in the conditions of the COVID-19 pandemic, based on the example of border regions of the Baltic Sea countries and the Northwestern Federal District of the Russian Federation, were presented. Governmental measures and restrictions on the functioning of the economic subjects introduced in the border regions caused some shock and stress situation, which are of great importance for the course of the crisis conditions and the way out of the crisis.
Purpose of the article: The purpose of the study is to establish a specific recognition of the research object, to provide a description or a conclusion about the condition of this object within a specified research completion date.
Methods: The study uses the methods of systemic, structural, factor and comparative analysis, considering common and available parameters. A qualitative research of the object is carried out on the basis of successive stages.
Findings & Value-added: Currently, the frontier economy is facing new challenges that test the basic mechanisms of functioning in crisis conditions. All these processes imply measures to eliminate the consequences of post-pandemic phenomena.

Introduction

It should be noted that to date the situation is exacerbated by exceptional uncertainty about the measures taken by public administration bodies in the

border regions. This is primarily the lack of diagnostics and measures for the introduction of quarantine in certain sectors, forced constraints on the economic and commercial activity of the population, restrictions on the access of the entire population to recreation and entertainment sectors, the transition to remote work and distance learning in schools and universities and the closure of children's and pre-school institutions. At present, the scale and nature of the impact of all these artificial restrictions in various industries and sectors of the economy is unclear. All this increases the complexity of diagnostics in the current crisis conditions. The problems of COVID-19 pandemic diagnosis have not yet been studied in the scientific literature, so the realization of the purpose and relevance of this study is of great importance. The research material is based on the example of the Baltic Sea countries and the border regions of the Northwestern Federal District (NWFD) of the Russian Federation. Russia is also a Baltic Sea country, but the scale and difference in the comparison of research would not be correct. Therefore, only one out of eight federal districts of Russia has been chosen, which borders with the countries of the European Union and has a direct relation to the Baltic Sea. In recent years, diagnostics as a research category has been boldly used in the assessment of cross-border cooperation. It plays the role of the most important scientific method and tool that enables answering many crisis problems in practically all researches.

The unfolding economic crisis has shown that many scholars are trying to make sense of the economic consequences of the coronavirus. For example, Ludvigson *et al.* (2020) found that the pandemic COVID-19 is a major multi-period exogenous shock. Baker *et al.* (2020) note that COVID-19 led to a massive spike in uncertainty and no close studies exist in science. The authors found that a pandemic COVID-19 shock results in an 11% annualized decrease in GDP. In another study (König & Winkler, 2020), which was conducted on a sample of 42 countries (mostly European), it has been studied how coronavirus mortality rates affect GDP growth. Researchers note that the stringency of enforcement measures is an important factor in growth. For example, stricter measures lead to lower GDP in the quarter studied, but are associated with a positive catch-up growth effect in the next quarter.

The COVID-19 pandemic has caused an economic crisis and has had extremely negative effects on economic activity, GDP growth, and unemployment (König & Winkler, 2020). In addition, studies on the Baltic Sea countries confirm this conclusion (Ehlert, 2020). The author conducted an interesting study on German regions (401 counties were studied), which shows that there are inter-regional differences in the level of socioeconom-

ic, demographic and health variables affecting the economy. Hensvik *et al.* (2020) in their paper show the changes caused by COVID-19 in the Swedish labor market. The authors give the example of a 40% decrease in vacancies during the first three months after the COVID-19 outbreak. The resulting tightness in the labor market redistributed job searches towards less affected occupations regardless of changes in job vacancies.

The study is built on an analysis of the causes that emerged during the expansion of the COVID-19 pandemic (Claeson & Hanson, 2021). For example, early findings on the development of the pandemic have already provided guidance on the scale and direction in which to focus crisis response and increase support for businesses and populations.

It should be emphasized that the diagnosis of crisis phenomena in cross-border systems has its basic parameters and forms. Any parameters represent a system of criteria that reveal the specifics of a particular object. If we consider pandemic crisis phenomena in border regions, then it will be a system of indicators of qualitative characteristics and indicators of crisis research, taking into account the relevant factors influencing it in a particular period of time.

Some Aspects of COVID-19 Development in the Baltic Sea States countries

A qualitative result of scientific research is the first condition for the successful development and functioning of the economy of border regions in the post-pandemic time and the possibility to prevent a crisis situation in all spheres of the border economy. Of course, the minimization of negative consequences of crisis phenomena in post-pandemic time is central to the activities of governing bodies. However, in the border conditions of the regions of the Baltic Sea countries and NWFD regions of the Russian Federation, there is its specificity and features when unforeseen circumstances arise, and all kinds of business activities are associated with relevant changes. In minimizing these problems, scientific studies help to develop appropriate forms, methods and means, which allow to obtain certain guarantees against probable errors and miscalculations in anti-crisis situations.

For example, the problems encountered during the pandemic in the coastal regions of the NWFD show considerable variation in the level of socio-economic shock and stress. The situation in NWFD regions is closely connected with controlling, where problems are formulated, and analysis begins, the purpose of which is to identify the real discrepancies, reduction or increase of deformation, actual and optimal state of the most important

crisis situations. Key parameters of the crisis situation are defined, then specific problems are highlighted, there may be five to ten or more of them. Then we determine the sequence of operations: problem analysis, identification of the primary problem, analysis of the primary problem, diagnosis of the primary problem, and a diagnosis is established. On the basis of this material, forecasting and decision-making to eliminate contradictions is developed. It is very important that this process proceeds on the basis of specific indicators. In a pandemic, there are unifying indicators and characteristics that are comparable in crisis situations.

Results

The pandemic showed that COVID-19 did what no other virus has managed to do in the last century. During the pandemic, not only the economy, but also the social life of the population was significantly affected: quarantine, isolation, other restrictions on human freedoms, the loss of loved ones and the complete uncertainty of what comes next. Thus, COVID-19 has become a complete scientific puzzle for world science, and the threat of infection is now more relevant than it used to be. In the Baltic region, the pandemic has affected all countries, limiting the normal freedom of movement of goods, persons, services and capital. This is evidenced by the GDP data (Table 1).

It should be noted that Lithuania, Sweden and Estonia (7,721.52; 7,369.57 and 7,346.66 respectively) have the highest number of cases per 100,000 people, although detected COVID-19 cases are highest in Germany and Poland (Table 2). However, the most "severe" indicator, which characterizes the state and the course of the pandemic is the mortality rate per 100,000 people. That's why Poland and Sweden are ahead of other countries of the Baltic Sea (131.48 and 131.32 respectively). This indicator is exceptionally hard for the population and clearly shows that state administration bodies and other institutions of the states do not cope with the epidemic of coronavirus in full measure.

Among the countries of the Baltic Sea is also the Russian Federation. However, due to non-comparable proportions and differences in law, standards, and statistical reporting, separate studies are proposed for the Northwestern Federal District. This district is of great importance for the development of the whole economy of Russia. Firstly, it is located at the junction with developed EU countries and has more chances to integrate into the world economy than regions of other districts. Secondly, the border regions have access to the Baltic Sea and occupy a prominent place in

the maritime activities of the whole country. Thirdly, the only exclave territory of Russia – Kaliningrad region – is located in this district.

Studies conducted on the spread of the COVID-19 epidemic in the Northwestern Federal District of Russia clearly show that the dynamics of disease spread in NWFD regions differ significantly. The northern regions of the NWFD differ in disease detection. In the Arkhangelsk and Murmansk regions 54,586 and 45,371 diseases were detected respectively. In the Arkhangelsk oblast over 48 thousand people recovered during this period, and in the Murmansk oblast over 43 thousand people died 552 and 886 people respectively. High morbidity level was also registered in Komi Republic: over 38 thousand infected people, over 36 thousand people recovered and 730 died. By February 15 the situation was gradually stabilizing and the number of new infections in these regions was over 100 people each. The situation is somewhat different in regions bordering the European Union. These are the Kaliningrad, Novgorod and Pskov regions and the Republic of Karelia. In these regions the number of detected cases was in the range of 30 thousand people, more than 20 thousand people recovered. At the same time, the number of deaths was 232 in Kaliningrad Oblast, 155 in Pskov Oblast and 113 in Novgorod Oblast (Table 3).

The city of St. Petersburg stands out sharply from other subjects in the Northwestern Federal District of Russia. This city has the official status of a separate subject of the Russian Federation and has a great influence on the neighboring regions of the district. In St. Petersburg, 354,196 people have been diagnosed with coronavirus. This figure can be safely compared to the population of all the separately taken large cities-regional centers of the NWFD. St. Petersburg has the largest agglomeration in the Northwestern Federal District of Russia. The mobility of the population and the potential for infection here is very high.

In contrast to the average indicators for the federal district, the variation in the given indicators is much greater in the regions (Table 4). For example, by the level of variation by two times, and the ratio between the maximum and minimum levels also differs by more than two times. The highest average nominal wages are fixed in the northern regions: the Murmansk Oblast – 74,358 rubles; the Komi Republic – 61,270 rubles; the Arkhangelsk Oblast – 58,637 rubles and of course the city of Saint Petersburg. Here nominal wages have been above 64,000 rubles for a long time. In traditionally European regions: Novgorod, Pskov and Kaliningrad regions, nominal wages are keeping over 30 thousand rubles. the growth rate of nominal wages during the pandemic slowed down a little. However, in most regions of the Northwestern District annual growth rates of nominal wages were observed (from 11.4% – the Vologda region to 0.8% – the

Novgorod region). By the way, Novgorod oblast was minus 1.9% in real wage growth.

Studies on the level of unemployment show that the NWFD the level of unemployment is traditionally high in the northern regions. For example, in the Republic of Karelia – 9.4% (unemployment growth of 1.7%); Murmansk and Arkhangelsk regions – 8.2% and 7.8% respectively (unemployment growth of 3.5% and 1.5%). The unemployment rate in the Komi Republic was higher than the national average – 8.3%, while the unemployment rate increased by 1.0%. The lowest level of unemployment was in Leningrad and Kaliningrad regions – 5.1% and 5.2% respectively (unemployment increased by 1.2% and 0.5%). It should be noted that in the NWFD the greatest damage from the pandemic crisis was observed in the spheres of retail trade, services and services, as well as in transport. The analysis shows that in these areas the situation worsened to such an extent that it created a zone of socio-economic stress and risk.

Nowadays it is becoming obvious that COVID-19 has struck the economic and political systems of many countries and regions. Science is looking for indisputable methods and indicators to overcome these unexpected crisis phenomena. If we consider the situation in the NWFD of Russia, on can refer to the sample of key indicators that affect the development of pandemic processes when diagnosing these phenomena (Table 5). In the table below the main indicators influencing the development of crisis phenomena in the course of coronavirus for each NWFD region were shown.
The overall impact on the crisis phenomena developed in the regions of the district shows that the largest cities and the agglomerations formed around them experience the greatest risks. This is understandable, since agglomerations have a higher population density and a greater intensity of interaction, especially due to migrant workers in the northern regions of the district.

Conclusions

It should be noted that the pandemic in the Baltic Sea countries and NWFD regions showed that COVID-19 has brought about many problems that humanity has never faced before. This is illustrated by the conclusions drawn as a result of the COVID-19 project. These conclusions should be considered in the future when similar challenges and crises emerge.

The border regions of the Northwestern Federal District of Russia could not avoid mistakes either. In the northern regions, where there was a massive movement of labor force and population, the infection rates were

much higher than in the entire Russian Federation. COVID-19 was much more severe in underdeveloped regions, where there was a lack of basic resources and personnel in medical institutions, so the infection rates were high.

Thus, there is a need for a system of assistance measures to assist affected businesses, business entities, the population and the definition of precautionary measures for the prevention and treatment of viral diseases. The materials of the study are of interest to scientists and practitioners who deal with the problems of crisis phenomena in regional and border systems, as well as challenges and emerging phenomena similar to the COVID-19 coronavirus pandemic.

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Annex

Table 1. Gross domestic product of the EU Baltic Sea countries

Baltic Sea countries	GDP (current prices, million EUR)		Real GDP growth rate, %		GDP per capita, EUR	
	2019	2020	2019	2020	2019	2020
Germany	3,449,050	3,332,230	0.6	-4.9	41,510	40,070
Poland	532,329.2	521,514.5	4.5	-2.7	13,870	13,600
Sweden	474,550.5	472,260.1	1.4	-2.8	46,170	45,610
Denmark	312,747.2	311,726	2.8	-2.7	53,760	53,470
Lithuania	48,797.4	48,794.2	4.3	-0.8	17,460	17,460
Latvia	30,420.9	29,334	2.0	-3.6	15,900	15,430
Estonia	28,112.4	27,166.9	5.0	-2.9	21,220	20,440
Finland	240,261	237,467	1.3	-2.8	43,510	42,940

Source: compiled from Eurostat data.

Table 2. Main characteristics of the epidemic spread in the EU Baltic Sea countries as of March 24, 2021.

Baltic Sea countries	Population at the beginning of 2021	The total number of detected	Number of cases per 100,000 people	Mortality	Mortality per 100,000 people
Germany	83,166,711	2,647,710	3,192.39	74,964	89.47
Poland	37,958,138	2,089,869	5,521.94	49,761	131.48
Sweden	10,327.589	744,272	7,369.57	13,262	131.32
Denmark	5,822,763	226,277	3,906.58	2,402	41.47
Lithuania	2,794,090	210,202	7,721.52	3,501	128.61
Latvia	1,907,675	97,586	5,173.69	1,828	96.91
Estonia	1,328,976	97,456	7,346.66	809	60.99
Finland	5,525,292	72,073	1,300.79	808	14.58

Source: compiled from World Health Organization data.

Table 3. Main characteristics of the epidemic spread in the Northwestern Federal District as of February 15, 2021

Northwestern Federal District	Retrieved	New	Active	Recovered	Dead
Arkhangelsk region	54,586	194	5,445	48,589	552
Nenets Autonomous Okrug	1,075	1	24	1,007	4
Vologda region	36,682	231	4,074	31,895	713
Kaliningrad region	26,616	148	2,451	23,933	232
Republic of Karelia	38,889	165	4,208	34,410	271
Komi Republic	38,338	121	616	36,992	730
Leningrad region	33,784	191	2,828	30,446	510
Murmansk region	45,371	144	1,378	43,107	886
Novgorod region	25,965	110	3,453	22,399	113
Pskov region	30,806	104	10,824	19,827	155
St. Petersburg	354,196	1,093	74,481	269,203	10,512

Source: compiled from Stopcoronavirus data.

Table 4. Indicators of wages, inflation and unemployment in the regions of the Northwestern Federal District in 2020

Northwestern Federal District	Average monthly nominal wage, May 2020, rubles.	CPI, growth in January-June 2020 to January-June 2019, %	Growth of real wages, January-May 2020 to January-May 2019, %.	Unemployment rate, Q2 2020, %	Increase in unemployment, Q2 2020 to Q2 2019, %	Socio-Economic Stress Index, CPI + increase in unemployment
Northwestern Federal District	55,793	2.9	4.5	5.0	1.5	4.4
Arkhangelsk region	58,637	3.6	3.8	7.8	1.5	5.1
Vologda region	42,910	3.1	8.2	6.5	2.7	5.8
Kaliningrad region	36,661	2.7	4.2	5.2	0.5	3.2
Republic of Karelia	47,313	2.9	5.5	9.4	1.7	4.6
Komi Republic	61,270	4.1	2.6	8.3	1.0	5.1
Leningrad region	47,545	2.5	2.7	5.1	1.2	3.7
Murmansk region	74,358	2.9	6.4	8.2	3.5	6.4
Novgorod region	31,892	29	-1.9	5.7	2.6	5.5
Pskov region	32,473	2.2	5.8	6.8	1.7	3,. 9
St. Petersburg	64,265	2.7	4.5	2.7	1.3	4.0

Source: compiled from Federal State Statistics Service data.

Table 5. Values of the main indicators influencing the development of crisis phenomena

Northwestern Federal District	Share of urban residents in the total population, %	Demo-geographical potential of the region, people per 1 km^2	Poverty rate, %	Life expectancy at birth, years	Number of beds per capita	The number of employed people entering the region to work, % of the employed population of the region
Arkhangelsk region	78.5	53.5	12.5	72	5.2	1.01
Nenets Autonomous Okrugt	73.3	17.7	9.7	71.5	5.2	18.21
Vologda region	72.6	197.8	13.6	71.3	4.2	0.72
Kaliningrad region	77.7	45.4	13.7	72.6	4.4	0.45
Republic of Karelia	80.7	100.5	15.6	70.7	4.4	0.63
Komi Republic	78.2	47.1	14.9	71.1	4.3	4.33
Leningrad region	64.3	3414.9	8.4	72.5	2.3	2.09
Murmansk region	92.2	23.6	9.9	71.7	6,4	2.26
Novgorod region	71.3	407.4	13.8	69.7	2.8	0.79
Pskov region	71.7	190.7	17	70	3.3	0.38
St. Petersburg	100	1247.3	6.6	75.5	4.3	7.34

Source: compiled from Federal State Statistics Service data.

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Monetary policy in times of crisis: from the Great Recession to the Covid-19 pandemic

JEL Classification: *E52, E58*

Keywords: *expansionary policy, monetary stimulus, negative interest rates, centralized virtual currencies, balance sheet expansion.*

Abstract

Research background: The period (2012-2020) has been characterized by expansionary monetary policies consisting of low (even negative) interest rates and the expansion of central bank balance sheets. The growth of the money supply has not been passed on to the prices of goods and services (CPI) for the time being, but it has had an impact on financial markets in general and on public debt in particular. This situation may generate long-term imbalances such as public debt overhang, investment errors and higher inflation rates in the future. In recent years, many decentralized virtual currencies and new electronic means of payment have emerged, prompting many central banks to consider the creation of a centralized virtual currency.

Purpose of the article: The aim of this article is to analyze the monetary policy of the main central banks from the years following the Great Recession to the economic crisis generated by the Covid-19 pandemic. It will study the measures adopted by these entities to face both crises and will analyze the process of creating centralized virtual currencies.
Methods: Correlations between different macroeconomic variables will be shown through IBM SPPS Statistics. The linear correlation coefficient (Pearson) has been applied to relate monetary policy with different variables.
Findings & Value added: There is a strong correlation between monetary aggregates, government indebtedness and stock market capitalization in the main currency areas. The most important contribution of the article is the analysis of the long-term risks of expansionary monetary policies.

Introduction

The Covid-19 pandemic has caused a health and economic crisis in many countries. As is known, it started in December 2019 in the province of Hubei (China) and spread to other regions of the world in a very few months. Governments reacted by decreeing measures of confinement of the population and restriction of mobility to avoid the sanitary collapse in hospitals. On the economic front, various measures were approved (public guarantees, direct aid to families and companies, assumption of part of private sector payrolls, etc.) which are leading to an increase in public spending, financed mainly through the purchase of public debt securities by central banks. This article will analyze the monetary policies of the European Central Bank (ECB), the Federal Reserve (Fed) and, to a lesser extent, the Bank of Japan (BOJ) before and during the pandemic. There is some similarity between the central banks' reaction to the 2008 financial crisis, known as the Great Recession, and the ongoing response to the pandemic-generated crisis.

After the Great Recession, the major central banks adopted an expansionary monetary policy that has been boosted by the pandemic. In general, they opted for a strategy of reduced interest rates (Rogoff, 2017) along with the purchase of government (monetization of the fiscal deficit) and private debt securities. These monetary stimuli have expanded the balance sheet of central banks. Some countries, such as Germany and Spain, have even issued securities at negative rates. This unconventional phenomenon means that the creditor pays for lending and the debtor gets paid for borrowing. This is a subsidy to indebtedness and a policy that discourages long-term savings.

The Fed relied on asset purchase programs in the secondary markets through Quantitative Easing (QE). In 2012, the BOJ introduced the "Abenomics" program, a QE equivalent that sought to inject liquidity into the Japanese economy to address stagnation. This program is named after Shinzō Abe, who was the country's prime minister between 2012 and 2020 (Xing, 2020). The People's Bank of China (PBOC) continued its policy of devaluing the yuan in order to boost exports. In turn, in 2012, the then president of the ECB, Mario Draghi, announced that he would do everything possible to maintain the euro project in the face of the sovereign debt crisis that some countries were facing at the time. These expansionary policies were provoking a kind of "currency war" between the main currency areas.
The ECB introduced unconventional measures such as long-term loans to commercial banks, known as Targeted Longer-Term Refinancing Operations (TLTROs) and Long-Term Refinancing Operations (LTROs). TLTROs started in 2014. Then, in 2016, the second series was approved and in March 2019 the third phase started. The objective of this instrument is for banks to grant loans to households and companies, as they will be able to obtain more financing through this mechanism and at a more advantageous interest rate. In March and April 2020, the TLTRO-III conditions were improved. In addition, more operations were added to the LTRO program. This facility was created in 2011 and is intended to provide long-term financing to banks at a time when the interbank market was suffering. In April 2020, a new instrument was created to maintain liquidity flow, the PELTRO. It consists of a series of long-term refinancing operations due to the pandemic emergency, at a fixed interest rate 25 points below the reference rate, which is at 0%, i.e., it is a negative rate. The program matures in mid-2021. Thus, banks using this mechanism would be charged for borrowing from the central bank. In addition, the PELTRO does not have the conditionality required in TLTRO-III on the maximum amount that can be obtained.

As for asset purchases, the Asset Purchase Program (APP) was resumed in November 2019 and the Pandemic Emergency Purchase Program (PEPP) was launched in March 2020 with a €750 billion operation that was extended in June of that year.

In March 2020, the Fed lowered the reference interest rate in the interbank market to a range between 0% and 0.25%, continued with asset purchases (from 3.9 to 6.6 trillion dollars between March and December) and increased lending to financial institutions.

For the time being, the increase in the money supply has not had a significant impact on the Consumer Price Index (CPI), but it is possible that it will do so in the coming years. In this regard, the Bundesbank has warned

of the danger of an inflationary escalation following the release of the CPI data for January 2021. Specifically, the harmonized CPI for the eurozone stood at 0.9% (the previous year ended in deflation), but Germany's CPI reached 1.4%. If this risk were to occur in the short term, the ECB could act by raising interest rates, but this would increase the financial cost to the most indebted governments and could lead to a sovereign debt crisis. The harmonized CPI target is at 2% per year, although the monetary authority is trying to keep it close to, but below, that value, since the ECB's main task is to monitor price stability. The Fed, however, has a dual objective since, in addition to controlling inflation, it also has to promote economic growth and reduce unemployment. In August 2020, they changed their traditional target, which, like the ECB, was that CPI should not exceed 2 % per year. From that moment on, the target was made more flexible by taking an average of years as a reference, so that during an annual economic period it will be possible to exceed 2% to the extent that it is compensated in subsequent years.

The Fed has more room to issue than other central banks because the dollar is the international reserve currency and most international trade is conducted in its currency. Moreover, during the first stage of the pandemic, economic agents increased their liquidity needs and with it, the demand for euros or dollars, since they are strong currencies in the context of fiat currencies. This is not the case in countries that accumulated high inflation rates before the pandemic and where the demand for the local currency is very low. This is the case of Venezuela and Argentina. In these countries, the phenomenon of spontaneous (de facto) dollarization is increasing, as economic agents try to save and carry out their transactions in foreign currency in view of the depreciation of the local currency. In fact, this phenomenon is not recent, and many Latin American countries are semi-dollarized and, in some cases, (such as Panama, Ecuador and El Salvador); officially dollarized. This process of using a foreign currency in a country has also occurred in other regions. For example, Kosovo and Montenegro use the euro, although they are not part of the European Monetary Union (EMU), and South Africa's neighboring countries use the rand.

In recent years, a trend towards a reduction in the use of cash has been observed in certain developed countries (Fabris, 2019). In Europe, the countries where this phenomenon is most important are Sweden and the Netherlands. The rise of virtual means of payment is the main cause of this process. This is one of the reasons, along with the emergence of decentralized cryptocurrencies, why some central banks are planning the creation of a centralized virtual currency, known as Central Bank Digital Curreny (CBDC) (Griffoli et al, 2018). In the case of Sweden, the project to create a

digital krona (e-krona) is in pilot phase. However, a major economic power such as China launched its digital yuan project in four cities (Shenzhen, Chengdu, Suzhou and Xiongan) during the pandemic. One of the PBOC's goals is to boost international demand for the yuang and offer an alternative to private payment platforms such as Alichat or Wepay (Kim,2020). More such projects will be announced in the coming years (Mayer, 2019). In fact, in October 2020 the ECB published a report analyzing the objectives of the possible creation of the digital euro and the effects it would have on monetary policy and commercial banks. This sector could be affected if there is a banking panic and a move to the central bank's currency. In addition, the profitability of commercial banks is being squeezed by low interest rates and the sector is facing a very significant digital transformation process.

Although the impact of the pandemic has been very strong, the previous scenario was not the most appropriate. Some countries had entered recession and others were experiencing an economic slowdown. Among the main causes were the effects of the trade war between China and the US and the uncertainty generated by brexit. In fact, some indicators such as the Purchasing Managers Index (PMI) or the inversion of the yield curve in the US showed that 2020 could be a year of crisis. In this sense, Covid-19 could be considered the definitive trigger.

Stimulus policies during the pandemic are stabilizing financial markets in the short term, but, if perpetuated, could lead to a problem of public over-indebtedness, investment errors and inflation. In the eurozone, some politicians and academics have planned to cancel the debts issued during this period of health crisis. This idea has been rejected by the ECB as it would have a very negative impact on its balance sheet and on the international exchange rate of the euro (Okano & Eguchi, 2020).

The hypothesis put forward in this article is that, although monetary stimuli (asset purchases and low interest rates) have not generated a significant increase in the CPI for the moment, they are causing a dis-torsion in the financial markets and excessive government indebtedness. Moreover, they have not led to significant growth in Gross Domestic Product (GDP) either.

Research methodology

A bivariate correlation analysis is performed by applying Pearson's correlation coefficient using IBM's SPPS Statistics program (Taguchi,2018). The linear correlation coefficient has been applied. This coefficient is intended to determine what is the degree of intensity that exists between two data or

variables. Therefore, the linear correlation coefficient is used to check when the relationship between two variables is linear and is called Pearson's correlation coefficient and is part of a statistic whose purpose is to check the intensity that exists between the two variables that it aims to define. The coefficient ranges from -1 (perfect negative correlation) to 1 (perfect positive correlation). If the result is 0, it indicates that there is no relationship between the variables. This method serves to relate monetary policy to different variables has been widely used in the economic literature as shown by the studies of (Guerello, 2018) and (Kenourgios et al, 2019) for the Eurozone.

Results

Figure 1 shows the trend towards lower interest rates. In the case of Japan, official rates are negative (-0.10%). The ECB maintains them at 0%, but some governments, such as Germany and Spain, have issued debt at negative rates. In the case of the Fed, there was a rise in the benchmark rate between 2007 and 2019 and it was subsequently lowered. The BPOC, although it has higher rates than the rest of the central banks, has also reduced them in recent years.

Analyzing the evolution of the Fed's assets (Figure 2) shows a significant expansion since September 2019, i.e., before the pandemic, although it has increased after the health crisis. During the 2017-sept 2019 period, there was a reduction in the balance sheet (tapering) until the Fed injected liquidity into the market to support commercial banks due to a crisis in the repo market.

As for the ECB's balance sheet, Figure 3 shows a significant expansion consisting of liquidity injection to buy securities and grant loans to banks in the Eurozone.

Table 1 shows the results of the correlations performed. First, the correlation between M2 (Japan) and M3 (Eurozone and USA) with debt to GDP is shown. In the Eurozone, M3 and debt over GDP are positively correlated (0.691), so that as M3 grows, debt grows. This is also the case in Japan and the USA where the growth of M2 and M3 respectively also generates a growth of debt over GDP (0.345 and 0.915) respectively.

Second, we observe the correlation between M2 (Japan) and M3(Eurozone and USA) with CPI. In both the Eurozone and Japan, we find a negative correlation (-0.271 and -0.420) respectively. This means that M2 and M3 growth is not generating inflation. In the case of the USA the correlation is positive (0.314) but weak.

Third, we observe the correlation between M2 (Japan) and M3 (Eurozone and USA) with the rate of change of GDP. In all three cases (Eurozone, USA, and Japan) the correlation is negative (-0.751, -0.754 and -0.840) respectively. This means that the growth of M2 and M3 is not causing GDP growth, as both variables vary in different directions.

In fourth and last place, the correlation between M2 (Japan) and M3 (Eurozone and USA) with the selected stock market indexes is observed. In both the Eurozone and Japan, a positive correlation is observed (0.680 and 0.622) respectively. In the case of M3 and the capitalization of the Dow Jones, a positive correlation is also observed (0.552).

This means that both variables vary in the same direction and that therefore a growth of M2 and M3 brings with its growth of the bourgeoning index.

Conclusions

Central banks have reacted to the Covid-19 pandemic with monetary stimulus policies based on the purchase of securities to finance governments and certain companies. These policies were already underway before the pandemic, as shown by the expansion of balance sheets and low interest rates during the period (2012-2019) but have been boosted by the economic crisis. The rise of digital means of payment and decentralized cryptocurrencies coupled with the trend towards cash reduction in certain countries has led many central banks to consider the creation of a centralized virtual currency. Although a certain loosening of monetary policies can be understood in the context of a crisis, it can generate important imbalances that can aggravate the situation in the long term.

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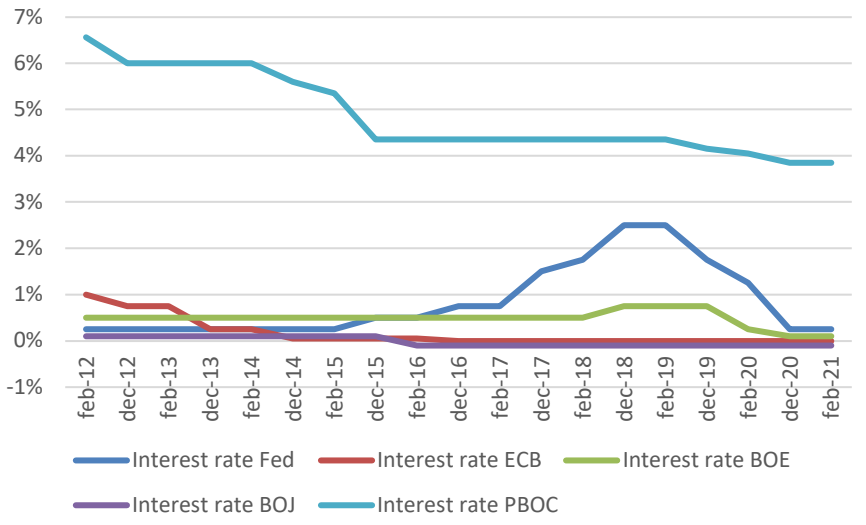
Annex

Table 1. Correlations between M2-M3 and Debt/GDP, CPI, GDP variation rate and selected stock index.

Correlation M2-M3 with Public debt			
Pearson Correl.	P. Debt /GDP U.S.	P. Debt/GDP Eurozone	P. Debt/GDP Japan
M3 Eurozone	0.537	0.691	0.188
M3 Fed $	0.915	-0.737	0.793
M2 Japan	-0.081	0.087	0.345
Correlation M2-M3 with CPI			
Pearson Correl.	CPI Eurozone	CPI USA	CPI JAPAN
M3 Eurozone	-0.271	0.276	-0.663
M3 Fed $	-0.321	0.314	-0.284
M2 Japan	-0.404	0.219	-0.42
Correlation M2-M3 with GDP variation rate			
Pearson Correl.	Annual GDP V.R. USA	Annual GDP V.R. Japan	Annual GDP V.R. Germany
M3 Eurozone	-0.808	-0.834	-0.75
M3 Fed $	-0.754	-0.815	-0.694
M2 Japan	-0.941	-0.84	-0.804
M2-M3 Correlation with selected Stock Market Index			
Pearson Correl.	Dow Jones	Nikkei 225	DAX
M3 Eurozone			0.68
M3 Fed $	0.552		
M2 Japan		0.622	

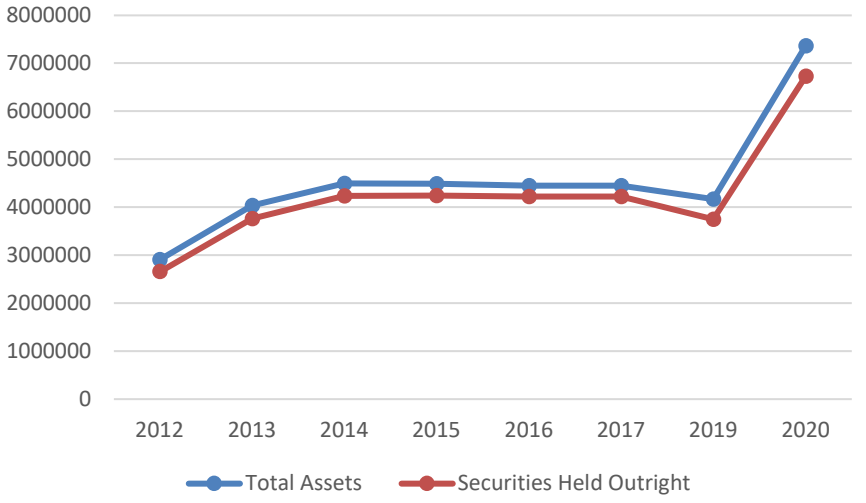
Source: own elaboration using IBM SPSS Statistics 27 and data extracted from ECB, Fed, BOJ and IMF.

Figure 1. Interest rate trends (2012-2021)



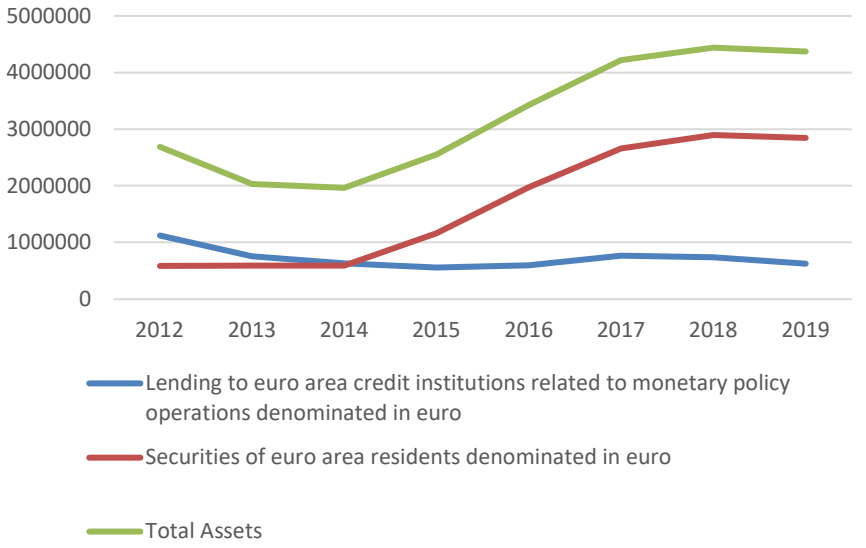
Source: own elaboration with data from the Fed, BOJ, ECB, PBOC and BOE.

Figure 2. Evolution of Total Assets and securities owned by the Fed (2012-2020).



Source: own elaboration, data from the Fed. Data are in millions of dollars.

Figure 3. Evolution of ECB assets (2012-2019)



Source: own elaboration with ECB data. Data are in millions of euros.

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The role of aid funds in supporting the functioning of SMEs in Poland during the pandemic

JEL Classification: *A10; D22; E22; E44; G00*

Keywords: *economics; firms; finance; capital; money market*

Abstract

Research background: The SME sector is the engine of the economy in Poland because it generates a number of jobs, stimulates the market and increases the level of competitiveness of the regions. Moreover, the described sector is less affected by the effects of any crisis. Especially during a pandemic, attention should be paid to entrepreneurs in this area and the financial support of their activity. Hence, the article discusses the financial aid given to this sector with particular focus on the subsidizing wages.
The article consists of three parts. The first theoretical one, which is an introduction to the subject of the SME sector and its importance for global economy. The second part presents the possibilities of obtaining financing by micro, small and medium-sized enterprises during the pandemic. Part three describes the importance of financial aid provided for the SME sector. For the sector, it is particularly important to maintain the employment. Thus, particular attention should be paid to the financing of workers' wages under the anti-crisis shield.
Purpose of the article: The aim of the article is to present the sources of financing using aid funds of micro, small and medium-sized enterprises in Poland, during the pandemic with the special focus on the co-financing the employees' wages, in order to counteract the negative effects of the pandemic.
Methods: The following methods are employed: literature review on the subject, analysis of data available at the Local Data Bank of the Central Statistical Office of Poland (GUS), empirical analysis, inference method, analysis of interviews, government documents and the method of deduction.

Findings & Value added: A detailed analysis of the acquisition of financing by SMEs in Poland during the pandemic will show how significant the funds are for the sector in question, in particular in the field of financing salaries.

Introduction

Motivation: Micro, small and medium-sized enterprises are an extremely important sector of the economy Especially in Poland, where they generate almost three quarters of gross domestic product. Analogously, the described sector creates a significant number of jobs, and thus is an important element for all citizens. At the European Union level, SMEs are a determinant for the creation of entrepreneurship policy. According to the European Commission SMEs and entrepreneurship are the determinants of economic growth, innovation, generating new jobs and global integration in the EU society (Eurostat Statistics).

Therefore, the subject of research will be the sector of micro, small and medium-sized enterprises, because they constitute such an important element of the economy. Since the outbreak of the COVID-19 pandemic, this sector has undergone a significant test in terms of continuing to operate. In response to the situation, the state proposes financing under the anti-crisis shield.

The possibility of additional financing during the pandemic is a pillar for the maintenance of the business activity of the enterprises in question in the economic market. The analysis shows that the aid offered is extremely desirable among entrepreneurs. Of the possible forms of support of the SMEs, it is particularly important to subsidize the salaries of employees. In the article the area of financing of the SME sector under the anti-crisis shield is described, and more precisely subsidies to employees' salaries, the problem of which had not been previously undertaken by researchers. Hence the research question has been formulated: which of the proposed directions of support under the anticrisis-shield is most desirable among entrepreneurs from the SME sector in Poland?

Aims: The aim of the article is to present the sources of financing using aid funds of micro, small and medium-sized enterprises in Poland, during the pandemic with a special focus on the co-financing the employees' wages, in order to counteract the negative effects of the pandemic.

Methods: The analysis used a literature review on the subject, data available at the Local Data Bank of the Central Statistical Office, as well as empirical analysis, inference method, interview analysis, government documents and the method of deduction.

Article Sections: The article consists of three parts. The first theoretical one, which is an introduction to the subject of the SME sector and its importance for global economy. The importance of the sector in question for the Polish economy was presented. The second part presents the possibilities of obtaining financing by micro, small and medium-sized enterprises during the pandemic and presents the conditions for obtaining the financing. Part three describes the importance of financial aid provided for the SME sector, where it is particularly important to maintain the employment. Thus, particular attention should be paid to the financing of workers' wages under the anti-crisis shield.

Litereture review

The importance of the SME sector is widely emphasized in the literature on the subject. Anna Marciniuk-Kluska stresses that micro, small and medium-sized enterprises are of strategic importance for the economy of each country. Statistically, they generate more than half of GDP in most countries, and also employ more than half of all people working in a given country. Hence, it is so important to support entrepreneurship and create new business entities (Marciuniuk-Kluska, 2016).

At the same time, researchers, like Cibela Neagu, emphasize that the sector of micro, small and medium-sized enterprises is the most attractive and innovative system. Some contribution of the sector the economic development is repeatedly emphasized and unanimously stated (Neagu, 2016).

The importance of the SME sector for the economy has already been discussed in the last decade. In 1995, Mulhern described the development perspective of the sector due to its noticeable increase (Muhlern, 1995). Peter Drucker, emphasising the importance of this sector, also agreed with the above statement. His views on the importance of SMEs for the economy are in line with those of other researchers (Wilk, Drucker, 2006).

In 2018, there were as many as 1,729,223 SMEs in Poland, the breakdown is presented in the figure below.

According to numerous studies, like Andrzej Wilk's and Peter-Drucker's articles, financing of SMEs is a critical constraint on the development of the sector. Entity owners often manage their working capital ineffectively, while bad flow of information between banks and entrepreneurs implies extension of the loan application process by economic entities. Due to the lack of the adequate volume of capital, the further growth in the sector of micro, small and medium-sized enterprises is noticeably hampered. Ac-

cording to some researchers, governments should not provide direct funding to entrepreneurs (Abe, Troilo, Batsaikhan, 2015).

The COVID-19 pandemic has a profound impact on the operations of the sector, micro, small and medium-sized enterprises. There are also broad political implications. The sudden onset of the pandemic was a shock to the economy and entrepreneurs. The above events have a long-lasting effect on the activities of economic entities. In the long term, SMEs will face a broad spectrum of challenges in terms of economic change and many new regulations (Juergensen, Guimon, Narula, 2020).

The pandemic poses a huge challenge for entrepreneurs and the economy around the world. A study from December 2020 advances the thesis that female entrepreneurs are particularly affected by the pandemic situation and the lack of access to financing. On the other hand, according to media reports, the sectors directly related to entertainment, i.e. the hotel industry, gastronomy and travel agencies, suffered the most. The pandemic also negatively affects workers, the possibility of infection makes them fearful (He, Mao, Morrison, 2020).

According to the PARP's Report, the sector of economic entities generates about three quarters of the Polish GDP, i.e. 72,3%. While SMEs generates 49,1%. The largest of them are microenterprises, which are responsible for 30,3% of GDP (Skowrońska, Zakrzewski, Łapiński, 2020).

In line with SME policy, there is a skills, innovation and internationalization gap in Poland. Hence, action is taken to introduce new and to develop existing policy measures. The above-mentioned activities are important for the competitiveness of Polish SMEs. Much of the activities are focused on the legal framework (deregulation), more favorable administration and digitization of all services (European Commission, 2019).

The literature on the subject indicates the basic functions of the micro, small and medium-sized enterprises sector. They are centers of innovation and centers of entrepreneurship. As innovation centers, SMEs widely promote innovation, provide pro-innovation services, and support cooperation in the field of science and business (Gorączkowska, Tomaszewski, 2019).

Sources of SME financing in Poland

The SARS-CoV-2 pandemic has put sectors to the test. SMEs in particular suffer from its negative effects. In response to the lack of financing for current operations, the government allocated funds to entities under the anti-crisis shield. The Polish anti-crisis shield has been approved by the European Commission. The Polish aid program, worth PLN 500 million in

April, to support the economy in the context of the SARS-CoV-2 pandemic has been response to the situation in the country. The funds from the country were to satisfy 3 thousand companies operating in Poland in the context of liquidity and economic activity (European Commission, 2021a).

According to the Ministry of Family and Social Policy, at the beginning of June 2020, Polish entrepreneurs have already received about PLN 23.8 billion as part of the instruments provided under the anti-crisis shields. Financing for Poland includes, among others, wage subsidies, the Guaranteed Employee Benefit Fund, inactivity allowance, loans, which is presented below. Managers emphasize that the above support is extremely important in order to maintain the conducted activity and employment level (Serwis Rzeczpospolitej Polskiej, 2021).

Receiving financing from the Guaranteed Employee Benefits Fund is associated with incurring downtime or reducing the working time. Popular financing are also low-interest loans for micro-entrepreneurs up to the amount of PLN 5,000. PLN, for purposes related to covering the costs of running a business.

The European Commission approved a modification of the Smart Growth Operational Program in Poland. EUR 314.5 million was transferred to support the SME sector in the country. Summing up the above amount with the funds allocated to the financing of the SME sector, it generates as much as EUR 841 million of support in the field of working capital in the micro, small and medium-sized enterprises sector, in the form of grants and financial instruments. The above-mentioned financing accounts for 92% of all funds allocated to business entities fighting with the negative effects of the SARS-CoV-2 pandemic in Poland. According to forecasts, support will be granted to over 7,200 enterprises, of which 20% are entities from the Mazowieckie voivodship. Mazovia is the region most affected by the coronavirus pandemic, as there is a relatively large number of companies in this region that employ a much larger number of people. At the same time, the European Commission makes it possible to relocate funds between categories of regions. Mazowieckie voivodship received EUR 75.2 million. Additionally, this Operational Program aims to support research related to the SARS-CoV-2 epidemic. Among the beneficiaries of the OP Smart Growth, who conduct research in the field of developing an innovative platform for inducing a cellular response to the virus and aimed at introducing a unique approach to vaccines (European Commssion, 2021b).

The initiative to invest in the European Union, which was the result of the outbreak of the pandemic, made it possible for Poland to use the help from the European Regional Development Fund to maximally accelerate and flexibly respond to the needs in the most vulnerable sectors. SMEs are

among the sectors most affected by the pandemic (European Commssion, 2021b).

The report of the Central Statistical Office shows decreases in the use of the night base in Poland in October and November 2020. According to the analysis, the estimated decrease in the number of tourists, using night establishments, in centers with less than 10 beds, in November 2020 was 78.9% compared to the previous year. On the other hand, in October 2020, compared to the same month in 2019, there was a decrease by 46.8% in the use of accommodation services. Even taking into account only domestic tourists, without people coming from abroad, the decrease in this period was as much as 40,7%. The above data shows how much the tourism industry suffered during the pandemic. The Smart Growth OP operates in order to optimally use the program allocation and to counteract the economic effects of the pandemic by providing the sector of micro, small and medium-sized enterprises with liquidity and supporting research on SARS-CoV-2 (European Commssion, 2021b).

Activities under the anti-crisis shield are extremely dynamic. The last update took place on September 22, 2020 and included activities under the anti-crisis shield 5.0, the provisions of which entered into force on October 15, 2020. They included assistance for the tourism industry particularly affected by the pandemic (KPMG, 2021).

The conditions for obtaining financing under the anti-crisis shields include elements such as a decrease in turnover or maintaining the conducted activity (KPMG, 2021).

The importance of financing from the anti-crisis shield for the SME sector

The aim of the Polish anti-crisis shield is to protect entrepreneurs, jobs and consumers, protecting economic entities from the negative consequences of the SARS-CoV-2 pandemic. The introduced provisions constitute financial facilities for local governments, contractors and awarding entities in the scope of undertaking public procurement. The shield also introduces subsidies to the interest on bank loans in relation to companies. In addition, people who have lost their current source of income can get the so-called credit holidays. The goal of government actions is to protect some Polish companies, employees and consumers. The act in question was drawn up by the Ministry of Development together with the Chancellery of the Prime Minister, the Ministry of State Property, the Ministry of Finance and many other institutions. All solutions proposed under the anti-crisis shield were intro-

duced during the active dialogue with employees' representatives, entrepreneurs and local governments. According to the Deputy Prime Minister the regulation introduces solutions for economic entities that have encountered the crisis in order to survive in the crisis and to secure jobs. The ruling party emphasizes in its statement the effectiveness of the anti-crisis shield introduced on the market, as well as its constant improvement (GOV.PL, 2021 b).

According to the Central Statistical Office presenting the impact of COVID-19 on selected elements of the labor market in Poland in the first quarter of 2020, 24.4% of jobs were lost during this period due to the global pandemic in Poland. The layoffs of employees, in connection with the above-mentioned liquidation of jobs, took place in all sectors. Hence, co-financing of remuneration for employees under the anti-crisis shield is so important for the economy, because the conditions for obtaining this financing include the condition that it is not possible to dismiss an employee covered by the subsidy (GUS, 2020).

In addition to supporting entrepreneurs, the anti-crisis shield also offers some security measures for local governments that currently record lower incomes, also from taxes. The possibility of postponing payments of local government units to the State Treasury was also introduced under specific circumstances. Another facilitation is the facilitation of tender procedures, which allow for easier implementation of procedures during the pandemic and improve the situation of public procurement contractors. The introduced changes are aimed at reducing costs and improving financial liquidity already at the time of order fulfillment. Under these provisions, the obligation to provide collateral in excess of the EU limits is abolished, the introduction of partial payment of remuneration and the payment of advances, under conditions that meet the EU and time limits. The anti-crisis shield also introduces a reduction in the amounts of guarantees granted to contractors, restrictions on the possibility of deducting contractual penalties from the contractor's remuneration or other obligations, as well as other solutions facilitating the functioning of economic entities on the market affected by the pandemic. Additionally, in a situation where the SARS-CoV-2 pandemic had a negative impact on the proper performance of the contract between contractors, it is possible to renegotiate it (GOV.PL, 2021 b).

Another solution for financing SME sector is loans with interest reduced by government subsidies. The proposed instruments provide the entrepreneur with financing of working capital, and thus ensure financial liquidity. In addition, the state gives the right to individual employees who have lost their job or the main source of income to withhold loan repayment for a period of 3 months without charging additional interest and fees. Support

for entrepreneurs also exists in terms of maintaining employment, wage subsidies are introduced, for people affected by the negative effects of the pandemic, exemptions from the obligation to comply with collective labor agreements or remuneration regulations (GOV.PL, 2021 b).

Acquiring financing for the anti-crisis shield has not only numerous advantages. There are also visible disadvantages. The advantages include the possibility of maintaining employment, maintaining business, the ability to pay current liabilities to contractors, and financing additional precautions necessary during the pandemic. There are also disadvantages in the area of receiving and obtaining financing among entrepreneurs. The most noticeable is the need to provide services as part of obtaining financing through qualified, responsive staff who are diligent in terms of deadlines and ensure their compliance, because failure to submit certain elementary documents within predetermined deadlines may involve the need to return the obtained financing. The state takes steps to minimize the necessary documentation, while entrepreneurs still have to be prepared, have documents paid for with the funds obtained from the financing and settlements during the audit of the company's balance sheet or possible financial controls.

As already mentioned, we can find many studies in the field of defining the micro, small and medium-sized enterprises sector and the importance of the entities presented for the functioning of the economy of individual countries. The description of the sector of the economy in question can be found both in the literature and in the studies prepared by the Central Statistical Office and in numerous reports of the European Commission. At the same time, the authors often focus their research on the innovativeness of the micro, small and medium-sized enterprises sector and on the methods of its financing, as SMEs are a specific engine of regional economic development.

In the situation of the global pandemic caused by the SARS-CoV-2 virus, the EU countries have provided for additional financing for entrepreneurs, through the use of many mechanisms, both in terms of obtaining financing by economic entities, as well as through the implementation of concessions for businesses, i.e. temporary suspension of installments credits. Currently, there are no compact studies describing the results of entrepreneurs receiving subsidies under the anti-crisis shield in Poland.

Research methodology

The aim of the article is to present the sources of financing using aid funds of micro, small and medium-sized enterprises in Poland, during the pan-

demic with a special focus on the co-financing the employees' wages, in the order to counteract the negative effects of the pandemic.

In the article author looks for the answer to the research question, which of the proposed directions of support under the anticrisis-shield is most desirable among entrepreneurs from the SME sector in Poland.

The purpose of the article is to discuss the research question which of the proposed directions of support is most desirable among entrepreneurs from the SME sector.

The research hypothesis that the financing proposed by the state for the sector of micro, small and medium-sized enterprises in Poland, in terms of co-financing of employees' wages, supports their further functioning in the pandemic economic reality and supports the maintenance of the employment volume in companies is verified. Wage financing under the anti-crisis shield is particularly important as employees are the company's value.

Results

In the research on the sector of micro, small and medium-sized enterprises, the method of critical analysis of the literature was used. According to the publications, SMEs account for about 99% of all companies, hence research on the condition of the sector enjoys growing interest among researchers. In addition, the following methods were used to verify the question and research hypothesis: literature review of the subject, data available at the Local Data Bank of the Central Statistical Office of Poland and empirical analysis, inference method, interview analysis, government documents and the method of deduction (Prashar, Sunder, 2020).

Certainly, the strength of the application of the method of critical content literature is the analysis of the current literature on the subject, scientific works, popular science studies, press articles or interviews. The content analysis allows for the acquisition of an up-to-date view on the research subject, and the positions of the CEOs of companies presented in the article show the real view of entrepreneurs on the application of the anti-crisis shield in the companies they manage. The conducted analysis shows the social and scientific importance of the examined issue, which is the financing of the sector of micro, small and medium-sized enterprises as part of the anti-crisis shield. However, the method used does not allow to fill the gap, which is to show the importance of financing for SMEs in a global perspective. The topic of the emerging global pandemic is an area that will still be widely explored. On the other hand, economic entities only after the closure of the reports for 2020 will be able to determine the results of the year and refer to specific values to determine to what extent financing helped to maintain the conducted economic activity.

Discussion and conclusions

The impact of new regulations under the anti-crisis shield on economic entities in Poland is presented in the basic on examples of the following companies Telemex and PKS Nova. This companies present SMEs from the same industry related to the transport and represent the same size of the sector. Companies in the transportation sector were selected as comparable, because information on this topic was available. Co-financing in the field of remuneration for employees is available for entities that meet certain conditions. The entity applying for financing must record a decrease in economic turnover by at least 15%, calculated in relation to the turnover in any given 2 consecutive months in 2020 compared to the total turnover of 2 consecutive months of 2019 or must show a decrease in turnover by at least 25% in relation to any month in 2020 in relation to the previous month of the same year. Basically, the economic entity applying for financing must also not be in arrears in terms of tax liabilities, social security, etc. During the period of receiving the grant for a given employee, the employer cannot terminate the employment contract for reasons not related to the employee. Co-financing is granted in the amount of 50% of the minimum wage, i.e. PLN 1,300 gross, in the event that an economic entity reduces the remuneration of employees who cannot work due to COVID-19 by no more than 50%, despite their readiness to work - economic downtime. There is also an option to subsidize up to half of employees' remuneration, but not more than by PLN 2,079.43 gross per employee, if the employer reduces the working time of employees by a maximum of 20%, but only to 0.5 full-time (CMS, 2020).

The president of PKS Nova states that after the announcement of the pandemic, the company's turnover dropped dramatically. The transportation industry is another segment of the country's economy that has been adversely affected by the pandemic. The president of Nova indicates that some long-distance routes have been suspended due to the safety of travelers and drivers. The above-mentioned actions also imply the possibility of losing a job by the employees of the Nova company, which analogically translates into the family life of employees and the emergence of emotional problems. Hence, the president of Nova points out that not only the fear caused by the epidemiological situation poses a threat to employees, but also the anxiety that builds up among them about possible job loss. The above situation causes depression and apathy in the society. The entrepreneur emphasizes that the Company must remember that human resources constitute the employer's value (GOV.PL, 2021 a).

The anti-crisis shield in Poland made it possible to subsidize some of the costs of employees' salaries and their social security contributions. The president of Nova emphasizes that the above support is a key response to the company's needs in terms of maintaining the employment level. Nova received financing for employees affected by economic downtime and shortened working hours. The support in question made it possible to maintain employment for all employees of the company, precisely 707 people. Andrzej Mioduszewski assures that the company will continue to try to maintain employment, while counting on additional aid instruments (GOV.PL, 2021 a).

Another company that received financing to maintain employment is Telemex. The main activity of the company is furniture production, transport and forwarding. The company's president, points out that wage subsidies helped the company to survive the crisis caused by the pandemic. The entrepreneur emphasizes that the company's turnover fell by 40 percent and customers withheld their orders. The president considered a reduction in employment, while thanks to financing under the crisis shield and limiting employees in terms of working hours, it was possible to retain the current workforce (GOV.PL, 2021 a).

According to the critical analysis conducted and based on the example of PKS Nova and Telemex, financing under the anti-crisis shield granted by the Polish government made it possible to continue business. Co-financing of the employees' wages and salaries from the analyzed enterprises made it possible to maintain employment. Maintaining jobs in companies, in the special situation of the pandemic, is one of the most important elements for business entities, apart from maintaining the conducted activity. The above solutions confirm the hypothesis that the financing proposed by the state for the sector of micro, small and medium-sized enterprises in Poland supports their further functioning during the pandemic.

Financing proposed by the state, in particular regarding wages, according to the conducted analysis based on interviews, is an effective support for the further functioning of enterprises. The analysis confirms that support and financing for employees' wages is important for entrepreneurs and meets their needs. In addition, the funds in question also protect the interests of employees, as there are additional restrictions with regard to maintaining employment among employees for whom the entities received funding.

The coronavirus pandemic that appeared suddenly in the world poses an extremely serious challenge to the global economy. Hence, research in its scope is extremely important, as well as counteracting its negative effects. The first step is to stop the path of a wide spectrum of infections, and then

targete measures to finance enterprises, especially the SME sector, which is strategic for the economies of individual countries (Welfens, 2020).

The presented analysis shows that financing under the anti-crisis shield allows you to maintain employment in micro, small and medium-sized enterprises. On the other hand, further research and analysis should be carried out on the importance of anti-crisis funding following the publication of the financial statements. After closing the balance sheets of companies, it will be possible to carry out further research and compare the amount of subsidies granted in specific economic entities and compare how the subsidy to employees' wages translated into the volume of employment in a longer period of time.

According to the article of a team of scientists from August 2020, it was indicated that further research should be undertaken in the field of state intervention in the functioning of the economy in order to predict possible economic consequences for citizens of states, companies and the entire society (Wankmüller, Rass, Wall, 2020).

The researchers emphasize that the current crisis related to the pandemic may have an even wider spectrum than the crisis of 2008 and present the mechanisms that mediate the configuration of the economy globally (Coveri, Cozza, Nascia, Zanferi, 2020).

The European Commission introduced drastic changes in its forecasts, both economic and budgetary. The economy is predicted to contract by 8.7%. It has been shown that the optimistic scenarios for 2021 show that the GDP growth will be at the level of 6.1%. The situation of the global pandemic will have an impact on the global economy, therefore extensive analyzes should be made in this area and research on the subject matter should be undertaken. This topic is widely discussed on research conferences, where is presented the situation related to the SARS-CoV-2 virus (Truger, Gros, Costantini, Brooks, Fortun, Haupteier, Leiner-Killinger, 2020).

To sum up, research into solutions for combating the COVID-19 pandemic and financing the activities of entities in this period is extremely important in order to avoid negative solutions. Christian Wankmüller refers to this unique situation in which documents are presented in the field of managing natural disasters in terms of stopping the further spread of the virus and showing the currently used ineffective solutions (Wankmüller, 2020).

The research hypothesis that the financing proposed by the state for the sector of micro, small and medium-sized enterprises in Poland, in terms of co-financing of employees' wages, supports their further functioning in the pandemic economic reality and supports the maintenance of the employ-

ment volume in companies is positively verified. According to the analysis carried out on the example of PKS Nova and Telemex. The article presenting interviews with company CEOs shows that the remuneration financing allowed to maintain the conducted activity and current employment. However, the analysis undertaken does not present the full picture of the functioning of the SME sector after receiving funding. After finalizing the annual reports, entrepreneurs will be able to conduct further research on the effectiveness of aid instruments, which can be presented using economic measures.

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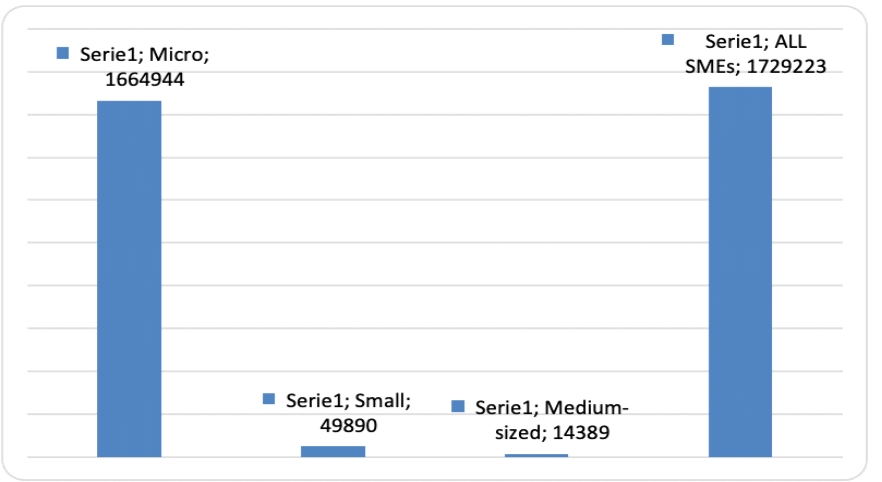
Annex

Table 1. Anti-crisis shield - selected forms of financing

Name of financing	Description
Co-financing part of the costs of remuneration for employees and the social security contributions due from these remuneration	For companies, we are seeing a decrease in turnover. Paid on a monthly basis. Financial arrears related to the payment of taxes and social security contributions, health insurance, the Guaranteed Employee Benefit Fund, the Labor Fund or the Solidarity Fund by the end of the third quarter of 2019.
Subsidies to employees' salaries in the event of an economic downtime	Support is granted to entities that recorded a decline in economic turnover, do not meet the conditions for bankruptcy and are not in arrears with the settlement of public law obligations until the end of the third quarter of 2019. The subsidy covers the financing of payments of employees affected by economic downtime or shortened working hours. The employer must sign an agreement with trade unions or employee representatives.
Working capital loan to finance a working capital deficit	For the company who has a deficit in working capital and in 2019 it had a turnover of over PLN 4 million.

Source: own studybased on GOV.PL (2021) https://www.gov.pl/web/tarczaantykryzysowa/srednia-firma-do-250-pracownikow

Figure 1. Number of SMEs in Poland in 2018



Source: own studybased on Statista (2021c) https://www.statista.com/statistics/818716/small-and-medium-sized-enterprises-poland/

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Developing methods to assess the public value of research

JEL Classification: *C52; H43; I20; O30; O35*

Keywords: *Public value of research, Research impact, Assessment methods, Social sciences, Basic and applied research*

Abstract

Research background: Currently, in many countries, research evaluation systems are being improved, which apply not only to individuals and teams carrying out these studies but also to scientific institutions. The impact of scientific research on the economy and society is evaluated, and this assessment is run within individual scientific disciplines and fields. This type of evaluation is important since its results often determine the position of scientific institutions in relevant rankings and the level of public funding granted. Despite the existence of some useful approaches and methods, there are difficulties in making assessments for research conducted within the social sciences field and individual disciplines within it.
Purpose of the article: The article aims to present the results of the literature review on the approaches, methodological frameworks and methods of assessing the public value and impact of research conducted within social sciences, and especially in economics, business and management.
Methods: Basic bibliometric methods were used in the analysis of the literature and data was collected applying the Web of Science multiple databases. The research used performance indicators, such as e.g. the number of publications, total number of citations, sum of times cited per year and organizations enhanced.
Findings & Value Added: The obtained research results made it possible to identify the key journals as well as outline the state of knowledge regarding approaches and methods to assess the public value and impact of research in economics, business and management. The thesis about the lack of universal coherent methodological frameworks and methods for carrying out this assessment has, to some extent, been positively verified. This created the basis for continuing research in the area and

proposing possible directions for the development of methodological studies on building new approaches, frameworks and methods.

Introduction

Successful research, which is financed from public funds, necessitates professional management to meet the complex challenges related to the need to properly support and finance interdisciplinary activities of people caring for the positive social impact of the results of conducted research (Schuetzenmeister, 2010). Effective delivery of this type of 'mature research outcomes' and ensuring the adequate public value of research requires management focused on the personal development of individuals who should become leaders of research in individual institutions and leaders in research conducted in various fields and scientific disciplines (Olsson & Meek, 2013).

The public value of research is stated and articulated through impact (Watermeyer, 2012). The notions of public value of research and impact are not the same as the traditional understanding of quality of research and therefore separate evaluation criteria are introduced for these two areas. The criteria for the first one relate to impact assessment outside the scientific community. In line with the presentation of this kind of assessment in the literature, value of research indicators can be analyzed at various levels (scientific, social and political), and the conducted research can generate significant changes not only in science but primarily among the general public (Reale et al., 2018). In particular, societal research impact plays a growing role and there is pressure from science policy makers and institutions dealing with co-financing of scientific and research activities on the practical approaches for measuring public value (Hills & Sullivan, 2008). Thus, the use of assessment systems enabling the estimation of the societal impact resulting from conducted research by individual scientists, teams of scientific workers and institutions that employ them is necessary. This impact can be identified with changes resulting from the obtained outcomes of the research and affect the increase in scientific competitiveness of individuals and institutions, improving the efficiency of the economy, as well as enhancing the productivity and well-being of the general public (Reale et al., 2018).

Due to the great importance of the assessment of the public value of research, universal methods as well as those aimed at specific fields of science are developed. In the case of hard sciences and Science, Technology, Engineering, and Mathematics (STEM) disciplines, simple to use indicators can be e.g.: number of patents, technology transfer, research-based spin-

offs as well as research on emerging technologies, research results commercialization and license incomes. However, research on social sciences and individual disciplines under this field is particularly interesting, because it is difficult to choose objective indicators and assessment criteria in contrast to these used within technical sciences.

It is important to utilise methods that can be the basis for reliable operationalization and researching societal impact measurements e.g. based on quantitative metrics with the use of bibliometric research assessment (Petersohn & Heinze, 2018) and multiscale models (Benneworth, 2015). Researchers are increasingly interested in issues regarding the possibility of determining typology of approaches and methods of assessing social impact, as well as capturing the diversity of mechanisms for measuring the impact of social research under Social Sciences and Humanities (SSH) (Muhonen, Benneworth & Olmos-Penuela, 2020). In practice, there is a well-established belief about the lack of opportunities to conduct objective assessments of scientific research as part of social sciences, especially in countries just introducing new evaluation systems. Contrary to appearances, in social sciences, the achievements in developing such methods are significant, and getting to know the state of knowledge can build the basis for further progress of methodological research in this field. The paper aims to present the results of the literature review on the approaches, methodological frameworks and methods of assessing the public value and impact of research conducted within social sciences, and especially in economics, business and management.

Assessing the Public Impact of Research

The logical structure of the activities of scientific research and R&D projects as well as the long-term effects and impact are important issues related to the field of evaluation (Grzeszczyk, 2018). The existence of research impact and public value of research should be demonstrated and proven by measuring with the use of indicators and available assessment methods. The measured impact can relate to society, subjective well-being, quality of life, economy, environment, climate, health, culture and others. The measurement of the generated impact should take into account the transfers of interdisciplinary knowledge, vast experiences and dependencies between varied actors within rich ecosystems, and this impact can be classified and measured in the following five ways (Meagher & Martin, 2017):

- instrumental impacts - products and services resulting from research that may be useful to policy makers, practitioners and various types of organizations,
- conceptual impacts - new understanding and raising awareness of potential recipients of research results,
- capacity building impacts - developing collaborative abilities and training,
- attitude or cultural change - supporting the exchange of knowledge between individuals and institutions,
- enduring connectivity - building long-lived external relationships.

Different systems of evaluation methods are being developed in various countries, but there are particularly inspiring examples in this area. A good illustration are the approaches implemented in the UK, where impact measurement is generally presented in the form of knowledge exchange between academic and non-academic stakeholders (Maythorne, 2019). Research innovation can be analyzed as technology transfer as well as knowledge transfer, exchange and creation (Davenport, 2013). Effective and efficient spending of public funding for multi-university domain-specific knowledge exchange is supported by the Knowledge Exchange Framework (KEF) and related assessment methods. The KEF complementarily supports the Research Excellence Framework (REF) and the Teaching Excellence Framework (TEF) (Johnson et al., 2020). According to this REF approach, the societal impact of research can be understood as a positive or negative impact (caused by research) on society, economy, the environment, culture, health and quality of life (Samuel & Derrick, 2015).

Among the methods supporting the assessment of the social impact of research (conducted as part of the SSH), there are qualitative methods (e.g. case studies, peer reviews and surveys) and quantitative methods (based on statistical indicators and sometimes advanced mathematical models), and, in particular, the following can be mentioned (Reale et al., 2018):

1) Payback Framework (mixed methods and case studies),
2) Social Impact Assessment Methods for Research and Funding Instruments (SIAMPI) based on case studies,
3) Social Impact Open Repository (SIOIR) using social impact scores,
4) Successful Actions (measuring results coming from research),
5) Opportunity Approach (case studies),
6) Agora Model (multi-actor interactions in open debates).

Methods to assess the public value of research most often have a little objective character and are mainly based on subjective expert opinions. Such evaluations belong to poorly structured problems regarding decision-making in high uncertainty. Especially in the case of social sciences, guide-

lines and principles of designating the public value of research are hardly legible, ambiguous, and the public regulations and documents often change under the influence of the current research policies.

Data and research methodology

The conducted research concerned a review of the literature related to the research impact topic and the methods of assessing the public value of research within social sciences, and especially in economics, business and management. Bibliometric data on the cited scientific literature was collected using the Web of Science multiple databases. The research used performance indicators, such as e.g. the number of papers, total number of citations and Sum of Times Cited per Year (STCY). Besides, the organizations-enhanced indicator was used to identify key and most productive research organizations in the selected topic.

The research was conducted towards the analysis and assessment of the state of knowledge and the most important achievements in the field of approaches, methodological frameworks and methods of assessing the public value and impact of research, as well as identifying leading research centers for this type of research. Collecting and analyzing bibliometric data made it possible to verify the thesis about the lack of universal coherent methodological frameworks and methods for carrying out this assessment in economics, business and management.

Data from WoS databases were collected in March 2021 and the following search parameters were applied:

- a basic search for 'public value of research' or 'research impact' topics,
- timespan 2000-2020 (in the last century, the interest in these issues was low, the STCY parameter was at a level not exceeding 22),
- refined by the following WoS Categories – Information Science and Library Science, Education and Educational Research, Management, Health Policy and Services, Social Sciences Interdisciplinary, Public Environmental and Occupational Health, Business, Multidisciplinary Sciences, Environmental Sciences, Economics, Environmental Studies, Business Finance, Public Administration, Ecology, Communication, Education Scientific Disciplines, Geography, Sociology, Social Work, Ergonomics, Political Science, Psychology Applied, Social Sciences Biomedical, Ethics, Development Studies, Humanities Multidisciplinary and Operations Research Management Science.

Selected WoS Categories are related to social sciences, and especially to economics, business and management, and in their case significant publica-

tions were noted in the databases used. These categories are given in the order resulting from the number of publications related to chosen topics.

Results and discussion

For the studied period, in selected WoS Categories, 994 publications related to 'public value of research' or 'research impact' topics were found (mainly concerning the second one). The largest number of such publications is included in the 'Information Science and Library Science' category (34.8%). Relatively many publications appear in the case of 'Education and Educational Research' (12.4%) and 'Management' (11.2%). Figure 1 shows the visualization of 15 most significant categories.

Relatively few publications in this field are visible in the two categories important for SSH: 'Economics' (2.6%) and 'Business Finance' (2.3%). This should be made up for e.g. in connection with the current improvement of research impact assessment systems carried out in many countries around the world, which may result in a further increase in the number of research and publications in this field.

There is a significant growth in interest in this issue from the beginning of the current century, which is reflected in a clear upward trend and an increase in the STCY parameter from 2 in 2001 to 2 622 in 2020. The sum of times cited is 13 989 (without self-citations 12 749) and average citations per item is 14.1.

Research centers related to a large number of publications of key importance for the research impact field were identified. The organizations with the highest research productivity in this field are British and Australian. The list of 15 most important organizations includes only two organizations from other countries: the government agency that consists of public organizations of higher education in the U.S. state of Georgia and Consejo Superior de Investigaciones Científicas from Spain.

Taking into account the search parameters, the journals with the most publications related to the selected topic were identified (Figure 2). The top five are Scientometrics (6.1%), Health Research Policy and Systems (4.5%), Research Evaluation (3.3%), Journal of Informetrics (2.0%) and Plos One (1.8%).

Main methodological solutions have been manually identified on the example of the category of 'Economics' (19 out of 26 papers were analyzed). From this analysis of the literature, it appears that no leading approaches and methods (that are comprehensive and universal) can be identified. The methods used were usually fragmentary and the following were

identified: bibliometric analysis, statistical models, document analysis, case studies, questionnaire surveys, survey of expert opinion and mixed method approaches. The most frequently used method was bibliometric analysis (about half of the publications) in combination with selected statistical models. Case studies and document analysis also played an important role.

Conclusions

The obtained research results made it possible to preliminary assess the state of knowledge, current achievements and leading study centers in the field of methods for assessing the public value and research impact. The thesis about the lack of universal coherent methodological frameworks and methods for carrying out this assessment (in economics, business and management) has been positively verified only to a limited extent and further research is needed.

The processes of improving the approaches and methods of assessing the public value and research impact currently underway in various countries should draw on the rich experience and valuable achievements resulting from many years of research conducted in selected centers around the world. New models supporting the analysis of knowledge exchange between academic and non-academic stakeholders can be based on interdisciplinary concepts and solutions resulting from the development of digital technologies.

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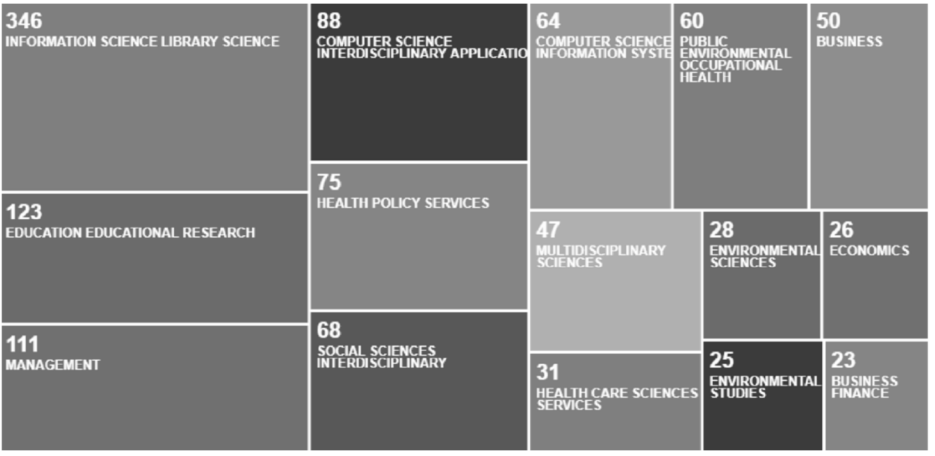
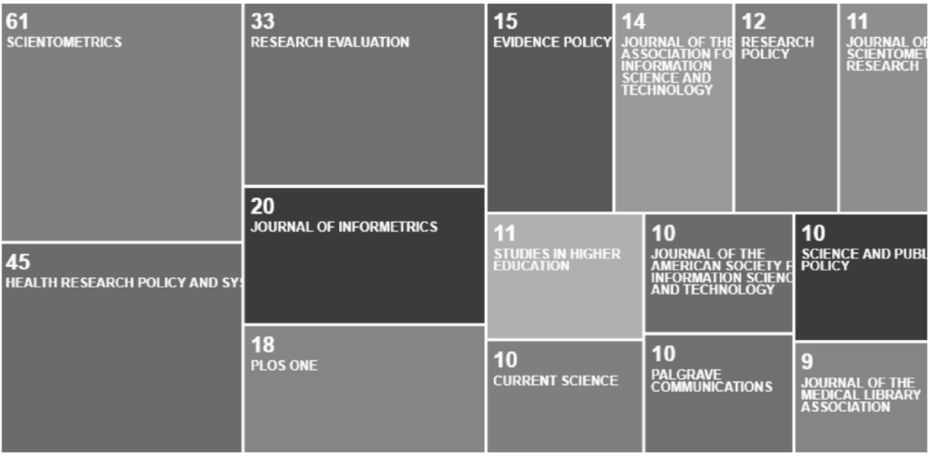
Annex

Figure 1. Treemap visualization of results for selected WoS Categories



Source: own search results based on WoS.

Figure 2. Important journal titles



Source: own search results based on WoS\.

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Transparency of publicly available information about fiscal and monetary policy in Poland

JEL Classification: *E58, H30; H60*

Keywords: *transparency, fiscal policy, monetary policy*

Abstract

Research background: The quality of information provided by fiscal and monetary authorities are important in a democratic state. Ensuring fiscal policy transparency reduces fiscal risk and corruption and promotes public acceptance of fiscal reforms. Ensuring transparency in monetary policy allows market participants to anticipate central bank responses and take their effects into account when making investment and consumption decisions.
Aim of the article: The aim of the article is to evaluate the transparency of information provided to the public by the fiscal and monetary authorities in Poland in the light of international standards of fiscal and monetary policy transparency and to propose changes to increase it.
Methods: Qualitative analysis, deductive and inductive reasoning were used. The assessment of the level of transparency of publicly available information on fiscal and monetary policy in Poland was based on the analysis of the implementation of good practices formulated by the International Monetary Fund and the open budget index calculated by the International Budget Partnership.
Findings and added value: There are no publications in the national literature dealing with the transparency of publicly available information on fiscal and monetary policies in the context of coordination of these policies. Poland lacks transparent message about public finance, with particular emphasis on the state budget, which would allow citizens to control the government's fiscal policy actions. There is a lack of transparent information about the operations of the NBP in relation to the government. There is a lack of clear, reliable and complete information for citizens about the coordination of actions taken by the fiscal and monetary authorities in Poland to achieve specific objectives of the state's financial policy.

Introduction

Transparency is a mandatory element of the functioning of a democratic state and one of the conditions for the financial stability of a country. Transparency in the field of fiscal and monetary policy can be seen as the degree of public understanding of the process of these policies and political decisions made. It is important not only the availability of information to the public in this regard, but also its scope, quality, ease of access to it. Transparency of actions taken should be ensured by fiscal authorities (first of all, the government) conducting fiscal policy and responsible for security of public finance, and monetary authorities (central bank) conducting monetary policy and responsible for stabilization of the price level.

The aim of this paper is to assess the transparency of information provided to the public by fiscal and monetary authorities in Poland in the light of international standards of fiscal and monetary policy transparency and to propose changes to increase their transparency. Qualitative analysis, deductive and inductive reasoning were used. The evaluation of the level of transparency of publicly available information on fiscal and monetary policy in Poland was based on the analysis of the implementation of good practices defined by the International Monetary Fund (IMF) and the Open Budget Indicator (OBI) calculated by the International Budget Partnership (IBP).

The literature review section discusses the essence of fiscal and monetary transparency. The part devoted to discussion of research methodology assesses the extent of implementation of good practices in Poland in the field of fiscal and central bank transparency developed by IMF, indicating the reasons for limited fulfillment of these standards. The discussion section points out the dysfunctional actions of fiscal and monetary authorities in Poland during the COVID-19 crisis and suggests actions that should be taken to increase the level of fiscal and monetary transparency in Poland. The last part of the article presents conclusions from the conducted research.

Literature review

Publicly available fiscal and monetary policy information should enable the electorate and financial markets to accurately assess the financial position of the state and the real benefits and costs of government actions, including the current and projected economic and social consequences of those actions (Koptis, Craig, 1998, p. 2).

Fiscal transparency is defined as openness to the general public about the functions of government, the type of fiscal policy, public sector accounts and its projections, but opaque fiscal practices tend to create a number of allocative distortions in public finance. This transparency can be considered from three points of view, i.e. transparency: institutional, accounting, indicators and forecasts (Koptis, Craig, 1998, p. 6,8,9). An attempt to measure the level of fiscal transparency in this view was made by Alt & Lassen (2003). It should be noted that the literature recognizes the benefits of fiscal transparency (Stiglitz, 2001, p. 32-34), but there are few empirical studies that have convincingly examined its effects (Wehner, de Renzio 2015, p. 9).

Fiscal transparency is supported by effective fiscal rules, independent fiscal institutions, medium-term budgetary frameworks.

Fiscal rules are permanent restrictions on fiscal policy, defined in legal acts and are designed to strengthen the discipline of public finance and limit the freedom of politicians in shaping fiscal policy. So, they are an instrument of social and market control over public spending (Kopits, Symansky, 1998, p. 2). Fiscal rules are also understood as rules of the budgetary procedure in terms of preparing, passing and executing the state budget, or affecting the level of public revenue and expenditure, deficit and public debt (Alesina, Perotti, 1996, p. 401).

Poorly designed fiscal rules can cause procyclicality. Therefore, independent fiscal councils (IFIs) are established to maintain the credibility and sustainability of fiscal policy without undermining its support for stabilizing the economy (IMF, 2013, p. 6). These councils have an important role in enhancing fiscal discipline, mainly by tackling excessive deficits in good times, which contributes to increasing the fiscal space for countercyclical fiscal policy during recessions (Alesina, Tabellini, 2005, p. 2-4). The rationale for IFIs is also the problem of information asymmetry between the government and the public/electorate (Beetsma, Debrun, Fang, Kim, Lledo, Mbaye, Zhang, 2018, p. 3). This may be due to fiscal illusion, i.e. insufficient understanding of the government's intertemporal fiscal constraints (Buchanan, 1967, p. 125), and temporal inconsistency, where the government saddles its successors with large debts, leaving less fiscal space in the future (Hagemann, 2011, p. 81).

Monetary policy, whose main objective is to stabilize prices, shapes private sector expectations through both communication and interest rate decisions (Geraats, 2002, p. 533). Increased central bank transparency is beneficial and is associated with significantly better private forecasts (Ehrmann, Eijffinger, Fratzscher, 2010, p. 6). During periods of uncertainty, the more market participants trust the actions of the monetary authority, the less vol-

atile inflation and output will be, leading to a more stable economy (Papadamou, Arvanitis, 2014, p. 106).

Features that are considered necessary in the institutional transparency of the central bank are a numerical target for monetary policy, producing and making available an inflation report (explains the expected effects of monetary policy instruments), producing and making available an inflation forecast (explains why changes have occurred), evaluating past policies and their effects (Próchniak, Szyszko, 2019, p. 394). Difficulties in assessing the effectiveness of specific central bank monetary policy decisions lead to research on what effects the lack of central bank transparency generates and how this affects the effectiveness of monetary policy (Demertzis, Hallett, 2015, p. 279).

Assessing the impact of central bank communication on private sector expectations is difficult due to its complexity. Moreover, the tone of central bank policy documents or statements is difficult to measure. Therefore, managing expectations is a key challenge for central banks and depends on the communication strategy they adopt (Blinder, Goodhart, Hildebrand, Lipton, Wyplosz 2001, p. 4-6). In order to increase the transparency of monetary policy and ensure central bank communication, voting records of individual monetary policy council members should be made public (Seelajaroen, Budsaratragoon, Jitmaneeroj, 2019, p. 369).

Empirical research focuses primarily on central bank transparency and its impact on market expectations of short-term interest rates. The impact of national government transparency and the availability of reliable data on the domestic economy from sources other than the central bank on social and market expectations is rarely assessed. And yet, greater government transparency, independent of central bank transparency, reduces the duration of inflation and currency crises, increases the predictability and credibility of national economic policy, and increases confidence in the effectiveness of policy decisions (Shambaugh, Shen, 2018, p. 393). There should also be research on whether central bank interest in fiscal policy topics (in addition to traditional monetary policy issues) is a consistent feature of central bank communication (Moschella, Pinto, 2018, p. 515).

Research methods

The idea of developing a framework for fiscal and monetary policy transparency emerged during the Asian financial crisis of the late 1990s. Following this crisis, IMF published a Code of Good Practice on Fiscal Transparency (IMF, 1998), and subsequently the Organization for Economic

Cooperation and Development issued its own standards, known as Best Practices for Fiscal Transparency (OECD, 2002). The standards formulated by the IMF highlight the right of citizens to have access to information on fiscal policy and to have an effective opportunity to participate in its formulation, as well as the right to have access to information on monetary policy. The International Monetary Fund offers an assessment of each country's fiscal transparency practices according to criteria grouped in the pillars mentioned above. In 2003, it assessed our country's fulfillment of fiscal transparency standards (IMF, 2004). The Fiscal Transparency Code contains a set of principles built around four pillars (IMF, 2019): fiscal reporting, fiscal forecasting and budgeting, fiscal risk analysis and management, resource revenue. The International Monetary Fund has also developed a set of good transparency practices for central banks' monetary policies, which are also classified under four pillars (IMF, 1999): transparency of central banks' roles, responsibilities and objectives for monetary policy, open process for formulating and reporting monetary policy decisions, public availability of monetary policy information, accountability and assurances of integrity on the part of the central bank.

Transparency is rather a qualitative concept, defined quite flexibly. Despite this limitation, attempts are made to create indicators, to measure fiscal and monetary transparency. However, these are not indicators that do not need to be changed, improved. The creation of such indicators makes it possible to study the level of fiscal transparency, primarily in relation to the state budget, or monetary transparency, in relation to the central bank, over time and space (Szyszko, 2016, p. 12).

In empirical studies of the level of fiscal transparency, there is a focus on assessing the transparency of the state budget, as the primary public fund. The International Budget Partnership (IBP) has been conducting research on central budget transparency since 2006. The level of budget transparency is assessed by the level of the Open Budget Index (OBI), which is based on an evaluation of the amount and type of information in the most important documents concerning the central budget. The index is calculated based on responses to approximately 100 questions from the Budget Openness Questionnaire. It assesses: public access to key budget documents, comprehensiveness of the budget bill, comprehensiveness of other key budget documents, strength of oversight institutions, and public involvement in the budget process. The questionnaires are completed by independent experts - researchers from academic institutions or civil society organizations, not politically involved. The impartiality and accuracy of the responses are verified by an independent reviewer - someone with knowledge of the budget system and then reviewed by IBP staff. The gov-

ernments of the countries being assessed are also asked to comment. The main advantage of the IBP survey is its broad scope and time series diversity, and the disadvantage of focusing only on the national budget, with some of the survey questions focusing on aspects of fiscal transparency whose relationship to actual budget transparency may be imperfect. In addition, the IBP survey is primarily concerned with the comprehensiveness and timely availability of budget information, but not its reliability. Many of the questions are derived from: the IMF's code of good practices on fiscal transparency and the OECD's best practices on fiscal transparency (Wehner, de Renzio, 2012, p. 97; Arapis, Reitano, 2018, p. 551). The level of transparency of the state budget in Poland was assessed by IBP six times, three times as considerable (OBI above 60 points out of 100 possible points) and three times as limited (OBI below 60 points). Thus, it can be concluded that the average level of OBI in these six studies was 62 points. It is worth noting that in successive surveys, Poland's position in the ranking of the level of state budget transparency systematically decreased as the number of countries included in the survey increased (2008 10th place and in 2019 32nd place, except 2015 - Table 1). Among the areas of state budget transparency covered by the IBP survey, the strength of supervisory institutions (the activities of the Supreme Audit Office - SAO) was rated highest, and public participation in the budget process, especially in the process of preparing the draft budget law, was rated lowest. There is also a lack of mechanisms for identifying budget priorities consistent with the public's point of view (e-mail, telephone, internet, surveys, interviews, meetings). The principle of budget openness is fulfilled through media broadcasts of parliamentary sittings with regard to the budget debate, public access to the transcripts of these sittings (on the website of the Sejm and the Senate). There is also public participation in the formulation of audit plans (SAO), but there is no information as to how complaints were taken into account in the audits carried out.

Fiscal information in Poland is provided primarily by the Minister of Finance and the following documents informing about the government's fiscal policy are available on the website of the Ministry of Finance: the draft budget law, the budget act, the report on execution of the state budget (including the report on execution of local government budgets), the Long-term Financial Plan of the State, the Public Debt Management Strategy. In addition, on the website of the Public Information Bulletin (BIP) it is possible to obtain financial documents of entities covered by the BIP.

The structure of the system of public finance in Poland and the mechanism of financing public tasks have assigned the state budget, the role of a public fund transferring a significant part of public funds to local govern-

ment units, state special purpose funds, executive agencies. It makes its place in the system of public finance less and less understood. In 2014-2019, public revenues included in the Budget Law accounted for about 73% of total sector revenues and public expenditures included in the Budget Law accounted for about 57-61% of total sector expenditures, with state budget revenues accounting for only more than 41-44% of total sector revenues and state budget expenditures for more than 19-22% of total sector expenditures (Table 2). In practice, greater importance is attributed to the state budget than it results from its share in public revenues and expenditures. The debate on the condition of public finance in our country is dominated by the discussion of the Budget Act, and to a lesser extent, the execution of the state budget and assessment of state budget execution. Information contained in documents concerning the state budget is incomprehensible for a citizen without specialist knowledge of public finance. These documents mainly contain many tables with data according to budget classification. There is also a question whether the representatives of citizens elected in the Sejm and the Senate understand what they are talking about (the Budget Act, budget discharge). Although the Chancellery of the Sejm and the Chancellery of the Senate support deputies and senators with expert opinions on the draft budget law in its entirety or its individual fragments, they are not always publicly available (Jastrzębska, 2020, p. 7).

Assessing the fulfilment of international fiscal transparency standards in Poland, developed by the IMF, it may be concluded that these standards are fulfilled to a limited extent, which is due to the following phenomena. First of all, there are no consolidated financial statements of the public finance sector in Poland, which means that the analysis can be carried out at the level of the state budget, local government budgets, but not all the entities of the sector, and it is impossible to fully identify the financial flows between them. Uniform accounting principles and chart of accounts apply only to a part of the sector units, which makes it impossible to compare the management of public funds within the sector. In addition, the data in the national fiscal reports are not comparable with those of Eurostat. It should also be stressed that reporting by the sector units is dominated by budget reporting based on budget classification, which is not transparent to the average citizen. Although most of the sector entities' financial reports are subject to external control (the Supreme Chamber of Control, regional chambers of auditors), they do not enable accountability and responsibility of the entities' public funds' administrators. Moreover, there is a lack of formulation of clear and measurable objectives of fiscal policy in its individual areas, and instead the focus on the state budget deficit and State Treasury debt prevails. The credibility of medium-term planning is low, as

it is not fully linked to budgets for subsequent years. In addition, reports on the implementation of key strategies and programmes, especially in the government subsector, are inconsistent with annual budgetary reports. It should also be stressed that important data in the area of public finance are published in a form that makes them difficult to process or are not published at all. There is a lack of synthetic budget information (e.g. in the form of a budget for the citizen), a comprehensive analysis on medium-term and long-term consequences of programmes financed from public funds (especially implemented by the government), an analysis of the sensitivity of the budget forecast to changes in macroeconomic indicators (Jastrzębska, 2018, p. 4-5).

Assessing the fulfilment of international monetary transparency standards in Poland developed by the IMF, it can be stated that the standard of the legally guaranteed independence of the NBP is fulfilled and National Bank of Poland (NBP) fulfils these standards. It provides on its website the necessary information about the level of key interest rates, the level of core inflation, the level of average exchange rates of major international currencies, prices and quotations of gold. It also provides information on the macroeconomic outlook in inflation reports, inflation and GDP projections. It also provides data on: balance of payments, reserve assets, M3 money supply, debt, government debt securities, liquidity situation in the banking sector, open market operations, loans granted by NBP. There are also available such documents as monetary policy strategy, monetary policy assumptions, reports on the implementation of monetary policy assumptions, voting results of the Monetary Policy Council and information from press conferences. You can also find information on the activities of the Financial Stability Committee in the area of macroprudential supervision and reports on the financial system in Poland.

Discussion

Fiscal policy in Poland is conducted within the national and EU fiscal framework (Ciak, 2014, p. 35-36). The basic national fiscal rules include: the constitutional limit of state public debt at 3/5 of GDP; prudential and sanctioning procedures aimed at not allowing this limit to be exceeded; and the stabilizing expenditure rule. The basic EU fiscal rules include: general government deficit and debt to GDP ratio in % (accordingly 3% and 60%). The European fiscal framework is complemented by a requirement to maintain the structural deficit at or close to the medium-term objective (MTO). The stabilization expenditure rule serves this purpose and the introduction

of this rule increased the level of the fiscal rule indicator for Poland from 1.04 in 2014 to 1.54 in 2015-2019 (European Commission, 2021).

However, steps are still being taken to push public spending outside the state budget to increase the fiscal space for its growth. Such actions is incompatible with the mechanism and purpose of implementation of the stabilization expenditure rule. The scale of this phenomenon has increased significantly in 2020. The expenditures of the Polish Development Fund and the COVID-19 Anti-Crisis Fund are made outside the limitations of the stabilization expenditure rule. In addition, the source of financing of their expenditures is the issue of bonds, and the resulting debt is not included in the level of public debt calculated according to the national methodology (the difference was approximately PLN 224 billion - data from the ministry of finance - retrieved from http://www.mf.gov.pl). These funds are outside the control of the minister of finance and parliament. Therefore, it is very important to ensure the transparency of these funds, i.e. information should be publicly available on where they receive funds for the implementation of tasks, what is the effectiveness and efficiency of spending these funds (forecast and realized). External audit institutions should play an important role in this evaluation. In addition, it is necessary to determine the timeframe and path of the state's exit from financial support of private companies after the COVID-19 crisis (Rahim, Allen, Barroy, Gores, Kutzin, 2020, p. 3).

In 2020, the application of the stabilization spending rule was suspended due to the state of the epidemic. In 2021, it is applied again, but in a "loosened" formula. This makes the principles adopted in shaping the framework for public expenditure unclear and may be based on a high degree of discretion. According to the government's announcement in the draft budget law for 2021, in 2022-2024 there is to be a return to the old construction of this rule, although attempts are still being made to introduce new exclusions. It should also be noted that the mechanism introduced in the last few years to finance the activities of various entities (e.g. universities, broadcasting entities) by transferring treasury securities makes the stabilization expenditure rule, as an instrument to control public spending, practically irrelevant.

It is also worth noting another completely new solution, which significantly reduces the transparency of the state budget in Poland. It is about transferring around PLN 10 billion of state budget expenditure in the form of non-expiring expenditure that can be implemented by the end of November 2021 (infringement of the statutory principle of budgetary accuracy).

The challenge for the NBP is the growing public debt in Poland and its involvement in the purchase of treasury securities, as well as the pursuit of

a direct inflation target. The substance of the repurchase of Treasury securities by the NBP is important. The National Bank of Poland buys bonds on the secondary market in transactions made primarily with state banks. In this way, it enables the government to significantly increase the issuance of Treasury bonds, needed to finance the so-called anti-crisis shield, without the risk that this will result in a strong revaluation of these securities and an increase in debt service costs. The scale, nature and period of these purchases, as well as the transparency of NBP operations in relation to the government, are very important. It should be noted that the bonds of the Polish Development Fund and Bank Gospodarstwa Krajowego are covered by Treasury guarantees. These transactions entail macroeconomic risk and pose a threat to the independence of the central bank. And one more action of the NBP is controversial, namely two currency interventions by the NBP in December 2020, carried out to weaken the zloty. The policy of weakening the national currency is beneficial for exporters, but it raises the cost of living and reduces the purchasing power of consumers. A measurable effect of these interventions was an increase in the NBP's profit for 2020, but 95% of this profit is state budget revenue.

Conclusions

In assessing the transparency of fiscal and monetary information, the following characteristics should be taken into account: scope, frequency, timeliness, quality (comprehensibility, readability, comparability), integrity, comprehensiveness, orderliness, policy orientation, credibility.

Very important for fiscal transparency is the terminology used for public sector. The recipients of data on deficit and debt of public sector in Poland should be reliably informed about differences in the calculation of their level according to national and EU methodologies.

It is also important to specify in Polish legal regulations the main measure of the public sector deficit, which could serve as a target for fiscal policy and be regularly monitored and published with little delay.

The government should prepare an assessment of the state of public finance, specifying in particular the impact of financing anti-crisis measures on the level of public debt, its servicing costs and Poland's creditworthiness. This would also allow for a comprehensive explanation of the role of the NBP in financing public expenditure that is not included in the state budget.

It is also important to develop a path for the reduction of debt in relation to GDP in the coming years and sources of funds for debt repayment or

refinancing. The government should also take care to strengthen the stabilization expenditure rule, rather than seeking creative solutions to omit it.

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Data sources:

http://survey.internationalbudget.org

http://www.nik.gov.pl

http://www.mf.gov.pl.

Annex

Table 1. Open budget index in 2008-2019 - Poland's place in the ranking

Year	The country with the highest level of OBI*	OBI* indicator level for Poland	Poland's position in the ranking of fiscal transparency of surveyed countries according to the level of OBI*
2008	Wielka Brytania 88	67	10th out of 77 countries surveyed
2010	Republika Południowej Afryki 92	64	16th out of 91 countries surveyed
2012	New Zealand 93	59	25th out of 98 countries surveyed
2015	New Zealand 88	64	22th out of 101 countries surveyed
2017	New Zealand 89	59	30th out of 112 countries surveyed
2019	New Zealand 87	59	32th out of 117countries surveyed

Notice*: OBI indicator level 81-100 points - high level, 61-80 points - considerable level, 41-60 points - limited level, 21-40 points - minimum level, 0-20 points - poor level

Source: own compilation based on IBP data (IBP, 2020,2021). Retrieved from http://survey.internationalbudget.org/#rankings.

Table 2. Public revenues and expenditures included in the Budget Act against the background of total public revenues and expenditures after consolidation in 2015-2020

Specification	Share of PFS`s revenues included in the Budget Act to total PFS`s revenues in%	Share of state budget revenues in total PFS`s revenues in%	Share of PFS`s expenditures included in the Budget Act to total PFS`s revenues in%	Share of state budget expenditures in total PFS`s revenues in%
2014	73.1	41.4	61.1	21.3
2015	73.0	41.5	61.0	21.0
2016	72.6	44.4	57.5	21.6
2017	73.7	44.6	59.0	22.4
2018	73.1	43.6	58.0	20.4
2019	73.3	42.8	57.1	18.6
2020	75,10	40,4	60,4	20,0

Notice * PFS – public finance sector

Source: own compilation based on Supreme Audit Office data. Retrieved from http://www.nik.gov.pl.

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System transformation in Poland and Eastern Germany - two versions of the social market economy?

JEL Classification: *B22, B52, E02, E29, E65, G28, N24, P16, P21*

Keywords: *system transformation, shock therapy, economic system, Social Market Economy, institutional framework*

Abstract

Research background: The process of systemic transformation in the countries of Central and Eastern Europe, including Poland and Eastern Germany, which began in the early 1990s, can be described as a unique event in the entire economic history of the world. Therefore, in a situation where it was necessary to decide on the model and pace of stabilization, it was difficult to refer to the experience of other countries. The 30 years that have passed since the beginning of the systemic transformation in Poland and East Germany have been a convenient time to undertake an assessment of the course of the transformation process, the changes that have taken place in these economies and to describe the economic models that have shaped them. The reason for this lies in the importance of this subject and the consequences which the countries of Central and Eastern Europe, including Poland and East Germany, continue to face.
Purpose of the article: The aim of the article is to compare the course and consequences of the systemic transformation in Poland and East Germany, to highlight subconsciousness and differences and to determine to what extent the shape of the economic system meets the assumptions of the SME.
Methods: The method used in this paper is a comparative analysis covering the main macroeconomic indicators of both economies and institutional aspects and critical study of literature.
Findings & Value added: The main added value of the article is a comparative analysis of the Polish and East German system transformation from the perspective of 30 years from its beginning, its successes and failures and a reference

to the assumptions of the social market economy, as well as an attempt to answer the question about the contemporary characteristics of both economies.

Introduction

The process of systemic transformation in the countries of Central and Eastern Europe, including Poland and Eastern Germany, which began in the early 1990s, can be described as a unique event in the entire economic history of the world. Therefore, in a situation where it was necessary to decide on the model and pace of stabilisation, it was difficult to refer to the experience of other countries.

The aim of the article is to compare the course and consequences of the systemic transformation in Poland and East Germany, to highlight subconsciousness and differences and to determine to what extent the shape of the economic system meets the assumptions of the SME. In both cases the same model was chosen, but the routes to get there were different and the results of the process are surprising. When attempting to compare the transformation of East Germany and Poland, the following differences must be taken into account: Poland followed the path of shock therapy, while in the case of East Germany there was a transfer of market institutions accompanied by financial support from the old federal states and the European Union. Thus, the transformation in this country was expected to be the easiest and its social costs minimal (Maier, 2012).

As the problem undertaken in the study is complex and not amenable to econometric modelling, the qualitative analysis method of comparative analysis was used for the purposes of analysis. Comparisons were made between key macroeconomic indicators for the two economies, as well as the institutional and legal frameworks that underpinned the further development of the two economies. Moreover, as the subject under analysis has its theoretical background, the method of critical literature study was applied.

The article first describes the theoretical issues of the economic transformation process, then identifies the main features of the social market economy model, which can be found in the literature review. Next, the research methodology is described. The next part discusses the results of the analysis of the transformation process and the features of the economic model of Poland and East Germany in the context of assessing the degree to which they achieve the features of a social market economy. The whole study is summed up by the final conclusions.

Literature review

As regards the issue of systemic transformation in Poland, there are English-language studies available on the subject. The model of the Social Market Economy and the systemic transformation of the East German economy, on the other hand, has not been published much in English (an exception is e.g. Maier, 2012).Therefore, this article fills the existing gaps in this respect.

One of the key dilemmas that divided economists, according to the criterion of how often they are raised in literature, is the question of choosing the pace of systemic transition, also known as "shock therapy versus graduation" (Kołodko, 2000; Kołodko, 2020; Kouba, 2016). The radical model, called shock therapy, assumed an immediate change in the functioning of the economic system. In Poland, the dominant approach among economists was shock therapy, which later translated into the nature of the changes (Rosati, 1994).

The second issue is the proper understanding of the Social Market Economy model as an economic model. The economic policy implemented in Germany after the Second World War is part of an economic system called the Social Market Economy (Soziale Marktwirtschaft or SME). It has become synonymous with Germany's success and post-war prosperity in West Germany, which is why it is seen as an attractive proposition for countries that are seeking a new path for their development.

The most famous representative of Ordoliberal doctrine was Walter Eucken. The ordoliberal school does not understand a "strong state" as a state that intervenes decisively in the economic process, but an effective framework, which sets the economic order, i.e. creates formal institutional conditions, under which the socio-economic process is free and a level playing field for the participation of all (Karsten, 1985).

In Germany, this model has not been fully implemented in practice. This is a warning and a lesson that the supporters of this concept should take into account. Firstly, there needs to be a clearly defined path to achieving it. In the case of countries with a system other than the capitalist system, this route will be longer, requiring a great deal of social effort, including acceptance of the values which, in the social market economy, play a significant role, such as freedom, responsibility for oneself, one's fate and society. The lack of acceptance of these values will mean that policies pursued in this style can be quickly rejected, as was the case during the first post-war recession in Germany in 1967. Another important issue is to pursue a thoughtful, constant economic policy that puts man and his development at the heart of the matter, protects free competition and private ownership. A

good economic policy, according to Erhard, is the best social policy. In addition, emphasis should be placed on building politically independent institutions that protect the market, competition, law and monetary policy from the pressures of interest groups. As far as the social structure is concerned, care must be taken to develop the middle class, which is at the core of this doctrine, and to develop the importance of trade unions. There is also a flaw in this model, namely the lack of a clear definition of what social means. This makes this adjective likely to be interpreted differently by political parties and inevitably leads to the expansion of the social security system.

Research methodology

The problem addressed in this article concerns the issue of systemic transformation, the choice of the target economic model and how to reach it. This is not a problem that can be subjected to econometric modelling, due to its complex nature and the need to analyze factors that are also qualitative in nature. The analysis uses a method of qualitative analysis, which is the comparative analysis of the Polish and East German economies. Secondary statistical data of the World Bank and German institutions - Arbeitskreis "VGR der Länder" - were used. The analysis included the analysis of economic indicators for the period 1991 - 2019, as well as institutional factors in terms of chosen formal and informal institutions. The paper assumes, based on the practice of Central and Eastern European economies, that the shape of the target economic model of economies undergoing systemic transformation is determined by the initial conditions of the transformation process, the role of the state in this process and the features of the economic policy pursued.

Course and effects of the economic system transformation in Poland

As mentioned in the introduction to this study, the reforms that were to be carried out in Poland, but also in other countries of Central and Eastern Europe, the model of ”shock transformation” agreement was proposed and financed by the IMF (Kołodko, 2020). This policy was called the Washington Consensus by the British economist John Williamson in 1989 (Williamson, 1990).

Reforms in Poland were inspired by monetarism, first of all, stabilizing the economy, and in particular controlling inflation, transforming the eco-

nomic system and what goes with it - opening up the economy. The program of stabilization reforms and systemic transformations was introduced in January 1990, at the earliest in the group of Central and Eastern European countries, due to the hyperinflation that Poland had been struggling with since 1989. Actions that were taken on the basis of monetary policy were aimed at slowing down the rapid growth of the nominal money stock, as well as increasing the nominal interest rate. Moreover, a fundamental limitation in the use of preferential loans was envisaged, a one-off change in the terms of loan agreements concluded in the past in terms of interest rates, restrictions on the financing of the state deficit by the NBP, and an increase in the political independence of the NBP from the government (Dąbrowski, 1997).

The greatest success of the program turned out to be the quick achievement of external balance. Over time, however, the adverse effects of the reforms began to emerge. The first of these was the recession (see Table 1. in Annex).

In the autumn of 1990, inflation started to accelerate again, mainly due to the rise in oil prices following the Iraqi attack on Kuwait. Another factor influencing the growing inflation was the devaluation of the Polish currency on January 1, 1990 from PLN 6,500 for USD 1 to a level lower than the black market rate: 1 USD=9500 PLN (Dąbrowski, 1997). Since November 1990, the deterioration of the current account balance has resulted in the suspension of the IMF stand-by arrangement. In May it was decided to devalue the zloty by 17%. In view of the deterioration of the trade balance, in October in 1991, the NBP decided to change the exchange rate policy. A crawling peg rate with a monthly devaluation rate of 1.8% was introduced (Rosati, 1994). The reforms that have been carried out and their effects have increased social discontent. In November 1991, elections were held and a new government emerged, with Jan Olszewski as prime minister and Balcerowicz leaving the political scene.

In the following years, we can see a gradual acceleration of economic growth, which may have been caused by the increasing number of private entities that have undertaken export activities. Inflation has gradually decreased, which in 2000 was just over 6%. The relatively unfavourable situation persisted in the labour market. The two-digit unemployment rate continued until the first decade of the 21st century (see Table1.).

The system transformation, its consequences for the development of the East German economy

The process of transformation of the German Democratic Republic began with the so-called State Agreement (Staatsvertrag) of 18 May 1990 between the GDR and Germany[1]. Another legal act was the *Einigungsvertrag* of 31 August 1990. The State Agreement provided for the creation of a monetary and socio-economic union on the territory of both German states.

East Germany was a special case among the countries of Central and Eastern Europe which were undergoing systemic transformation. The East German economic system had not undergone any major changes since the 1970s, and there were no conditions for the creation of sufficiently expansive grassroots entrepreneurship. The main problems of this economy were over-intensive industrialization, shortages in the supply of essential goods and shortages in housing. There was therefore no indication that the stability of this system had been affected and, later on, the participation of East German citizens in the privatization process was truly traceable. The beneficiaries of the privatization process for the assets of the former GDR were West German companies and West German citizens. Furthermore, and this is very important, a socialist system of values prevailed in East German society. These signals showed that in East German society there was a strong connection to the values of socialism, not capitalism, and therefore the construction of a capitalist system such as the social market economy was very much in question. The problem of identification with the ideology of socialism and therefore with high expectations of the state and its policies and the lack of identification of the majority of middle class.

The Deutsch Bundesbank was responsible for organizing the money exchange process. For the economy, it was essentially about developing more efficient companies who, with competitive products, lay the foundations for create growth and secure employment (Bofinger, 1990).

The exchange rates at which the currency of the former GDR was exchanged into the currency of West Germany increased the amount of money in circulation, the competitiveness of businesses was affected - it fell due to an increase in wages and liabilities, the interest rate changed. To a certain extent, these rates have influenced price levels.

Within the framework of economic union, the system of the social mar-

[1] Vertrag über die Schaffung einer Währungs- Wirtschafts und Sozialunion zwischen der Bundesrepublik Deutschland und der Deutschen Demokratischen Republik, Bonn 18 May 1990. The political and legal state was created on 3 October 1990. The former German Democratic Republic has also become part of the European Economic Community.

ket economy with its constituent elements: private ownership of the means of production, free movement of prices of goods and factors of production according to market rules, competition in the markets, full mobility of people and capital was transferred to the former GDR.

The problem of privatization has become one of the most important issues affecting the speed and effectiveness of the German reunification process. In East Germany, a model of total privatization was adopted, which was intended to be completed by 1993 (indeed, this process has been extended to 1994). This meant that what had not been privatized was being eliminated.

By the mid-1990s, there was a sharp decline in economic growth in East Germany (see Figure 1), and by the mid-1990s, the growth rate of both parts of Germany had equalled. Looking at Figure 1. below, it is difficult not to ask ourselves why there have been such differences in growth rates between East and West Germany since 1991? One possibility is the relationship between East German GDP and the level of transfers to the former GDR. From the time of reunification until 2003, support for the former East Germany totalled more than EUR 1.2 trillion (Jansen, 2004). After taking into account the recurring tax measures, it exceeded the East German GDP. Since 1995, East Germany has been included in the West German public finance system. As we can see from Figure 1. above, after the boom of 2000, the old federal state began to be more dependent on the world economy and the German economy gained momentum again. During a severe recession following the financial crisis in 2008/2009, production fell in both parts of the region, while in the west, due to its dependence on exports, it was slightly lower than in the east of the German economy.

After the reunification of Germany until 2006, the unemployment rate in East Germany was two-tonnes higher than in West Germany, and the observed economic recovery did not reduce the queues at the East German employment offices. In East Germany, as a result of emigration, the population decreased by around 2% during the first two years of the transformation process. The level of unemployment started to rise sharply and reached around 17.6 in 2005 (see Table 2).

What needs to be highlighted when analyzing the systemic transformation in East Germany is the significant role of the state and its financial and institutional support.

Under purely market-based conditions, East Germany as a production location would hardly have opportunity. Neither was the East German production, which had been handed down from the GDR era competitive. Production from East Germany is still being (at least in so far as it is not aimed at purely local goods) to satisfy the demand for goods in East Germany.

Monetary union must be the prerequisite for this is that, in addition to the German mark other important institutions in West Germany transferable to East Germany were. In this way, an institutional framework (mainly legal, fiscal and financial systems) should be established, which is market-economic transformation is indispensable.

Conclusions

The transformation process that began in the countries of Central and Eastern Europe in the early 1990s, including Poland and the German Democratic Republic, made it necessary to choose the model to which these economies would be heading. The German Democratic Republic adopted the SME model and the entire institutional and legal apparatus from West Germany. The shock caused by the transformation and the further development of events showed that the initial conditions in which the East German economy found itself differed from those that took place in West Germany after 1945, and that the society of the former GDR is instilled with completely different values than those on which the model of the Social Market Economy is based. The process of transformations was much more painful and lengthy than assumed. Moreover, the role of the state in the development of the East German economy significantly exceeded the role assigned to it by the doctrine of the Social Market Economy, imposing a rigid institutional structure not adapted to the economy undergoing transformation and financial transfers trying to stimulate development of East German economy.

In Poland, the interest in the Social Market Economy appeared in the 1990s and ended mainly with an entry in the Polish constitution in 1997. The systemic transformation in Poland was carried out on the basis of a monetarist vision of the stabilization policy, which does not have much in common with the German approach. Moreover, in comparison with Germany, the role of trade unions in Poland is smaller. There was no attempt to formulate a coherent concept of this model for Poland, despite many conferences and publications on this subject. Such actions should be taken due to the constitutional provision.

The question posed in the title is rhetorical. Both in Poland and in East Germany we are dealing with a model of the Social Market Economy, but only in name. It does not have much to do with an ordoliberal vision, but it is a repetition of certain slogans without serious discussion on its possible shape, both in Poland and in East Germany, taking into account the specificity of their development and the needs of these economies.

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Annex

Table 1. Selected macroeconomic indicators of Poland in 1990-2019

Indicator/Year	1990	1991	1992	1993	1995	2000	2005	2010	2015	2019
GDP growth rate (in %)	-7.17	-7.01	2.5	3.7	6.9	4.56	3.49	3.6	3.84	4.1
Inflation in % of GDP	86.54	55.26	38.6	30.6	27.97	6.11	2.56	1.66	0.77	2.95
Unemployment rate (in%)	6.3	11.8	13.6	14.39	13.69	16.31	17.7	9.6	7.5	3.3

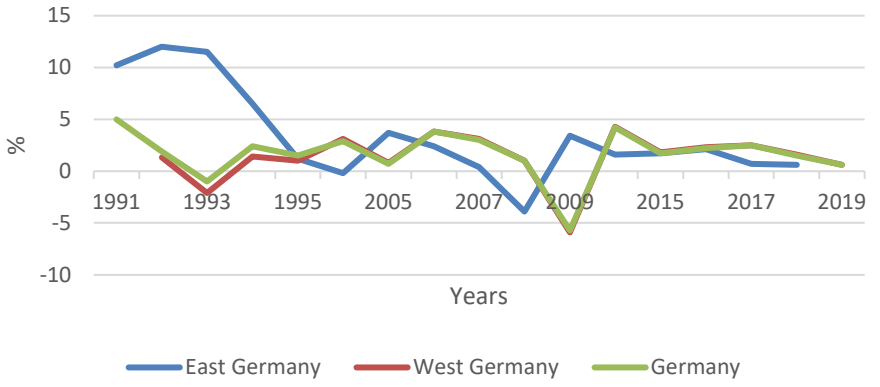
Source: World Bank, https://data.worldbank.org/ (access 22/11/2020).

Table 2. Selected macroeconomic indicators of Poland in 1990-2019

Years	1991	1995	2000	2005	2010	2015	2018
Nominal GDP (in million Euro)	107 373	206 981	231 439	253 211	285 630	337 297	372 308
Domestic labour force (in 1 000 persons)	6 787	6 105	6 008	5 670	5 882	5 892	6 017
Employed residents (in 1 000 persons)	6 994	6 320	6 358	6 059	6 294	6 258	6 330
Employment rate in %	47.8	44.7	46.1	45.8	49.7	49.9	50.3
Unemployment rate in %	10.6	13.3	16.4	17.6	11.0	8.5	6.9

Source: World Bank, https://data.worldbank.org/ (access 22/11/2020).

Figure 1. GDP growth rate in % between 1991 and 2019 in East Germany, West Germany and Germany together



Source: Arbeitskreis „VGR der Länder“, Stand November 2019 and Februar 2020.

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The study of human capital in the local context

JEL Classification: *O10; R58; R11*

Keywords: *economics, regional economics, economics of development, human capital*

Abstract

Research background: Local development as a problem of practical importance has also become an important object of theoretical research in contemporary economics. The application values of the search for local answers to global challenges has contributed to the development of research on the impact of various factors on local economic development.

Purpose of the article: The aim of the article is therefore to define the role of one of the factors influencing local development which is human capital. It was assumed that human capital and its changes contribute to an increase in the dynamics of economic development of the studied commune.

Methods: The study uses qualitative (logical) analysis methods and quantitative analysis methods. In turn, in the analysis of statistical data, correlation and regression analyzes were used, as well as multivariate comparative analysis using the Hellwig method. Statistical material was collected for the Ustka commune (Pomorskie Voivodeship), and the research period covers the years 2004-2017.

Findings & Value added: The presented analysis indicates that the hypothesis about the significant role of human capital in the local economic development of the examined local government unit can be considered correct. The considerations conducted here indicate the usefulness of the model for a commune with a predominance of tourist services, and further research could be carried out for communes with a different (e.g. industrial or agricultural) specificity.

Introduction

In the analyses of the determinants of economic development on the national, regional and local scale, a lot of importance is attributed to human capital (Manca 2012). Authors seem to agree that the significance of human capital in economic development and growth refers both to its quantitative and qualitative characteristics (Faggian, Modrego, McCann 2019). It should be pointed out that human capital is broadly defined as the outcome of investment not only in education, but also in the improvement of the qualitative features of human resources, i.e. investment in health, environmental protection and culture (Di Cataldo, Rodríguez-Pose 2017).

The aim of the article is therefore to define the role of one of the factors influencing local development, i.e. human capital. It was assumed that human capital and its changes contribute to an increase in the dynamics of economic development of the examined commune.

In order to accomplish this goal, we used the local development model. Its important element is the part dedicated to the study of the role of human capital in economic growth and its characteristics in the analyzed example. In the paper, we used statistical material mainly from the Local Data Bank, but also from other sources of local business information. The study covers the area of the urban commune of Ustka, located in the Pomeranian Province. It spans the period from 2004 to 2017.

The dedicated model is based on statistical methods, such as the analysis of correlation and regression and multidimensional comparative analyses, with the application of the Hellwig method. The selected methodology allowed us to come up with the synthetic presentation of human capital in economic growth in the commune under study.

The first part of the paper includes a review of economic literature concerning the issues of economic development and human capital as its determinant. In the second part, we discuss the research method, and in the subsequent section we present the research findings and the possible application. The final part of the paper includes synthetic conclusions.

Literature review

Historically, the first attempts to formulate the definition of the concept of human capital were made in the works of well-known representatives of economic studies, such as: G. Becker (1964), T. Schultz (1961), or J. Mincer (1984).

It is not an easy task to measure human capital because of the heterogeneity of this economic category. In one approach, the role of improving the quality of human capital by investing in it is studied, having in mind quite a significant time horizon between the costs incurred and the real growth of the quality of this capital (Goldin 2016).

The size of human capital resources is one of the basic sources of economic growth. The more people are employed and the longer their working time is, the more goods they are able to produce. As the measures describing human capital resources, the indicators of human potential and the degree of professional and economic activity of the population were adopted (Mincer 1984).

Research methodology

In the research procedure, we verified the variables, which consisted of the most important factors and measures describing human capital. After that, we interpreted and analyzed the estimation of the model parameters. We conducted a preliminary analysis of the statistical material in order to eliminate quasi-constant variables, which showed the inconsistency of descriptive characteristics or independent variables which duplicated information. Next, we calculated the critical values of the correlation coefficient of independent variables for the assigned relevance level 0.05 and for n-2 degrees of freedom, where the number of observations is n=14, which is r=0.49 (for Student's T-test 1.9712). To examine the mutual relationship between the components describing human capital, we applied the regression analysis, covering the estimation of the structural parameters of the model with the use of the Classical Least Squares Method; the study of the degree of coincidence (adjustment) of the model with the empirical data, through the analysis of the coefficient of determination R^2, informing to what extent the variation of the dependent variable was explained by the model; the verification of the hypothesis of the relevance of the model's structural parameters with the application of Student's T-test; checking value p treated as the individualized level of relevance. In the further model, the research procedure, based on regression models, included the analysis of: the influence of the selected determinants of the level of human capital and relations between the variables describing capital and conditions of development and the synthetic variable describing the level of local economic development (as the dependent variable).

Because of the complex character of local economic development, the multidimensional comparative analysis (MCA) was used as a research tool for measuring and evaluating it.

Results

The list of potential variables describing human capital resources in the quantitative dimension is presented in Table 1.

Because only for two characteristics: the demographic burden indicator and the number of employed people, the coefficients of variation reached the threshold value, we eliminated the other variables, marked with low variation (between 1.9% and 5%) from the further research procedure. It should be pointed out, however, that the variables qualified for further analyses ($Y(kl)_3$ i $Y(kl)_4$) also had low differentiation.

The indicators from Table 2 assumed mainly negative values, which, consequently, led to a decrease in the size of the population of Ustka in the analyzed period of 14 years by 3.7%.

To verify the strength of relationships between the characteristics of human capital resources (the demographic burden indicator, the size of working population) and the determinants of the volume of resources (population growth, migration balance), we used correlation coefficients.

As Table 3 shows, vectors R_n of the correlation coefficients of each of the dependent variables were as follows:

- for the demographic burden indicator ($Y(kl)_3$) vector $R(kl)_3$ = (-0,79; -0,37),
- for the number of working people ($Y(kl)_4$) vector $R(kl)_4$ = (0,75; 0,44),

thus, the correlations between the population growth and the demographic situation, and between the population growth and the number of working people can be deemed as relevant.

The data from Table 4 allow us to evaluate the adjustment of the model, measured with coefficients of determination, as moderate. At the same time, we can observe the significant relevance of the result of the study - value $p < 0,01$.

Apart from the measures listed in Table 5, we assumed that another relevant factor influencing the quality of human capital in future is the scale of foreign language teaching in schools, Due to the lack of data for years 2004-2007 (Table 6), this indicator can only serve the supplementary role.

In the further research procedure, we used all variables except for "the average score at junior high school final examinations" ($Y(jl)_3$), which was

marked with a low degree of variation (4%). As factors affecting the quality of human capital resources, we adopted the variables presented in Table 7.

The data in Table 8 show that the relationships of such dependent variables as "The percentage of councillors with higher education in the City Council" $(Y(jl)_1)$ and "The number of books borrowed from a library per one inhabitant" $(Y(jl)_5)$ are marked with the lack of coincidence, resulting from their exclusively decreasing value and different (predominantly increasing) values of the other variables in the research period. Thus, they need to be ignored in further analyses. In turn, the non-coincidence of characters of all (except for the abovementioned ones) variables with regard to "The number of primary school students per one computer" $(Y(jl)_4)$ results from the fact that we have the destimulant here (the fewer students, the better).

As Table 8 shows, vectors R_n of the coefficients of correlation of each dependent variables with the potential independent variables, after eliminating $(Y(jl)_1, X(jl)_3, X(jl)_5)$ from the set of dependent variables, were as follows:

- for the pre-school enrolment ratio $(Y(jl)_2)$ vector $R(jl)_2$ = (0.49; 0.44; 0.79),
- for the number of school students per one computer $(Y(jl)_4)$ $R(jl)_4$ = (-0.31; -0.60; -0.39),
- for the number of participants of cultural events $(Y(jl)_6)$ $R(jl)_6$ = (0.15; 0.35; 0.71),
- for the dynamics of the median of the commune inhabitants' age $(Y(jl)_7)$ $R(jl)_7$ = (0.71; 0.77; 0.76).

The analysis of correlations of the selected factors with the level of human capital quality requires not only using the value of the presented vectors $(R(jl)_2, R(jl)_4, R(jl)_6, R(jl)_7)$ as the base, but also adopting the substantive approach to relationships between variables. Taking this into account, the high correlation (0.79) between the pre-school enrolment ratio and the number of cultural events must be deemed as accidental, not reflected in reality.

We should adopt a similar approach to the relationship between the number of pupils per one computer and health care spending (-0.60). In turn, the influence of the commune's educational expenditure on the percentage of kindergarten kids in the overall population of children aged three to six is significant (0.49). The direct connection between the intensity of the commune's cultural life and the number of cultural events organized by municipal institutions is logically justified (0.71). What is a bit puzzling are the factors affecting the residents' life expectancy, estimated in the paper in the form of "the dynamics of the median of the inhabitants' age." Among

the analyzed variables, only the relationship with health care spending (0.77) can be considered obvious, while the correlation with expenditure on education (0.71) is significant only to a certain degree. It is difficult to treat the number of cultural events as the factor prolonging life expectancy, so we ignored it in the analysis.

As the data in Table 9 show, the correlations that can be deemed relevant include the influence of the number of cultural events $(X(jl)_4)$ on the number of their participants $(Y(jl)_6$ and the impact of health care spending $(X(jl)_2)$ and educational expenditure $(X(jl)_1)$ on the inhabitants' health condition, estimated on the basis of the dynamics of their age $(Y(jl)_7)$, with the average coincidence of model parameters measured with coefficients of determination.

The research procedure regarding the analysis of human capital was concluded with the generation of the synthetic measure of human capital, the components of which include the standardized values of six variables: the number of people employed, the demographic burden indicator, the pre-school enrolment ratio, the number of students per one computer, the number of participants of cultural events, and the dynamics of the median of inhabitants' age.

Discussion and conclusions

The analysis of the curve shown in Figure 1, which is a synthetic indicator calculated for the analyzed variables, allows us to formulate the following conclusions:

- the very low value of the synthetic measure in 2007 was mostly influenced by a drop in the number of people employed to the lowest level in the research period, with the simultaneous decrease (as compared to previous years) of the number of participants of cultural events,
- another "collapse" in 2011 was mainly caused by "the participants of cultural events", whose number dropped to the lowest level in the period under analysis and by the pre-school enrolment ratio, not exceeding 60% in the years 2011-2012,
- from 2015, the synthetic measure was more strongly influenced by the values of resource variables (the demographic burden dropped to its minimum level in 2017), which moved in the direction opposite to the direction of "qualitative" indicators, which, except for "the number of participants of cultural events" were the highest in 2017.

An additional study examined relationships between the resource (kl) and qualitative (jl) aspect of human capital (HC), generating partial varia-

bles synthetic for both dimensions, and then calculating coefficients of correlation with human capital as a whole. The analysis of vector R(HC) = (r_{kl}; r_{jl}) with values (0.83; -0.19) indicates the occurrence of a strong relationship with reference to the quality of human capital and its lack in the case of resources.

Our analysis of human capital for the commune of Ustka may serve as the basis for further research into the local economic development of this entity. However, it should be emphasized here that the study of the role of human capital may concern both its influence on economic growth and, more broadly, on economic development. Both these categories are the subject of interest of the local government, which strives for increasing the level of GDP in the region and, in the long-term, for maintaining economic growth. The commune of Ustka is grappling with changes in the economic structure, which have similar roots as in other Polish communes (Wosiek 2020). At the same time, however, we can often observe fluctuations in inhabitants' professional activity and population migrations, which have already been the subject of studies concerning other local units (Bieszk-Stolorz and Dmytrów 2019).

In further research, it will certainly be worth extending the catalogue of variables affecting economic growth and development to include physical and financial capital, natural environment assets, conditions of the economic and legal environment, as well as external surroundings. Steps made in this paper may become a part of further research into local economic development.

There is no doubt that the tool for the analysis of factors describing human capital in the commune of Ustka can be used for studying other self-government units. However, a set of variables may differ because of the specific character of the economy, the demographic structure, the availability of statistical data, which may be a limitation to using the approach presented here. The tool and the approach, however, are universal and can be successfully used for other territorial units.

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Annex

Table 1. Human capital resources

Symbol	Specification	Measurement unit	Coefficient of variation
$Y(kl)_1$	Total population	persons	1.9%
$Y(kl)_2$	Percentage of people of working age in total population	%	5.0%
$Y(kl)_3$	Demographic burden indicator	%	14.7%
$Y(kl)_4$	Number of employed people	persons	12.9%
$Y(kl)_5$	Coefficient of professional activity	%	4.5%

Table 2. Variables determining human capital resources

Symbol	Specification	Measurement unit	Coefficient of variation
$X(kl)_1$	Demographic dynamics indicator (population growth)	persons	153.8%
$X(kl)_2$	Migration balance	persons	52.8%

Table 3. Correlation coefficients – human capital resources

Specification	$Y(kl)_3$	$Y(kl)_4$	$X(kl)_1$	$X(kl)_2$
$Y(kl)_3$	1			
$Y(kl)_4$	-0,49	1		
$X(kl)_1$	-0,79	0,75	1	
$X(kl)_2$	-0,37	0,44	0,27	1

Table 4. The results of regression analysis – human capital resources

Correlation between variables:		Assessments of model parameters		Standard errors of parameter estimation		Coefficient of determination	Student's T-test	Value *P*
dependent	independent	a_0	a_i	Sa_0	Sa_i			
$Y(kl)_3$	$X(kl)_1$	51.03	-0.223	1.708	0.050	0.62	-4.467	0.00077
$Y(kl)_4$	$X(kl)_1$	2767.2	8.788	76.81	2.246	0.56	3.912	0.00206

Table 5. Variables describing the quality of human capital

Symbol	Specification	Measurement unit	Coefficient of variation
$Y(jl)_1$	Percentage of councillors with higher education in the City Council	%	15.3%
$Y(jl)_2$	Pre-school enrolment ratio	%	17.1%
$Y(jl)_3$	Average score at junior high school final examinations (% of points scored)	%	4.2%
$Y(jl)_4$	Number of primary school students per one computer	units	103.7%
$Y(jl)_5$	Number of books borrowed from a library per one inhabitant	units	31.9%
$Y(jl)_6$	Number of participants of municipal cultural events	persons	51.3%
$Y(jl)_7$	The dynamics of the median of inhabitants' age	%	57.7%

Table 6. Students learning foreign languages in the schools of Ustka

Specification		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Primary schools	Number of students	1,243	1,172	1,131	1,151	1,109	996	1,206	1,342	987	1,584
	% of the total number of students*	126 %	127 %	127 %	129 %	125 %	117 %	131 %	130 %	105 %	143 %
Junior high schools	Number of students	609	684	679	641	524	491	498	514	494	313
	% of the total number of students*	133 %	149 %	176 %	201 %	200 %	183 %	210 %	220 %	217 %	212 %

Note: *students are recorded as many times as the number of languages they learn.
Source: Author's own work based on data from the Local Data Bank.

Table 7. Variables determining the quality of human capital

Symbol	Specification	Measurement unit	Coefficient of variation
$\mathbf{X(jl)_1}$	Commune's real spending on education per one inhabitant	zloty	13.9%
$\mathbf{X(jl)_2}$	Commune's real spending on health care per one inhabitant	zloty	18.3%
$\mathbf{X(jl)_3}$	Size of the book collection in the municipal library	items	4.2%
$\mathbf{X(jl)_4}$	Number of municipal cultural events	items	33.7%

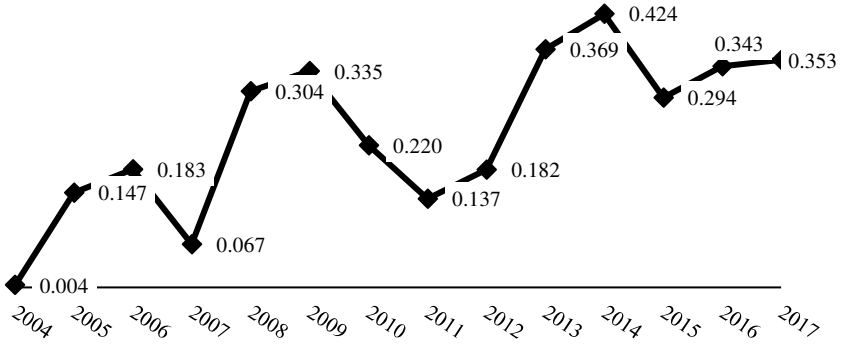
Table 8. Matrix of correlations – human capital quality

Variables	$Y(jl)_1$	$Y(jl)_2$	$Y(jl)_4$	$Y(jl)_5$	$Y(jl)_6$	$Y(jl)_7$	$X(jl)_1$	$X(jl)_2$	$X(jl)_4$
$Y(jl)_1$	1								
$Y(jl)_2$	-0.32	1							
$Y(jl)_4$	0.87	-0.25	1						
$Y(jl)_5$	0.86	-0.41	0.79	1					
$Y(jl)_6$	-0.22	0.42	-0.26	-0.38	1				
$Y(jl)_7$	-0.85	0.58	-0.81	-0.95	0.51	1			
$X(jl)_1$	-0.54	0.49	-0.31	-0.76	0.15	0.71	1		
$X(jl)_2$	-0.55	0.44	-0.60	-0.80	0.35	0.77	0.66	1	
$X(jl)_4$	-0.43	0.79	-0.39	-0.63	0.71	0.76	0.57	0.56	1

Table 9. The results of the regression analysis – the quality of human capital

Correlation between variables:		Assessments of model parameters		Standard errors of parameter estimation		Coefficient of determination dependent	T - Student's statistics	Value P a_0
dependent	independent	a_0	a_i	Sa_0	Sa_i			
$Y(jl)_6$	$X(jl)_4$	1954.4	40.26	1127.8	11.468	0.51	3.511	0.0043
$Y(jl)_7$	$X(jl)_2$	-0.0902	0.0062	0.0368	0.0015	0.60	4.215	0.0012
$Y(jl)_7$	$X(jl)_1$	-0.1225	0.00023	0.0530	0.00006	0.51	3.527	0.0041

Figure 1. The synthetic measure of human capital (HC)



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Changings in households' behavior in formation of stocks due to pandemic

JEL Classification: *H1, D04; D15; D23; E21*

Keywords: *stocks; household goods; emergency situations; pandemics*

Research background: The world economy has undergone significant transformations during 2020. The global pandemic has affected the economy of households very much. In critical moments of limited access to products of different levels of need, people began to create stocks, or further increase existing ones. In the case of households, these were stocks of basic necessities (food and hygiene products).
Purpose of the article: The purpose of the article is to present and investigate the problems associated with the changings in households' behavior in formation of stocks due to pandemic.
Methods: The study is based on a theoretical analysis of the scientific literature on food stocks in a pandemic (emergency), statistical analysis and surveys.
Findings & Value added: The behavior of households in relation to food stocks in a pandemic (emergency) was studied. It is proposed to assess as a promising direction of typical (standard) behavior of households in case of emergencies and actu-

alized anticipatory activities of public authorities to form insurance stocks of products to solidify the risk of depletion of stocks of products by businesses, individuals and the state. The transformation of consumer behavior in relation to the maintenance of stocks of consumer goods in anticipation of emergencies is proved (substantiated).

Introduction

Problems of formation and maintenance of stocks are to some extent characteristic both at the level of business, the country's economy in general, and at the level of households. An actual example of the latter is the transformation of household behavior in a pandemic, where we can observe deviations from traditional rational behavior.

Traditionally, the more developed the economy, its service sector, the less households pay attention to product stocks, because there is a high level of availability of goods in a broad sense, in the availability of time, space, range, price and so on. Standard approaches to inventory functions such as isolating cyclic, insurance, seasonal, promotional, speculation, stabilization, service inherent in the business entities of little use to the evaluation and the causes of their functions held by households stock products. In any case, certain identified reasons for the accumulation of stocks in households accordingly generate consequences of their behavior, which can be interpreted as positive for business and the economy as a whole, creating additional direct and related demand groups of goods.

In general, in the case of the formation of stocks of products by households in emergencies, there is a need for causal analysis of their behavior, identification of trends and development of recommendations for the adaptation of this behavior to the dynamics and potential of emergencies.

Literature review

Since March 2020, scientists have been observing the impact of the pandemic on the lives of the population and changes in the economy. Scientists focus heavily on modeling and forecasting excess demand for goods and services during a pandemic (Nikolopoulos, K., Punia S., Schäfers, A., Tsinopoulos, Ch., Vasilakis, Ch., 2021, pp. 99-115).

Widespread consumer panic in most countries was primarily observed during March, but with significant differences in timing and level of panic between countries. Keane, M., Neal, T. A model has been proposed that

assumes that both domestic and global transmission of viruses significantly contribute to consumer panic. (Keane, M., Neal, T., 2021, pp. 86-105).

A pandemic reduces the financial efficiency of financial institutions; however, the social effectiveness of MFIs increases under the influence of COVID-19 (Zheng, C., Zhang, J., 2021, pp. 407-423), thereby changing consumer perceptions. People's concern about the impact of COVID-19 on their financial situation leads to the formation of state aid to the population (Kobayashi, Y., Heinrich, T., Bryant, KA, 2020) in the form of control over the production and movement of goods, as well as the formation of stocks of national importance. Public policy is also important because of the restriction of internal movement of people to reduce panic (Keane, M., Neal, T., 2021, pp. 86-105).

Innovations in food production can offer urban communities sustainable alternatives to accessing food that meet both local food security and green infrastructure needs. They also draw attention to persistent socio-political barriers (O'Hara, S., Toussaint E. C., 2021). Also important is the issue of food waste accumulation due to changes in household storage habits for food (Smith, T.A., Landry, C. E., 2021, pp. 4-21).

Nationwide changes since the pandemic have forced scientists to look more globally at the issue and evaluate the entire supply chain (Flynn, B., Candor, D., Pagell, M., Dooley, K. J., Azadegan, A., 2021, pp. 3-6). The global supply chain is a lifeline for the world economy through rapid response and appropriate policy measures to overcome this pandemic economic crisis, (Qin, X., Godil, DI, Khan, MK, Sarwat S., Alam S., Janjua, L., 2021). A new concept of extended supply chain and modeling of consumer behavior in a pandemic are considered in order to promote the balance of the world economy (Taghikhah, F., Voinov A., Shukla, N., Filatova, T., Anufriev M., 2021, pp. 852-868).

Life of people during the year in a pandemic has stabilized the behavior of households in the formation of stocks of products. There are some experience in this area, dominance of conscious decisions as opposed to spontaneous and emotional and it gives confidence to objectively assess content and directions transformation of this behavior.

Research methodology

The purpose of the article is to identify trends and assess changings in households' behavior in formation of stocks due to pandemic. To achieve the goal of the article, the authors conducted monographic studies of the problem of stocks of goods / products, put forward a number of hypoth-

eses and with the help of marketing research on the behavior of Ukrainian households through an online survey assessed the probability of their confirmation or rejection. The main hypothesis of the study is:

- the onset and prolonged existence of emergency conditions (pandemics) significantly affects the formation of changes in the behavior of households to maintain stocks of consumer products and such a transformation will have a residual effect on their behavior in a return to normal situations.
- Additional hypotheses include the following:
- the existence of differences in the behavior of state bodies of economic entities and households in terms of motivation and functional content of stocks;
- principles of rational and irrational behavior of households in a pandemic and the dynamics of such relations are combined;
- whether households' stockpile behavior in a pandemic is the result of a trade-off between a rational (classical) and a behavioral (behavioral) economy.

To achieve the objectives of the study provides the following stages:

- to determine the reasons for the formation of stocks in a pandemic based on critical analysis of sources and systematization of recent research and publications in the field of current trends and key requirements in the field of households;
- the analysis of tendencies of formation of stocks by Ukrainians on the basis of processing of results of the online questionnaire. The survey was conducted during January-March 2021, using a stratified proportional sample; the age and occupation of the respondents were taken as classification characteristics. The standard error in the results of sample formation is 5%, and the coefficient of variation is 31%. In fact, 148 respondents were interviewed;
- test hypotheses and draw conclusions and controversial provisions.

Results

Behavior of households in relation to the formation of stocks in a pandemic

The spread of behavioral economics in the last decade, caused primarily by a positive perception of human values, concern for the environment (environment, climate) and humanity (poverty, mortality, hunger, etc.), in some way transformed the behavior of households in general in the direction of

weakening rational behavior. However, the imposition district and the transformation behavior of households state of emergency (pandemics) able to cause unexpected effects, generate useless trends and more. That is why it is so important in the express mode to evaluate and detect such changes based on the use of primary information. To this end, a survey of households on their behavior in relation to the maintenance of stocks after a year in a pandemic was organized in Ukraine.

In order to ensure the reliability of the survey results, n = 148 citizens were interviewed.

The purpose of processing the survey results are Generalized spare received information from respondents, was conducted as a sample survey, the results need to ensure the transfer of the entire general population of consumers, which requires the use of known methods of statistical analysis. We used the following methods to evaluate the survey results:

- determination of the mean value of the percentage of survey results, the root mean square error at a given level of confidence (P = 95%) and confidence intervals of the survey results;
- use of χ^2-criteria for assessing the consistency of respondents' answers, identifying the relationship (or lack thereof) between the nominal characteristics for both the sample and the general population;
- application of ABC analysis to assess the distribution of respondents' answers;
- testing hypotheses and agreeing with respondents.

Below are the most significant results of the survey.

Question 1. Do you keep stocks of goods at home just in case? (Figure 1).

The determined average value of the surveyed respondents, who confirmed a certain type of answer, means that at a given level of confidence (P = 0.95), the average value of the assessment for the general population is in a certain range. Using the formula "STANDOT DEVIATION" in the Excel environment for the obtained survey results, we determine the standard deviation σ = 10.01%. Then for n = 148 the root mean square error is σ_x = 0.82%.

Thus, the average number of consumers for the general population, always holding only cyclical stocks (1 type of response) can be determined as follows: $\overline{x} = x \pm t \cdot \sigma_{\overline{x}}$ =37±1,96*0,82. We can say that for the general population the share of respondents (%) holding only cyclical stocks is in the range. Similarly, confidence intervals are defined for the average value of consumers who support other answers to question 1 (Table 1).

To establish the relationship between such nominal characteristics as "stock retention" and the demographic characteristics of respondents, we use χ^2-criterion, which will identify the degree of consistency of respondents' answers, to identify whether there is a relationship (or absent) between these characteristics.

To determine whether there is a relationship between the features, a matrix of conjugate frequencies of certain variables is constructed and the χ^2 criterion is used. It should be noted that if the test χ^2 indicates a connection, it also exists for the general population. To apply the criterion χ^2, it is necessary to compare the observation frequencies of a certain feature (f_{ci}) with the expected frequencies (f_{oj}), which are determined on the basis of the survey frequencies of the respondents. To do this, build a table according to the survey data of respondents, where f_{cs} - the results of the survey of respondents (table 2). The expected frequencies are determined by the formula:

$$f_{oi} = \frac{sum\_of\_column\_k \times sum\_f\_string\_m}{number\_of\_respondents},$$

where k, m = 1.2; and = 1.4.

The next step is to determine χ^2 by the formula

$$\chi^2 = \sum_{i=1}^{4} \frac{(f_{ci} - f_{oi})^2}{f_{oi}}$$

Estimation of the calculated χ^2 with tabular value.

In the case of the study of answers to 1 and 28 questions (each of the questions has 6 types of answers), then k = 6 and m = 6, and the degree of freedom is defined as K = (6-1) * (6-1) = 25, then the tabular value of χ^2table = 37.7. Obtained $\chi^2 = \sum_{i=1}^{36} \frac{(f_{ci}-f_{oi})^2}{f_{oi}}$ = 20,74. Then we can conclude that there is a condition $\chi^2_{count} <= \chi^2_{table}$, that is, the variable "inventory retention" and the demographic variable are independent.

We can conclude that such a variable as age does not affect the creation of stocks by consumers, which is reliable with a probability of P = 95% and for the general population of consumers in Ukraine.

Question 2. Most often you keep stocks (turn over several options) (Figure 2).

To determine the importance of stocking consumers Ukraine, use ABC analysis. Using this method of analysis allowed to identify the most common answers about the stocks of respondents.

The distribution of respondents revealed two groups - group B index V> 0.7, and group C - indicator V <0.7. As we can see, group A is absent, there is a statement that products, household chemicals and hygiene products, medicines and disinfectants form group B, as evidenced by the calculated indicator V_i.

Question 3. What food do you think you need to have as a stockpile in case of emergencies?

Let's consider the answers of the respondents to the questions concerning the stocks of certain foodstuffs in order to identify the degree of their importance for the respondents. Based on the calculation of the weighted average value (the weight is a score from 1 to 5), the rating of each type of stocks is established, sorted by degree of importance.

We can conclude that consumers keep stocks of those products that have the longest shelf life, as evidenced by the rating of stocks.

As follows from the assessment of answers to other questions, the maintenance of food stocks in the household has become an important characteristic of their lives and it will remain for the future as a residual effect. The behavior of households has become more rational in terms of the formation of insurance reserves, in relation to other functions of stocks (compared to business), the pandemic has not changed the status quo. Demographics do not affect the content of household holding behavior. Households are ready to share the risk with government agencies and businesses to maintain insurance stocks in case of emergencies. There is a significant relationship between occupation and attitudes towards household maintenance.

Conclusions

In accordance with the objectives of this study and based on the research methodology proposed by the authors, the following results were obtained in the article:

- the main hypothesis was confirmed: the onset and prolonged existence of emergency conditions (pandemics) significantly affects the formation of changes in the behavior of households to maintain stocks of consumer products and such a transformation will have a residual effect on their behavior in return to normal;

- the first additional hypothesis was confirmed: increasing of the households stocks;
- the second additional hypothesis was confirmed: rationality in a broad sense (in terms of health) is enhanced and partially remains in normal conditions;
- the third additional hypothesis was confirmed: the behavior is dynamic, in the beginning more emotional, then with the acquisition of experience increases rationality.

The use of the obtained research results can be useful for building crisis management systems by economic entities and modernizing the system of household strategic stocks.

The following issues are proposed as discussion positions and directions of perspective researches:

- How is the behavior of households regarding the maintenance of stocks transformed in terms of impact on the country's economy?
- to what extent will the transformation of households' stockholding behavior become irreversible?
- whether healthy trends (conscious fashion, conscious life, minimalism) are not weakened in a pandemic due to fear for life.

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Annex

Table 1. Determining the confidence interval for the average value of respondents from the general population of consumers who supported a certain answer to question 1

	Types of respondents' answers						
	1	**2**	**3**	**4**	**5**	**6**	**Together**
Number of respondents,% (x)	3 7	1 5.1	2 1.2	4. 8	1 3.7	8. 2	100
The lower limit of the confidence interval	3 5.39	1 3.49	1 9.59	3. 19	1 2.09	6. 59	
The upper limit of the confidence interval	3 8.61	1 6.71	2 2.81	6. 41	1 5.31	9. 81	

Table 2. Calculation χ^2- criterion. Matrix of conjugate frequencies

	Age of respondents						
Stock maintenance	**18-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70 and >**	Together
always only cyclical stocks	9	10	22	9	4	2	56
I have no stocks, everything is available	5	4	6	4			19
always cyclical stocks and insurance for individual items	4	6	14	7	1		32
no monitor stocks		3	5	1			9
always cyclical and insurance	4	8	4	2			18
always cyclical and now I keep insurance during a pandemic	4	3	3	3	1		14
Together	26	34	54	26	6	2	148
Total,%	16.9	23	37.8	16.9	4.1	1.3	100

Table 2. Continued

Matrix of expected frequencies							
	18-29	**30-39**	**40-49**	**50-59**	**60-69**	**70 and more**	**Total,%**
always only cyclical stocks	9.84	12.86	20.43	9.84	2.27	0.76	56.00
I have no stocks, everything is available	3.34	4.36	6.93	3.34	0.77	0.26	19.00
always cyclical stocks and insurance for individual items	5.62	7.35	11.68	5.62	1.30	0.43	32.00
no monitor in stock	1.58	2.07	3.28	1.58	0.36	0.12	9.00
always cyclical and insurance	3.16	4.14	6.57	3.16	0.73	0.24	18.00
always cyclical and now I keep insurance during a pandemic	2.46	3.22	5.11	2.46	0.57	0.19	14.00
Together	26.00	34.00	54.00	26.00	6.00	2.00	148.00

Calculation of the criterion							
	18-29	**30-39**	**40-49**	**50-59**	**60-69**	**70 and more**	**Together**
always only cyclical stocks	0.07	0.64	0.12	0.07	1.32	2.04	4.26
I have no stocks, everything is available	0.83	0.03	0.13	0.13	0.77	0.26	2.14
always cyclical stocks and insurance for individual items	0.47	0.25	0.46	0.34	0.07	0.43	2.02
no monitor stocks	1.58	0.42	0.90	0.21	0.36	0.12	3.60
always cyclical and insurance	0.22	3.61	1.00	0.43	0.73	0.24	6.24
always cyclical and now I keep insurance during a pandemic	0.96	0.01	0.87	0.12	0.33	0.19	2.49
Together	4.13	4.96	3.48	1.30	3.58	3.29	20.74

Figure 1. Question 1. Do you keep stocks of goods at home just in case?

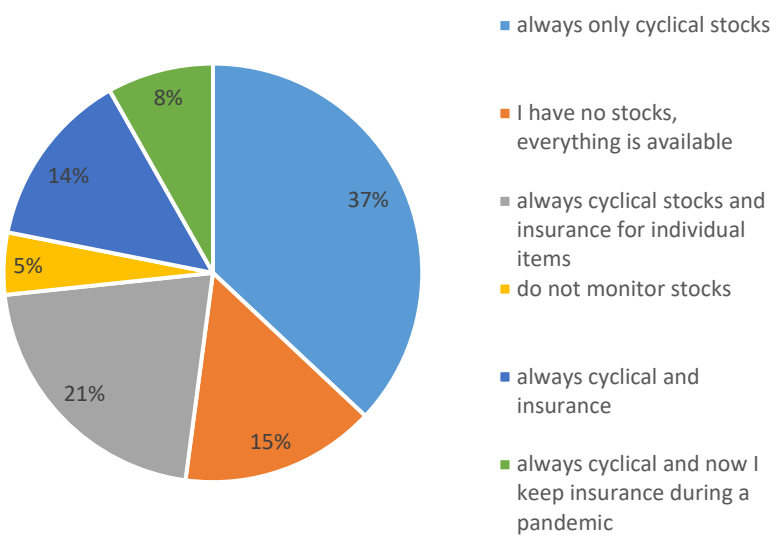
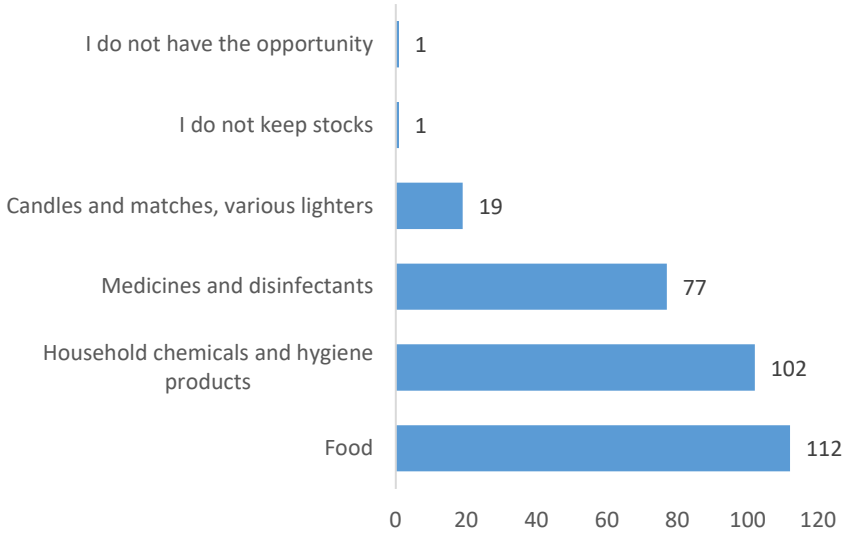


Figure 2. Question 2. Most often you keep stocks (turn over several options)



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Variation, changes, and economic conditions of greenhouse gas emissions from industry and agriculture in European Union states

JEL Classification: *Q01, Q53, Q54, Q56, R11, R12*

Keywords: *greenhouse gas emission, industry, agriculture, variation, economic factors, economic growth, European Union states*

Abstract

Research background: One of the biggest challenges of the present time is the climate crisis, and the effects of global warming are widely known. The cause of the unfavorable climate change is the growing emission of greenhouse gases, and the pollution is caused by unlimited and ubiquitous human activity, agricultural and industrial production.
Purpose of the article: The aim of the article was to compare and evaluate the level, trends and diversity of greenhouse gas emissions from industry and agriculture in the countries of the European Union in 2010-2018, and to examine whether there is a link between the level of greenhouse gas emissions and the economic development of countries and other economic indicators characterizing the industry and agriculture sector.
Methods: The assessment of the issues taken into account included indicators that deal with the emission of greenhouse gases such as carbon dioxide, methane and nitrous oxide (Y01-Y09), economic indicators (X01-X06), as well as indicators showing the climate-related expenditure and losses of EU countries. The source of empirical data was information from the European Statistical Office. The research period was 2010-2018. The empirical data were subject to statistical analysis.
Findings & Value added: In the European Union countries, the share of greenhouse gas emissions from industrial processes and agriculture is diversified, gradually increasing and in 2018 was 8.8% and 10.1% respectively. Agricultural production emits significantly more methane and nitrous oxide, while industry emits more carbon dioxide. On the basis of the study it was found that there is a significant impact of the economic development of the country on the level of greenhouse gas

emissions from agriculture, while there is no impact in the case of industry. In order to avoid aggravation of adverse climate change, all EU member states should take effective, efficient and sustainable actions in industry and agriculture to reduce the level of greenhouse gas emissions as soon as possible.

Introduction

One of the negative effects of operations of all global economies is the increasing environmental pollution contributing to global warming and consequently the global climate crisis (WMO, 2019; ESOTC, 2019; IPCC, 2019). A growing body of evidence suggests that the risk of extreme heat will be growing as climate change progresses and will pose serious public health and economic hazards, with climate change affecting nearly 50% of the world's societies and economies by 2035 (Chen et al. 2020).

The current climate crisis is the result of detrimental effects of increasing concentrations of greenhouse gases (Hamit-Haggar, 2012, pp. 358-364; Storch et al. 2015, p. 16; Pajewski, 2016, pp. 214-218; Pawlak, 2017, pp. 138-151; Chen et al. 2020; Jovanović et al. 2015, pp. 16290-16310), which are generated naturally and anthropogenically in the atmosphere. Of all of the long-lived greenhouse gases that are emitted as a result of human activity, carbon dioxide CO_2, methane CH_4 and nitrous oxide N_2O have the greatest impact on climate change (ESOTC, 2019).

The main sources of anthropogenic gas emissions are the energy sector, transport, industry, agriculture, and landfills. Increased intensification of industrial processes and agricultural production, development of tourism and consumerism in developed countries are often prioritised and external environmental costs are often ignored (Pajewski and Gołębiewska, 2020; Schläpfer, 2020). Therefore, the hope for change lies in the gradual steps countries are taking to reduce the burden on the natural environment. But are all EU countries really effective in taking measures to reduce emissions of harmful pollutants and are they effectively managing greenhouse gas emissions to reduce them? Knowing that economic growth is a priority in many countries, an answer was also sought as to whether GHG emissions increase with rising GDP, business investment or government subsidies and outlays for industry or agriculture. In an effort to answer these questions, the first objective of the article was to assess the level of emissions and the progress of the countries in managing their GHG emissions, the trends between 2010 and 2018 as well as the variation between countries. The second objective was to examine differences between the countries in total greenhouse gas emissions and emissions such as CO_2, CH_4, N_2O, from

industry and agriculture. The third objective was to determine the strength of correlation between economic indicators and indicators characterising greenhouse gas emissions. Achievement of the paper's objectives was intended to allow the verification of the hypothesis assuming that EU countries are still significantly varied in terms of greenhouse gas emissions from industry and agriculture, and that the amount of these gases released to the environment depends on the economic development of a country and other economic conditions.

Research methodology

Achieving the objectives of the article and verifying the hypothesis assumed in the introduction to the study was possible thanks to the analysis and evaluation of the available indicators for monitoring the sustainable development goals collected by the European Statistical Office (Eurostat 2020). The selection of indicators was based on the expert method, which consisted of holding discussions with independent experts on the validity of variable selection. For evaluation of the issues addressed, the following were taken into account:

- indicators characterising total greenhouse gas emissions by industry (P) and agriculture (A) as a % of total emissions (Y_{01P}, Y_{05A}) and, in particular, release of gases such as carbon dioxide CO_2 (Y_{02P}, Y_{06A}), methane CH_4 (Y_{03P}, Y_{07A}) and nitrous oxide N_2O (Y_{04P}, Y_{08A}), and total greenhouse gas emissions in tonnes per capita (Y_{09})
- economic indicators such as GDP per capita (X_{01}), share of business investment in GDP (X_{02P}), R&D expenditure in the corporate sector (X_{03P}) and agriculture (X_{04A}), and agricultural factor income per annual work unit (X_{05A}) as well as stocking rate (X_{06A}).

The studied period covered the years 2010 to 2018. Twenty-seven European Union states were analysed. The collected indicators were subdivided into dependent variables Y and independent variables X. Such subdivision of the indicators was employed to verify the existence of any links between the economic indicators and emissions of greenhouse gases generated in the course of production and agricultural processes. Empirical data has been statistically analysed. Core descriptive statistics of the examined set of EU countries were utilised in the paper. Inter alia, indices of the rate of increase or decrease I_t in %, rates of change R in percentage points, coefficients of variation V_s in %, asymmetry coefficients A and kurtoses K, and correlation coefficients r_{xy} were calculated. Calculation of the rates of increase or decrease I_t was performed to evaluate the percentage (%) change

in GHG emissions in 2018 compared to base year 2010 (I_t=t_{2018}-t_{2010} *100-100), and calculation of the rate R – to evaluate the difference in percentage points (p.p.) between emissions in 2018 compared to 2010 (R=t_{2018}-t_{2010}). Values of indicators I_s and R greater than zero indicate an increase in the level of emissions, whereas values less than zero indicate a decrease in emissions. To assess the variability (variation) of the studied countries, the coefficient of variation V_s ($V_s = S/\bar{x} * 100\%$, where $\bar{x}$ and S represent the arithmetic mean and standard deviation, respectively) was used. The variation between EU countries in emissions is significant when Vs>10%. The measure of asymmetry A was used to assess whether a majority of the countries are above or below the average level of the studied variable. On the other hand, measures of kurtosis K were calculated to assess the concentration of results around the average for EU countries. To meet one of the specific objectives of the article, correlation analysis was performed during the study and linear correlation coefficients r_{xy} were calculated.

Results

The present study has yielded alarming results regarding GHG emissions from industry and agriculture in European Union countries for 2010-2018. Agriculture accounts for a larger share of total GHG emissions (Y_{05A}2018=10.1%) than industry (Y_{01P}2018=8.8%). EU(27) countries are significantly varied in terms of the release of gases into the environment, as confirmed by the calculated coefficients of variation V_s (industry – V_s2018=45.3%, agriculture – V_s2018=56.1%); no significant decrease or increase in variation between countries has been observed (Table 1). In 2010-2018, only four EU countries (27) saw a decline in greenhouse gas emissions from industry (Spain, Croatia, Portugal and France), and only one from agriculture (Cyprus).

Based on the calculated coefficients of variation V_s, it can be concluded that EU countries are significantly differentiated in terms of carbon dioxide CO_2, methane CH_4 and nitrous oxide N_2O emissions, the differentiation does not change, and the distance between the countries emitting the most and the least of these gases, both from industry and from agriculture is consistently high and has remained at a similar level for years.

EU(27) countries emit significantly more carbon dioxide CO_2 from production processes and product applications than from agricultural activities. In 2018, EU CO_2 emissions from industry accounted for 7.4% of total CO_2 emissions and from agriculture – for merely 0.3%. CO_2 emissions from agriculture have practically remained at a similar level for years (2010-

2018), while CO_2 release from production processes increased by $R_{PCO2}2018\text{-}2010$=0.6 percentage points and $I_{sPCO2}2018$ was 8.9%. Industry plays a negligible role in the emission of CH_4 methane, while agriculture is the main contributor to its emission. As the data collected for EU countries(27) shows, CH_4 emissions from industry accounted for $Y_{03P}2018$=0.3% of total CH_4 emissions, while from agriculture – as much as $Y_{07A}2018$=54.2%. CH_4 emissions from industry are relatively low and have remained at a similar level since 2010 or have increased significantly in case of agricultural activity (R_{Y07A}=4.5 p.p.; I_{sY07A}=8.9%). In EU(27) Member States, similarly to methane, nitrous oxide N_2O also originates in huge part from agricultural activities. The share of N_2O emissions from industry in 2018 was 4.3%, while from agriculture – as much as 78.7% of total N_2O emissions. It should be emphasised that within the analysed period of 2010-2018, a positive trend of decrease in N_2O emissions from industry was observed ($R_{Y04}P$=-4.2 p.p.; I_{sY04P}=-50.9%). The calculated coefficients of change I_s and R indicated a reduction in the share of industry in N_2O emissions between 2010 and 2018 by about one half. Unfortunately, such conclusions cannot be drawn for nitrous oxide emissions from agriculture. Not only is agriculture a major emitter of N_2O, but over the analysed period it emitted even more and increasingly more of this gas, as confirmed by the calculated coefficients (R_{Y08A}=+4.0 p.p.; I_{sY08A}=+5.3%).

One of the objectives of the study was to determine whether there are correlations between economic conditions and GHG emissions. A significant positive correlation at the level of r_{xy}=+0.596 exists between variables Y_{09} (GHG emissions in tonnes per capita) and X_{01} (GDP per capita). Based on this coefficient, it can be concluded that the richer the EU(27) countries, with higher economic development, the significantly higher the GHG emissions in tonnes per capita.

However, after using an indicator measuring the share of GHG emissions from industry and agriculture in % of total emissions, it turns out that the resulting correlations with economic conditions are no longer so evident. In the case of indicators describing the share of emissions from industry in % of total emissions for total greenhouse gases (Y_{01P}), CO_2 (Y_{02P}), CH_4 (Y_{03P}) and N_2O (Y_{04P}) and indicators characterising economic conditions, such as GDP per capita in EUR (X_{01}), share of business investment in % of GDP (X_{02P}) and gross domestic expenditure on R&D in the corporate sector in % of GDP (X_{03P}), there are no significant correlations. Therefore, it can be unambiguously concluded that economic conditions such as GDP per capita, share of business investment or government support for R&D in the corporate sector in EU(27) countries are not correlated with total green

house gas emissions, CO_2, CH_4 or N_2O emissions from industrial processes and product manufacturing (Table 2).

An analysis of the level of greenhouse gas emissions from agriculture and the relationship of the level of these emissions with economic conditions reveals more significant correlations. A significant positive correlation exists between the level of GDP per capita and the share of CH_4 methane emissions from agriculture (r_{xy}=0.78). Significant positive correlations are also found between government support for research and development (R&D) in agriculture (X_{04A}) and the share of agriculture in total GHG emissions Y_{05A} (r_{xy}=0.53), in carbon dioxide emissions Y_{06A} (r_{xy}=0.69) and methane emissions Y_{07A} (r_{xy}=0.57). In addition, significantly more methane is emitted from agriculture in EU(27) countries with relatively higher agricultural factor income in EUR per annual work unit (AWU) X_{05A} (r_{xy}=0.47) and significantly higher stocking rate X_{06A} (r_{xy}=0.46). In contrast, no correlation was found between N_2O emissions from agriculture and the economic conditions taken into account in the study (Table 2).

Conclusions

Industry and agriculture in EU(27) countries play a significant role as emitters of greenhouse gases and the impact of these economic sectors on environmental pollution has further increased in recent years. During the analysed period of 2010-2018, no progress has been observed in the effective reduction of the concentration levels of these harmful gases from industry and agriculture, and the EU(27) countries continue to vary significantly in this respect. Agriculture accounts for a larger share of total GHG emissions (10.1%) than industry (8.8%). Industry emits considerably more carbon dioxide CO_2 than agriculture, while agriculture is the main contributor of methane CH_4 and nitrous oxide N_2O.

When analysing the correlation between the overall indicator Y_{09} representing total GHG emissions in tonnes per capita of a country and the GDP per capita (X_{01}), it appears that the higher the economic growth of a country, the higher the level of GHG emissions per capita. However, when looking at indicators describing the share of greenhouse gas emissions from industry and agriculture as a % of total emissions, no such obvious correlations are found. For example, in the case of industry, there is no significant correlation between economic factors such as GDP per capita, share of business investment or government support for R&D in the business sector and GHG emissions from industry. In contrast, in the agricultural sector,

more confirmed correlations between gas emission indicators and economic conditions were found. Methane CH_4 emissions from agriculture significantly increase with all economic indicators included in the study, such as GDP per capita, government support for agricultural R&D, agricultural income or stocking rate. The most disturbing is the significant positive correlation between emissions of all GHGs studied and government support for agricultural R&D, meaning that the higher the support, the more GHGs the country emits.

In conclusion, the results of the presented research indicate the existence of differences in the level of greenhouse gas emissions from industry and agriculture in individual EU countries, as well as a relationship between the economic conditions of these countries and the level of emissions. The paper may contribute to the continuation of the discussion on this subject among scientists, as well as a wide range of stakeholders, deciding on the future directions of development of the industrial and agricultural sectors in times of the global climate crisis.

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Annex

Table 1. Greenhouse gas emissions from industry (Y_{01P}) and agriculture (Y_{05A}) in 2010-2018 in EU(27) countries – statistics

Greenhouse gas emissions from industry in % of total emissions (Y_{01P})						**Greenhouse gas emissions from agriculture in % of total emissions (Y_{05A})**					
Statistics for	2010	2015	2016	2017	2018	**Statistics for**	2010	2015	2016	2017	2018
EU(27)	8.4	8.7	8.7	8.8	8.8	**EU(27)**	9.0	10.1	10.1	10.0	10.1
Y_{01P} min. Estonia	2.5	2.8	2.5	3.0	3.1	**Y_{05A} min. Malta**	2.1	2.6	2.9	2.5	2.5
Y_{01P} max Slovakia	20.5	21.8	22.0	22.1	22.1	**Y_{05A} max Ireland**	27.9	30.0	29.8	30.6	31.1
V_s	49.2	46.6	47.3	46.8	45.3	**V_s**	57.0	56.0	55.0	56.8	56.1
A_s	0.9	0.7	0.7	0.7	0.7	**A_s**	1.6	1.5	1.5	1.5	1.5
K	0.9	0.4	0.2	0.1	0.1	**K**	3.1	1.9	1.9	2.2	2.5

* Key: y_{01Pmin} – minimum value for the country, y_{01Pmax} – maximum value for the country, V_s – coefficient of variation in % for EU(27) countries, A_s – asymmetry, K – kurtosis.

Source: own calculations based on Eurostat (2020). Your key to European statistics. Retrieved from https://ec.europa.eu/eurostat/data/database (28-30.11.2020).

Table 2. Correlations r_{xy} between variables characterising the level of greenhouse gas emissions from industry Y_P and agriculture Y_A in EU(27) in 2018 and economic factors X

Correlations r_{xy} – emission from industry				**Correlation r_{xy} – emission from agriculture**				
Variable	X_{01}	X_{02P}	X_{03P}	Variable	X_{01}	X_{04A}	X_{05A}	X_{06A}
Y_{01P}	-0.19	0.22	-0.01	Y_{05A}	0.14	0.53*	-0.12	-0.09
Y_{02P}	-0.20	0.35	-0.01	Y_{06A}	0.32	0.69*	0.03	-0.06
Y_{03P}	0.33	0.22	0.34	Y_{07A}	0.78*	0.57*	0.47*	0.46*
Y_{04P}	0.22	0.19	0.14	$Y0_{8A}$	-0.16	0.28	-0.19	-0.31

* The correlation coefficients marked by an asterisk are significant with $p<0.05$; N=27 (missing data was deleted on a case-to-case basis).

Source: as in Table 1.

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Social protection for maternity - policy trend in EU selected countries

JEL Classification: *J11; J13; J18*

Keywords: *social protection*; *family policy; maternity and paternity benefits*

Abstract

Research background: In the time of the deepening demographic crisis on the Europe, the family policy pursued by governments is aimed at stopping the decline in the population. One of its instruments is paid maternity allowance. It is also an element of health and economic protection of working women and their children in the perinatal period.
Purpose of the article: The aim of this article is to identify differences within adopted models in UE selected countries (Bulgaria, Germany, Ireland, and Poland) for establish construction the maternity benefit. This regulation also influences changes in the expenditure on maternity' and paternity' benefit as well on the level of the on birth and total fertility between 2009-2019. Authors present the overview of the policy trends and the social protection' instruments for maternity in Europe. Then, presents the characteristic of the maternity allowance' construction in selected countries.
Methods: The paper was written on the basis of available literature, current legislation, reports of social security institutions in selected countries as well European Commission and International Labor Organization. During undertaken research comparative and descriptive analysis methods were used.

Findings & Value added: The research allows to assess the validity of the government's actions and the impact of benefit increases in selected countries. This paper extends the literature on overview of the trends in the policy and construction the maternity allowance in selected countries. Also can provide the guidelines for private and public sector e.g. Human Resources teams the government members and policies makers in other countries.

Introduction

At the beginning of the 20th century, maternity leave was not a common phenomenon. Men occupied high positions, they were not interested in such issues. Before 1919, there was maternity leave in many European countries, but it was unpaid and lasted 3-4 weeks. Doctors considered it too short to fully recover, suggesting 6 weeks before and after childbirth. The situation changed after the end of World War I. Initially, the main focus was on returning to normal functioning and ensuring 8 hours of work for the breadwinner (one of the assumptions of the establishment of the Labor Commission, which focused only on male work). This situation prompted women to protests, e.g. in Great Britain, France and the United States, where they fought for the right to a fair, international standard for working women. Women took to the streets and demanded 12 weeks of paid maternity leave as a medical necessity and a social right. The result of these activities was the establishment of the International Labor Organization, which regulates working conditions all over the world. In October 1919, the first International Congress of Working Women was convened in Washington. One of the aspects discussed was maternity leave. Congress adopted the 1919 Convention for the Protection of Maternity, which was the world's first law on fair working conditions for mothers (Siegel, 2019). The main idea was to guarantee mothers 6 weeks of postpartum and pre-delivery leave, which was to be sufficiently paid to keep the mother and child healthy and healthy. According to International Labor Organization (ILO) an important point was also to protect the position of a woman at work during her absence so that she would not be. In 1952, the Convention for the Protection of Maternity was re-convened, the assumptions in this matter have not changed much. Information was introduced on the amount of the benefit in the case of payment from compulsory insurance, which may not be lower than 2/3 of a woman's earnings before going on maternity leave. In addition to the cash allowance, the mother should receive medical assistance. Such provisions existed for many years until 2000, when the last Convention on the Protection of Motherhood was convened by ILO. During

this meeting, the leave was extended to a minimum of 14 weeks. In the same year, the Recommendation on the protection of maternity was published, which extended this period even further, to 18 weeks, and talks about adjusting the length of leave to the number of children born in one delivery. It also increased the recommended allowance to total pay before maternity leave.

Research methodology

The research conducted in this article concerns the functioning of the maternity allowance in: Bulgaria, Germany, Ireland and Poland between 2009 - 2019. The choice of these countries was dictated by the specificity of the allowance functioning in a given country: in Bulgaria existing the longest maternity leave, the mixed system occurs in Germany, in Ireland all receive lump sum and Poland as authors' place of work and life.

Various research tools were used to achieve the aim of the article. The article is based on a descriptive method involving the analysis of literature related to security and social policy. In addition, the desk research method was used, based on documents showing trends and the scope of the functioning of this in the studied countries. This analysis made it possible to present the evolution of this instrument of social policy, as well as to show the territorial differentiation, both in the formal and legal aspect as well as in the financial dimension.

The methodology used made it possible to achieve the goal of the article and to formulate conclusions and recommendations regarding private and public sector e.g. Human Resources teams, the government members and policies makers in other countries.

Results

In Bulgaria, the maternity allowance is financed by the sickness and maternity insurance contribution, which is 3.5% of the monthly salary. The payment is made in 60% by the employer and 40% by the employee. Collection of contributions and payment of benefits is the responsibility of the National Social Insurance Institution (Szyszko–Głowacka, 2014, p. 2).

In order to receive the benefit for pregnancy and childbirth, the condition of being insured in the event of sickness or maternity for 12 months must be met, and the child must be alive, not submitted for adoption or foster family, parental rights must not be revoked, mother must not with-

draw her right to unemployment benefit. In Bulgaria, maternity leave is the longest in the entire European Union and lasts 410 days, regardless of the number of children born during one birth. Every woman must use 135 days. Part of this period, 45 days, should be used before the planned date of birth. The rest is intended for postpartum use.

In the case of adopting a child under 5 years of age, the conditions for receiving the benefit are the same as in the case of the birth of a child, additionally the adoption may not be annulled by the court. Adoptive parents have 365 days to use until their child turns 5.

The biological father and the adoptive father are entitled to 15 paid days, and after the child is 6 months old, he may take care of the child until the end of the granted period of the pregnancy and childbirth allowance. The condition for receiving the allowance is a marriage with the child's mother or living in the same household.

The basis for calculating all benefits is the average daily earnings for the last 24 months. The benefit rate is 90% of gross salary. The benefit cannot be lower than the minimum monthly salary, which in 2019 was BGN 560 (€ 286) and higher than the maximum social security and health insurance income, BGN 3,000 (€ 1,534). For fathers and adoptive parents, the rate is calculated in the same way.

According to data from European Commission after the 410 days of pregnancy and childbirth leave have been used up, parents have the option to take advantage of the infant care benefit The allowance is paid until the child turns 2 years old. The rate of this benefit in 2019 was BGN 380 (€ 194).

Maternity Benefit in Ireland is funded by Pay-Related Social Insurance (PRSI) contributions, which is earnings-related social insurance. Every insured person applying for Maternity Benefit must pay PRSI contributions for at least one year. For this benefit, it is the penultimate tax year before the start of the benefit year (Burdzińska, 2019, p.12). All employees and the self-employed aged between 16 and 66 are covered by the same social security system. There is no single premium rate. Employees are divided into 11 classes depending on such factors as occupation or earnings**.** Contribution rates vary greatly, but on average, most workers pay 4% of wages, and employers pay 10.75%, all of which are collected by the Social Insurance Fund**.** Benefit payments are handled by the Department of Employment Affairs and Social Protection. In Ireland, regardless of the number of children born in one birth, leave is granted for 26 weeks (156 days - Sundays are not included). The leave must be taken at least 2 weeks, but not earlier than 16 weeks before the planned date of birth. It is mandatory for every mother to take at least 4 weeks' leave from childbirth. It is possible to

take 16 weeks of additional maternity leave, but it is no longer covered by the allowance, so it is free of charge. In 2014, the government introduced a unified rate of benefit, in 2019 all beneficiaries receive € 245 per week. The full benefit is paid when the woman is not getting any other allowance, such as Widow's Allowance, Prisoner's Wife, Single Parent's Allowance. If she has any other source of income, she gets 50% of the benefit.

Fathers have the opportunity to take Paternity Leave. It lasts for 2 weeks and is paid as Maternity Benefit - € 245. If the mother dies within 40 weeks of giving birth, the father may take the outstanding part of her leave as well as her allowance. If the death would occur within the first 24 weeks, the father may apply for an extension of the maternity leave period.

For women adopting children, there is a separate allowance (Adoptive Leave) which consists of 24 paid and 16 unpaid weeks. All other rules are the same as for Maternity Benefit. In November 2019, additional help was introduced, Parent's Leave. It is a two-weeks leave for parents so that they can spend more time with their child in their first year of life. The rate is the same as for other benefits.

Until 2004, Germany was perceived as a country with one of the lowest fertility rates in Western Europe, as well as relatively low employment rates of mothers with young children. The problem that has been growing for decades required a thorough legislative change. In order to counteract this unfavorable phenomenon, the German government reformed the support system for parents on parental leave. This was done in accordance to the assumptions of the Scandinavian model (Spiess & Wrohlich, 2008, pp. 576-591). Prior to this reform, German maternity leave benefits were relatively permanent transfers to the lowest-income families. The average allowance was approximately EUR 4,000 and was paid for a maximum of 2 years. It also was not dependent of the mother's earnings before the child was born (Raute, 2019, pp. 203-222). The parental benefit reform in Germany is also a particularly interesting case of state-led public policy aimed at returning mothers to the labor market. Introduced in 2007, the parental benefit called "Elterngeld" ("parents' money") offers income replacement for up to 14 months (up to a maximum benefit of EUR 25,200 or approximately USD 28,000) or a basic money transfer in case of no other earnings from work in the period before birth (minimum benefit EUR 3,600 or USD 4,000) (Kluve & Szmitz, 2018, pp. 143-173).

The entry into force of these regulations provided mothers (parents) with a significant income supplement in the amount of at least 67% of the annual earnings before birth. A bonus is also 2 months of additional leave if this time is used by fathers. In Germany, the percentage of children when the father is taking parental leave has increased significantly, i.e. - from

8.8% for children born in 2007 to 32% for all children born in 2013 (after the introduction in 2007 of a two-months "bonus period" when both parents take at least 2 months of leave) (Moss & Deven 2015 pp. 137-144).

Nevertheless, while the reform has ensured an increase in benefits for women with higher education and higher earnings, the changes for women with very low incomes (and lower education) are slight or even perceived negative.

According to the research results (Chirkova, 2019, pp. 1-27)**,** the reform had two effects on the female labor market. First, a higher parental leave allowance reduces the loss of income of mothers who were employed before childbirth. As a result, the probability of returning to work decreases in the first year of motherhood and mainly affects high-income mothers. Secondly, the likelihood of taking up employment increases significantly in the second year of maternity, when the allowance payments end up.

According to the Polish legislation in Poland, maternity allowance is financed by sickness insurance paid from social insurance. The amount of the contribution for sickness risk is covered by the insured and amounts to 2.45% of the salary. The benefit is granted to employees and persons engaged in non-agricultural business activity, who have compulsory or voluntary health insurance. The funds are administered by the Social Insurance Institution, but in justified cases, benefits are paid by the employer on behalf of ZUS and from the funds accumulated in the Social Insurance Fund.

A woman may take advantage of maternity allowance when she gives birth to a child, adopts a child up to the age of 7, or accepts a child up to the age of 7 to be brought up in a foster family..

The allowance is granted for the period specified in the Labour Code as maternity leave, parental leave and paternity leave.

Depending on the number of children born at one birth, employees are entitled to maternity leave of:

- 20 weeks - if one child is born,
- 31 weeks - if two children are born,
- 33 weeks - if three children are born,
- 35 weeks - if four children are born,
- 37 weeks if five or more children are born.

A woman may go on maternity leave no earlier than 6 weeks before the expected date of childbirth, the rest is granted after giving birth.

The child's father may apply for paternity leave, which lasts 2 weeks and is paid 100% of the average wage paid in the last 12 months. In addition, child’s father can also take advantage of maternity leave, which is commonly known as paternity leave, if the mother decides not to continue receiving the allowance, however, she must take the obligatory 14 weeks of

leave after childbirth or 8 weeks in the case of the mother who has a certificate of incapacity to function independently. Other reasons for the father or other insured family member to take advantage of the allowance are the mother's death, abandonment of the child and her hospitalization, which makes it impossible to care for the child.

The Polish social insurance system provides the possibility of taking parental leave after using up the amount of maternity leave. The first 6 weeks (if one child is born) or 8 weeks (if more than one child is born during one birth) is called additional maternity leave. Parents can share the childcare time, but the total amount may not exceed 6 weeks.

If the parents do recognize the need to stay at home longer with the child, they can apply for parental benefit. This allowance can be used by the mother, father or both parents. It can also be divided into a maximum of four parts, but the duration cannot exceed 32 weeks (including 6 or 8 weeks of additional maternity leave) for the birth of one child or 34 weeks for the birth of two or more children in one delivery.

The amount of the allowance depends on how long leave the parents will choose. If a woman decides to take only maternity leave, she will receive 100% of the remuneration paid for the period of the last year prior to the leave, she may later apply for parental leave. The rate of this second benefit will be 60% of her salary. Mother may also immediately report an intention to take maternity and parental leave all together. Then the amount of the allowance will be 80% of the calculation basis.

Conclusions

At present, liberal, conservative and social democratic systems of the welfare state have developed against the background of evolutionary changes. After a deeper analysis of the processes taking place in the world, another model was identified - the South European one (Esping – Andersen, 2010, pp. 125-148). A feature of the liberal model is that the child is a private matter of the parents and does not grant any additional parental rights. The state supports families through the tax system and low-level social benefits, and special assistance is directed only to the most needy. There are also extreme views that a child makes parents happy, which drives them to work, so they do not need additional support. The conservative model is widespread in continental Europe. Its main assumption is social insurance depending on the income criterion and that the man is the main breadwinner. Support for women in combining work and family responsibilities is limited. The social democratic model is determined by the involvement of

the state in pro-family policy. The view that characterizes the social democratic system is that children are the future, so it is society's responsibility to pay for the costs of having and bringing them up. The development of child development services requires parents to reconcile work and family. As a result, it is a very expensive model and therefore often keeps the tax and employment rate high. The South European model is similar to the conservative one. It is characterized by high family responsibility. The assumption is to maintain family ties, thanks to which the child is looked after by relatives. Social benefits are low and unevenly distributed (Balcerzak – Paradowska, 2009, pp. 15-16). In Germany, pro-family policy is based on the principle of subsidiarity. This assistance mainly consists of financial support and the benefits in kind are small. In the case of Ireland, family policy is that the family should look after itself, thus offering little social assistance, mainly to low-income families. In the countries of the former communist bloc there is a model like in the Scandinavian countries. Gender equality and the right to social assistance are respected, and they are distinguished by the amount and scope of cash and in-kind benefits as well as limited access to them, e.g. it affects this income criterion.

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Expression of the impact of social business on the economy in Lithuania

JEL Classification: *O35;*

Keywords: *Social business; impact; benefit*

Abstract

Research background: Social business solves problems that cannot be solved by traditional businesses, government agencies, and traditional non-governmental organizations. The secrecy and uniqueness of social business in solving the most sensitive problems of society, being able to survive independently and ensure the continuity of activities gives this form of activity an advantage and determines its growing popularity. Such businesses are based on the laws of the market, use effective ways based on proven business principles to meet social needs and solve existing societal problems.
Purpose of the article: The aim of the article is to substantiate the impact of social business on the country's economy, which allows to calculate the benefits of social business according to the established criteria.
Methods: The benefits for social business were assessed using social performance and impact assessment studies, which assessed changes in key areas such as: change in income, change in housing, change in criminal activity, change in health, and change in income. The benefit-cost ratio and return of social business was

determined by conducting the following studies: evaluation of the results of work in a social enterprise using two questionnaires, evaluation of the impact of work in a social enterprise using two research groups and two questionnaires.
Findings & Value added: The significant positive increase in gross income and labour income over the last month, as well as the number of avoided arrests and changes in stable housing and reduced number of persons counseled on alcohol and drug addiction, led to a positive current net benefit per person employed in the social enterprise for all groups. It amounts to EUR 1.63 per year, with a return of EUR 0.63 per euro spent on social enterprise support.

Introduction

Social business is associated with phenomena such as the social economy and social innovation, and thus social business is receiving increasing interest from different stakeholders. Social business initiatives are increasing in Lithuania. Legal regulation is beginning to be formed - the Concept of Social Business has been issued, and the Law on Social Business is awaiting approval.

During the research of social business, a problem was raised: how can the impact of social business on the country's economy be measured and what is it like in Lithuania?

Object of research – social business.

Aim of research – justify the impact of social business on the country's economy.

Research methods: Mathematical, statistical processing and questionnaire evaluation methods were used in the study to evaluate the impact of social business on the economy. The assessment of the impact of social business on the economy is based on a cost-benefit analysis, a multidimensional regression.

Theoretical analysis of the impact of social business on the economy

Social business is still a new phenomenon, especially in Lithuania. Social business is undoubtedly important, with getting attention from different stakeholders. Research focuses on the uniqueness of this business in relation to operating principles, social business models (Yunus, Moingeon and Lehmann-Ortega, 2010; Pol, Ville, 2009, Simanaviciene, 2017), Ridley Duff and Bull (2011) developed a comprehensive description of social business, managerial specifics, and place in a cross-sectoral environment. Alter (2007), Martin and Osberg (2007), Defourny (2001) have contributed

greatly to the definition of social business. The social business model is examined by Gucku, Dees and Anderson (2003), Sommerrock (2010), Guclu et al. (2002) and Perrini and Vurro (2006). One of the key elements in accelerating the start-up of such businesses and in increasing public interest is to demonstrate the benefits of such initiatives. So far, there is no evaluation system in Lithuania that would show the value and impact of such social business initiatives.

Ridley Duff and Bull (2011) prepared a comprehensive description of social business with literature analysis, managerial specifics, and place in a cross-sectoral environment. Alter (2007), Martin and Osberg (2007), Defourny (2001) contributed the most to the definition of social business. The social business model is examined by Gucku, Dees and Anderson (2003), Sommerrock (2010), Guclu et al. (2002) and Perrini and Vurro (2006). Despite all the existing work, the social business model is not sufficiently explored to single out the essential components of the business model. According to Yunus (2010), social business is a new type of enterprise that differs from traditional forms of enterprise organization, the main goal of which is to maximize their profits.

M. Wildmannova (2018) points out that the concept of social business is based on public-private partnership in the provision of public services and the promotion of public employment policies.

The existing Law on Social Enterprises in Lithuania encourages the growing number of socially disadvantaged workers in social enterprises that comply with the law and this restricts the freedom of such enterprises, they become more dependent on subsidies, and the growing number of such workers leads to increasing government spending. According to the European Commission (2014), such use of public funds is inadequate. Rising costs are not supported because they do not solve the essence of the problem, provide unequal opportunities for the representatives of the target group.

Research methodology

As González (2017) argues, social value creation is related to social impact. Other scholars (Gregori, P. (2019), Jiao, H. (2011), Cohen, B.; Smith, B .; Mitchell, R. (2008), Kuratko (2016), Gordon (2018), Margion (2018), Choi (2014)) states that creating a positive economic, social or environmental impact on society is considered a prerequisite for social or sustainable entrepreneurship.

Cost-benefit analysis is a key method of economic analysis that allows the economic impact of certain measures or initiatives to be identified and assessed by assessing the direct and indirect economic costs and benefits (Boardman et al., 2011; Cordes, 2012). The purpose of a cost-benefit analysis is to determine whether the initiative benefits society and whether it is needed.

When developing the research methodology of the impact of social business on the economy, it is important to single out the main entities related to the benefits of social business.

Benefits of social business are evaluated through the results of working for social enterprises and assessing their impact.

Costs are obtained by interviewing social enterprises and collecting data on the costs associated with business costs and the costs of carrying out a social mission.

Thus, the benefit-cost ratio of social business and the return are determined by the following studies:

- Evaluation of the results of work in a social enterprise, using two questionnaires: a survey of persons employed in a social enterprise a year ago (primary survey) and a survey of the same persons who had already worked in a social enterprise for a year (secondary survey);
- Impact assessment of work in a social enterprise, using two research groups and two questionnaires: primary and secondary of persons employed in the selected social enterprise a year ago (target group) and primary and secondary including but not employing potential employees in the same company (control group) surveys.

This study will allow a quasi-experimental study to determine how working in a social enterprise (SB) affected the lives of individuals in the year after they applied to the SB for employment compared to individuals who also applied to the SB for employment but were not recruited.

The cost-benefit analysis (CBA) will allow to evaluate the benefits and costs of social business and and to evaluate the benefits or created value of one euro spent on social business. This study will calculate the benefit-cost ratio obtained by dividing the current net benefit of social business by the cost of social business. For evaluation of benefits, the results of the work social business and the results of the impact assessment studies and the information gathered from the social enterprises participating in the study will be used to assess the benefits.

The benefits are identified in 5 main areas: income, housing stability, criminal activity, health, and SB income from the SB survey.

The social business benefit per employee is calculated by adding together all the benefits of employment in SB (income, stable housing, health,

criminal activity) assessed in euros for the whole society, SB employee, SB, taxpayers not related to social business. The benefits were assessed by assessing changes in outcomes in each and all social enterprises involved in the study and changes in impact assessment.

The total monetary benefits of social business to the public, SB employee, SB, taxpayers, discounted and recalculated per employee can be compared to SB discounted costs per employee to quantify the benefits and costs or to assess the benefits to society of one euro spent on SB (formula 1), SB employee (formula 2), SB (formula 3) and taxpayers (formula 4) or return (formula 5) and other indicators of economic analysis such as internal rate of return, payback period.

$$Benefits\ per\ euro\ spent_{Society} = \frac{Benefits\ per\ employee\ are\ calculated\ for\ society}{SB\ Costs\ per\ employee} \quad (1)$$

$$Benefits\ per\ euro\ spent_{SB\ employee} = \frac{The\ benefit\ per\ employee,calculated\ for\ the\ SB\ employee}{SB\ Costs\ per\ employee} \quad (2)$$

$$Benefits\ per\ euro\ spent_{SB} = \frac{The\ benefit\ per\ employee,calculated\ for\ the\ SB}{SB\ Costs\ per\ employee} \quad (3)$$

$$Benefits\ per\ euro\ spent_{Taxpayer} = \frac{The\ benefit\ per\ employee,calculated\ for\ the\ taxpayer}{SB\ Costs\ per\ employee} \quad (4)$$

$$Return = Benefits\ per\ euro\ spent_{Society} - 1 \quad (5)$$

Results

The study lasted from September 2018 to September 2019. The study involved 3 companies meeting SB status.

Working in SB changed the attitudes of employees towards work as a social institution.

The work in SB significantly influenced respondents 'beliefs about their further social integration.

The results of the benefit assessment per employee are presented in Table 1.

The social business benefit per employee is calculated by adding together all the benefits of employment in SB assessed in euros for the whole society, SB employee, SB, taxpayers not related to social business.

Based on the data presented in Table 2 and the data on business income obtained from the business survey, a cost-benefit analysis is carried out below.

Applying Table 1 determined nominal values and additional data from the overlap analysis (double difference), discounted present values were calculated. For example, discounted 3734 Eur / y. the value is 3577 Eur / y. Monetary values have been recalculated accordingly. As a result of employment, in SB employee loses part of the state subsidies and his taxes and contributions increase. It is estimated that on average the state subsidies (social benefits) decreased by 36 EUR / month, and the paid taxes and contributions increased by 87 EUR / month, thus the SB employee lost a total of 123.5 EUR / month. The estimated annual discounted effect is 1420 Eur / y. The income of SB employees from family members and friends decreased, while that of other respondents increased, therefore the double difference reaches 244 Eur / month. The discounted annual effect is 2808 Eur / y.

Due to the lack of permanent residence, the state has to cover the cost of living (it is assumed that they amount to 810 EUR / month). Taking into account the value of double difference, the obtained discounted annual effect value is 81.3 Eur / y. (It should be noted that the majority of respondents in both study groups had stable housing). Housing costs per year (discounted value) for SB employees increased by EUR 124 / year. The quality of life index increased by 0.07, so the annual effect is 630 Eur / y. (discounted value 591 Eur / year). The impact of criminal activity on society has been assessed as the ratio of the number of detentions avoided to the costs of detention and imprisonment. The estimated discounted annual effect is 21106 Eur / y.

Due to health changes, the annual discount benefit is 93 Eur / year. Due to the reduced use of drugs, SB employees have a positive impact. The average annual discounted effect is 908 Eur / y.

The society receives a positive net benefit of € 1.63 per SB employed, and the return on an SB spent per euro is € 0.63.

Conclusions

The results of the empirical study revealed that work experience, having housing, family, and dependents led to a higher probability of employment, and criminal record significantly reduced the probability of employment.. The impact assessment study, based on the double difference method, confirmed the data obtained in the results study and was used in the cost-benefit analysis. The significant positive increase in gross income and labor income over the last month, as well as the number of avoided arrests and changes in stable housing and reduced alcohol and drug substance counsel-

ing, led to a positive current net benefit of one employed SB for all groups in society. It amounts to EUR 1.63 per year and the return on one euro spent in support of SB is EUR 0.63.

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Annex

Table 1. Key indicators measured in monetary terms (per SB employed)

Indicator	Double difference rate	Rate per year, EUR	Benefit, EUR (undiscounted)
Stable housing in the last year (change in the share of persons with stable housing)	0.0873	810 *12= 10800	849
Total income during the last month (monthly income change in Eur)	30,63	30,63*12=367,6	368
Labor income during the last month (change in monthly labor income)	311,17	311,17*12=3734,04	3734
Avoided detentions	1,1650	19566	22794
Alcohol or drug addiction counseling (percentage change in counseling)	-0,0597	16200	967

Table 2. Cost - benefit analysis (per SB employee employed), EUR

Variables	Society	SB Employee	SB as a business enterprise	Taxpayers not directly related to SB	Friends and relatives of the SB employee
Incomes					
Labor income	3577	3577	0	0	0
Taxes and government	0	-1420	0	1420	0
Other income	0	-2808	0	0	2808
Housing					
Amounts paid for housing	43	-124	0	81	0
Quality of life	591	591	0	0	0
Criminal activities					
Criminal activities	21106	0	0	21106	0
Health					
General health	93	93	0	0	0
Addiction to drugs	908	908	0	0	0
SB incomes					
Business	29004	0	29004	0	0
State support	0	0	2305	-2305	0

Table 2. Continued

Variables	Society	SB Employee	SB as a business enterprise	Taxpayers not directly related to SB	Friends and relatives of the SB employee
Total SB costs	-21034	0	-21034	0	0
Present net	34288	817	7970	22607	2808
Benefit for one SB employee employed	1,630	0,039	0,379	1,075	0,133
Return	0,630				

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The institutional drivers of regulatory performance. Case of the telecom industry

JEL Classification: *L51; L96; D02*

Keywords: *regulatory governance; determinants of regulatory governance; accountability*

Abstract

Research background: In recent years, the development of economic thought has been turning to the concept of regulatory governance. Regulatory governance meant as constraining regulatory discretion calls for check and balances among market, state, and civil society, and makes it of great importance for designing socio-economic framework. Accountability, independence, and transparency are the features that stimulate openness, flexibility and efficiency of the regulatory ecosystem, and the advanced results of sectoral performance. Regulatory governance is a key concept in the institutional underpinning of regulatory performance in a sector. It is presented on the example of the telecommunications sector as a utility contemporarily of fundamental importance in everyday life.
Purpose of the article: The aim of the paper is to present the specificity of the institutional determinants of economic regulation.
Methods: The monographic and case study method
Findings & Value added: Regulatory framework requires more adaptability and accountability which seems to result in more stakeholder participation in regulation processes. More inclusive regulatory mechanisms can be implemented with legislation that establishes proper boundaries and obligations, with regulators maintaining reserve powers. Consequently, regulators can engage in more light-handed regulation, encouraging voluntary compliance with industry policies or market-driven standards to minimize or avoid the need for more stringent regulatory intervention.

Introduction

Despite the lack of consensus in terms of terminology, regulation generally involves control or steering carried out by a state agency for the purpose of focusing on and following rules which aim to stimulate behaviour towards compliance with the values of the regulated community (Koop&Lodge, 2017).

In recent years, the development of economic thought has been turning to the concept of regulatory governance. Regulatory governance meant as constraining regulatory discretion (Levy&Spiller, 1994) calls for check and balances among market, state, and civil society, and makes it of great importance for designing socio-economic framework. Accountability, independence, and transparency are the features that follow to stimulate openness, flexibility and efficiency of the regulatory ecosystem, and the advanced results of the sectoral performance.

The aim of the paper is to present the specificity of the institutional determinants of economic regulation.

Literature review

The study of regulatory reality of industries in advanced market economies has revealed further determinants of several regulatory approaches. Traditional economic thought, represented mainly by the Chicago School of Economics, reflected the role of interest group games and accommodation of private interest conflicts, shaping the position of regulator as one favouring the politics of interest groups (Stigler, 1971; Posner, 1971, Peltzman, 1976; Becker, 1983). The result of such arrangements – the exercise of market power of industry players (private companies), is resolved by the incentive approach to sectoral regulatory economics. Incentive regulatory rules are to be optimally designed to place the firm's eagerness toward profit maximization, where it is most important to take into consideration both the interest of producer and consumer (Loeb &Magat, 1979; Laffont&Tirole, 1991; Laffont&Tirole, 1993; Sappington & Weisman, 1996). New institutional economics went deeper into the analyses, searching for the determinants of effective regulation in the activities of government as the one shaping a regulation. As the existence of vast private interests and the problem of their sole impact on the regulatory process is considered grounded theory, the institutional approach directed attention towards the exploration of incentives of politicians' opportunism within regulatory processes.

By highlighting the institutional design of public utility regulation, researchers have been attempting to clarify the drivers of limiting governmental opportunism, that is seeking to explain the determinants of regulatory governance (Levy & Spiller, 1994; Spiller &Tomassi, 2006). Regulatory actions involve achieving allocative efficiency and a compromise between allocative efficiency and distribution of wealth among consumers and producers and depend on the existence of regulatory governance.

Unlike neoclassical economists, institutionalists differentiate between the sources of regulatory problems not basing on the opportunism of regulator *per se*, exercise of market power or pure efficiency incentives as such, but on:

- the emphasis on institutional aspects of regulatory frameworks,
- the importance of contracting schemes toward second best incentives,
- the significance of the shift of the analysis from the regulatory policy to regulatory governance strictly linked to institutional environment.

The focus of regulatory policy within the institutional scope was not so much on the object of prices being closer to long-run marginal cost or mark-ups sensitive to cost changes as on regulatory processes and its ability keep those policies well-established and stable.

Regulation in the institutional sense is a product of political and legislative processes, an implicit contract out of exchanges of political nature, where the binding agreement between regulator (government) and the company is less exposed (unlike in incentive literature).

Regulatory governance requires flexibility and adaptation to changing environments and learning from mistakes (Vass, 2006, p. 188).

Research methodology

In order to present the specificity of the institutional determinants of economic regulation, the monographic method is used. The subject of the analysis is a range of countries selected according to their performance in the areas of investment in fibre connection as a share of total fixed broadband, and the long tradition in economic regulation development.

The claim of this paper is that, basing on the example of the ICT industry, institutional determinants of economic regulation could be significant for investment in fibre optics networks. Consequently, it was analyzed if institutional determinants of economic regulation can possibly have any influence on investment in fibre optics networks, especially since this is a technologically disruptive area of telecom industry.

To get an insight into structure and processes the following need to be taken into consideration (Vass, 2006, p.190):

1. Legal framework;
2. Separation of roles and responsibilities;
3. Principles of good regulation;
4. Forming a "whole of government view";
5. Provision of relevant information.

Additionally, transparency and accountability are main principles of regulatory framework i.e.:

1. Giving reasons for decision;
2. Exposure to investigation;
3. The possibility of independent review.

Results

Korea has one of the world's fastest and cheapest broadband connections, then Japan, Lithuania, Sweden and Latvia, respectively . The US and the UK results are below OECD average, which is 25,6% of fibre connections in total fixed broadband (OECD, 2019).

The main elements and characteristics of regulatory governance of the chosen countries are introduced based on the provided methodology. It must be noted that the initial process of regulatory governance begins from parliaments and their legislature which has recently focused on thorough investigation of regulatory framework. In the case of dispute, it finishes with the monitoring and audit of regulatory actions which the judiciary system (court) is responsible for. Lately, Regulatory Impact Assessment has become another, key element of regulatory governance.

Legal framework

The main acts that regulate providing telecommunications services in selected jurisdictions are: Telecommunications Business Act (1995) and the Act on Promotion of Information and Communications Network Utilization and Information Protection in South Korea, Cable Telecommunications Law, Radio Wave Law, Nippon Telegraph and Telephone Corporation Law (NTT Law) and Telecommunication Business Act (1984) in Japan, Law on Electronic Communications (2004) in Lithuania, The Electronic Communications Act (2003) in Sweden, the Electronic Communications Law of Latvia (2004), The Communications Act (1934) in the United States, the Communications Act (2003) in the United Kingdom. The law delivers rules

for the fair use of relevant telecom facilities, regulates the procedures and requirements for licenses/authorization for telecom networks and service providers as well as the regulatory order facilitating utilization of information and communications networks, protecting personal information of people using information and communications services, and developing an environment in which people can utilize information and communications networks. The framework stipulates the conditions on which the regulator has the power to impose obligations, as is often the case in universal services and significant market power. The regulations provide information for network and service providers about their rights and obligations.

Separation of roles and responsibilities

The particular states delegated the regulatory task to public, independent agencies that were to secure the credibility for investors based on the regulator's statutory powers and duties. Regulatory functions were granted to minimize political risk meant as constraining discretionary decisions of regulators, but, at the same time, the side effect was the increase of the regulatory risk (in Korea and Japan direct and open dependence on politicians' decisions).

The Korea Communications Commission (2008; before Ministry of Information and Communication), Ministry of Internal Affairs and Communications (MIAC) in Japan, Communications Regulatory Authority (2001) in Lithuania, Swedish Post and Telecom Authority (1992, under the Ministry of Infrastructure), the Public Utilities Commission (2001) in Latvia, Federal Communications Commission (1934) in the United States, and Ofcom (2003) in the United Kingdom regulate communications by wire, satellite, cable, across the countries, investigate, decide, and penalize the activities listed as harmful to fair competition in the telecom and internet industry. Moreover, the entities are responsible for monitoring consumer issues and ensure efficient utilization of resources and secure communications in mail, telephony, Internet, radio. The processes are complemented by entities forcing to promote and secure competition like the Korea Fair Trade Commission (ministerial-level central administrative organization and a quasi-judicial body).

Principles of good regulation

This sort of soft law incorporates different aspects of a regulator's task and rules for regulators to follow in order to provide objectiveness, impartiality and consistence to regulatory decisions and actions. OECD countries

implemented the recommendations from OECD Reviews of Regulatory Reform to further regulatory adjustments in the sector. In Japan, The Basic Program on Reducing Administrative Burden and Implementation Guidelines for Policy Evaluation of Regulation was introduced. Lithuania has plans of administrative burden reduction measures and reckon with the EU recommendations. The Ordinance on Impact Analysis of Regulation exists in Sweden. In Latvia, there is no explicit program on ex post reviews of regulation, and regulatory framework is improved systematically with the cooperation of stakeholders. The State Chancellery in Latvia develops and applies uniform rules of regulatory drafting, including the impact assessment guidelines. The United States approach to good regulation is guided by the Administrative Procedure Act. Moreover, OIRA provide guidance on the implementation of ex post evaluation. In the United Kingdom consultation principles are revised and published by the Cabinet Office. There is also the Small Business, Enterprise, and Employment Act viable in this domain of administrative management. Regulatory reviews are mostly business-oriented in most of the selected jurisdictions.

Integrated and coordinated approach to public service delivery by public entities

Policy, not service provision, is recently an increasingly dominant form of regulating behaviour. It's more steering, than "rowing", as was the case in the past (Vass, 2006, p. 192). The review of the coordinated approach is the analysis of the adoption of a broadband plan in a particular jurisdiction. The Korean government launched the Broadband convergence Network project, Japan - u-Japan broadband strategy, Lithuania - the Lithuania's Next Generation Internet Access Development Plan and Guidelines for the development of the next generation mobile networks (5G) in the Republic of Lithuania for 2020 – 2025, Sweden - A Completely Connected Sweden by 2025 – a Broadband Strategy, in Latvia - Latvia's national broadband strategy, Connecting America: The National Broadband Plan in the United States, and Britain's Superfast Broadband Future in the United Kingdom. They all provide political foundations to adapt the infrastructure to the digital era, with the objectives to convert the societies and economies of the countries into an information society with ubiquitous broadband convergence for the advancement of growth and productivity.

Provision of relevant information

In Korea the e-Legislation Centre and Regulatory Information Portal inform the public about upcoming consultations and provide feedback while the Regulatory Reform Sinmungo alerts the government about unnecessary burdens on business and citizens. In Japan there is an interactive website available for the public to access impact assessments and provide comments on draft subordinate regulations. Similarly, the rest of the countries: Lithuania, Sweden, Latvia, United States and United Kingdom communicate with the public mainly via the regulator's website in order to report decisions, inform about public consultation, upload public hearing documentary and deliver results of public hearings and consultations. In Sweden a new website for each consultation is created by the ministry and there is no central government portal to make communication with stakeholders easier. There is, however, such a website in the US – Regulations.gov, where the public can get access to regulatory materials, and via which they can participate in the rule-making process.

Giving reasons for decision

Systemic and methodological approach to assessing the consequences of proposed and existing regulations is Regulatory Impact Assessment (RIA). In Korea regulatory impact assessment (RIA) is undertaken for all regulation initiated by the executive. Japanese justification of regulatory decisions is underpinned by systematic improvement of regulatory policy, and a guidance and advice by ministries as well as support by non-departmental bodies. RIA as well as ex post evaluation of regulation complement the process of regulation (especially that initiated by the executive). Impact of regulation is assessed for any legislative acts in Lithuania, but RIA is of poor quality - no oversight of RIA and public consultations of drafts are developed by parliament and executive. Impact assessment in Sweden is carried out by regulators when drafting new or amended legislative proposals and general advice. Ex ante evaluation is required for all primary laws and subordinate regulations, and ex post review is required to be conducted ad hoc to submit all proposed statutes that may impact business along with the accompanying impact assessment to the Swedish Better Regulation Council for review. In Latvia obligation to conduct RIA exists for all drafts of legal acts (run mainly for subordinate regulations submitted to the Cabinet, quantification of impact is in fact rare). The US jurisdiction is characterized by well-developed evaluation of regulatory costs and benefits, i.e. RIAs are required for all significant regulatory proposals, and ex

post evaluation is mandatory for subordinate regulations. In the United Kingdom there is special emphasis on evidence-based policy making – preliminary and final stage RIA, with stakeholder comments for all regulations except for deregulatory and low-cost measures given. Moreover, regulators conduct ex post reviews with particular emphasis on possible impact on businesses and extended to the elements of inclusive growth.

Exposure to investigation

Public consultations and independent audit by authoritative bodies (ex. committees in parliaments) are also essential for effective regulatory framework. Public consultations are conducted in all the analyzed jurisdictions. In Korea, the results of consultations are attached to all regulations initiated by the executive. Moreover, ex post evaluation is mandatory as part of RIA. In Japan, examples of control include monitoring and review of the implementation of regulatory reform initiatives, managing ex ante and ex post evaluations, establishing guidelines and platforms to support evaluations, review policies under the supervision of the Cabinet. In Lithuania, coordination of regulatory policy, promotion of regulatory quality, supervising the process of law-making, monitoring the overall quality of impact assessment, as well as audits of law-compliance are already in effect and there are also technical law-making requirements. Within Swedish jurisdiction there is a requirement to submit all proposed statutes that may impact business along with the accompanying impact assessment. Moreover, there is a constitutional requirement to engage stakeholders (usually a mix of policy makers, experts, politicians) when formulating government instruments. In Latvia public consultations are carried out by the regulator and are organized as extramural public consultations and intramural public hearings. In the United States public notice and comment is a part of rule-making procedures. Issues that are raised by commentaters must be included in the agency's final rule, which is subject to judicial review. In the United Kingdom consultations are conducted for all regulations. External, independent investigation of evidence and analysis of new regulatory proposals in RIAs and investigation of the quality of ex post evaluations of legislation are conducted.

The possibility of independent review

In Korea, decisions by MSIT and KCC may be appealed to the Central Administrative Appeals Commission based on the Administrative Appeals Act, and can be further appealed to the Seoul Administration Court. KCC's

decisions may be appealed to the KCC's internal committee prior to appeal to the Central Administrative Appeals Commission, and the decisions by KFTC may be appealed to KFTC's internal committee or the Seoul High Court. In Japan, the decisions of the MIAC can be appealed to a court. The appeal is as an action for revocation of a decision made by administrative agencies. Alternatively, in respect of the revocation of license or registration an application for examination can also be filed directly to the MIAC. In Lithuania, Sweden, Latvia, United States and United Kingdom regulatory framework sets up a clear dispute resolution mechanism to solve disputes. When negotiations among parties fail to solve dispute, a litigation mechanism (court) and alternative dispute resolution mechanisms are most often implemented.

Conclusions

On one hand we have the examples of the United States and the United Kingdom and, on the other hand, Korea and Japan who represent different approaches to the constitutional element of regulatory governance i.e. separation of roles and responsibilities. However, sectoral regulators both in the US and the UK, as well as Korea and Japan have political power over the regulator's decisions to a certain degree. In the US, the member of the FCC board is elected by the President and approved by Congress, in the UK Ofcom is government-approved. In Korea KCC is a subordinate organization of the executive and president, and in Japan the role of the regulator is carried out by the ministry.

Even though the foundations of regulatory governance are generally strong in all the selected countries (i.e. legal basis that frame the activity of ICT industry, providing relevant information etc.), this does not seem to impact risk- and cost-burden investment in fibre optics as they are high in Korea, Japan, Lithuania, Sweden and Latvia, but low in the US and the UK.

The well-established position of a state is of particular importance for gaining the appropriate financial and institutional support. Moreover, not only are regulated service providers accountable to regulators for their business aims and for their actions to comply with regulatory policy. At the same time, regulators are committed to those regulated to properly carry out their task i.e. aim towards consumer and producer interest convergence.

The more the results of telecom sector operations are dependent on disruptive technologies, the more tensions arise in regulatory governance of the telecom industry. The regulatory framework needs more adaptability and accountability which seems to involve greater stakeholder participation

in regulation processes. This aspect of regulatory policy deals with making regulations less of a burden and more innovation-friendly. The subsidiarity of regulation, including more inclusive mechanisms, can be implemented with legislation that establishes proper boundaries and obligations, with the regulator maintaining reserve powers. In line with this, regulators can engage in more light-handed regulation, encouraging voluntary compliance with industry policies or market-driven standards to minimize or avoid the need for more stringent regulatory intervention.

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Money supply, global liquidity and asset prices – panel evidence from OECD countries 1991-2018

JEL Classification: *E12; E41; E44; E51; E52; F65; G28*

Keywords: *endogenous money supply, domestic credit, global liquidity, asset prices, panel regressions*

Abstract

Research background: The paper joins the debate on endogenous character of money supply. Money is used in general to pay for transactions. The basis for further analysis is their disaggregation into GDP based and non-GDP-based transactions in the spirit of Werner (2005). In this approach increased expenditures both in real and financial sector of economy can stand behind new money creation.
Purpose of the article: The paper empirically verifies the hypothesis that the domestic money supply is positively determined not only by growth in GDP-based transactions but also by assets prices and in the age of globalization it can be also positively influenced by an external factor, namely by the global liquidity.
Methods: OECD countries were chosen for statistical research. The period under investigation runs from 1991 to 2018. The econometric methods used included: panel unit roots tests, panel Granger causality test and panel estimations (OLS and models with fixed/random effects).
Findings & Value added: The article confirms the hypothesis that real and financial economic activity together with global liquidity positively influence domestic credit and thus money supply.

Introduction

The assumption of exogeneity of money supply which is often met in macroeconomic textbooks does not suit the modern economic conditions. In the

real word the central banks does not directly control the money supply since the money supply is a function of the financial behavior of the various economic units, especially commercial banks which play a key role in the process of creating money. Money supply is thus endogenous to the creation of credit.

The aim of this paper is to join the debate on endogenous character of money supply. Money is used in general to pay for transactions. The basis for further analysis is their disaggregation into GDP based and non-GDP-based transactions in the spirit of Werner (2005). In this approach increased expenditures both in real and financial sector of economy can stand behind new money creation.

The paper empirically verifies the hypothesis that the domestic money supply is positively determined not only by growth in GDP-based transactions but also by assets prices and in the age of globalization it can be also positively influenced by an external factor, namely by the global liquidity.

OECD countries were chosen for statistical research due to data availability. The period under investigation runs from 1991 (after the post-communist countries entered free market-oriented capitalist economies) to 2018.

The paper is organized in six sections. Section 2 presents a brief review of underlying theory and empirical works. Section 3 provides hypothesis and describes data and empirical methodology to be used in the econometric study. Section 4 presents and discuss findings and section 5 concludes.

Underlying theory (theoretical and empirical work)

Endogeneity of money

The debate on exogenous or endogenous character of money supply accelerated in the 70s and 80s of the last century. The old attitude towards money which was treated as an exogenous product of the central bank's monetary policy was confronted with the behavior of commercial banks providing credit on demand. To resolve the problem of money supply exogeneity or endogeneity, post-Keynesians pointed to so-called reverse causation. Kaldor (1982) concludes that money supply adapts to its demand through two mechanisms, first, commercial banks increase their reserves to meet new credit demand, and second, central banks become adjusted to this demand. Inability to control the money supply and falling inflation with an increase in money supply in the late 80s caused a departure from monetarist view on exogenous money supply also by central banks. They generally

accepted the endogenous nature of money and started controlling short-term interest rate to influence inflation and GDP.

Considerations regarding the factors influencing the money supply should start with the fact that the key part of *M* is the creation of credit by banks, which affects the number and value of transactions. According to Werner (2005) the quantity of money used for transactions is driven by the real and also by financial economy. Thus supply of money is a function of profit expectations in both sectors of the economy. The causality goes from the expected income of firms in the real economy and expected profits in the financial economy to the demand of credit which leads to the creation of money.

Asset prices and money supply

The relationship between the money supply and asset prices is well described in economic literature. The relationship between the money supply and asset prices appears however to be two-way. This is visible in the process of creating and bursting of the speculative bubble as described in Hyman Minsky' style by the Economic Affairs Department (2012). Asset prices initially rise significantly as a result of credit creation for financial transactions and remain above the fundamental values. Then the speculative bubble bursts and asset prices suddenly fall. Fall in assets process (e.g. property and stock prices) reduce the value of assets held by households and businesses (*the balance sheet channel*). Borrowers lose their creditworthiness and increase their risk of default. The number of bad loans leads to instability of the banking and financial system and worsen bank balance sheets by reducing the value of the banks' assets and equity (*the bank capital channel*), which causes the phenomenon of credit rationing. Banks are then more averse to risk and are becoming more cautious in granting loans, which together with rising market interest rates (*the interest rate channel*) and lower levels of optimism among households and producers limit their demand for consumer goods and services or means of production.

International capital flows and money supply

In global economy national monetary aggregates could be determined also by international capital flows in direct and indirect way. The international capital inflows are reflected in accumulation of the central bank's foreign reserves (the balance of payments surplus) which, if not sterilized, increase the amount of money in circulation (Reinhardt and Reinhardt, 2008). On the contrary, balance of payments deficit causes an outflow of

foreign currency. Domestic money flows into the central bank as payment for foreign currency. Thus, the unsterilized changes in the balance of payments have a direct impact on the money supply.

But even with balanced balance of payments, dynamics of domestic credit and thus money supply may be affected by international capital flows. They have an effect on the funding environment faced by banks and non-banks. In the globalized financial world domestic banks and non-banks can obtain financing from the international financial system.

Capital flows (especially to emerging economies) can inflate (deflate) the domestic money supply also in an indirect way causing domestic bubbles in asset prices and later deflate it when foreign investors withdraw the capital causing bubbles to burst.

Hypothesis, data and empirical method

Hypothesis

The research hypothesis assumes that global liquidity, real economic activity and asset prices positively influence money supply. The choice of analyzed variables refer to the broad literature on post-Keynesian theory on endogenous money and were divided into two main groups: demand-pull and supply push factors. Pull factors are driven by each country's demand for GDP-based and non-GDP-based transactions proxied by financial transactions. Push factors are driven by domestic (credit rationing) or external shocks influencing supply side of money supply.

In the process of hypotheses testing, real economic activity is proxied by gross domestic product which is decomposed into real GDP and inflation measured by GDP deflator. As stock markets booms often accompany assets prices inflation periods, domestic stock market capitalization is a proxy for asset prices development and thus financial economic activity. The US money supply is in turn approximation of global liquidity.

Data

The data set focuses on OECD countries. Annual data from 1991 to 2018 were utilized (unbalanced panel). These were dictated by the availability of the data for OECD countries. All variables are downloaded from the WDI online database of the World Bank. As WDI dos not provide all needed time series for countries that belong to the Eurozone (broad money) and for Iceland (market capitalization of domestic companies) these coun-

tries were excluded for the econometric analysis. Also, because the US money supply development was chosen as a proxy for global liquidity the USA was excluded from the examined sample. Table 1 lists the analyzed countries and the sample period.

Methodology

Panel unit roots tests

The research starts with a panel unit root tests to determine the stationarity of variables used in econometric models. The analysis of the panel data set requires a panel unit root test framework which has higher power than unit root tests based on individual time series (Eviews, 2014). Panel unit test as proposed by Levin, Lin and Chu (2012) was computed. The null hypothesis that panel data has unit root, so it is nonstationary. By rejecting this hypothesis we assume stationarity of examined time-series.

Panel Granger causality test

Then Granger (1969) causality test is pursued, which can roughly be described to determine whether one time series (*x*) is useful in forecasting another (*y*). Thus, in the Granger sense, *x* is a cause of *y*. It is important to note that the statement "*x* Granger causes *y*" does not imply that *y* is the effect or the result of *x*. Granger causality measures precedence and information content but does not itself indicate causality in the more common use of the term (Eviews, 2014). The Granger causality concept delivers however some hints regarding interpretation of the relationship.

Panel estimation

Data used for the panel data estimation are cross-sectional data (data of each country) pooled over several time periods. The general form of panel models is written as:

$$Y_{it} = \propto + X_{it}\beta_{it} + \delta_i + \gamma_t + \varepsilon_{it},$$

where Y_{it} denotes dependent variable at t periods and i cross-sectional units, X_{it} is a vector of regressors, $\propto$ stands for the overall constant, δ_i and γ_t represents cross-section effects, and respectively time specific effects,

which cannot exist or be of random or fixed character, and ε_{it} are error terms.

Preliminary regression for panel data include the pooled model performed on all available observations as if they were homogeneous cross-sectional data without any individual effect ($\delta_i = 0$ and $\gamma_t = 0$). All observations are treated as coming from a random sample and the simple ordinary lest square (OLS) method is applied (1st model). As heterogeneity of the panel is assumed, cross-section and time specific effects δ_i and γ_t may be included in the OLS panel model using fixed or random effect methods (2nd model). The Hausman test (Hausman, 1978) will be computed to choose between fixed and random effects model.

Findings and discussion

The research is based on yearly data of broad money (M_{it}), real GDP growth (dY_{it}), GDP deflator (dP_{it}), market capitalization of listed companies (CAP_{it}) and US broad money ($MUSA_{it}$) in selected OECD countries during a period of 28 years starting from 1991. To avoid non-stationarity, all variables in levels (M_{it}, $MUSA_{it}, CAP_{it}$) were transformed into growth rates (dM_{it}, $dMUSA_{it}, dCAP_{it}$),

Panel unit roots tests

Levin, Lin and Chu panel unit root test was used for checking the stationarity of variables. The results indicate that all variables, after transforming them into growth rates, are stationary. The null hypothesis of non-stationarity was rejected with 1 percent level of significance. Details of Levin, Lin and Chu panel unit root test (assuming common unit rate process) results of different variables are given in Table 2. The stationarity of variables enables further research.

Panel Granger causality test

The bidirectional causality between money supply and components of nominal GDP (real GDP and inflation), as well as between money supply and asset prices proxied by market capitalization of domestic companies, is assumed. As far as the relationship between global liquidity proxied by US money supply and domestic money supply is concerned, unidirectional causality is expected assuming that global liquidity affects domestic money

supply. This idea is connected with the positive relation between global money supply and international capital flows.

Table 3 provides a summery statistics regarding two direction causality between money supply and other variables. According to Granger's definition we can state that for selected OECD countries the bidirectional causality between money supply and real GDP and money supply and asset prices exists. The results support the assumption on money endogeneity.

Tests show however unidirectional causality of money supply and inflation. Inflation measured by GDP deflator affects money supply, but there is no causal effect on inflation from money supply creation. The link between money supply and inflation is well established in the economy. It is based generally on the assumption that by constant real output and other factors not affecting the demand for money, growth rate of money supply should affect inflation. However some papers indicate that this relationship may not always be present (e.g. Goodhardt and Hoffmann, 2008) A number of researcher find a one-two year lag between changes in monetary aggregates and inflation. Based on their findings, the Granger causality test for causality between lagged money supply growth and inflation was performed. On the basis of the calculations, there is a causal effect of one-year lagged money supply growth on inflation.

Although there is no causality between domestic money supply and global money supply proxied by US broad money, the one lag of global money liquidity growth can improve prediction of domestic money supply growth by Granger's definition. In economic literature different channels of international transmission of monetary shocks are discussed. Expansionary monetary policy can effect other's country money supply in indirect form, that is not by direct central bank's injection of money into the economy but by endogenous character of money. It comprises influence of one country's expansionary policy on both home and foreign output through exchange and interest rate channels and on cross-border capital flows.

Panel estimations

Hypothesis on positive relationship between global liquidity, real and financial economic activity and money supply:.

$$dM_{it} = f[\overset{+}{\overbrace{dY_{it}}}, \overset{+}{\overbrace{dP_{it}}}, \overset{+}{\overbrace{dMUSA_{it}(-1)}}, \overset{+}{\overbrace{dCAP_{it}}})$$

was tested by panel regression model which operational version is of the form of equation:

$$\mathrm{d}M_{it} = \propto + \beta_1 dY_{it} + \beta_2\, dP_{it} + \beta_3 dMUSA_{it}(-1) + \beta_4 dCAP_{it} + \delta_i + \gamma_t + \varepsilon_{it}$$

where dM_{it} denotes broad money growth at t periods and i cross sectional units, dY_{it} is real GDP growth, dP_{it} is GDP deflator, $dM_{USAit}(-1)$ is one-lagged broad money growth in the USA and $dCAP_{it}$ is market capitalization growth of listed domestic companies.

Table 4 depicts the outcomes of four panel regressions model: (1) pooled OLS, (2) panel EGLS with period random effect and (3) panel EGLS with cross section random effects. Pooled OLS was chosen for preliminary examination, next, models with random effects were chosen (as Hausmann' test, the results of which are presented in Table 5, suggests that random effects model is more appropriate for this research).

All the regression showed that both real GDP growth and inflation are significant positive determinants of money supply. This is consistent with theoretical arguments supporting endogenous character of money supply resulting from real (GDP-based) economic activity and the results of Granger causality tests. The statistics presented in Table [4] show that nominal GDP growth (with two components: real GDP change and GDP deflator) has the strongest positive impact on domestic money supply.

Another significant variable (in three regressions except for a EGLS model with cross section random effect) effecting money supply is the change in market capitalization of listed companies which is a proxy for asset prices growth in this research. The relatively minor impact of market capitalization of listed companies can be explained in the fact that financial assets include much more instruments and markets than only traded equity securities. Derivatives, mutual funds, real estate assets, debt instruments and other instruments resulting from financial innovations create a huge set of instruments for financial transactions which are excluded in GDP calculation. Nevertheless asset prices behavior (including stock markets) is positively correlated with business cycle with wealth effect and collaterals influencing economic activity and bank credit and thus domestic money supply.

Global liquidity as measured by one year lagged US broad money growth is another significant positive coefficient of money supply growth in three regressions. Only in panel EGLS (with period random effects), the money supply response to US money supply is not significant but still positive. This implies that higher global liquidity encourages investors to invest internationally, suggesting some supply-push money creation as the result of international capital flows.

Conclusions

The article confirms that real and financial economic activity together with global liquidity positively influence domestic credit and thus money supply. The results show that the discussion on the character of money supply should go in the direction of mutual feedback. The monetary authority may introduce high-powered money into circulation (by granting loans, monetizing public debt or unsterilized foreign reserve increase) but it is the commercial banks which are responsible for credit creation. The role of monetary policy turns on the effects of interest rate on relevant economic variables through price effect and credit rationing by banks (Arestis and Sawyer, 2006). The supplementary instruments in relation to interest rates policy comprise credit rationing by the monetary authorities.

The amount of money in an economy is driven not only by the real economy but also by the financial economy. Especially the periods of financial instability are accompanied by excessive monetary and credit growth/shrinking. Prudential regulations that restrict leverage (and thus control the amount of credit) and limit risk-taking during price bubbles periods should be therefore taken into account.

Money supply fluctuations can result also from external shocks which can be exemplified in the last decade by the QE episodes in major economies. The increase in global liquidity influences the economies in many countries. In the research, the reaction of domestic money supply to the changes in US money supply is positively and statistically significant. It confirms the importance of spill-over effect of expansionary policy in major economies to other economies. Macroprudential policy should consider also that fact.

When analyzing the research results, however, it should be borne in mind that this text is an introduction to further research, which could be conducted in the following directions. First, while studying money endogeneity broad money could be replaced by domestic credit as broad money is partially (M1) controlled by the central bank, second, market capitalization could be replaced by a regressor better characterizing the value of financial transactions and thus the financial part of the economy.

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Annex

Table 1. List of countries

Countries	Sample period
Australia, Canada, Chile, Czech Republic, Denmark, Hungary, Israel, Japan, Korea, Mexico, New Zealand, Norway, Poland, Sweden, Switzerland, Turkey, United Kingdom	1991-2018

Table 2. Results of Levin, Lin and Chu panel unit root test

Panel Unit Root Test - Method: Levin, Lin & Chu t-stat				
Null: Unit root (assumes common unit root process)				
	Statistic	Prob	Cross-sections	Obs
dM	-11.97	0.0000	18	301
dY	-11.31	0.0000	18	323
dP	-8.37	0.0000	19	337
dMUSA	-6.28	0.0000	19	342
dCAP	-15.68	0.0000	17	253

Individual intercept; trend assumption: no deterministic trend; automatic selection of lag length

Table 3. Pairwise granger causality tests

Stacked test (common coefficients); Lags to include 2/3^				
Null Hypothesis:	**Obs**	**F-Statistics**	**Prob.**	**Remarks**
dM does not Granger cause dY	461	9.97	0.0000***	bidirectional causality
dY does not Granger cause dM		9.91	0.0000***	
dM does not Granger cause dP	461	1.71	0.1772	no causality
dM (-1) does not Granger cause dP	448	2.85	0.0590*	bidirectional causality
dP does not Granger cause dM	461	51.02	0.0000***	with lag (M-1 → P)
dM does not Granger cause dMUSA	464	1.31	0.2713	no causality
dMUSA does not Granger cause dM		1.33	0.2658	
dMUSA (-1) does not Granger cause dM^	428	2.86	0.0369 **	causality at p<0,05
dM does not Granger cause dCAP	352	4.89	0.0006***	bidirectional causality
dCAP does not Granger cause dM		7.52	0.0081***	

*** - significant at the 1 per cent level ; ** - significant at the 5 per cent level; * - significant at the 10 per cent level

Table 4. Results of panel regression of broad money growth

Dependent Variable Broad Money Growth			
Variable Coefficient t-Statistic (in brackets)			
Variable	**OLS (Model I)**	**Panel EGLS (period random effect) (Model II)**	**Panel EGLS (cross section random effect) (Model III)**
∝	1.44 (1,06)	0.76 (0.38)	1.56 (1.12)
dY	0.57 (2.63) ***	0.78 (3.58) ***	0.54 (2.46) **
dP	1.21 (23.95) ***	1.20 (24.83) ***	1.21 (23.38) ***
dMUSA (-1)	0.29 (1,74) *	0.28 (0.97)	
dCAP	0.02 (1.65) *	0.04 (2.47) **	0.02 (1.62)
R-squered	0.611	0.633	0.599
Cross-section included	17	17	17
Periods icluded	28	28	28
Total panel (unbalanced) observations	388	388	388

*** - significant at the 1 per cent level ; ** - significant at the 5 per cent level; * - significant at the 10 per cent level

Table 5. Results of Hausman tests

Tests		**Model II Panel EGLS (period random effect)**	**Model III Panel EGLS (cross section random effect)**
Hausman test	**Chi-Square Statistic**	5.06022	8.29100
	Probability	0.1674	0.0815*

*** - significant at the 1 per cent level ; ** - significant at the 5 per cent level; * - significant at the 10 per cent level

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Development of science and technology park in Podkarpackie Voivodeship, with particular emphasis on AEROPOLIS Technological Incubator

JEL Classification: *A13; D02*

Keywords: *science and technology park; labor market; Podkarpackie Voivodeship, AEROPOLIS Technological Incubator*

Abstract

Research background: Science and technology parks are on one side more and more popular and on the other side – invisible for most of societies. The authors had a try of making such parks' significance and importance evident. The research constitute a trial of parks' essentializing in the voivodeship that is marked by infrastructure neglections in comparison to other Polish regions.

Purpose of the article: The aim of the article is to present significance and impact of science and technology park located in Podkarpackie Voivodeship, with particular emphasis on Technological Incubator, and its impact on local environment (both social and natural), labor market as well as life standard of societies.

Methods: In order to conduct research, survey method was used which was based on auctorial questionnaire.

Findings & Value added: On the base of research, the authors verified impact of science and technology park' development on separate elements connected with functioning of local societies. The authors focused on park's impact on employment and labor market in general, local economy, life standard of local communities and natural environment. Additionally, the value added of the research are opinions of employees of the science and technology park located in Podkarpackie Voivodeship as well as local communities.

Introduction

Over the past decades we can observe research on science and technology parks' development and, as such, spur economic prosperity. However, despite the worldwide proliferation of science parks, their contribution is yet to be fully understood (Lecluyse *et al.,* 2019, p. 559). This widespread initiative pursues technology-based industrial and entrepreneurial growth through business development and technology transfer across firms. The authors of the paper analyzed the literature on science and technology parks in an effort to provide a basis for stimulating additional research in the globally important problematic. Despite the common agreement on SPs' potential benefits, literature presents mixed results regarding the performance of SPs (Meseguer-Martines *et al*., 2020). Some researchers claim that the literature of the subject has been made over the past 30 years that attention to science and technology parks has indeed increased, but it has not yet exploded (Hobbs *et al.,* 2016, pp. 957 - 960; Fulgencio, 2017; Diez-Vial&Montoro-Sanchez, 2017; Fernández-Esquinas *et al.,* 2016). Even though studies in other research fields that are very similar to problematic of sciences and research parks, such as innovation, entrepreneurship, and strategy have been made (Mora-Valentín *et al.,* 2018, pp. 1410-1435). Moreover, literature on science and technology parks, according to some scientists (Amonpat & Tanner, 2020, pp. 400 - 420; Silva *et al*., 2016; Wasim, 2014;) lacks a systematic understanding of how regional contextual factors affect the performance of STPs. Many papers have discussed parks' role in promoting new technology-based firms and their impacts on firms' performances, often giving opposite conclusions. On the one side, some authors believe that STPs have generally failed to foster the establishment and growth of technology-based firms or to encourage technology transfer among firms and public research organizations (Albahari *et al*., 2010). Moreover, most studies focus on park-internal factors and neglect the regional context and connections when evaluating STPs' performance. The authors of this paper focused on regional and local context of such parks functioning and the role they play in a local societies. Additionally, according to some researchers (Albahari *et al*., 2013, p. 560) in spite of the fact, that many authors have analyzed the role and the efficiency of science parks, only a few contributions have analyzed national science park systems as a whole. The reason is lack of data, and evidence regarding the performance of science parks. Other researchers also focused on expanding general understanding of talent attraction management in STPs with a specific interest in universities as a human and strategic resource (Löfsten *et al*., 2019, p. 2457). One aspect of STPs' development that has come into

focus is the attraction of talent, which could include attracting specific expertise, making it easier for firms to be established and reach skilled workers (Cadorin *et al*., 2021, p. 1). However, related insights into the dynamics of relation between firms and universities in respect of the specific role of the science park have been limited (Theeranattapong *et al*., 2021). It is also worth to mention that science and technology parks play an important role in the promotion of innovation. Their objective is to act as a bridge between universities and industry (as mentioned above) with the support of public administrations. However, the specific role of a science parks might vary depending on the geographical setting. For that reason, the mission statement of science parks can greatly differ from one another (Berbegal-Mirabent *et al*., 2019). The analysis of the literature also points at the fact that the effectiveness of science and technology parks in fostering tenants' innovative performance is still an open issue. Unfortunately, the literature is not conclusive on whether these structures trigger and provide active support to firms' innovation and to the development of successful research networks, or are simply the result of local political interests, with no effective impact on tenants (Corrocher *et al*., 2019, p. 140). The importance of entrepreneurial ecosystems is accentuated in the academic entrepreneurship context since academic spinoffs (ASOs) must rely on actors from the ecosystem to access resources they lack in order to improve their performance (Franco-Leal *et al*., 2019). Although science and technology parks are established globally as an innovation policy instrument to foster growth and networking, there is limited attention in the literature of the subject given towards research into possible types within these real estate objects. Prior attempts in categorizing science parks are characterized by the limited number of cases and/or variables. Science and technology parks are believed to enhance innovation, entrepreneurship, and economic value for firms and regions. In addition, research show mixed results on these performances and it is reasoned that distinct types within science and technology parks exist that might explain these unclear results (Bennet NG *et al*., 2019, p. 719). The development of this model considered STPs' business models and value propositions, their objectives and goals, development stage, stakeholder's commitment, and respective legal and governance structures (Lyra *et al*., 2017).

In view of the foregoing, science and technology parks are facilities that, on the one hand, generate considerable interest, and on the other hand, are virtually unnoticeable by part of society.

After literature review and in view of the foregoing, the authors of the paper have taken up the issue concerning functioning of STPs from a local

perspective on the basis of Podkarpacie Science and Technology Park AEROPOLIS (PPNT), especially Technology Incubator.

The study aims to present the importance of development and the impact of science and technology park in Podkarpackie Voivodeship, with a particular emphasis on AEROPOLIS Technology Incubator, on the environment, the labor market, and the standard of living of societies. There were also presented science and technology parks in Poland.

The following hypothesis was formulated: Podkarpacie Science and Technology Park AEROPOLIS (PPNT) positively influences the regional labor market and the natural environment, generating social and economic benefits. The article presents a new approach to the problem, as it is an analysis of the development of the technology park in the Podkarpackie Voivodeship, which is highly neglected in terms of infrastructure compared to other regions of Poland.

The genesis of science and technology parks

Role of innovation in development, not only entrepreneurships, but the entire economy, is undisputed (Brożek, 2019, p. 21). Entrepreneurship and innovation support centers certainly improve the development level in the field of new technologies and support newly established companies. It significantly affects the functioning and economy of the areas in which they are located. It has contributed significantly to the increase in the number of science and technology parks in the world. In turn, it contributed to the dissemination of this concept among society (Kwieciński, 2005, p. 191). The emergence of a science and technology park in a given area manifests innovation and human creativity. Internal factors influencing the establishment of a science park include business incubators and technology transfer centers. The basic factors influencing the creation of the park are, first of all, human capital.

Additionally, the presence of universities and research units has a huge impact on the creation of parks. It makes it possible to join forces on the scientist-entrepreneur line. As a result, researchers gain experience and broaden their competencies, and the owners of companies dynamically develop their goals (Kwieciński, 2005, p. 191). Elements of both business and political considerations are important in this case also because "the availability of venture capital is a crucial factor in spin-off companies. It is a development factor that creates new jobs and stimulates private research. Its presence is particularly important at the regional level (…) because public authorities must actively create the conditions for cooperation and the

dynamics of business development" (Kwieciński, 2005, p. 186; Bukowski & Zawistowski, 2008, p. 34). A frequent phenomenon occurring at the stage of creating a park is that both private and public authorities can cooperate. However, this does not exclude the possibility that they could be the creators of the creation. The European Union, on the other hand, often decides on options for the participation of both sides. The main reason for such cooperation is the possibility of taking advantage of the state's aid; therefore, only the private sector's activity happens sporadically (Bukowski & Zawistowski, 2008, p. 7).

It is estimated that there are currently about 900 technology parks operating globally, of which about 365 are located in the European Union (…). Over the last 10-12 years, the number of technology parks in Europe has doubled, mainly due to the European Union's adopted policy, focusing on the development of innovation in the Member States. According to estimates, there are over 40,000 sq m of office space in European technology parks. Organizations employ a total of around 750,000 people (Staszków, 2015, p. 73).

One example of a science and technology park in the world is Bohanson Research Park in Menlo Park, California (USA), established in 1948. It is seen as a fundamental center focused on innovation and enterprise development. In the 1950s, the United States contributed to the creation of a new stage in the science and innovation sector, as well as the use of new technology and development, when the first science and research parks were established. It contributed to the technological development of agricultural land, unused land, or low investment potential areas. The creation of Palo Alto (USA) Stanford Industrial in 1951, whose name was changed in 1954 to Stanford Research Park, played a key role in the birth of PNT in the world. Until now, the park has been called the Silicon Valley, where Apple, Google, Facebook, eBay, and Netflix have their headquarters. The literature review shows that the greatest boom in science and technology parks was in the 1980s, while over the years, the number of parks under construction began to decline due to the crisis of the 1990s. In the footsteps of the United States, it followed, among others, Great Britain, which began to create its first parks in the seventies, and their development was greatly influenced by the reform of the activities of English universities, established by Prime Minister Margaret Thatcher, who ruled in those years. Over the years, countries began to develop in innovation and technology, which meant that science and technology parks began to appear at a relatively fast pace in all countries, not only in Europe.

In Poland, Science and Technology Parks started operating in the 1980s. Prof. Bohdan Gruchman started work on the Wielkopolska Center for In-

novation and Entrepreneurship in 1990. The authorities slowly began to notice the importance of parks as a source of economic aid and an element of companies' support and development. They treated them as providing jobs primarily for people in the region where they were created (Staszków, 2015, p. 56). Unfortunately, most decisions regarding the creation of new technology parks have been unsuccessful. The basic reasons for these failures include the low level of knowledge about creating such projects. Science and technology parks were emerging at that time. These were facilities that were so new and heavily involved in their development with large sums of money that their correct control required, above all, capital and knowledge.

Science and technology parks in Poland

In Poland, the first science and technology park was the Poznań Science and Technology Park, which was established in 1995. In the following years, and especially in 1998, the Kraków Technology Park, Wrocław Technology Park, and the Science and Technology Park in Koszalin were established (Staszków, 2015, pp. 55-70). The largest number of science and technology parks are currently located in the Śląskie Voivodeship, as many as 16. The Wielkopolskie Voivodeship is next in the lead, on a par with the Zachodniopomorskie Voivodeship. The last place is occupied by the Lubuskie Voivodeship, where there is only one park called: Lubuski Industrial and Technological Park (www.paih.gov.pl). Financial aid from EU funds turned out to be a great help, without which it would probably not have been possible to achieve results at such a rapid pace. Due to EU financial aid, there are opportunities to create such facilities.

In the years 2000–2003, TA's creation and development were additionally supported by EU funds under the Phare program. Under the Phare program, among others: an infrastructure component, in which projects devoted to the development and modernization of infrastructure were financed so that it contributed to the strengthening of the competitiveness of regions, served the development of the local SME sector, and increased the attractiveness of the location for investors, i.e., supporting the construction and development of PNT. Phare was used by, among others: Pomeranian Science and Technology Park, Industrial and Service Park in Bielsko Biała, and Toruń Technology Park (Bukowski & Zawistowski, 2008, p. 23). Later, the Sectoral Operational Program Increase in Competition for Enterprises (SPO WKP) for the years 2004-2006 made Polish parks significantly strengthened, developing more and more and increasing the standard of

their activities. PNT is the greatest aid in Poland for companies implementing new technologies.

In most cases, parks in Poland could present difficulties related to the economy, lack of jobs in a given area, and other such barriers as the reason for their location. In areas where technological development was almost invisible, and where innovation was at a very low level, the willingness to invest in them would be irrational. On the other hand, creating it to ensure local communities' prosperity by primarily creating new jobs is more useful (SOOIPP, 2019). Technology parks should focus mainly on innovation and technological progress; nevertheless, their jobs contribute significantly to generating social benefits related to parks' functioning.

Podkarpacie Science and Technology Park AEROPOLIS

Podkarpacie Science and Technology Park AEROPOLIS (PPNT) is considered the most attractive investment area in south-eastern Poland. Due to its location, we identify it primarily with the nearby airport (Jasionka airport) (https://TRibownisko.pl). The Podkarpacie Science and Technology Park is the first industry park to maintain the long-term and deeply rooted traditions of the aviation industry. Podkarpacie Science and Technology Park AEROPOLIS was established on May 19, 2003, as a result of signing an agreement between the self-government of the Podkarpackie Voivodeship, Rzeszów Poviat, Rzeszów University, Rzeszów University of Technology, Trzebownisko Commune (https://podkarpackie.trade.gov.pl/pl/dla-inwestorow/investment-w-region/parks-and-incubators) and the Głogów Małopolski Commune. The next stage was implementing the project to create the PPNT (Resolution of the Podkarpackie Province Council No. XXVV273/04 of 15.07.2004), the creation and management of the PPNT (Resolution of the Podkarpackie Voivodeship Board No. 122/190/04 of 6.072004). The mission of the PPNT is to stimulate the multifunctional development of the Podkarpackie Voivodeship based on the ideas of innovation and technology transfer through the synergistic use of the regional scientific, research, economic and infrastructural potential. Using the advantages of this region of Podkarpacie and its location positively affects the park's development, reflected in investors' great interest.

Research methods

The research methods used in the article include, among others, the study of the subject literature (desk research) and the diagnostic survey method using the proprietary questionnaire (quantitative research). Two research techniques were combined during the research, such as CAWI (direct interview technique, during which respondents received a questionnaire for self-completion) and PAPI (direct interview carried out using a paper questionnaire completed due to a trained interviewer). The empirical study was indifferent to 102 respondents.

The main eligibility criterion was a place of residence of the respondents and their workplace. Therefore, among the respondents were residents of the Trzebownisko commune and employees of Technological Incubator where are functioning over 30 companies in the field of IT, aviation, medicine, motorization, services, and others. The Technology Incubator was chosen for the analysis because of its size and number of companies that run their activities within the Incubator. The method of selecting this research subject (the Incubator) was interview with management staff with focus on the efficiency of the companies as well as opinions of employees concerning broad perspectives of their professional career development in the companies. The research was carried out at the turn of January and February 2020.

Data was collected through the diagnostic method (with the use of a questionnaire survey and interview among the Incubator's employees). Statistical analysis of the collected data has been conducted with the STATISTICA 13.1 software package. The data have been used to evaluate whether the dependencies observed in the sample were the effect of a general regularity present in the entire population or a random result.

The following hypothesis was formulated: Podkarpacie Science and Technology Park AEROPOLIS (PPNT) positively influences the regional labor market and the natural environment, generating social and economic benefits.

On the base of research, the authors verified impact of science and technology park' development on separate elements connected with functioning of local societies. The authors focused on park's impact on employment and labor market in general, local economy, life standard of local communities and natural environment. Additionally, the value added of the research are opinions of employees of the science and technology park located in Podkarpackie Voivodeship as well as local communities.

Results

Based on the analysis of the research results, it can be concluded that it isn't easy to present the research results in the sector in which the respondents found employment. Most of them are employees of the aviation sector, in which 38% of respondents work. It seems obvious since the PPNT is located near the airport. Figure 1 shows the structure of employment by sector.

The industries in which the respondents work are mainly the aviation industry (38% of respondents), trade and services (26% of respondents), the automotive (19%) and construction industries (6% of respondents), followed by the mechanical sector (4%), as well as metals (6%) and pharmaceuticals (1% of the respondents) (Figure 1).

Another issue subject to verification was respondents' expectations towards companies operating in the Podkarpacie Science and Technology Park. According to the data analysis presented in Figure 2, most people were most interested in higher salaries (58% of the respondents), and organizing as many jobs as possible, which means creating new workplaces such an answer was chosen by as many as 29% of the respondents. The third most frequently selected answer to the question concerning respondents' expectations was investing in developing the region in which they work (5%). Another aspect that was considered was promotion of the region, which were significant for almost 4% of the respondents. The least important expectation of the respondents from the companies working in AEROPOLIS was the increase in technology. Only one person thinks that it should be the managers' responsibility that prospers there (Figure 2).

Another research problem undertaken was the impact of AEROPOLIS on the level of employment in the region. The vast majority of respondents (90%) believe that the Podkarpacie Science and Technology Park contributed to reducing the unemployment rate in the studied area. However, a negligible percentage of respondents believe that the establishment of the PPNT resulted in an increase in unemployment, which seems to be completely unjustified. On the other hand, 8% of respondents believe that the operation of the park has no impact on this phenomenon in the region, which is also surprising because, with the naked eye, it can be noticed that the activities of the PPNT contributed to the development of, among others technical and social infrastructure in the region (Figure 3).

When analyzing the appearance of AEROPOLIS on the Podkarpacie labor market, it should be emphasized that an important element of this is the development of infrastructure, especially road infrastructure. 84% of respondents believe that the development of PPNT also influenced the pro-

gress of modernization works in infrastructure. A definite minority of the respondents (16%) believe that this has no impact on road transport development (Figure 4).

Another important aspect of the research was to analyze the respondents' opinions on the impact of the Podkarpacie Science and Technology Park AEROPOLIS on developing the local economy of the Trzebownisko commune and neighboring towns. The respondents' responses vary considerably; however, it was noticed that all respondents believed that the park had a positive impact on local development (48% of respondents expressed this opinion moderately). Slightly less, i.e., 39% of respondents, describe the park's operation's impact on the region's economy as definitely positive, whereas 13% of the respondents could not comment on it, which may be due to the lack of knowledge on a specific topic or the reluctance to express themselves (Figure 5).

The analysis of the data presented in Figure 6 shows that the PPNT functioning benefits are significant and noticed by the respondents. Once again, satisfaction with reducing the region's unemployment rate is visible (almost 21% of the respondents). Promotion of the region and the resulting benefits seems to be important for 31% of the respondents. Another raised issue perceived as a benefit from the functioning of the PPNT in the Trzebownisko commune was infrastructure improvement - 28% of the respondents believe that it is a privilege for the commune's inhabitants resulting from the location of AEROPOLIS in this place (this is reflected in the responses regarding the development of road infrastructure). The smallest number of respondents (1%) believe that the operation of the PPNT in this location does not bring any benefits to the region's economy.

Respondents were also asked about possible disadvantages and inconveniences resulting from the park's operation in the Trzebownisko commune in the Podkarpackie Voivodeship (Figure 7).

The analysis of the data presented in Figure 7 shows that most people (49% of respondents) admit that the Podkarpacie Science and Technology Park harms the region's natural environment and contributes significantly to the increase in its pollution. Whereas, 25% of respondents believe that the operation of AEROPOLIS is not associated with any inconveniences and therefore are satisfied with the fact that there is such a park in their commune, and 18% of the respondents believe that the type of activities in the park is limited. Moreover, 7% of people say that labor exploitation is prevalent in enterprises located in the PPNT.

Considering the data presented in Figure 8, it was found that the vast majority of respondents had a positive opinion on the PPNT and its new zones and subzones. Over 90% of respondents believe that the further de-

velopment of the park is a good solution. Only 8% of the respondents would not like the researched center to develop and contribute to further degradation of the studied area's natural environment.

The vast majority of respondents (79%) assume that the labor market's possibilities have significantly improved thanks to establishing the PPNT in the Trzebownisko commune. Figure 9 shows the results of the studies that allow for such conclusions. It is also worth emphasizing that 21% of the respondents still believe that the opportunities offered by PPNT on the local labor market have not been properly used.

Additionally, the information worth analyzing was the respondents' opinion about the Trzebownisko commune's development and the nearby towns.

Only 3% of the respondents believe that the development of both the vicinity and the commune itself would be much better if AEROPOLIS areas were not located there. The same number of respondents (3%) claim that if the park were not functioning, the commune and its vicinity would not develop properly. The vast majority of respondents (74%) believed that the commune and its vicinity would develop much worse if there were no PPNT in their commune, and 20% of the respondents indicated that the region would develop in the same way, so they do not see any benefits resulting from the operation of PPNT in this area (Figure 10).

Subsequent analyzed issues concerned the impact of the Podkarpacie Science and Technology Park AEROPOLIS on the natural environment. The research was carried out considering both positive and negative aspects related to it.

The figure above (Figure 11) presents a negative picture of the functioning of the PPNT. 36% of people confirmed that cutting down forests and trees bothers them the most. Slightly fewer respondents (31%) emphasized that another negative effect of the functioning of the PPNT in the Trzebownisko commune was the reconstruction of green areas, among others, for parking lots, pavements, and new construction facilities.

Looking positively at the functioning of the PPNT, the following responses appeared with the difference of one vote: recycling and development of ecological solutions (46%) and specifying the required impact of greenery in the resort (44%). The research results are presented in Figure 12.

The last question concerned the impact of PPNT on the number of inhabitants in the region.

When analyzing the data presented in Figure 13, it is worth emphasizing that the answers' differences are small. Most of the respondents, i.e., 43%, could not answer this question. Almost 40% of respondents believe that the

functioning of the PPNT in their commune has a decisive impact on the increase in the number of inhabitants.

Conclusions

To sum up, the conducted research results show the point of view of both the inhabitants of the Trzebownisko commune and the AEROPOLIS Technological Incubator employees. The analysis of the results of the conducted research highlighted the positive and negative issues related to the functioning of the Podkarpacie Science and Technology Park. Most of the questions asked focused on the importance of the PPNT in the context of its impact on the environment, where, despite the negative factors, the Podkarpacie Science and Technology Park was received positively. The research also concerned the impact of the PPNT on the labor market and the local economy. The research results present a positive aspect of technology and science park functioning in the region's development. PPNT influences the improvement of infrastructure, communication, and contributes to the promotion of the Podkarpackie Voivodeship. The decline in unemployment and a better situation on the labor market, and higher earnings, are also of great importance for the respondents.

Due to the analysis of the research results, it can be concluded that the development of science and technology parks is noticeable due to the specificity of their operation. The research showed a positive impact of the PPNT on the local economy's functioning through the impact on the development of infrastructure, road communication, and increasing the number of jobs, which translates into better living conditions for local communities.

The research may constitute minor contribution to broader research on national or even world-wide level. It can also be stated that the development of the science park may have a positive effect on the society and economy of a given region. It is also worth emphasizing that the creation of other such initiatives, such as technology transfer centers, incubators, pre-incubators, and other centers of this type, based on innovation and new technology, contribute to the overall economic growth of regions. Comparing to the findings of other researchers the authors of the paper should emphasize that the results can be perceived as familiar to those who took the local societies into account. The importance of such parks and the role they play on the local level (both from economic and social perspectives) is of a great significance (Poon&Granger, 2003, pp.25-38).

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Annex

Figure 1. Sectors in which companies located in the PPNT operate (in %)

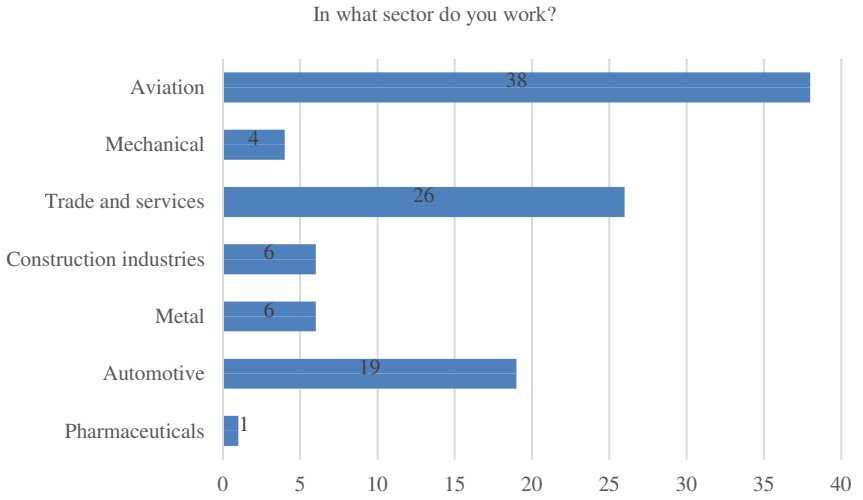


Figure 2. Respondents' expectations towards companies located in the PPNT area (in %)

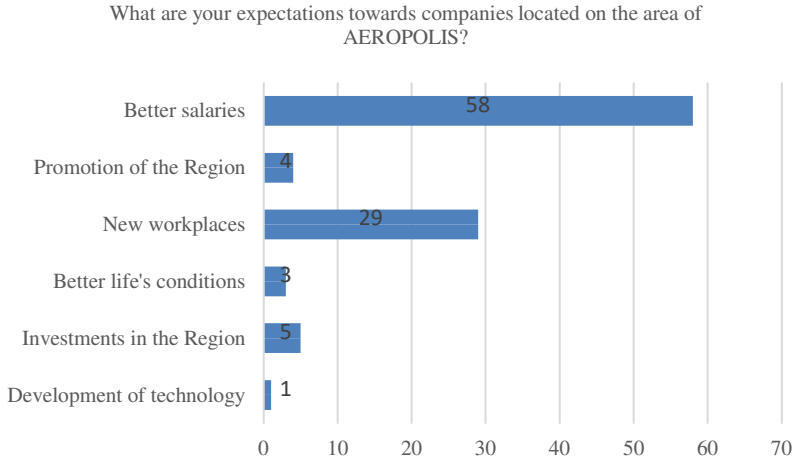


Figure 3. Impact of PPNT on employment in the Podkarpackie Voivodeship according to the respondents (in %)

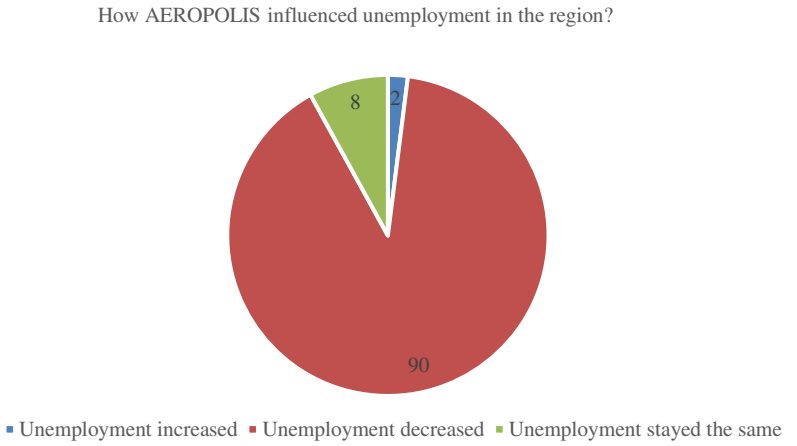


Figure 4. Impact of PPNT on the development of the region's road infrastructure according to the respondents (in %)

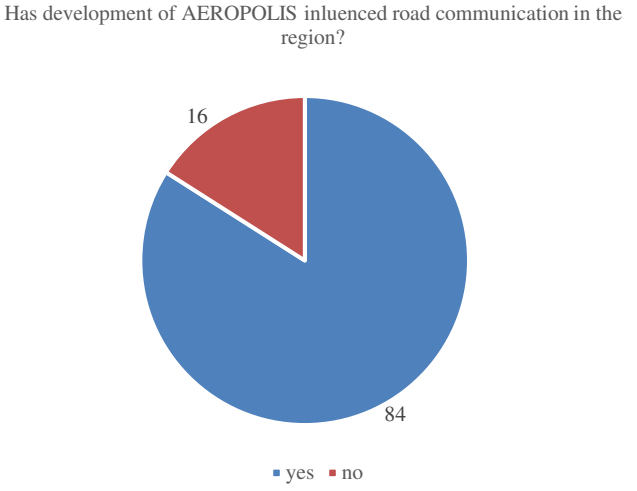


Figure 5. Impact of the PPNT on the development of the local economy according to the respondents (in %)

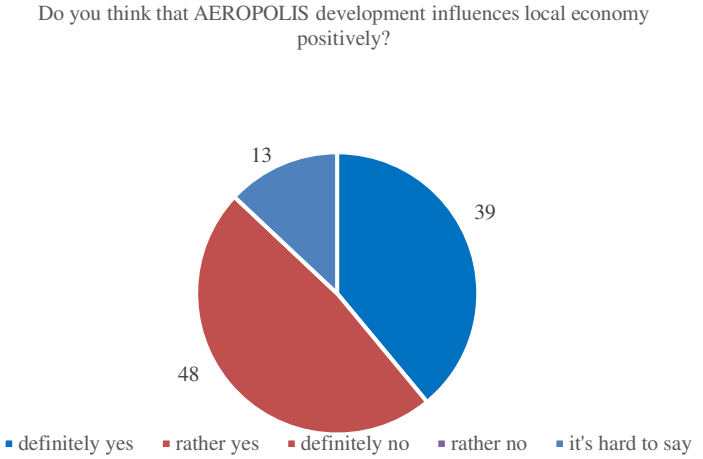


Figure 6. Benefits from the functioning of the PPNT in the Podkarpackie Voivodeship according to the respondents (in %)

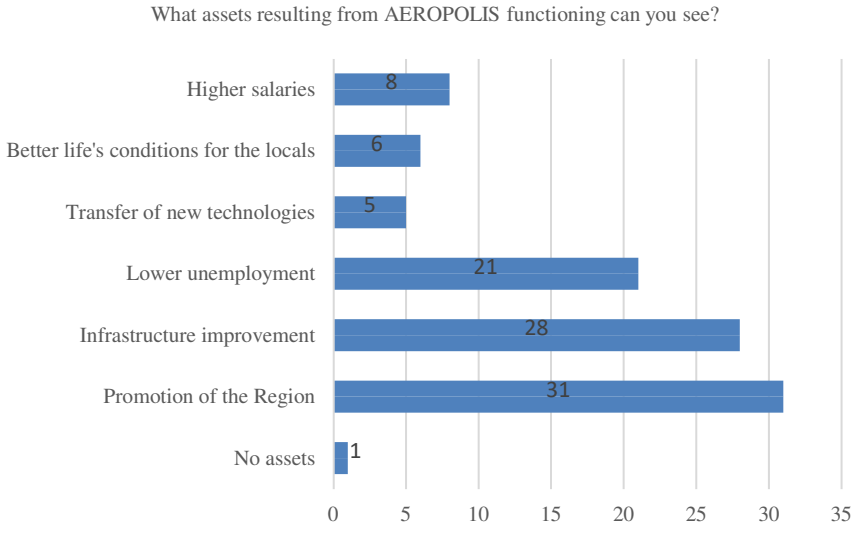


Figure 7. Negative aspects of the functioning of the PPNT in the Podkarpackie Voivodeship according to the respondents (in %)

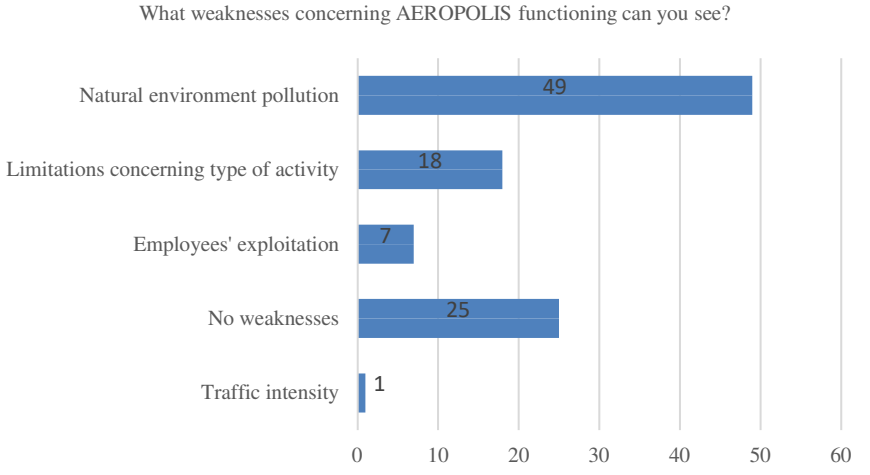


Figure 8. Development of new zones and subzones of the PPNT according to the respondents (in %)

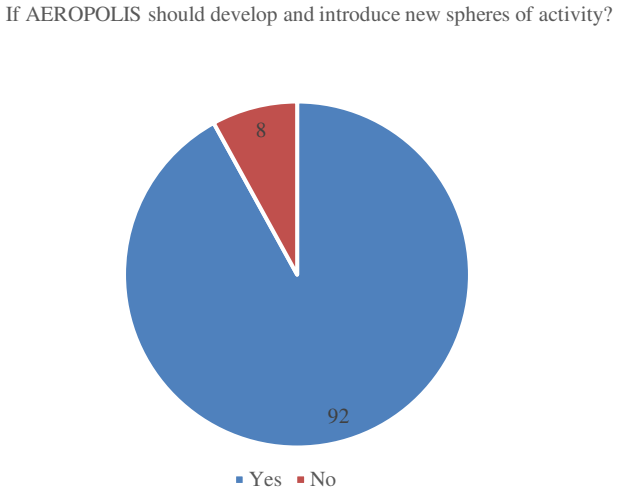


Figure 9. Opportunities on the Podkarpacie labor market and the activity of the PPNT according to the respondents (in %)

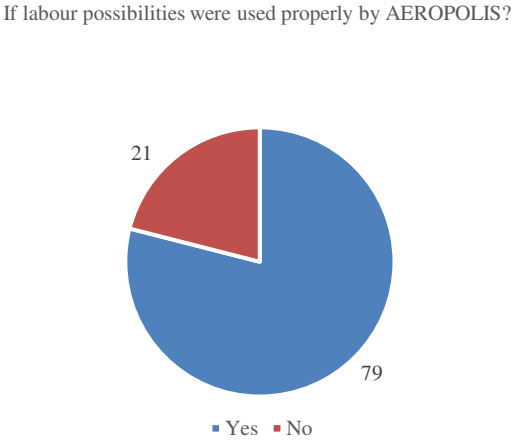


Figure 10. Impact of the PPNT on the economic development of the region according to the respondents (in %)

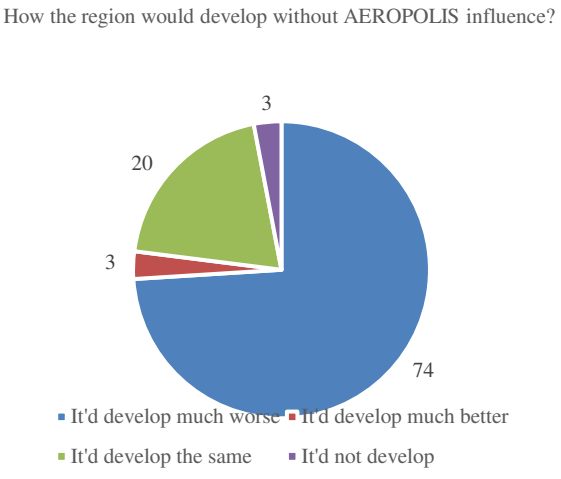


Figure 11. The negative impact of the PPNT on the natural environment of the region according to the respondents (in %)

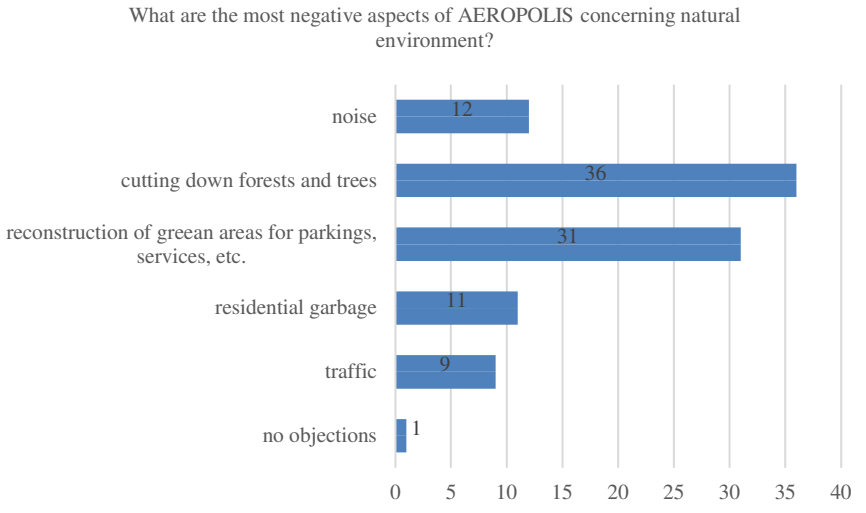


Figure 12. The positive impact of PPNT on the natural environment of the region according to the respondents (in %)

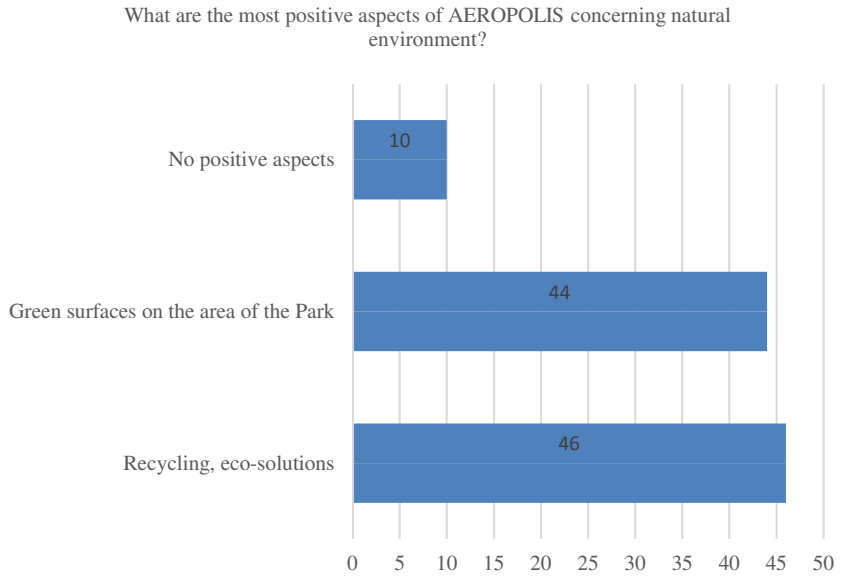
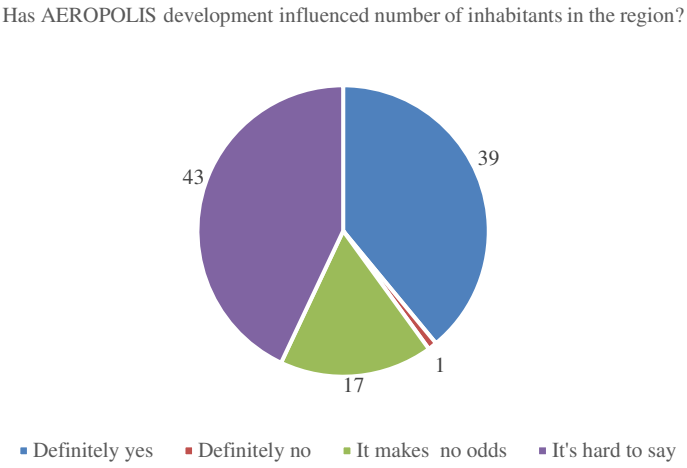


Figure 13. The increase in the number of inhabitants as a result of the activities of the PPNT according to the respondents (in %)



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The national innovation system in a catching-up country: empirical evidence of a triple helix in Poland

JEL Classification: *O31; O33; O38; L14; C35*

Keywords: *national innovation system; triple helix; industry; catching-up country; Poland*

Abstract

Research background: There are two main directions for the research of the national innovation system (NIS): the international comparison of macro data from national statistic offices or specific micro research restricted mostly to analysing selected issues. There is a lack of empirical studies regarding the national innovation system as a whole based on micro raw data and using statistical models.

Purpose of the article: To identify and evaluate the impact of the triple helix (an input and output approach) on the NIS in Poland, including internal interactions between industry, science and government.

Methods: The surveys was conducted by the authors in 2013-2017 in 6284 manufacturing enterprises. The multifactor stepwise logistics regression forward was used to evaluate what, where and how effectively the NIS institutions in catching-up and medium-sized countries such as Poland are working.

Findings & value added: The NIS of Poland is a complicated system. Some parts of the network are effectively, some are not. Domestic institutions have an impact that is often short-term, fragmented, and non-continuous though it can be strong from time to time. Strangely, organizations with low knowledge potential support industry innovation activity more efficiently and in a more organised way than science units excluding foreign ones. This can also be the case for R&D and regional knowledge supporting institutions depending on their quality. A vertical supply chain is a key factor in a better NIS performance in Poland. This paper presents the theoretical concept and an empirical model which can be used in other countries to evaluate input-output NIS efficiency.

Introduction

Innovation systems have been the subject of much research over the past thirty years. The starting point for understanding its phenomenon was initially its macroeconomic dimension. It was a logically constructive one as a result of the clear differences between countries and even neighbouring ones, but it is difficult to assess empirically. This was because this level of analysis is complicated. National and international statistics from the OECD and the EU base on a big aggregate data. This allows for a broad, but simultaneously superficial, though necessary, study of innovation systems which can be compared. General development trends on an international and global scale can be identified. The second approach is to evaluate national innovation systems using micro-data. This researches analyze the functioning of individual elements of the Triple Helix and the relationships between them (Mascarenhas, 2020, pp. 316-343; Fitriani et al., 2019, pp. 233-248). They fill the knowledge base but compared to national and international statistical research, researches based on micro-data are rarely representative, and tends to generate hypotheses and predictions that are very narrow. There is, therefore, no attempt at a holistic understanding of the national innovation system, where all elements of the Triple Helix are placed simultaneously, and the research itself concerns the components of the network and the relationships between them. There is some research on NIS from Spain (Hernández-Trasobares & Murillo-Luna, 2020, Article Number: 120296) and South Korea (Lee et al., 2020, Article Number 101604). However, their number is limited and research methods in this area are in their infancy. In addition, there is currently no research in this area in developing or catching-up countries.

The most important questions that arise when examining the national innovation system are:

1. Is each element of the triple helix (science, enterprises, government) working effectively?
2. Which of the actors, if any, has the greatest influence on the acceleration of technological progress in the system and why?
3. Do subsequent institutions in the innovation system have a permanent and multi-directional or only an incidental and isolated impact?

The authors of the study will attempt to answer these questions in this article, whose main aim is to identify and define the impact strength and mutual relations of successive elements of the Triple Helix in the national innovation system on the input (entry into the system) and achieved results (exit from the system). Analysis allows for the assessment of the directions, strength of influence and durability of the impact in the process of transforming the input vector into the output vector.

Based on the concepts and the research problems outlined, five research hypotheses were formulated:

H1: *The national innovation system in Poland is balanced and stable. This refers to the balance between the elements of the Triple Helix, the durability of their impact and continuity at the input and output.*

H2: *A greater involvement of the Triple Helix actors in innovation activities upon entering the system results in the achievement of adequate output results (similar odds ratios).*

H3: *The science sector has an effective and multi-directional impact on the innovation activity of industry in Poland.*

H4: *Support institutions have an effective and multi-directional impact on the innovation activity of industry in Poland.*

H5: *The sectoral environment of enterprises has an effective and multi-directional effect on the innovation activity of industry in Poland.*

Research methodology

Research was conducted in the form of questionnaires in Polish industry between 2013-2017 in accordance with the international methodological standards included in the Oslo Manual (2005, pp. 1-164) together with the

authors' own contribution. 6284 correctly completed questionnaires were collected.

The dependent variables are those illustrating the innovation activity on entering and exiting the system. At the entrance to the NSI, outlays incurred by enterprises on research and development activities (technology creation) and investments in new machinery and technical equipment (technology transfer) were taken into account. The result of exit activity are innovative products and technologies directly in production introduced in enterprises.

There are four groups of independent variables in the group. The first concerns the internal attributes of enterprises (size of enterprises, ownership, technological advancement, the economic situation and sales range). The second group of independent variables include cooperation in the field of innovation with suppliers, customers, competitors and within the capital group (the first constituent of the triple helix). The third group of variables concerns science institutes (cooperation with universities, departments of the Polish Academy of Sciences, foreign research centres and other R&D departments - they are the second part of triple helix). The last element of the system are business support organizations, which are public organizations that support enterprises at various stages of the innovation process (the third part of triple helix).

All the variables accepted for the study are dummy variables. The respondents were not asked about the amount of expenditure incurred, but about whether such expenditure occurred.

Due to the qualitative nature of the dependent variables and the specifics of the research sample, multivariate logistic models were used to test the research hypotheses. The Wald test and p-value were used to assess the accuracy of the models. The significance of the parameters of the independent variables was checked by standard error, Student's t-distribution and p-value.

The presentation and interpretation of the study results included in the tables was based on the odds ratio. This is a measure specific to logistics models. The threshold value of the quotient is 1. Above this value, the chances for innovative activity are higher than in the reference group by a certain percentage. Below 1, the likelihood of innovative activity is lower. The reference variables included micro and domestic enterprises, low technology, local sales ranges, and improvement in the market situation.

Results

A horizontal analysis of the variables (Table 1) allows for the assessment of the directions and forces in the process of transforming the input vector into the output vector.

The first group of variables analyzed was expenditure on innovation. R&D activity in domestic industry is focused on creating new products and production technologies Investment in buildings and in machinery and technical equipment mainly results in the modernization of the technology park owned. The purchase of software in industry is related only to the need to produce new products.

High-tech entities in Poland are strongly involved in R&D (138% more often than other technological groups), but they introduce new products only 40% more often, while the interest in changes in production technology decreases by 40%. This is in line with the research by Hirsch-Kreinsen *et al.* (2006, p. 17), who found that in countries with a traditional industrial structure, high R&D expenditure positively affects product innovations, but, at the same time, reduces the number of technological innovations.

Enterprises from the group of medium-high technologies develop R&D 50% more often and invest in 23% activities at the same time. Unfortunately, this has resulted in a 28% reduction in commitment to production modernization, which, in turn, does not match the conclusions of Hirsch-Kreinsen *et al.* (2006, p. 18). A possible reason for this type of divergence may be the time lag between inputs and outcomes or this is the result of the lack of systemic support for this group of enterprises with state policy instruments.

In the case of enterprises from the group of medium-low technologies, innovation activity on the expenditure side is significant, although still weak, and ultimately this is not reflected in the effects. The main conclusion related to the levels of technology is the thesis that industrial enterprises in Poland are too poorly differentiated in terms of technology (they have high homogeneity). Technological advancement is not a systemic circumstance for differentiating innovation policy. Research must continue in order to discover possible explanations for this.

Exporters are an important part of the national innovation system. They conduct R&D 54% more often and buy new machines or devices 21% more often, which in turn leads to the acceleration of 20% in the implementation of new products in foreign markets. Similarly, high-tech enterprises, whose operating in foreign markets are more innovative than another enterprises.

The size of enterprises has traditionally been a strong determinant of input and output innovation activity. Small and medium-sized entities behave

similarly i.e. they are both involved in R&D (with levels of 38% and 86% more often, respectively) and investment activities (by 42% and 66%), and the results achieved are limited only to new products. However, large entities are more than twice as likely to conduct research and buy new machines and devices 76% more often. However, they achieve the effects only on the side of new production technologies, with chances higher by 27% compared to other entities.

Recession and economic stagnation are strongly unfavourable for conducting innovation activity in any form. A prerequisite for innovation activity, therefore, is a permanent and time-stable improvement in the economic situation, even at a moderate level.

Another large group of determinants of the innovativeness of the national system is the cooperation of industry in the area of innovation with scientific and sectoral organizations . Joint research work carried out with universities and other research institutes is the strongest determinant of the national system, with transformation only towards new products. Unfortunately, there is no link between this process and passive technology transfer. In other words, R&D is carried out in isolation without parallel modernization of the production technology, i.e. the so-called fast path of progress, effective in the short term. The Polish Academy of Sciences (PAN) departments, although slightly less important, twice as often encourage enterprises to engage in R&D activities, with effects on the side of production technology - a long path of progress, but with greater potential. Moreover, the effectiveness of the transformation of R&D in new solutions is higher on the part of PAN departments than on the part of universities. Unfortunately, these departments also focus on research activity without the support of passive technology transfer. Foreign research centres also play an important role in shaping the national innovation system. Their impact on R&D in enterprises is slightly lower, but with the parallel combination of processes of generating knowledge and transferring it to industry. The impact of these two channels is similar, and, as a consequence, changes in production technologies are 67% more frequent.

Vertical and horizontal connections of enterprises with suppliers, recipients and within the capital group are the second area of innovation cooperation complementing science. It turns out that the vertical supply chain up and down is the most durable element of the innovation system in Poland. There is an acceleration of the transformation of R&D works and the purchase of machinery and equipment in new products and production technologies, with a stronger influence of suppliers on these processes. Enterprises that are part of the capital group have their own unique characteristics. These include the quick and effective ability to produce goods shortly

after establishing a production line. It is also worth mentioning that the Polish industrial system lacks significant horizontal relations with competitors.

The last group of the independent variables that were analyzed is business support organizations, which are the third element of a technological transformation system. In the context of research and development work, all business support organizations contributed to supporting industry. Unfortunately, in the case of innovation centers in the remaining input and output elements which were analyzed, the situation is no longer clearly positive. Technology parks and incubators contribute to the costs of purchasing new machinery and equipment (an increase in opportunities of 76% and 62%, respectively), though none of the institutions analyzed influenced the creation of product innovations. In Polish conditions technology parks contribute to the implementation of new technological processes too.

This type of innovative activity is also supported by technology incubators and technology transfer centers. It is concerning that the conditions of statistical significance were not met by academic business incubators. One possible explanation for this is that these organizations lack maturity.

Business angel networks are a relatively new form of supporting venture capital projects in Poland. Their impact on the industry is visible only at the entrance - R&D intensification by 61%.

The most interesting types of organizations, however, are those with less knowledge transfer potential (loan and guarantee funds and training and consulting centres). They are involved in all stages of the input and output innovation process and can achieve effects comparable to the impact of innovation centres.

Conclusions

The operation of Triple Helix agents in the Polish innovation system is varied. In the light of the conducted study, the following can be said about the research hypotheses.

Hypothesis 1 is mostly refuted. It is difficult to talk about a stable and lasting influence of successive actors in the innovation system in Poland. It can only be confirmed that their impact is positive, but of variable strength and quality. Technological activity in Poland depends mainly on the efforts of its own enterprises.

Hypothesis 2 is partially confirmed. In most situations, there is an input to output vector transformation, although the strength of this definitely decreases at the end of the process. Moreover, scientific institutes and innovation centers act point-wise.

Hypothesis 3 is supported regarding the effectiveness of the scientific institutes in strengthening the innovativeness of enterprises (only R&D)but refuted regarding the stability of the impact. A positive exception here is the foreign research institutes that offer a more integrated offer combined with the transfer of ready-made technologies.

Although Industrial enterprises receive support from business support organizations (hypothesis 4), they do so in a non-uniform form. Financial institutes and training and consulting centres are the most stable here. Innovation centres are focused on R&D, but the results of their activities can be seen in manufacturing processes and this impact has greater potential.

Suppliers and recipients (hypothesis 5) provide strong and stable support for the national innovation system in Poland, with special importance attached to the former. Unfortunately, relations with competitors do not determine the technological activity in the system in any direction

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Annex

Table 1. The value of the odds ratio for entry into the system and exit from the system in industry in Poland influenced by selected factors in 2013-2017 - logit modelling

Independent variables	Odds ratio			
	Entry into the system		Exit from the system	
	R&D	New Machinery	New product	New technology process
R&D expenditure	x	x	2.11 (***)	1.51 (***)
Investments in new buildings	x	x	1.60 (***)	1.87 (***)
Investments in new machinery and technical equipment	x	x	1.71 (***)	2.24 (***)
Investments in software	x	x	1.67 (***)	-
Medium-low technology enterprises	1.14 (*)	1.24 (***)	-	-
Medium-high technology enterprises	1.50 (***)	1.23 (***)	-	0.71 (***)
High technology enterprises	2.38 (***)	-	1.40 (**)	0.60 (***)
Small enterprises	1.38 (***)	1.42 (***)	1.18 (**)	-
Medium-sized enterprises	1.86 (***)	1.66 (***)	1.24 (**)	-
Large enterprises	3.07 (***)	1.76 (***)	-	1.,27 (*)
Enterprises with partial foreign capital	1.27 (*)	-	-	-
Recession	0.41 (***)	0.60 (***)	0.81 (**)	0.78 (***)
Economic stagnation	0.55 (***)	0.68 (***)	0.73 (***)	0.77 (***)
Domestic sales range	1.36 (***)	-	-	-
Export	1.54 (***)	1.21 (***)	1.20 (***)	-
Cooperation with suppliers	2.05 (***)	1.55 (***)	2.17 (***)	1.44 (***)
Cooperation with PAN	2.16 (**)	-	-	1.82 (**)
Cooperation with universities	2.70 (***)	-	1.69 (***)	-
Cooperation with domestic scientific institutes	2.25 (***)	-	1.53 (*)	-
Cooperation with domestic foreign institutes	1.89 (**)	2.07 (**)	-	1.67 (*)
Cooperation with recipients	1.46 (***)	1.29 (***)	1.49 (***)	1.39 (***)
Cooperation with enterprises in the capital group	-	1.46 (**)	2.46 (***)	-
Technology Parks	1.76 (***)	1.76 (***)	-	1.44 (***)
Technology Incubators	1.77 (**)	1.62 (**)	-	1.65 (**)
Technology Transfer Centres	2.17 (***)	-	-	1.70 (***)
Business Angels Networks	1.61 (*)	-	-	-
Local and Regional Loan Funds	1.30 (***)	1.54 (***)	1.35 (***)	1.42 (***)

Table 1. Continued

Independent variables	Odds ratio			
	Entry into the system		Exit from the system	
	R&D	New Machinery	New product	New technology process
Credit Guarantee Funds	1.36 (***)	1.47 (***)	1.38 (***)	1.70 (***)
Training and Consulting Centres	1.82 (***)	1.77 (***)	1.48 (***)	1.59 (***)
Constants	0.16 (***)	0.83 (***)	1.17 (**)	0.29 (***)
Sample	6284	6284	6284	6284
chi-square	1559.6	719.9	1528.4	1274.2
p-value	0.00	0.00	0.00	0.00

(***) – statistical significance at 1%, (**) – statistical significance at 5%, (*) – statistical significance at 10%.
The sign "-" means rejection of the variable in the process of stepwise estimation of the model.

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Innovation and the dichotomy of deindustrialisation

JEL Classification: *O11; O14; 015; O24; O25; O31; O38; O41; O47*

Keywords: *deindustrialization; deindustrialisation dichotomy; innovation; structure of the economy*

Abstract

Research background: The issue of structural transformations from the point of view of shaping and at the same time achieving sustainable economic growth through the efficiency of production factors management (efficient allocation) is a key area of research on changes in the structure of the economy as such. Sustainable economic growth is assumed to be sustained economic growth at full employment, accumulating innovations increasing their share in the economy.
Purpose of the article: The aim of this paper is to investigate whether a dichotomy of deindustrialisation has occurred in the Polish economy between 1995 and 2018. How and whether the occurrence of this phenomenon can be an appropriate criterion for assessing the level of innovation in the industrial sector. It is also hypothesised that in the Polish economy the key determinant of the deindustrialisation dichotomy, was the lack of innovation in the manufacturing sector.
Methods: In order to achieve the objective and verify the hypothesis, a statistical analysis of key determinants of changes in the structure of the economy in terms of production and employment was applied.
Findings & Value added: Although in the Polish economy increasing demand, and above all GDP per capita, most determined the share of manufacturing in total employment, and thus its production, causing the largest increase in its share in total production in the entire period 1995-2018, a very low level of innovation in manufacturing caused a decline in its share in total employment being the main reason for the emergence of the deindustrialisation dichotomy.

Introduction

The issue of structural transformation from the point of view of determining and shaping, and therefore achieving and maintaining sustainable economic growth through the efficiency of factor management (efficient allocation) is a key area of research on changes in the structure of the economy as such (see Zalewska and Mickiewicz, 2006 , pp. 143-166 ; Dasgupta and Singh, 2006 , pp. 1-2 ; Baumol et al. , 1989 , pp. 5-8 ; Rodrik, 2016 , pp. 1-4 ; Dosi et al., 2020 , pp. 1-5). The efficient allocation of factors of production in the long run systematically raises the levels of their efficiency as well as their productivity, which in economic reality is achieved primarily through the emergence and introduction of innovations (Mazzucato, 2016 , pp. 45-81 ; Dosi et al., 2020 , pp. 5-16). In the last at least two decades of research on the evolution of economies (structural changes in the economic system), three important phenomena have been identified. The first is premature deindustrialization, followed by jobless growth of industry in the formal sector as well as faster growth of services than industry (Dasgupta and Singh, 2006 , pp. 1-2). It should be stressed that it is possible, in view of the stylized facts occurring in economies today, for an economy to undergo deindustrialization in terms of employment and yet not to experience deindustrialization in terms of changes in demand structure (Rowthorn and Coutts, 2004 , pp. 767-790 ; Palma, 2005 , pp. 660-688 ; Pieper, 2003 , pp. 831-850). In these economies it is mainly observed, especially in the industrial sector, that there is a low level of innovation or even no innovation at all. In addition, it has been observed that most of them produce "crisps" instead of "micro chips". (Dosi et al., 2020 , pp. 16-23). As well as different patterns of deindustrialisation (e.g. China South Korea), where there was no dual course of processes of structural changes in the economic system. The dichotomy of deindustrialisation usually occurs with the phenomenon of jobless economic growth, which is very common in the economy. This phenomenon occurring in the economy, as argued by Giovanni Dosi et al (2020 , pp. 23-27), or indicated by various patterns of deindustrialization is the result / effect of a low level of innovation in the industrial sector . The aim of this paper is to investigate whether a dichotomy of deindustrialisation has occurred in the Polish economy between 1995 and 2018. How and whether the occurrence of this phenomenon can be an appropriate criterion for assessing the level of innovation in the industrial sector. It is also hypothesised that in the Polish economy the key determinant of the deindustrialisation dichotomy, was the lack of innovation in the manufacturing sector.

Research methodology

According to a simple model of deindustrialisation by Rowthorn and Wells (1997), based on extensive research and empirical testing, deindustrialisation in the category of employment and production is the result/sequence of deindustrialisation in the category of demand structure. These two driving forces of structural change are the foundation of both the contemporary and classical theory of three sectors by Fischer (1945), Clark (1957) and Fourastie (1972), and at the same time constitute the basic criterion for dividing the economy into sectors and sections (its components), used by OCDE in its current structural research (on the evolution of the structure of the economy). However, at the turn of the 1980s and 1990s, as a result of technological and technical development, innovations appeared in services: new methods of manufacturing and supplying services (information and communication technologies, ICT), which caused large differences in labour productivity growth rates in the services sector. These changes, according to Baumol, Blackman and Wolff's (1989) theory, distinguished progressive, stagnant and asymptotically stagnant activities in this sector. The 4.0 revolution initiated an avalanche of both product and production innovations singling out hitherto unknown entire innovative sections and divisions of the industry sector as indicated by Ślusarczyk (2018). Therefore, the classical division of the economy into three sectors (agriculture, industry, services) today no longer fully explores the benefits of the criterion for dividing the economy, which is differences in labour productivity growth rates and changes in the demand structure. Therefore, referring to the PKD classification, which currently serves as the basic classification for structural studies carried out by the OECD, a more appropriate, from the point of view of the criterion adopted in it, division of the economy into sectors was made. Adoption of changes in the demand structure and differences in productivity growth rates between sections and divisions (according to the PKD classification) as the criterion for this division will allow better exploration of research conclusions stemming from it.

Separate structure of the economy:

A - Agriculture, forestry, hunting and fishing
B - Mining and quarrying
C - Manufacturing
D - Electricity, gas, steam and air conditioning supply - Water supply; sewerage, waste management and remediation activities
E - Construction
F - Wholesale and retail trade; repair of motor vehicles and motorbikes
G - Transport and storage - Information and communication

H - Accommodation and food service activities
I - Financial and insurance activities
J - Real estate activities - Professional, scientific and technical activities - Administrative and support service activities
K - Public administration and defence; compulsory social security - Education - Human health and social work activities - Arts, entertainment and recreation - Other service activities

The structure of the demand volume was calculated on the basis of real quantities, i.e. in constant prices. The relative price changes between the output of the sectors and sections of the economy mean that the changes in the sectoral share of demand or total output in current prices differ significantly from changes in real (physical) quantities. In contrast, absolute price changes cause real changes in the volume of demand or production expressed in monetary value, whereas the volume of employment depends on the real (physical) volume of demand or production. Hence, the impact of changes in the demand structure on the employment structure is analysed using constant prices. The volume in current prices after taking into account price deflators has been recalculated with an index to the base year (i.e. 1995) because according to the methodology introduced by J. Furastie and applied today, changes in the structure of the economy are determined by prevailing factors which are hardly discernible in the short term, but are cumulative, which means that they cause effects that build up despite changing circumstances in time and place, being well visible in the long term.

Test results

The analysis of the key determinants of the dichotomy of deindustrialisation in the Polish economy in 1995-2018 begins with a study of changes in the structure of the volume of demand for isolated sectors and sections of the economy.

Table 1 shows the structure of the volume of demand for sectors and sections of the Polish economy in the period 1995-2018

The conclusions arising from the analysis of Table 1 can be reduced to the following:

– The largest increase in the share of volume (as well as the largest absolute increase in volume) in total demand, and at the same time in the volume of total output, was recorded in manufacturing (C). Then, for the sections of the market services sector, the analysis showed a very clear increase in the share of volume in total demand, and thus significant in-

creases in the volume of demand in total output were recorded in the following sections: financial and insurance activities (I), transport and storage, and information and communication (G), accommodation and food service activities (H) , construction (E)real estate activities, professional, scientific and technical activities, administrative and support service activities (J) . On the other hand, a decrease in the share in the volume of total demand, and thus in the volume of total output for market services, the study showed only in the section wholesale and retail trade, repair of motor vehicles (F);

- In contrast, the share of non-market services (K) in total demand volume and total output declined, ultimately indicating that their output was not a constant part of total demand or total output in the Polish economy. However, we must remember that in most cases, the volume of demand, and hence output, of non-market services is determined by policy decisions taken by state and local government units;
- The share of agriculture (A), mining (B) and, to a lesser extent, energy, gas, steam and water supply (D) in the total demand volume and, at the same time, in the total production volume decreased almost to the same extent. However, the greatest decrease in the share was recorded in agriculture (A). The results of the analysis (Table 1) allow us to conclude that the change in the share of individual sectors and sections of the economy in the volume of total demand, and at the same time in the total volume of output, unequivocally speak for the presence in the Polish economy of features characteristic for industrialisation processes. Thus, we may conclude that the Polish economy in the period in question experienced a process of industrialisation in terms of the demand structure (its changes).

We then move on to analyse changes in the structure of the economy in terms of employment.

The results of research contained in Table 2 indicated that in the whole analysed period there were decreases in the share in employment in the whole economy (total = 100%) in the mining sector, classified in the literature as traditional industry for most of its sections (B - from 2.67% to 0.87% i.e. 1.8%), and in the manufacturing sector (C - from 23.21% to 17.63%). The decline in the share of manufacturing (C - by 5.58 %) in total employment clearly indicates that deindustrialisation processes are taking place in the structure of the economy in terms of employment. There was also a small decrease in the share in total employment in the manufacturing sector for the electricity, gas, water and steam production and supply section (D - from 2.01 % to 1.78 %). On the other hand, the share of non-market services (K - about 22 %) in total employment remained constant

throughout the period under review, but fluctuated (from 19.64 % to 23.18 %) as a result of decisions of state and local government policy makers. An increase in the share of total employment was found in the market services sector. However, a significant increase was found only in the following sections: real estate services, professional, scientific and technical activities, administrative and support services (J - from 4.15 % to 9.45 % i.e. 5.3 %) and transport and storage and information and communication (G - from 6.27 % to 8.04 % i.e. 1.77 %). In addition, in market services a slight constant increase in the share in total employment was found in the section of accommodation and catering services (H - from 1.39 to 1.86 %, i.e. 0.47 %), while in the remaining sections (E, F, I) the share in total employment changed by approximately 0.3 %.

Conclusions

Assuming that the structure of the output volume is directly shaped/determined by the structure of the demand volume, it is reasonable to assume on the basis of the results of the analysis of the demand volume structure (the highest increase in the share of volume in the total demand was recorded in manufacturing from 32.37% in 1995 to 42.05% in 2018, i.e. by 9.68%) that the increase in total output in the analysed period 1995-2018 in the Polish economy was caused primarily by an increase in the output volume of manufacturing, which additionally forced (necessary to service the increase in demand for manufacturing) an increase in the output of market services. On the other hand, the results of the analysis of the demand volume structure and employment structure in 1995-2018 indicate the occurrence of the phenomenon of deindustrialisation dichotomy in the Polish economy. Despite the fact that in the Polish economy the growing demand, and above all GDP per capita, most determined the share in total employment of manufacturing, and thus its production, causing the highest increase in its share in total production in the whole analysed period of 1995-2018, it was the very low level of innovation in the manufacturing sector (CSO data for 1995-2018) that caused that: low-processed, or only assembled from finished products with low added value, domestic production of manufacturing, which was additionally energy- and labour-intensive, and therefore not price-competitive, lost in international trade. In addition, the lack of innovation in the manufacturing sector resulted in such a relatively low increase in total value added compared to foreign production that the increase in its index value in current prices (own calculations based on CSO and Eurostat data for 1995-2018) translated into a decrease

in its share in total employment. As shown in the dissertation on the basis of the presented and described results of the analysis (in 1995-2018 for Poland) that a low level of innovation or lack thereof in industry for an economy undergoing trade liberalisation will lead to a dichotomy of deindustrialisation as a result of domestic demand being taken over by foreign production (even in the case of positive GDP per capita dynamics, with strongly increasing domestic demand).

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Annex

Table 1. Structure of demand volume in 1995 constant prices of the Polish economy

Years	Total	A	B	C	D	E	F	G	H	I	J	K
1995	100,00	8,84	3,06	32,37	3,93	7,57	15,42	6,12	0,91	1,81	7,85	12,12
1996	100,00	8,32	2,91	32,88	3,65	7,56	15,78	6,07	1,02	2,42	7,44	11,96
1997	100,00	7,53	2,69	34,14	3,45	7,64	15,75	6,06	1,03	3,06	7,55	10,99
1998	100,00	7,45	2,19	33,97	3,23	8,16	15,57	6,22	1,06	3,05	7,72	10,85
1999	100,00	6,88	2,02	33,10	3,21	8,12	16,31	6,47	1,17	4,29	7,56	10,29
2000	100,00	6,07	1,88	34,01	3,26	7,95	16,26	6,35	1,19	4,45	7,65	9,96
2001	100,00	6,31	1,79	32,91	3,60	7,82	16,34	6,61	1,14	3,97	8,13	10,02
2002	100,00	6,14	1,72	32,83	3,59	7,18	16,89	7,05	1,07	3,75	8,17	10,16
2003	100,00	5,89	1,60	34,69	3,49	6,62	15,70	7,16	1,02	3,89	8,45	10,23
2004	100,00	5,81	1,50	37,10	3,23	6,47	15,29	7,25	1,01	3,92	8,07	9,72
2005	100,00	5,52	1,43	37,06	3,26	7,02	14,99	7,28	1,03	4,01	8,07	9,66
2006	100,00	5,09	1,30	38,33	3,03	7,41	14,22	7,60	0,98	4,21	8,11	9,31
2007	100,00	4,72	1,20	39,20	2,87	7,82	13,99	7,49	0,97	4,60	8,02	9,02
2008	100,00	4,53	1,20	38,98	2,82	8,42	13,74	7,35	0,99	4,89	7,89	9,07
2009	100,00	4,79	1,11	36,45	3,25	9,05	14,33	9,17	1,02	4,23	7,47	8,54
2010	100,00	3,86	1,01	37,44	3,13	9,97	13,80	9,08	1,04	4,12	7,40	8,60
2011	100,00	3,84	1,01	38,98	3,07	10,31	12,78	9,20	1,08	4,12	7,41	8,11
2012	100,00	3,75	1,03	39,00	3,05	9,76	12,92	9,72	1,10	3,92	7,37	8,23
2013	100,00	3,82	0,98	39,63	3,09	9,44	12,79	9,76	1,15	4,16	7,16	8,14
2014	100,00	3,94	0,94	39,82	2,82	9,54	12,23	9,97	1,09	4,39	7,35	8,22
2015	100,00	3,70	0,93	41,75	2,99	9,92	12,77	10,38	1,08	4,64	7,78	8,30
2016	100,00	3,64	0,87	41,69	2,96	9,73	12,96	10,62	1,08	4,71	7,85	8,19
2017	100,00	3,58	0,80	42,55	2,71	9,45	12,90	10,93	1,01	4,45	7,98	7,99
2018	100,00	3,24	0,76	42,05	2,76	9,65	12,89	11,35	1,17	4,61	8,06	7,92

Source: own calculations based on CSO data; Eurostat.

Table 2. Employment structure (total economy=100) of the Polish economy in 1995-2018

Years	Total	A	B	C	D	E	F	G	H	I	J	K
1995	100,00	15,61	2,67	23,21	2,01	6,19	14,24	6,27	1,39	2,01	4,15	22,24
1996	100,00	16,84	2,54	23,63	1,94	6,50	14,22	6,23	1,41	2,14	4,45	20,12
1997	100,00	16,33	2,36	22,99	1,87	6,86	14,91	6,26	1,46	2,21	4,98	19,78
1998	100,00	16,20	2,15	22,46	1,83	6,80	15,26	6,22	1,61	2,37	5,45	19,64
1999	100,00	16,31	1,89	21,54	1,82	6,74	15,43	6,18	1,59	2,86	5,72	19,92
2000	100,00	16,42	1,67	20,01	1,77	6,09	15,52	5,83	1,69	2,23	6,15	22,62
2001	100,00	16,90	1,68	19,43	1,91	5,72	15,29	5,55	1,69	2,23	6,54	23,06
2002	100,00	16,93	1,63	19,06	1,86	5,29	15,61	5,66	1,65	2,27	7,01	23,05
2003	100,00	16,97	1,58	19,30	1,84	4,88	15,85	5,58	1,69	2,06	7,33	22,91
2004	100,00	16,86	1,49	19,77	1,77	4,63	15,59	5,54	1,70	2,16	7,39	23,08
2005	100,00	16,63	1,44	19,46	1,69	4,83	15,97	5,43	1,70	2,29	7,37	23,18
2006	100,00	16,23	1,37	19,71	1,64	5,23	15,76	5,59	1,73	2,33	7,60	22,83
2007	100,00	15,61	1,31	19,95	1,56	5,67	15,93	5,61	1,74	2,38	7,93	22,31
2008	100,00	15,26	1,32	19,27	1,52	5,98	16,16	5,76	1,97	2,47	8,07	22,22
2009	100,00	15,42	1,33	17,56	2,09	6,40	15,81	6,77	1,83	2,42	7,61	22,74
2010	100,00	16,84	1,23	17,27	2,13	6,13	15,52	6,66	1,68	2,40	7,72	22,43
2011	100,00	16,70	1,23	17,17	2,08	6,39	15,17	6,87	1,67	2,43	7,94	22,35
2012	100,00	16,78	1,23	16,98	2,02	6,12	14,98	6,98	1,74	2,47	8,13	22,58
2013	100,00	16,70	1,18	17,00	1,98	5,69	14,90	7,03	1,72	2,47	8,39	22,94
2014	100,00	16,38	1,10	17,26	1,91	5,63	14,95	7,11	1,71	2,45	8,64	22,86
2015	100,00	16,08	1,00	17,41	1,85	5,66	14,98	7,32	1,70	2,36	8,91	22,72
2016	100,00	15,60	0,91	17,53	1,80	5,75	14,98	7,59	1,77	2,31	9,28	22,49
2017	100,00	15,19	0,88	17,65	1,76	5,82	14,94	7,90	1,85	2,25	9,51	22,25
2018	100,00	14,94	0,87	17,63	1,78	6,06	14,80	8,04	1,86	2,22	9,45	22,36

Source: own calculations based on CSO data; Eurosta.

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Comparative analysis of Poland and selected countries in terms of household financial behaviour during the COVID-19 pandemic

JEL Classification: *C13; C22; C53; F31; D10*

Keywords: *personal finance management; COVID-19 pandemic; consumer financial behaviour*

Abstract

Research background: The outbreak of the COVID-19 pandemic, the reduction in income or the total loss of jobs have affected the financial behaviour of consumers worldwide. Managing the budget in times of turbulence and crisis has posed a challenge for households.
Purpose of the article: The aim of the article is to determine to what extent the COVID-19 pandemic has affected the financial behaviour of the inhabitants of various countries and how Poland has stood out from the rest.
Methods: Conclusion are drawn based on statistical methods. Due to the orderly nature of the questions analysed, non-parametric tests were used in the analysis: Mann-Whitney U tests, Chi square and a series of τ Kendall's tests.
Findings & Value added: There has been a fall in expenditure compared to the period before the pandemic, which may explain the lack of opportunities to spend money, the fall in revenue and the freezing of expenditure for fear of an uncertain future. There has also been a change in the way payments are made. Payment cards and purchases made over the Internet are increasingly popular. In the face of the COVID-19 pandemic, consumers are trying to save more, but not everyone can afford to do so.

Introduction

The COVID-19 pandemic has frozen some economic sectors and worsened the financial situation of societies worldwide. Total or partial loss of a source of income has exacerbated financial security concerns related to the pandemic. One in three people in Europe (35%) have lost income as a result of the pandemic, and almost half of consumers (47%) state they are more concerned about their financial situation than ever before (European Consumer Payment Report 2020; Drescher et al. 2020, pp. 1-6). Economic uncertainty has evoked interest in topics related to personal finance. Consumers are concerned about the impact of the economic downturn on local businesses (Barrafren et al. 2020, pp. 1-5; Freidline et al. 2020, pp. 1-18).

The goal of the paper is to determine to what extent the COVID-19 pandemic has affected the financial behaviour of the inhabitants of various countries and how Poland has stood out from the rest. The article is divided into four parts. The first focuses on personal finances and the changes taking place in consumer behaviour in terms of payments, savings and credit products during the pandemic period. The second part presents the research methodology, the statistical methods used and an analysis of the population studied, with particular emphasis on Poland. The third part discusses the results obtained from the study as well as conclusions that may be drawn on the possibility of using remote forms of personal finance management. The final section offers conclusions on the research.

Literature review

The pandemic has accelerated certain shifts in consumer and business behaviour that have been observed over a number of years. In recent months, the volume of e-commerce turnover has surged, along with an increase in the number of digital payments including, in particular, contactless payments via mobile applications (Payment Gateway Market – Growth, Trends, and Forecasts 2020-2025, 2020). Analysing the current negative scenarios of persistent and further restrictions during the pandemic, one positive note may be that once the coronavirus has been dealt with, the outlined trends in non-cash payments will probably continue, although some consumers around the world will return to their previous habits and pay in coins and banknotes (Bhutta et al. 2020, pp. 645-672; Yue et al. 2020, pp. 2363-2377).

Households perceive their finances and market behaviour from the perspective of both internal and external factors (Waliszewski, Warchlewska

2020a, pp. 893-904; Waliszewski, Warchlewska, 2020b, pp. 399-420). Internal factors include individual attitude, awareness, numeracy, knowledge, risk-taking, farsightedness, and learned behaviour. Internal factors are subjective and vary from person to person. External factors may include socio-economic, political, geographic and natural disasters (e.g. diseases that can potentially lead to a pandemic). External factors cannot be controlled and, more importantly, they can wreak financial havoc (Friedline et al. 2020, pp. 1-18). Awareness of financial issues and a grasp of financial knowledge allow clients to better prepare for changes (Lusardi et al. 2020, pp. 1-7). The pandemic period brought in its wake an intensified analysis of personal finances and financial behaviour in times of crisis (Liu et al. 2020, pp. 2378-2389).

Research methodology

The statistical material used in the article stems from the ING International Survey – New Technologies 2020. This online survey was carried out by Ipsos from December 19, 2019 till May/June 2020. The survey sample was representative in terms of age, gender and area of residence and reflects gender ratios and age distribution. These data were made available for research purposes by the Macroeconomic Analysis Office of ING Bank Śląski S.A. A research hypothesis was formulated that COVID-19 has had a significant impact on the financial behaviour of households, including savings, debt, payments and shopping habits in the countries surveyed, and this indicates some personal finance fragility, but the impact has varied between countries.

The research material collected from a secondary source presented limitations in terms of the methods of statistical data analysis that might be applied. Due to the orderly nature of the analysed questions, non-parametric tests were used in the analysis. The following research methods were used: the U Mann-Whitney, a series of Kendall's τ correlation analyses, a Chi-square test of independence, logistic regression using the Wald backward elimination method.

Results

Due to the orderly nature of the analysed questions, non-parametric tests were used in the analysis. A series of analyses based on Mann-Whitney U tests showed that the current expenditure of Poles relative to before the

pandemic differed in a statistically significant way from the expenditure of the French $Z = 2.18$; $p < .05$; $r = .06$, Italians $Z = 4.15$; $p < .001$; $r = .09$, Luxembourgers $Z = 4.65$; $p < .001$; $r = .12$, Spanish $Z = 2.91$; $p < .01$; $r = .07$, Turks $Z = 9.62$; $p < .001$; $r = .22$ and UK residents $Z = 2.46$; $p < 0.05$; $r = 0.06$. Poles usually spent less due to the COVID-19 pandemic (45.88%). The inhabitants of Turkey spent the most after the pandemic hit, with 47.87% admitting that they have been spending more. Turkey was the only country where most of the population admitted that their spending was greater after the pandemic arrived. On the other hand, the inhabitants of Luxembourg and Italy spent the least, where over 50% admitted spending less money than before the pandemic. However, these differences were minor.

Another analysis examined the changes in how often people paid in cash or by card during the pandemic by country. U Mann-Whitney test analyses revealed that Poland differed from the other countries examined with the exception of Belgium $Z = 1.33$; $p = .183$; $r = .03$, Luxembourg $Z = 1.63$; $p = .103$; $r = .04$, the Netherlands $Z = 1.93$; $p = .053$; $r = .04$ (result bordering on statistical tendency) and Great Britain $Z = 1.82$; $p = .069$; $r = .04$ in terms of the current share of cash payments.

About 70% of Poles stated that they currently make cash payments much less frequently. In this respect, only the Belgians were less likely to pay in cash, but the difference was statistically insignificant. On the other hand, residents of Turkey, the USA and Romania proved the most reluctant to give up paying in cash. However, in general, across all countries, cash payments were less frequent.

It was indicated that all the results of the Mann-Whitney U test analyses turned out to be statistically significant. This means that Poles differed from all other nationalities in terms of the frequency of card payments. 66.70% of Poles stated that they pay by card more often than before the pandemic. A similar tendency was observed in other countries are markedly so in Turkey, Spain, Romania and Belgium. The smallest increase in card payments was noted in the USA, the Netherlands, France and Austria.

Next, online and in-store shopping was examined in comparison with the period before the pandemic in selected countries.

Another series of comparative Mann-Whitney U test analyses also turned out to be statistically significant. After the COVID-19 pandemic hit, 59.96% of Poles stated that they shop online more often. Purchases made by the residents of Italy, Turkey, Great Britain, USA and Spain also followed a similar pattern. The pandemic had the least impact on increased online shopping among the inhabitants of Austria, the Czech Republic, France, the Netherlands and Germany.

Comparative analyses via Mann-Whitney tests showed that Poles differed from other nationalities in terms of how often they shop in-store, with the exception of the residents of Italy Z = 1.84; p = .065; r = .04, Luxembourg Z = 1.66; p = .097; r = .04, Turkey Z = 1.20; p = .231; r = .03 and Great Britain Z = 0.25; p = .800; r = .01.

55.94% of Poles stated that they currently shop in-store less frequently. In this respect, it was not demonstrated that any country declared this form of purchase to be less frequent in a statistically significant way. The inhabitants of the Czech Republic and Germany were the most reluctant to abandon the standard form of in-store shopping, but the differences in this respect were not extreme.

A series of Mann-Whitney U test analyses showed that Poles differed in a statistically significant way from the inhabitants of the Czech Republic in terms of making plans for the future $Z = 5.55$; $p < .001$; $r = .12$, German $Z = 2.86$; $p < .01$; $r = .06$, Italy $Z = 2.02$; $p < .05$; $r = .04$, Luxembourg $Z = 3.63$; $p < .001$; $r = .09$, the Netherlands $Z = 4.61$; $p < .001$; $r = .10$, Romania $Z = .64$; $p < .001$; $r = .08$ and Great Britain $Z = 3.58$; $p < .001$; $r = .08$.

Polish attitudes towards making plans for the future tended to fall in the middle of the scale. The inhabitants of Luxembourg were the most conscientious in terms of making plans for the future, while the Czechs and Turks were the least likely to make plans for the future. Overall, analysing the distribution of respondents' answers, it can be concluded that the respondents made plans for the future to a moderate extent.

The results of Mann-Whitney test analyses indicated that Poles differed from other nationalities (except for the French $Z = 0.94$; $p = .346$; $r = .02$) in terms of compliance with the statement that they live from day to day.

About 41% of Poles stated that they tend not to live from day to day. Fig. 8 below reveals strong variation between the inhabitants of different countries in terms of how they respond to this statement. The most conservative people who disagreed the most with the statement that they live from day to day were the residents of Turkey and Luxembourg. On the other hand, the inhabitants of Romania, Spain, the Czech Republic, the USA and Germany displayed the greatest tendency towards day-to-day living.

It was also shown that Poles differed from all countries except Luxembourg $Z = 1.66$; $p = .097$; $r = .04$, Spain $Z = 0.25$; $p = .803$; $r = .01$ and the USA $Z = 1.59$; $p = .111$; $r = .04$ in terms of propensity to make plans for the future. Poles usually stated that they often like to make plans and prepare for the future. In this respect, only the inhabitants of Luxembourg were more eager to plan for the future. The inhabitants of Great Britain, the

Netherlands, Germany and the Czech Republic were reluctant to make plans for the future.

A further analysis using Mann-Whitney U tests compared Poland with other countries in terms of having household savings.

Analyses performed using Mann-Whitney comparative tests showed that Poles differed from the inhabitants of Germany $Z = 3.10$; $p < .01$; $r = .07$, Italy $Z = 2.75$; $p < .01$; $r = .06$, Luxembourg $Z = 6.92$; $p < .001$; $r = .18$, Romania $Z = 5.29$; $p < .001$; $r = .12$ and Turkey $Z = 2.70$; $p < .01$; $r = .06$ in terms of having household savings.

In the case of 74.92% of the households surveyed, Poles had savings. The country with the highest percentage of household savings was Luxembourg (90.83%). A smaller number of households than in Poland had savings in Germany, Italy, Romania and Turkey. These differences, however, were not large. Similarly, using Mann-Whitney U tests, the amount of savings in individual countries was compared among the households that declared having savings. The inhabitants of Poland differed in a statistically significant way from the inhabitants of all countries except Austria $Z = 0.84$; $p = .404$; $r = .02$, Czech Republic $Z = 1.31$; $p = .189$; $r = .03$, the Netherlands $Z = 1.85$; $p = .064$; $r = .04$ and Spain $Z = 1.80$; $p = .072$; $r = .04$ in terms of the amount of savings held. Most Poles have savings in the amount of 1-3 salaries (31.95%) or 4-6 salaries (25.46%). The inhabitants of Luxembourg had the largest savings, followed by the inhabitants of Great Britain and the USA. On the other hand, the inhabitants of Romania and Turkey had the smallest amounts of savings.

By means of Mann-Whitney U test analyses Poles were also compared with residents of other countries in terms of debt. The inhabitants of Poland differed from the inhabitants of all countries in a statistically significant way except for Belgium $Z = 1.15$; $p = .249$; $r = .03$, Czech Republic $Z = 1.66$; $p = .096$; $r = .04$, Spain $Z = 0.92$; $p = .357$; $r = .02$ and Great Britain $Z = 1.35$; $p = .177$; $r = .03$ in terms of debt ownership. 58.55% of Poles were in debt. More people were in debt in Luxembourg (72.07%), Romania (71.54%) and Turkey (87.50%). Germany and the Netherlands had the smallest percentage of people with debts.

The next part of the study examined whether, and if so, what relations existed between planning for the future, having debts and savings, and financial behaviour once the COVID-19 pandemic hit. The future planning variable was defined as average planning for the future and the will to do so while avoiding living day-to-day. The relationships between the questions were examined using a series of Kendall's τ correlation analyses.

Correlation studies showed that planning one's future was associated with savings $\tau = .20$; $p < .001$ and the amount of these savings $\tau = .14$; p

<.001 in a statistically significant way. These relationships were positive, which means that people who stated that they plan their future tended to have savings and in higher amounts. Planning for the future was also associated in a statistically significant way with amount of debt τ = -.07; p <.001. This relationship was negative, which means that people who plan their future had less debt. It was also demonstrated that the amount of debt is related to saving τ = -.12; p <.001 and the amount of these savings τ = -.25; p <.001. People with larger debts tended to have fewer or no savings.

Discussion

The conducted research is consistent with the initial results of studies by other authors as to the actual impact of the COVID-19 pandemic on personal finances, although comparative studies between countries on the financial behaviour of households during the COVID-19 pandemic had not been previously conducted. The challenge for the financial services market is to diagnose which determinants may have significant relevance for the consumer in order to shift financial management towards modern financial tools and robo-advice. The implementation of modern technologies within the process of personal finance management brings in its wake a number of challenges in the area of data circulation and analysis, digitisation and automation of manual processes, and Big Data architecture. The authors are aware of the limitations of their study, and at the same time emphasise the broad range of study participants from many countries and its representativeness in terms of age, gender and place of residence. The conclusions of the study have practical implications for financial institutions and non-financial service providers for the household sector.

Conclusions

The outbreak of the pandemic significantly influenced the public's behaviour in terms of method of payment choice. Fear for one's health often forced people who had previously been undecided to switch from cash to payments using remote tools. Total cash payments lost out in favour of cards and mobile payments. In addition, the e-commerce market surged while purchases in brick-and-mortar stores decreased. In terms of household budget management in the area of savings and loans, it should be stated that the surveyed households tended to be inclined towards spending less than before the pandemic. In terms of the amount saved after the pandemic

hit, no differences were found between Poles and residents of other countries. Opinions on saving levels during COVID were split and it cannot be unequivocally stated whether other countries changed their financial behaviour in this regard. In terms of type of debt, debts from recognised institutions such as banks prevailed, followed by bank account overdrafts. These loans were mainly incurred by design (e.g. mortgages) rather than by necessity. Loans secured at a pawnshop or student loans were incurred by the smallest percentage of people. The inhabitants of Turkey stood out from the rest of the countries as they often had credit card debt not paid every month and a large proportion of people had also borrowed from their families. People with larger debts more often had little or no savings.

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