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International Entrepreneurship Review

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The impact of the Covid-19 pandemic on the operations of real estate agencies and the attitudes of their clients in Poland

Bartłomiej Marona, Mateusz Tomal

ABSTRACT

Objective: The objective of the article is to evaluate the impact of the Covid-19 pandemic on the operations of real estate agencies and the attitudes of their clients in Poland.

Research Design & Methods: A survey questionnaire with open-ended questions distributed among all Polish real estate agents associated in the Polish Real Estate Federation.

Findings: The Covid-19 pandemic changed the operations of real estate agents and the attitudes of tenants and landlords. Real estate brokers turned to remote work using state-of-the-art technologies, landlords became more flexible to the market conditions, and tenants were looking for flats in a better technical condition with a balcony or garden.

Implications & Recommendations: The changes caused by the Covid-19 pandemic in real estate agencies' operations and in the attitudes of their clients in Poland are permanent and highly likely to uphold in the post-Covid-19 times. The findings provide a reference for new housing projects as well as the way real estate agents operate.

Contribution & Value Added: This is the first study considering the entire housing market in Poland and analysing the durability of the Covid-19 pandemic impacts.

Article type: research article

Keywords: housing market; Covid-19; housing brokers; housing preferences; real estate agencies

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INTRODUCTION

The Covid-19 pandemic, which was one of the most severe health crises in recent years (Machaczka & Stopa, 2022; Migała-Warchoł & Pichla, 2021; Kinnunen *et at.*, 2021; Banaszyk *et al.*, 2021), affected many aspects of economic activities, including the housing market processes (Bełej, 2022) and even caused fear and anxiety (Loan *et al.*, 2021). Previous studies revealed that coronavirus occurrence contributed to a decrease in the rental prices of flats, altered housing preferences (Tomal & Helbich, 2022), and caused changes in the real estate professionals' operations (Kania & Kmieć, 2022). Still, some significant research gaps can be identified in the last of the mentioned items. First and foremost, previous studies were sectional and focused only on selected local housing markets. Secondly, most studies were developed at the beginning of the pandemic, so it is not known if the pandemic effects are permanent or transient. Considering the premises above, this article aims to evaluate the Covid-19 pandemic's impact on the operations of real estate agencies and the attitudes of their clients in Poland. Taking into account the abovementioned goal, this article shall provide answers to the following research questions:

RQ1: How did the Covid-19 pandemic affect the operations of real estate agencies and the attitudes of their clients in Poland?

RQ2: Are the changes triggered by the pandemic outbreak permanent or transient?

This study continued the analyses performed by Marona and Tomal (2020), which aimed to determine the impact of the pandemic on the operations of real estate agencies and the attitudes of their clients in Krakow. This research contributes to the current literature in several ways. Firstly, it takes into account the entire residential market in Poland rather than its narrow section, increasing the credibility and general nature of the conclusions drawn. Secondly, this article presents the durability evaluation of the Covid-19 pandemic's impact on the operations of real estate agencies and their clients' attitudes.

The rest of this article is organised as follows. The next section will provide a literature review on the impact of the Covid-19 pandemic on the operations of real estate agencies and the attitudes of their clients. Next, the methodology of the research will be presented, followed by the study results and their discussion. The last section will contain the main conclusions and limitations of this research and directions for future studies.

LITERATURE REVIEW

Impact of the Pandemic on Real Estate Agencies' Operations

Scientific literature investigating how the appearance of coronavirus affected the business operation of real estate agencies is scarce, but some significant studies can be pointed out. For instance, Koszel (2021) analysed the pandemic's impact on the real estate market professionals in Poland. In April 2020, the author surveyed 247 people working as estate surveyors, real estate brokers, and property managers in Poland. The study results revealed that the pandemic caused a significant drop in businesses' revenues and the number of new contracts and telephone calls. Furthermore, over half of the respondents noticed a decrease in their work effectiveness (measured as the ratio of the number of signed versus finalised agreements) and a generally lower interest in real estate. On the other hand, the respondents noticed a significant increase in the number of online meetings and emphasised that the pandemic contributed to much extended remote work time. In turn, Strączkowski and Bartkowiak (2021) observed that, as a result of the pandemic, some real estate agents in Poznan were even considering closing their businesses. Further, Marona and Tomal (2020) focused on the issue of higher use of digital technologies by the real estate market entities, in their study based on the example of Krakow. Questionnaire answers submitted by twenty-two real estate brokers were analysed. It helped conclude that the pandemic caused the digitalisation of traditional business models. Real estate agents started using such tools as Zoom, WhatsApp, Skype, and Messenger. The same conclusions were drawn by Kania and Kmieć (2022) and Najbar (2021) in the analysis of the pandemic's impact on the operations of property brokers and managers in Poland. The pandemic's impact on real estate entities' businesses was also investigated in other countries. For instance, Bakar and Yaacob (2020) concluded that real estate agencies in Malaysia undertook five measures to digitalise their business models; the measures included (i) implementing an agency management system, (ii) using social media for marketing purposes, (iii) video content development, (iv) optimising the content for search engines (SEO), and (v) training the staff on the use of digital technologies. Serbulova *et al*. (2020) highlighted that Virtual Reality technology was the key digital innovation in real estate companies, broadly implemented as a result of the pandemic's outbreak. A similar conclusion was reached by Starr *et al*. (2020) as well as Maalsen and Dowling (2020), who concluded that the pandemic was one of the main factors accelerating the development of property technology.

Considering the abovementioned studies on the pandemic's impact on real estate agencies, it shall be emphasised that the coronavirus occurrence came as a shock to such companies and had negative consequences first, and then caused adaptation of the studied companies to the new reality by utilising the increasingly common digital technologies.

Impact of the Pandemic on the Attitude of Real Estate Agencies' Clients

The outbreak of the pandemic affected the behaviour of real estate agencies' clients, *i.e*. buyers and tenants for their housing preferences, and sellers and landlords for the strategy of housing property selling or renting. The issue was investigated both theoretically and empirically. A theoretical investigation was carried out in the study by Nanda *et al*. (2021). The authors claimed that as a result of the pandemic

outbreak, preferences concerning the desired housing location, physical characteristics, and surroundings have changed. In reference to location, the authors emphasised that houses away from the city centre would be preferred, which results from many companies implementing remote work. According to the study authors, more work and generally more time spent at home will stimulate the demand for larger houses with convenient Internet access, featuring gardens or balconies. Health aspects such as the quality of indoor air or the materials that the house is made of shall be of significance as well. The assumptions outlined by Nanda *et al*. (2021) were confirmed in successive empirical analyses. First of all, the researchers noticed that housing preference changes apply to a very large group of residential market participants. For instance, Pagani *et al*. (2021) surveyed 5378 people living in Switzerland. As much as 60% of them claimed that the pandemic outbreak had changed their housing preferences. Delbosc and McCarthy (2021) studied a population of twenty-six Australians and discovered a significant change in their housing preferences giving priority to place over the location and the will to have a house with a garden. Interestingly enough, the study revealed that because of the likely remote work in the future, many people started preferring to live in the countryside rather than in a city, which was also observed by Boesel *et al*. (2021) and Kang *et al*. (2021). According to Duque-Calvache *et al*. (2021), such mobile behaviours result from a search for larger area flats. Zarrabi *et al*. (2021) noticed that the inhabitants of Teheran started paying attention to houses supporting a healthy lifestyle, *i.e.* those that have access to natural light and are characterised by good acoustic parameters. The conclusions were also confirmed by Peters and Halleran (2020), who stated that houses promoted after the pandemic offer the possibility to recover from stress owing to the optimum arrangement of the windows. Finally, Akbari *et al*. (2021) proved that the pandemic led to a situation in which health factors play the most significant role in the change in housing preferences. The change in housing preferences as a result of the pandemic outbreak was also confirmed by Tomal and Helbich (2022) and Guglielminetti *et al*. (2021), who used econometric methods instead of a survey for analysis. Tomal and Helbich (2022) demonstrated that the pandemic contributed to a drop in the interest in flats for rent in the centre of Krakow and those located in big blocks of flats. Guglielminetti *et al*. (2021) proved that the inhabitants of Italy started looking for larger flats during the pandemic. As presented above, the pandemic's impact on housing preferences has been quite well investigated. Nonetheless, the behaviour of sellers and landlords has been analysed previously in the literature in a very limited range. Previous articles primarily indicated that real estate owners who had been renting their flats for short periods changed their strategies in favour of long-term rental (Hesse & Vilchez, 2022; Tomal & Marona, 2020; Trojanek *et al*., 2021). Reina *et al*. (2020), who investigated the real estate market in Philadelphia, also pointed out the significant impact of the pandemic on landlords. The authors noticed that as much as 60% of the respondents had been affected by the pandemic by being forced to lower the rent or introduce elastic payment forms. The same was reported by Marona and Tomal (2020) for the Krakow real estate market.

Scientific literature provides no comparative studies that answer the question of whether the pandemic's impact on the real estate agencies' clients is permanent or occurred only temporarily as a result of shock caused by the pandemic outbreak.

RESEARCH METHODOLOGY

To execute the research process, a CAWI survey was carried out among Polish real estate brokers associated in the Polish Real Estate Federation (PREF). The respondents were asked about the pandemic's impact on the real estate agencies' operations and on their clients' attitudes:

- Did the Covid-19 pandemic contribute to changes in organising the work of your real estate agency with the use of new technologies?
- Has the work organisation of the real estate agency you work for changed (except for the potential development of new technologies) under the impact of the Covid-19 pandemic, and if so, how has it changed? If the changes have occurred, are they expected to be permanent, *i.e.* remain as part of the agency's operations after the pandemic?
- Have you noticed any changes in the flat tenants' preferences under the impact of the Covid-19 pandemic?

– Have you noticed a change in the flat landlords' strategies (rental period, rent rates) under the impact of the Covid-19 pandemic?

The survey was carried out in November-December 2021, *i.e*. during the fourth pandemic wave in Poland. Finally, forty responses were received, which means a response rate of 1.85%. Even though the response rate is very low, the study results can still be considered reliable, which results from the analysis carried out by Holbrook *et al*. (2008) and from the fact that the study sample was relatively representative of the entire population of real estate brokers being members of the Polish Real Estate Federation (Table 1).

Table 1. Characteristics of the study sample versus the general population

Characteristics	Category	Ratio [%]		Test for two proportions†
		Study sample	Population	
Gender	Man	37.50	47.06	Z value = 1.20 P-value = 0.23
	Woman	62.50	52.94	Z value = 1.20 P-value = 0.23
Work experience	1-2 years	2.50	No data	No data
	3-5 years	12.50	No data	No data
	6-10 years	20.00	No data	No data
	Above 10 years	65.00	No data	No data
Size of the market	1-100 000 inhabitants	15.00	28.57	Z value = 1.88 P-value = 0.06
	100 001-500 000 inhabitants	30.00	36.23	Z value = 0.81 P-value = 0.42
	500 001-1 000 000 inhabitants	37.50	18.10	Z value = 3.13* P-value = 0.00
	Above 1 000 000 inhabitants	17.50	17.10	Z value = 0.07 P-value = 0.95

Note: significant codes – '*' 0.01; † null hypothesis: there is no difference between the proportions.
Source: own elaboration.

RESULTS AND DISCUSSION

Changes in Real Estate Agencies' Operations

Two questions in the study were related to the issue of new models of office work organisation and the use of new technologies. Although both issues were raised in the context of the Covid-19 pandemic, they are directly linked to the fourth industrial revolution that accelerated some changes in the real estate sector (Jeon & Suh, 2017; Kania & Kmieć, 2022) and profoundly altered the way societies, economies, and enterprises work; it also reshaped relations between actors. As for the question concerning the impact of the Covid-19 pandemic on the organisation of real estate agencies' work, 63% of the respondents noticed such an impact while 34% of the respondents were of a different opinion. This suggests that the study results for real estate agencies from all over Poland, associated in the Polish Real Estate Federation, are highly similar to the results obtained in a study carried out at the beginning of the pandemic only for Krakow (Marona & Tomal, 2020). The respondents mainly pointed out online or hybrid work. An example can be found in an answer given by a respondent representing a real estate agency from Warsaw:

> 'Yes, we work remotely more often now than we used to before the pandemic (more hours/days a week, depending on the needs) and it will probably stay like that.'

Another example is a statement from a respondent from Krakow:

> 'The staff come to the office no more than once a week. Essentially, we work remotely and we expect to follow this work pattern after the pandemic.'

Noteworthy, many respondents indicated remote work to be the consequence of the pandemic and – importantly – expressed a conviction that this element will turn out permanent in a long-term perspective. This confirms the findings of a number of market analyses carried out at different stages of the pandemic (Colliers Hybrid and Beyond Report, 2022). Notably, the answers indicating the pandemic's impact or a lack of such impact on the agency's work organisation did not reveal the answers' dependence on the size of the serviced local real estate market or the agency's experience.

In the answer to the question concerning the pandemic's impact on the scope of use of new technologies in real estate agencies operations, 57% of the respondents indicated such an impact, while 43% of the respondents were of a different opinion. These findings contradict that the real estate sector's operation is traditional and conservative and not quick to adopt technological innovations (Baum 2020; Kania *et al*., 2020). A higher approximation of positive and negative opinions likely results from the fact that many agencies had introduced some technological solutions before the global pandemic. For instance, a representative of a real estate agency from Lublin who mentioned a lack of changes claimed:

> 'I was technologically ready for such a situation.' The person pointed out that 'virtual tours implemented before the pandemic proved that was the right direction to follow.'

We received a similar response from a real estate agency in Gdansk:

> 'We had such solutions as virtual walks and online presentations before Covid-19, so we did not add anything.'

For many real estate companies, the pandemic provided an impulse to introduce some changes in the scope and type of technologies used. It was determined in the course of the study that particular development occurred in the scope of disseminating real estate presentation videos and organising virtual tours or online meetings, *e.g.* via Zoom. In this context, let us emphasise that some respondents challenged the effectiveness of such tools but still implemented them. A good example confirming the above was provided by a real estate broker from Szczecin who said:

> 'Since many agencies introduced 3D virtual tours and videos, we felt we should also use it not to be left behind.'

Importantly, other new technological tools used in the work of real estate companies were scarcely introduced or not introduced at all (Ullah *et al*., 2018). The technologies can be grouped into nine categories including drones, unmanned aerial vehicles, the Internet of Things (IoT), clouds, software as a service, big data, 3D scanning, wearable technologies, virtual and augmented realities (VR and AR), artificial intelligence (AI), and robotics (Ullah *et al.*, 2018). Moreover, we should note that the catalogue listed above is not exhaustive, but it only presents digital technologies currently and practically used in real estate. However, the sector of modern technologies has been changing rapidly so a significant part of its inventions can be expected to be employed in real estate in the near future. A real estate agency from Goleniow, in its response mentioned:

> 'Preparing the presentations using spherical and bird's eye view photos – drone.'

It was the only case when the use of a drone was mentioned by a real estate agency. It shall be added that employing drones in a real estate agent's work is practical in special cases, not necessarily related to presenting flats located in densely built-up residential areas.

Finally, the possibility of using new technologies is directly related to the changes within new models of the agency's work organisation and team management methods. A good example was provided by a real estate agent from Krakow who answered the question on new technologies in the following way:

> 'It is a very positive aspect: (1) we learnt how to work remotely, (2) we learnt to manage a dispersed team, (3) we attach higher significance to Customer Relationship Management tools, (4) we save quite much time on remote (visual) contact with internal and external clients, (5) communication is more substantive and based on work performance and effects (or lack of them), (6) we started using new tools, time planning and task delegation.'

The above somehow confirms Mączyńska's thesis (2018), which points out that the digital revolution keeps creating new, previously unknown phenomena and thus shapes the new economy and its new entities, which have previously been completely unknown. In practical terms, modern technologies make it possible to increase the digitisation processes dynamics, including digitalisation in the real estate sector. The former relates to the analogue data conversion to digital forms (Gobble, 2018), and the latter means the transformation of business models used so far by real estate companies into models that increasingly utilise advanced digital technologies (Piazolo, 2018).

Attitude Changes in Real Estate Agencies' Clients

Most respondents noticed attitude changes in real estate agencies' clients. The previously described changes in real estate agencies' functioning and a broader scope of new technologies utilisation were highly stimulated by the clients' expectations. Considerable changes were observed in the housing preference area, which was the main focus of the study. In this context, 65% of the respondents noticed changes in the clients buying and renting residential premises. Some changes were noticed regardless of the city/town where the real estate agency participating in the study was operating. For instance, a respondent representing a real estate agency from Katowice noticed that:

'Quite many people started appreciating flats on ground floors with access to gardens.'

Similarly, a real estate agent from Poznan stated:

'Tenants are looking for flats ready to move into, featuring a balcony or a garden.'

Meanwhile, a real estate agent from Warsaw mentioned:

'Balconies were commonly expected elements of flats.'

Moreover, many real estate brokers paid attention to the lower significance of location when making housing decisions. A real estate agent from Krakow observed:

'A higher interest in bigger flats, with more rooms. The location has become less significant.'

Both these aspects were mentioned by a real estate agent from Lodz, who said:

'Yes, I have noticed changes in the tenants' preferences; suburbs and balconies are preferred.'

The changes in the location perception result from the widespread remote and hybrid work which does not require as frequent commuting as before the pandemic and directly contributes to changes in housing preferences (Shamshiripour *et al*., 2020). In this context, many real estate agents pointed out the need for Internet access in flats and the possibility of arranging a place to work; it has become a subject of separate literature studies on corporate real estate management (Marzban *et al*., 2021).

On the other side of the market participants, the survey questions focused on landlords. In the majority of the study respondents' opinions (75%), the landlords tried to adapt to the pandemic situation (lower rent, shorter rental period, more flexible agreement termination conditions, changing the rental strategy from a short-term to long-term), whereby the changes were only a temporary adaptation to the market situation (a momentary prevalence of supply over demand), which has now changed completely because of the war in Ukraine (Trojanek & Głuszak, 2022).

Finally, Table 2 synthetically summarises this study's results against a previous analysis carried out by Marona and Tomal (2020). Based on the comparison, it can be stated that from the beginning of the pandemic to the end of 2021, the changes in real estate agencies' operations and their clients' attitudes are permanent. Firstly, in both studies, at least half of the agents indicated significant changes in their agencies' operations and their clients' attitudes. Secondly, the changes identified in both studies were generally the same.

Table 2. The durability of the Covid-19 pandemic's effects

Area of change	Marona and Tomal (2020): July 2020	This study: November-December 2021
Real estate agencies' operations	70% of the agencies noticed changes involving remote and hybrid work using modern technology solutions.	63% of the agencies noticed changes involving remote and hybrid work using modern technology solutions.
Real estate clients' attitudes	80% of the agencies observed changes in their clients' attitudes. For landlords, they involved changing the form of rent, i.e. short-term rather than long-term rental and lower rent. Tenants were looking for flats in new buildings with a little garden or a balcony.	65% of the agencies observed changes in their clients' attitudes. For landlords, they involved changing the form of rent, i.e. short-term rather than long-term rental and lower rent. Tenants were looking for flats in new buildings with a little garden or a balcony.

Source: own elaboration.

CONCLUSIONS

This study presented the impact of the Covid-19 pandemic on real estate agencies' operations and their clients' attitudes in Poland. The analysis revealed that from the beginning of the pandemic, the changes have become permanent and essentially involve a higher share of remote work in real estate agencies and using modern technologies to that end. Real estate agencies' clients, in turn, changed their housing preferences and started looking for flats in new buildings featuring a balcony or garden. Landlords became more flexible to market conditions resulting from the Covid-19 pandemic.

This study has implications for housing market actors. Firstly, real estate agents should increase their competencies in the use of modern technologies. Secondly, when starting new investment projects, real estate developers should adjust the new housing stock to the post-pandemic housing preferences by increasing the size of flats and providing access to a balcony or garden.

The main limitation of this study was the low number of respondents, which is typical for business surveys. A second limitation related to the lack of consideration of the impact of the war in Ukraine on the persistence of the identified changes. Therefore, future studies should investigate if the war in Ukraine changed the post-Covid-19 landscape of the flat rental market within the real estate agents' operations and their clients' attitudes.

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Conflict of Interest

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Does masculine orientation affect entrepreneurial intentions? Empirical research results among students

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ABSTRACT

Objective: The article aims to present the research results on the relationship between the national culture dimension of masculinity/femininity according to Hosfstede's approach and declared entrepreneurial intentions.

Research Design & Methods: The research sample included 226 Polish students, whom we asked questions relating to Hofstede's dimensions of culture. In the next step, we created binomial logistic regression models. We verified the hypothesis based on the models' estimated parameters in the next step.

Findings: The study revealed that people representing a masculine cultural orientation tend to be more inclined to start their own businesses than those with a feminine orientation.

Implications & Recommendations: The research results confirmed that the characteristics attributed to male culture favour the emergence and development of entrepreneurial intentions. Thus, from the education perspective aimed at promoting pro-entrepreneurial behaviour, it is advisable to develop these qualities in society by emphasizing the educational process on the training of creative leaders, people with high mental resilience, and a willingness to compete and improve the surrounding world.

Contribution & Value Added: This article fills the research gap in the cultural determinants of entrepreneurial development, subject to the need to continue research on a more extensive research sample in terms of international comparisons.

Article type: research article

Keywords: entrepreneurial intentions; Hofstede; entrepreneurial determinants; masculinity; femininity; entrepreneurship education

JEL codes: I23, L26

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INTRODUCTION

Entrepreneurship is essential to a country's economic development determinant and growth (*e.g.,* Audretsch & Keilbach, 2004; Fritsch & Mueller, 2004; Stam & van Stel, 2009; Olaison & Sorensen, 2014; Khalilov & Yi, 2021; Gomes & Ferreira, 2022). Therefore, considering the notably dynamic nature of the economic changes that are taking place on a global scale, it becomes justifiable to emphasise the process of supporting entrepreneurship, considering the unique role of education (Duong *et al.*, 2022).

One of the most critical issues addressed in the literature relates to psycho-cognitive dimensions. They include the problem of human cognition and the knowledge generation about the environment and its use in behaviour, including economic ones. Entrepreneurial intentions expressed through a perceived inclination to launch business ventures are extensively explored in the literature. Thus far, researchers have mainly focused on the issues related to analysing key competencies in running a business or influencing whether a person wants to start a business. Therefore, verifying whether individuals' cultural dimension is significant in the emergence and fostering of entrepreneurial intentions seems vital.

The article's main aim is to verify the existence of a relationship between masculine and feminine cultural perceptions, as examined by the variables proposed by Hofstede, and the propensity expressed by the surveyed students to start a business shortly. For that purpose, we surveyed a sample of 226 students studying at the Krakow University of Economics, attempting to relate the cultural dimension proposed by Hofstede to their declared entrepreneurial intentions.

The undertaken subject matter is part of the current research on entrepreneurship education, which pays special attention to the fact that a comprehensive educational process aims to form appropriate entrepreneurial attitudes. Moreover, the article fills a research gap in the field of entrepreneurship and simultaneously responds to Schlaegel and Koenig (2014) who pointed out that a deeper consideration of cultural values is essential in the study of entrepreneurial intentions. The contribution of our study is an in-depth examination of the relationship between entrepreneurial intention and masculine and feminine cultures that strengthen or weaken entrepreneurial initiative.

The article consists of a theoretical part and an empirical part. In the theoretical part based on critical literature analysis, we will present a relationship between Hofstede's masculine and feminine cultures and prospective entrepreneurial intentions. Finally, we will formulate a research hypothesis which was tested in the empirical part of the article. Our results are based on the primary data obtained from the survey.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

National culture encompasses the joint norms, values, beliefs, behaviours, and roles occurring among members of a particular community living in a particular geographic region during the same time (Triandis, 1995). In the literature, one can find many studies referring to the national culture dimensions proposed by Hofstede (2001), which in his understanding, refers to the collective mental programming that distinguishes members of one group or category of people from others. Hofstede's concept is the most prominent and most frequently cited scientific framework for research on the impact of culture on the achievements of individuals, societies, organizations or states (Szymura-Tyc & Kucia, 2016). The distinctive features of culture defined in this way are the values that are passed across generations in society, resulting in the formation of appropriate attitudes and behavioural patterns (Hayton &Cacciotti, 2013; Wardana, *et al.*, 2021; Wach & Wojciechowski, 2016).

It should be noted that Hofstede's concept of dimensions of national culture is quite often used in studies on the impact of culture on entrepreneurship (*e.g.*, Morris, Davis, & Allen, 1994; Thomas & Mueller, 2000; Hayton, George, & Zahra, 2002; Wach, 2015). Some researchers believe cultural aspects can influence higher entrepreneurial intentions, but this influence is rarely direct (Nikoaev, Boudreaux, & Palich, 2017). Indeed, as Naqvi and Siddinqui (2020) point out, this regularity does not necessarily occur in every cultural context. Some researchers such as Bogatyreva, Edelman, Manolova, Osiyevskyy and Shirokova (2019) argue that the national cultures popularized by Hofstede encompass a total of six dimensions: (1) individualism/collectivism, (2) power distance, (3) uncertainty avoidance, (4) masculinity/femininity, (5) long-term/short-term orientation, and (6) indulgence/restraint, may affect entrepreneurial intentions. It is especially noticeable in the case of masculine cultures (Radziszewska, 2014; Newbery, Lean, Moizer, & Haddoud, 2018), which focus on competition and success. The case is different in female-oriented societies, where attitudes about caring and concern for others are cultivated (Al-Alawi & Alkhodari 2016). In highly masculinized cultures, relatively high competition, assertiveness among communities, ambition, and power aspiration can be observed. On the other hand, in feminist cultures, the focus is on relationships and quality of life (Czerwonka, 2015).

Empirical evidence from some studies indicates that pro-entrepreneurial individuals are characterized by a high degree of masculinity (McGarth, MacMillan, & Scheinberg, 1992). Based on a group of 13 countries characterizing different cultural backgrounds, McGarth, MacMillan and Scheinberg (1992) showed that the surveyed entrepreneurs characterized traits typical of a masculine orientation, while non-entrepreneurs were more feminine. Although the studies mentioned above did not provide clear conclusions regarding the overall cultural differences between entrepreneurs in different countries, it was noted that highly masculinized cultures manifest more significant tendencies to start their own ventures.

Bogatyreva, Edelman, Manolova, Osiyevskyy, and Shirokova (2019) argue that this is primarily driven by a high-results orientation in masculine cultures, which forms proactive strategies and increases the willingness of such individuals to seize opportunities and engage in entrepreneurial activities. On the other hand, in a study by Rubio-Bañón and Esteban-Lloret (2016), who compared the masculinity index with the number of male and female entrepreneurs, the collected research material disallowed the demonstration of an unambiguous relationship between masculinity and entrepreneurial intentions. It turned out that although the percentage of female entrepreneurs does not correspond to changes in the masculinity index between different countries, the researchers observed a significantly higher percentage among male-oriented entrepreneurs. Even in countries with low masculinity indexes, men seem to be a larger group in percentage terms among entrepreneurs (Rubio-Bañón & Esteban-Lloret, 2016). Similarly, in their study, Mueller and Thomas (2001) report that masculine orientation has little effect on individuals' entrepreneurial tendencies. Their study primarily points out the low significance of masculine and feminine orientation. According to them, the other dimensions of culture are much more significant when examining entrepreneurial inclinations among individuals.

On the contrary, while investigating the survey results of IBM, Shane (1993) initially assumed that masculinized societies would be more innovative than feminist societies. However, it turned out that the variable describing masculinity had no explanatory power. Thus, the researcher could not interpret the results and determine whether masculine orientation impacts entrepreneurship among men and women. The higher entrepreneurial intentions in masculinized societies are because, in such cultures, individuals willing to invest their efforts in generating potentially higher incomes are rewarded (Rusu, 2014). It may happen because a higher propensity for risk characterizes masculine-oriented countries.

On the other hand, Çelikkol, Kitapçi, and Doven (2019) explain the results of a negative relationship between masculinity and entrepreneurship in, among other things, the customers' awareness in terms of products, services, market, prices, and competition. They also expect quality, sensitivity, and care in customer relations, which are feminine values.

Given that the results of previous scientific research have not provided clear-cut answers in the context of the role of masculine and feminine cultures in entrepreneurial intentions, we decided to verify the following hypothesis:

H: Individuals representing masculine perceptions demonstrate higher entrepreneurial intentions.

Based on the above considerations, an empirical study verifying the above hypothesis was carried out in the later stages of the work.

RESEARCH METHODOLOGY

Sample and Data Collection

The study adopted a post-positivist approach characteristic of quantitative research. Our analysis was based on primary data from a survey of 226 students studying in Poland (Table 1). More than half of the respondents were women (64.6%), while 35.4% of the sample were men. The survey was conducted in January 2023. The survey form included questions relating to each of Hofstede's dimensions of culture, and for this article, a thread relating to one dimension of culture was included: masculinity vs femininity.

Variables in the Analysis

We included one dependent variable in the study, which related to entrepreneurial intentions, *i.e.*, students' declarations to start their own business in the nearby future (question: Would you consider starting your own business after graduation or while studying?). The proposed variable was in line with Turker and Selcuk (2009). The dependent variable was dichotomous, so if the answer to the question presented above was affirmative then the number 1 was assigned, otherwise the number 0.

Table 1. Students' profile

Category	Frequency	Percentage
Gender		
Male	80	35.4%
Female	146	64.6%
Form of studies		
Full-time	206	91.2%
Part-time	20	8.8%
Family patterns		
Yes	162	71.7%
No	64	28.3%

Source: own elaboration in PQStat.

Among the independent variables, two variables were specified: masculinity and femininity. Regarding the first independent variable, its value was calculated based on the arithmetic mean of three questions measured by a five-point Likert scale, namely: (1) 'I consider myself to be an assertive person and always express my opinion firmly, even when others are being silent,' (2) 'I love to compete with other people (co-workers, peers, etc.) – it makes me feel better (I feel strength and energy),' and (3) 'when assigning tasks, I don't follow dislike for the person, but rely on objective considerations.' On the other hand, with regard to the variable describing femininity, the following questions were detailed: (1) 'I consider that sometimes it is worth not reacting to the provocations (*e.g.*, verbal) of other people – sometimes it is necessary to keep silent about the matter,' (2) 'I do not like to compete with other people, as it wastes my time and energy,' and (3) 'when assigning tasks, I follow my sympathy for the given person, and do not rely on objective considerations.'

The study also included three control variables: *gender*, a *form of study*, and *family patterns* (question: Have any of your relatives – e.g., partner/partner, parents, siblings, grandparents, uncles, cousins – been in the past or are currently involved in business activity?). The variable describing *gender* was measured dichotomously, so a number 1 was assigned if a man answered and a number 0 if it was a woman. It is because men tend to show a higher propensity to start businesses than women, which corresponds to studies by other researchers (*e.g.* Zhang, Duysters, & Cloodt, 2014; Díaz-García & Jiménez-Moreno, 2010). Regarding the *form of study*, the variable is also dichotomous. Hence, if the respondent indicated that they were studying full-time, then the number 1 was assigned, whilst if they were studying part-time, then the number 0 was assigned. It is in line with Sandhu, Jain, and Yusof (2010). The last control variable referred to *family patterns* regarding relatives' business activities; if the surveyed student answered affirmatively that any of his/her relatives conduct/conducted business, then a number 1 was assigned, otherwise a number 0. It is in line with Bigos and Michalik (2020).

Research Model and Statistical Tests

Inference in this study was based on the results of the estimated parameters of binomial logistic regression, which applies to variables expressed on a weak scale. The reliability of the created models was verified through two statistical tests: (1) the likelihood ratio test (desired statistical significance) and (2) the Hosmer-Lemeshow test (desired lack of statistical significance). In addition, Pseudo *R*-square coefficients were calculated by Cox-Snell and Negelkerke methods. Due to the weak scale of variables used, *V*-Cramer coefficients were calculated to verify the interdependence between the variables used in this analysis. The proposed research model is presented in Figure 1.

Figure 1. Proposed research model
Source: own elaboration.

RESULTS AND DISCUSSION

We verified the hypothesis based on the parameter estimation results in the econometric models presented in Table 3. We measured their reliability using the likelihood ratio test and the Hosmer-Lemeshow test. In all models created, the likelihood ratio test was statistically significant (model 1: chi-square=12.926, p<0.01; model 2: chi-square=28.810, p<0.001; model 3: chi-square=28.236, p<0.001; model 4: chi-square=18. 067, p<0.001), while the Hosmer-Lemeshow test showed a statistical insignificance (model 1: chi-square=0.667, p=0.955; model 2: chi-square=8.194, p=0.415; model 3: chi-square=11.525, p=0.174; model 4: chi-square=4.239, p=0.835). In the Akeike Information Criterion context, model 3 exhibited a better fit, while model 1 was a relatively worse match.

A Pseudo R-square, measured by Negelkerke and Cox-Snell methods, was also calculated for the created binomial logistic regression models (Blomstermo, Deo Sharma, & Sallis, 2006; Smith & McKenna, 2013). For the first econometric model, Negelkerke's Pseudo *R*-square was 0.077, while Cox-Snell's Pseudo *R*-square was 0.056. Higher values were observed for models 2-4, where Negelkerke's Pseudo *R*-square was 0.165, 0.162, 0.106, respectively, while Cox-Snell's Pseudo *R*-square was 0.120, 0.118, 0.077, respectively (Table 3).

Table 2. *V*-Cramer coefficient

Variable	1	2	3	4	5	6
1. Entrepreneurial intentions	1	–	–	–	–	–
2. Gender	**0.155***	1	–	–	–	–
3. Form of study	0.065	0.003	1	–	–	–
4. Family patterns	**0.177****	0.096	0.046	1	–	–
5. Masculinity	**0.314****	0.257	**0.281***	0.157	1	–
6. Femininity	0.269	0.232	0.169	0.156	**0.271*****	1

Note: Significant codes: + p<0.1, * p<0.05, ** p<0.01, ***p<0.001
Source: own elaboration in PQStat.

Since the variables used in the analysis are expressed on a weak scale, the *V*-Cramer coefficient was calculated (Table 2). We could observe that relatively speaking, the *entrepreneurial intentions* and *masculinity* variables were related to each other to the highest degree (v=0.314, p<0.01). To a slightly lower degree, *form of study,* and *masculinity* (v=0.281, p<0.05) and *masculinity* and *femininity* (v=0.271, p<0.001) were related. *Gender* and *form of study* are associated with each other to the relatively lowest degree (v=0.003, p<0.001).

Based on the estimated parameters in all econometric models, it can be observed that *family patterns* was statistically significant among the control variables, while *gender* was in model 1. Based on this, it can be concluded that conducting business activity in the past and currently by relatives promotes higher entrepreneurial intentions (slightly more than twice often). However, in the context of *gender* in the first model, it can be noted that men manifested almost twice the

propensity to start a business than women; nevertheless, in the following regression models, the estimated parameter demonstrates statistical insignificance.

Table 3. The list of estimated models (odd ratios)

Variable	Model 1	Model 2	Model 3	Model 4
const.	1.548 (0.562)	0.319 (1.369)	**0.142*** **(0.857)**	**8.317*** **(0.950)**
Gender	**1.942*** **(0.314)**	1.544 (0.328)	1.574 (0.327)	1.784 (0.319)
Form of study	0.535 (0.554)	0.495 (0.580)	0.504 (0.575)	0.489 (0.568)
Family patterns	**2.178**** **(0.309)**	**2.125*** **(0.323)**	**2.145*** **(0.322)**	**2.131*** **(0.313)**
Masculinity	–	**2.023***** **(0.220)**	**2.152***** **(0.204)**	–
Femininity	–	0.825 (0.256)	–	**0.595*** **(0.235)**
Likelihood ratio test	*12.926***	*28.810****	*28.236****	*18.067****
Hosmer-Lemeshow test	*0.667* *(p=0.955)*	*8.194* *(p=0.415)*	*11.525* *(p=0.174)*	*4.239* *(p=0.835)*
Akaike Information Criterion	*285.596*	*273.712*	*272.286*	*282.455*
Pseudo R-square (Negelkerke)	*0.077*	*0.165*	*0.162*	*0.106*
Pseudo R-square (Cox-Snell)	*0.056*	*0.120*	*0.118*	*0.077*
N	*226*	*226*	*226*	*226*

Note: Significant codes: * p<0.05, ** p<0.01, ***p<0.001. Standard error in parentheses.
Source: own study.

We observed that entrepreneurial intentions occurred on average twice more often among those respondents who represented a masculine orientation according to the Hofstede approach (model 2: odd ratio=2.023, p<0.001; model 3: odd ratio=2.152, p<0.001). Thus, based on this, the research hypothesis that individuals representing masculine perceptions manifest higher entrepreneurial intentions can be confirmed. In addition, based on the estimated values in model 4, it can be concluded that the thesis is reasonable, as the *femininity* variable appearing separately shows the opposite tendency.

The results we obtained align with previously published research results (*e.g*. Garth, MacMillan, & Scheinberg, 1992; Radziszewska, 2014; Newbery, Lean, Moizer, & Haddoud, 2018; Bogatyreva, Edelman, Manolova, Osiyevskyy, & Shirokova, 2019). On the other hand, Pérez-Quintana, Hormiga, Martori, and Madariaga (2017) showed that cultural gender determines the occurrence of entrepreneurial intentions much more strongly than biological gender.

CONCLUSIONS

The above results prove that the masculine orientation shown is conducive to entrepreneurial intentions. Based on the results obtained among the studied group of students, the research hypothesis stating that individuals with masculine orientation exhibit a higher propensity to start a business was positively verified. It is aligned with the previously cited research results of other authors. The demonstrated relationship is undoubtedly related to psycho-personality predispositions useful in running a business, among which we can mention the propensity for risk, personal courage, competitive and achievement-oriented attitudes, which are attributed in science to masculine culture.

The obtained results generate implications for education in entrepreneurial development. Firstly, it is necessary to see the necessity of promoting from the elementary school level the development of the aforementioned traits attributed to masculine culture and thus creating young leaders, who in their future professional life will face the challenges of market competition. Obviously, it is not the

intention of the authors to call for the displacement of the female personality element from the population and thus aggressively 'breeding' the very representatives of the culture of masculinity, striving for rigour and leadership in every field, whether economic or social. Indeed, the development of entrepreneurship is not possible without the existence of courageous, creative, enterprising individuals, but neither would it be effective without the support of people who are rather oriented towards teamwork, harmony, and concern for others, with a limited propensity for risk, *i.e.* the qualities desired in employees and attributed to the female cultural dimension (Wach & Bilan, 2023).

Indeed, research limitations regarding the results obtained should be considered. One of the limitations that must be mentioned is the research sample. We limited our research to a group of economics university students, and it does not necessarily reflect trends in society. Moreover, further research needs to be expanded to other countries to make comparisons and account for cultural differences. The research published so far still needs to fill the existing research gap, so there remains a strong need for continuation. Moreover, future research should consider the educational policy in the existing and future studies analysing the impact of the current model of education in Poland on the formation of the personality traits of the younger generation.

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How to attract migrant entrepreneurs to peripheral regions? Evidence from Poland

Sabina Kubiciel-Lodzińska, Jolanta Maj, Alexandra David

ABSTRACT

Objective: The article aims to identify market entrance barriers faced by migrant entrepreneurs and reasons for the attractiveness of specific places when starting a business in so-called peripheral regions.

Research Design & Methods: This article presents the results of a qualitative study based on semi-structured interviews, for which 21 migrant entrepreneurs were interviewed in 2019 and 2020 in Opolskie Voivodeship.

Findings: The findings suggest the respondents selected the Opolskie Voivodeship for business activities on the bases of socio-spatial embeddedness. Neither the entrepreneurial ecosystem nor the promising economic situation were identified as meaningful for starting or growing businesses.

Implications & Recommendations: Drawing on the findings, the authors developed practical implications for policymakers. Attention should be given to tools attracting migrants to peripheral regions. Established migrant entrepreneurs in peripheral regions could be integrated into a regional attraction concept and make the local ecosystem more inclusive for this group of entrepreneurs. They may be turned into practice by giving them the right to member and participate in official networks of the economic development agency or the chamber of commerce. In general, the openness of migrants to reach out to support infrastructures for business creation should be actively addressed.

Contribution & Value Added: The research fills the research gaps relating to the spatial dimension and the regional context of the presence of migrant entrepreneurs in the peripheral areas of Poland.

Article type:	research article
Keywords:	Entrepreneurship; migrant entrepreneurship; migration; migration management; peripheral regions
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INTRODUCTION

Even though a few studies on the topic have been published in the past few years (Kordel *et al*., 2022; Elo *et al*., 2022; Elo *et al*., 2019), research on peripheral regions and migrant entrepreneurship remains underdeveloped. In Poland, studies on migrant entrepreneurship and the spatial dimensions also rather tend to focus on larger cities and/or metropolitan areas as Krakow (Brzozowski, 2019) and Warsaw (Andrejuk, 2017; Brzozowska & Postuła, 2014) then on peripheries. However, since Poland has numerous peripheral regions, it is necessary to address the issue there. This article deals with peripheral regions understood as those that are not only rural but marginalized for various reasons, such as the example of Opolskie Voivodeship. The region has been suffering from a brain drain for decades due to strong labour emigration to Germany and Western Europe and currently has the lowest GDP in Poland (CSO, 2022). Moreover, Opolskie Voivodeship is located between two bigger agglomerations which are the region of Katowice and Wroclaw. On the one hand, this means that this peripheral is not visible and that it is not attractive for investors who tend to capitalise on the two large agglomerations and cities. On the other

hand, a highly educated workforce is attracted to the bigger agglomerations and students chose to study there, without considering the existing universities in Opole. Thus, human resource in form of students and experts is less available to Opolskie Voivodeship from the beginning. This again leads to a downward spiral: less available human capital, less purchasing power, less attractive places to live, fewer economic advantages, less good education, less visibility, etc. Therefore, being distressed by a declining economic force, exemplary Opolskie Voivodeship is dependent on immigration and entrepreneurial activities. During the increase in immigration in recent years, peripheral regions, in general, are beginning to participate in the discourse, as migrants can contribute to maintaining or expanding the diversity of peripheral and rural labour markets (Kordel *et al*., 2022; Schemschat, 2021; David, 2015). While workers and self-employed often compete in larger cities and metropolitan areas, peripheral regions in general offer more potential for trying out business ideas and for start-ups. Here, also migrants as employees and entrepreneurs can contribute to the maintenance of the infrastructure, be creative and live and work at adequate distances. The uniqueness of migrant entrepreneurs' customer base due to diverse products and services (Curci & Mackoy, 2010) can broaden the economic sectors in 'left-behind places.' Migrant entrepreneurs' multifocal embeddedness (Solano *et al*., 2022), which is the simultaneous involvement with places and people in several spatial spheres such as country of origin (CoO) and the country of residence (CoR) (Henn, 2014) can create new opportunities for peripheries and individuals living there. In this context, Vertovec (2009) discusses the possibility that migrant entrepreneurs' transnational links may broaden, deepen, and intensify economic societal transformation processes. Moreover, such interlinkages allow for the development of trust-based social relations, economic exchange, and activation of regions less attractive for indigenous entrepreneurs (Glinka, 2018).

After years of being out of focus for international migration, in recent years, Poland has become one of the major destinations in Europe for some groups of migrants (OECD, 2021). Apart from Ukraine, the top three nationalities of newcomers in 2019 were Belarus and India (OECD, 2021). With the outbreak of war in Ukraine, since February 2022, increased numbers of women with children have immigrated to Poland. Besides refugees seeking protection, other groups of migrants come to Poland for economic reasons. They are attracted by employment possibilities, higher wages, and higher living standards that Poland offers in comparison to their countries of origin.

Against this backdrop, the present article deals with the attraction of migrant entrepreneurship in the Opolskie Voivodeship (David *et al*., 2022a; Xavier *et al*., 2013). Hereby, the focus lies on the identification of pull factors and market entrance barriers faced by migrant entrepreneurs in this peripheral region, who are inspired to start or run businesses outside the country's central metropolitan areas. In so doing, the article addresses the identified research gap which relates to migrant entrepreneurial activities in peripheral regions in Poland and asks the following questions:

1. What originally attracted migrants living in Opolskie Voivodeship to this specific peripheral region?
2. What were their major reasons for starting a business in the Opolskie Voivodeship?
3. What were and are the main barriers hindering migrants to run their own businesses in the Opolskie Voivodeship?

In what follows, we will start with a literature review to position our study in the scientific discourse on migrant entrepreneurship and spatial dimensions. Next, we will introduce our method and the research design, and then our main results. Finally, the article will conclude with a discussion of the findings. The conclusions will draw some implications for policymakers. By linking results to current debates, we will formulate suggestions for future research.

LITERATURE REVIEW

Inspired by David *et al*. (2022a), in this article migrant entrepreneurship is defined as an umbrella term for the phenomenon of migrants starting and running businesses in CoRs in the first and second generation. In so doing, the authors do not neglect further subgroups of migrant entrepreneurship (David *et al*., 2022a) such as, to name some, ethnic (Edwards *et al*., 2016), diaspora (Sternberg *et al*., 2023

forthcoming; Elo, & Minto-Coy, 2019) or refugee groups (Hartmann & Philipp, 2022). However, these groups do not play a role in the sample used here.

The fact that entrepreneurial activities are always embedded in a context was already demonstrated in studies by Polanyi (1944) and later Granovetter (1985). Both argue that economic activities at large are always embedded in social relations and cannot be taken out of the framework. Gradually, these ideas were translated into other scientific areas and in 1997, Oinas introduced the concept of spatial embeddedness. Against this backdrop, scholars recognise that entrepreneurship in general including migrant entrepreneurs is an important aspect of regional development and influences economic force (Sandoz *et al*., 2022). Moreover, some posit that spatialities influence entrepreneurs in overall and in that line migrant entrepreneurs' activities in the same manner (David & Schäfer, 2022). The interplay between migrant businesses and the regional dimension becomes particularly clear in times of crisis. Others observe that especially through the many lockdowns of the Covid-19 pandamic, local embeddedness among and well-being of like-minded people (Andrejuk, 2022; Terstriep *et al*., 2022) played a big role for SMEs, to which most migrant entrepreneurs belong. For instance, in Germany, specific measures were established for this vulnerable group of start-ups and SMEs (David *et al*., 2022b). Distinct from earlier crises, the shock caused by COVID-19 forced businesses, especially SMEs and start-ups to handle unexpected changes in almost any area of their business activities (Schepers, 2021; Kuckertz *et al*., 2020).

Drawing on embeddedness in geography, the concept was introduced by Hess (2004) and further developed into socio-spatial embeddedness. Besides the understanding of how regional environments affect economic activities, this concept was expanded by highlighting the relational perspective on economic actors and firms instead of analysing the geographical dimensions only (Bathelt & Glückler, 2003). In that vein, based on Yeung (2005; 2008) David and Schäfer (2022) highlight 'the characteristics of socio-spatial relations while accounting for power relations and actor-specific practice.' From the spatial perspective, considering relational space as an opportunity structure, Kloosterman *et al*. (1999) introduce their concept of mixed embeddedness describing migrant entrepreneurs in larger socio-spatial contexts. By combining multifocality and mixed embeddedness, Solano *et al*. (2022) argue that migrant entrepreneurs can be simultaneously involved in multiple groups of people and multiple places. This again refers mainly to those entrepreneurs who act transnationally. Transnationality in entrepreneurship describes the business makers who move and act cross-border (Harima & Baron 2020; Portes & You, 2013; Drori *et al*., 2009; Portes, 2001). In these terms, entrepreneurs being transnational can make an important contribution to the transfer of knowledge over long distances in transnational social spaces (Henn, 2014; Pries, 2001). Since some of the migrant entrepreneurs live transnationally or have a transnational business model, it is these entrepreneurs who are recognised since the work of Saxenian (2007) as main contributers to the growth of regions.

However, it is rare to find topic-related studies in rural areas and peripheries relating to Poland. Still, there are such exceptions as entrepreneurship in border regions, *e.g.* between Poland and Germany (Skraba & Nowicka, 2018) or refugee entrepreneurship in German rural areas (Kordel *et al*., 2022), the Marche region in central Italy (Brzozowski & Cucculelli, 2020), Baden-Württemberg in Germany (Leicht *et al*., 2012) or rural immigrant entrepreneurship in Norway (Munkejord, 2017).

Arguing that in the context of regional development, entrepreneurship is a supporting factor (Matejovsky *et al*., 2014), this, even more, applies to rural and in the case of Opolskie Voivodeship to peripheral regions. To close the knowledge gap related to understanding the contribution of migrant entrepreneurs in peripheral regions, our study can give some hints. While the survey does not address the exact circumstance of how migrant entrepreneurs contribute to the development of peripheral regions, it goes a step ahead and assumes that migrants make a regional contribution as entrepreneurs. Therefore, this article examines how to attract these migrants to peripheral regions and, in the best case, entice them to start up activities. Therefore, this study was intended to analyse the motives of decision-making of migrants for a specific destination, namely the Opolskie Voivodeship. Moreover, we decided to analyse the motives and barriers for migrant entrepreneurship in the Opolskie Voivodeship in connection to the decision to start up the business, particularly in this part of Poland.

Based on this, we formulated the following research questions.

RQ1: What originally attracted migrants living in Opolskie Voivodeship to this specific peripheral region?

RQ2: What were their major reasons for starting a business in the Opolskie Voivodeship?

RQ3: Which were and are the main barriers hindering migrants from running their own businesses in the Opolskie Voivodeship?

Next, we will provide insight into the chosen research method, present the results, and discuss them while developing implications for policymakers.

RESEARCH METHODOLOGY

This article is based on a qualitative study using semi-structured interviews. For this, an interview questionnaire was developed and piloted. The next step was the challenging identification of respondents who fulfilled the criteria of being migrant entrepreneurs in peripheral regions with entrepreneurial activities. To make arrangements with the target group, scholars used their networks and the so-called extended networks (through colleagues, acquaintances, and snowball sampling).

Additionally, contact was made with the Consulate of the Federal Republic of Germany in Opole, which regularly organises meetings of German entrepreneurs and entrepreneurs of German descent operating in the region (so-called Stammtisch). The involved scholars took part in such a meeting, during which they gained several contacts for research. The second institution that was contacted to attract respondents was the Opole Centre for Economic Development (OCRG). In addition, a database of Central Registration and Information on Businesses (CEIDG) was used, which was analysed for names suggesting that an entrepreneur may have a migration history. Unfortunately, a significant number of contacts were outdated, and it was not possible to obtain up-to-date contact details. Further attempts have also been made by using social media – Facebook – through posting information about the research (both quantitative and qualitative) on groups such as 'Ukrainians in Opole.' As a result, 21 respondents were selected. The basic characteristics of the respondents and their enterprises are presented in Table 1.

Acknowledging the several different nationalities of the respondents, it was decided not to differentiate them according to nationality or their CoO. The interviews were conducted personally by researchers and by students, who were trained for this purpose. The interviews were guideline oriented. This means, the interviewers received a list of issues to be addressed during the interview but did not strictly stick to an order. On average, the interviews lasted about 45 minutes and were conducted between September and December 2019 and February and May 2020. They were carried out in Polish, as all interviewees expressed readiness to use the Polish language.

The analysis of the interviews was done within the framework of the grounded theory (Hensel & Glinka, 2012). The analysis was performed using open coding and axial coding (Charmaz, 2006; Strauss & Corbin, 1997). To ensure the quality of the analysis, an audit trial procedure and a procedure for cooperation and disconfirming evidence were used (Creswell & Miller, 2000). Firstly, in-vivo coding was performed using MAXQDA software. The coding was approached by individual researchers, coding independently of each other. Following this procedure, during a joint meeting, the researchers double reviewed their codes.

RESULTS AND DISCUSSION

RQ1: What originally attracted migrants living in Opolskie Voivodeship to this specific peripheral region?

Most of the respondents declared that they decided to start up a business in the Opolskie Voivodship, because they were already inhabitants of this area. Only three respondents did not previously live in the region. Respondents were also asked about the reasons for choosing the Opolskie as their place of residence. Among the respondents from Ukraine, the existence of a network of contacts was indicated (chain migration), such as friends and family members. This attracted respondents to the region by also simplifying formal administrative matters. Moreover, the same respondents indicated

Table 1. Characteristics of respondents

Item	Nationality	Gender	Previous professional experience or education gained in the country of origin	Sector of industry	Company size
1	Italy	male	Working in the logistics industry	Transport	up to 9 persons
3*	Ukraine	female	Working in a production plant	Cosmetic	Self-employed
4	Germany	male	Law studies	Law	Self-employed
5	Germany	male	Agriculture	Hotel industry, agriculture	up to 9 persons
7	Ukraine	female	Computer science, studies: finance, Experience as an accountant and material processing engineer	Information Technology	up to 9 persons
8	Germany	male	Electrical industry	Electrical industry	up to 49 persons
9	Ukraine	male	Architectural studies	Construction industry	up to 49 persons
10	Egypt	male	Studies in the field of intercultural communication and art	Catering	up to 9 persons
11	Libya	male	Chemistry	Catering	up to 9 persons
12	United States	male	Law	Law	Self-employed
13	Georgia	male	Management studies	Catering	up to 9 persons
14	Ukraine	male	Studies	Catering and hotel industry	up to 9 persons
15	Turkey	male	Catering	Catering	up to 9 persons
16	Ukraine	female	Librarian	Cosmetic	Self-employed
17	Turkey	male	Catering	Catering	Self-employment
18	Ukraine	male	Construction industry technical high school, construction industry	Construction industry	up to 9 persons
19	Ukraine	male	Construction industry	Construction industry	up to 9 persons
20	Ukraine	male	Economics	Photovoltaics	up to 49 persons
21	Ukraine	male	Biology and chemistry academic teacher	Catering	up to 49 persons
22	Ukraine	female	Product Manager	Florist	up to 9 persons
23	Ukraine	female	Nurse	Hair and beauty salon	up to 9 persons

Note: * respondents 2 and 6 were excluded from the survey because they had dual citizenship.
Source: own elaboration.

that originally the regional employment agency assisted them to find employment in companies based in Opole. In the case of migrants from Germany and the United States, a sentimental factor was important. Both respondents No. 5 and No. 12 pointed to Polish origins and family roots because some of their ancestors came from the Opolskie Voivodship. Respondent No. 5 clarified that he came to Poland in the early 1990s during the privatisation of state-owned agricultural farms (PGR) and then, in favourable economic conditions, he decided to start his own business. Respondent No. 12 decided to study law in Poland for sentimental reasons. Respondents from Ukraine, Italy, and Georgia also indicated that they came to Opolskie for a higher education degree. Due to the demographic low, being located between two large academic centres, and the need to counteract the decline in the number of students, Opole universities have been very active in (re-)attracting foreign students for years, which, as research has shown, remain in the region after graduation (David, 2015). For some interviewees, the Opolskie Voivodship was not the first region of residence in Poland. Some of them previously lived in Toruń, Poznań (large cities in central Poland), or Jelcz-Laskowice (a small town in the Dolnośląskie Voivodeship). Respondents who did not previously live in the region declared that they chose this area as their spouses came from this area and they considered the target city as attractive. Furthermore, respondent No. 3 not only was from Opolskie Voivodship, but he also obtained assistance from the authorities, and most of his clients were from Opole and its surroundings.

RQ2: What were their major reasons for starting a business in the Opolskie Voivodeship?

The respondents were asked to recall the moment when they decided to start up the business and to explain their motives at that time. Within this area, the distinguished first- and second-order codes are shown in Figure 1.

Figure 1. Motives for starting a business in the Opolskie Voivodeship
Source: own elaboration.

The named motives were divided into internal and external motivations. Among the internal motives, the respondents indicated above all the needs of a higher order, *i.e.*, striving for independence, self-reliance, or the desire to use one's own skills. Respondent No. 9 indicated:

> Because I worked in different plants like this in Poland, and I just, I was there just for heavy lifting and not to..., and that forced me to start my own business and just do something myself, create something. And I also wanted to be independent because I usually had to do something that I didn't want to do, for example, various things and it forced me to start my own business and opened my eyes to grow and do something on my own.

On the other hand, personal preferences include the respondents' comments that they have chosen a particular industry because they have always liked performing certain activities.

The second group of reasons were external ones. Most often the respondents indicated a financial, or in a broader sense, economic, motive, but as in the case of respondent No. 19, it was partly connected with the desire to help his family in the home country:

> The main factor in establishing the business was the desire to earn more to help my family in Ukraine. I liked working for my current employer and I was treated well, and my salary was paid on time.

In addition, respondents indicated a market gap or high demand for a given offer. As indicated by respondent No. 13:

> In Opole, we are the first; we are something else. For example, there is no such bread here as we make in Georgia. There's bread there that... that's so natural. There are no additives, for example, chemicals and such, and that is why it is healthier for people.

Respondent No. 10 also indicated that he changed his plans based on market conditions:

> At first, we wanted to sell dresses, but not too much in Opole. By researching the market, we decided on fast food. It's a good location for such a business.

Some respondents suggested that their own business activity was a condition for them to work in their profession:

> I cannot be employed as an attorney-at-law. Starting my own business was the only way I could work in my profession (respondent No. 4).

On more than one occasion the interviewees specified that they were guided by a certain combination of internal and external motivation, as in the case of respondent No. 12:

> The crucial reason, I can tell you that, above all, was that I needed more autonomy than before. The need to be independent, *i.e.* the need to become independent, to be self-managed, not to be just some cog in another mechanism, *i.e.* an employee in the whole system of a given company, institution, etc. To be able to realise my ideas, to choose contractors or clients on my own and, above all, I won't hide the fact that the aim was also to achieve certain financial independence, not just to manage everything on my own – to shape the directions of actions, but also to work on my own account and, as a result of this independence, to achieve certain income here on my own account.

The analysis of the motives for starting one's own business was made with a division into the nature of motivation, distinguishing necessity-driven and opportunity-driven entrepreneurship. This distinction is particularly important because, as the research has shown, necessity-driven entrepreneurship has a lower chance of survival than opportunity-driven entrepreneurship (Brzozowski, 2019).

RQ3: What were and are the main barriers hindering migrants from running their own businesses in the Opolskie Voivodeship?

Another issue that appeared in virtually all interviews was the difficulty of establishing, but also running a business in Poland. Here, three respondents seem to be an exception (R3, R11, R15). Within this area, the first- and second-order codes we distinguished are shown in Figure 2.

The largest group of the barriers indicated were classified as administrative and legal barriers. Legal differences between CoO and CoR were pointed out, which resulted in some adaptation difficulties for migrant entrepreneurs. The excessive distribution of competences between offices was stressed, which was even described as non-functional administration. The legal status of migrants was also named as a barrier, as indicated by *e.g*. Respondent No. 10. and Respondent No. 23 who mentioned the tardiness of public administration and officials' 'arrogance':

> The biggest problem is Polish offices. Well, as with those girls who wait for a work permit: by law you wait a month, in the provincial office you must wait six months. For example, I come as an employer.... the applications are not available on the website of the office … you have to go to the office. And in the office as I understand, the application should be there, lying to take [but it is not there, instead there is] a queue, I wait an hour in the corridor to take the application, I enter the room, and this woman says to me 'Get out of here, I'll call you,' I stood up and said to her 'Excuse me?,' and it began. I sat for an hour in the corridor to take the paper, and she says to me 'Get out of here.' Well, I try not to let myself be pushed around. Because they should be for us, not we for them. I always think like this: according to your institution I don't have a single zloty of arrears, I don't …. Therefore, if I need it, it is due to me, and I don't have to ask for it. Officially it is 30 days, I will wait 30 days but not 31.

Respondent No. 22 mentioned also difficulties related to the access to external funds to support the business. Since the legal status depends on the legal system in a given country (and is independent of the entity itself), it has been classified as administrative and legal rather than personal factor.

The second group of barriers were identified as individual or personal barriers, among which the language barrier was mentioned most often. This also refers to the fears of attracting customers or the reaction of the competition, including the previous superior.

Further barriers were classified as social barriers. These include manifestations of intolerance and resentiments of Polish society as well as Polish customer's lack of trust. As indicated by Respondent No. 18:

> The contact with Poles was hard. If you are running a business and you are a foreigner, at the beginning they don't trust you, I don't know, for various reasons. Of course, we were providing our services very carefully and later there were Polish customers because at the beginning our customers were not from Poland. Later, when the customers from Poland showed up, they were very satisfied.

The lack of tolerance in society was indicated by respondents from Germany, Turkey, and Egypt, like respondent No. 10:

> Firstly, I think people should change; their attitude is wrong. They can see where we're from and they're getting above themselves.

The last barriers have been classified as market barriers and they include problems with recruiting employees both due to lack of desired qualifications and lack of motivation, especially among Poles. Respondent No. 1 indicated:

> Here's the problem in finding a skilled worker in the transport industry, a driver who can drive, but not only going forward, but also reversing to a loading dock, manoeuvre the back of the vehicle, because that is actually a problem. … Finding people from Poland is getting harder and harder because of the 500+ [Polish benefit program]. At the beginning of the year, I had an employee from Poland. He said that he would rather sit at home than go to work because he gets tired at work. There is also a problem with young people who are not willing to work. … They don't care [about consequences]. This is a different approach. It could be 10 years of difference between me and those who come to work, but a completely different mentality and different approach. You must know their qualifications well and verify them.

Due to strongly articulated difficulties with starting and running a business in Poland, the respondents were asked about the source of assistance in formal and administrative matters. These sources were divided into institutional and individual. Among institutional sources, the respondents indicated attorneys-at-law and notaries, an accounting office, the City Hall, and universities. Among the sources classified as individual, the following were mainly indicated: friends, other entrepreneurs, including parents and previous employer, wife/partner of Polish origin, the Internet, previous clients, employees, and own knowledge resulting from the profession (lawyer).

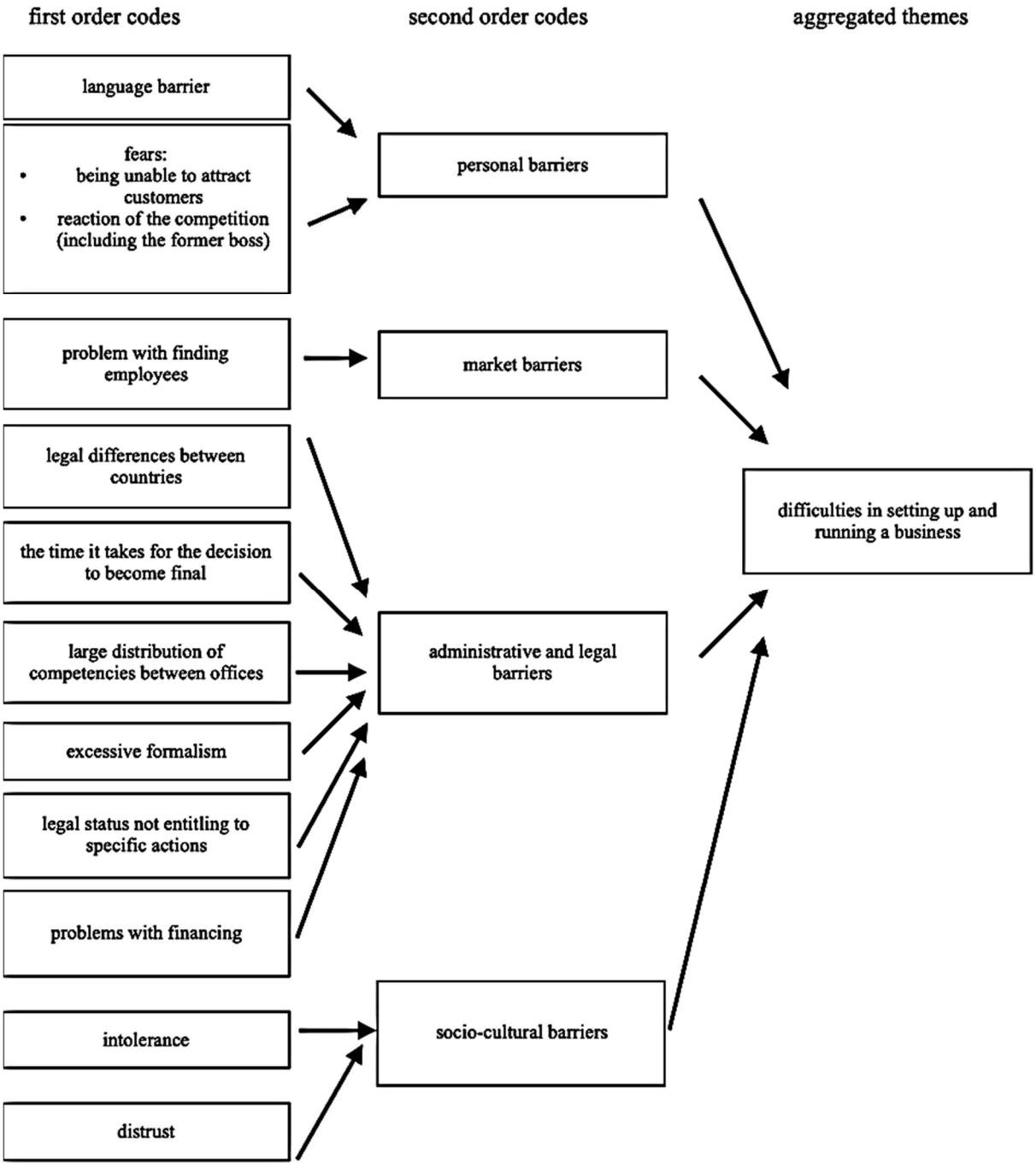

Figure 2. Difficulties in starting and running a business
Source: own elaboration.

Informal (individual) sources of information prevail over institutional sources, which may suggest some shortcomings in public administration in terms of promotion and assistance to migrants' wishing to start their own businesses in Poland. It is particularly alarming that despite a relatively extensive network of business support institutions in the Opolskie Voivodship, most respondents declared that they did not cooperate with such entities. Respondent No. 19 even mentioned the fear of cooperation with such entities:

> I don't know any companies that support people like me in running a business. I do everything myself and a friend who knows Polish helps me. I've never heard of companies that support people like me. There are of course consulting companies, but they charge a lot of money for

> consulting, and they give nothing concrete in return. I didn't use the help of such companies, but my colleagues told me about these companies and cheaters.

The observation that migrant entrepreneurs rely more on personal and family networks than on official resources and support infrastructures is one of the characteristics also identified by Metzger (2016), Leicht *et al*. (2012) and David *et al*., (2020) for countries like Germany.

Research has shown that migrant entrepreneurship is not limited to large metropolitan areas but also occurs in peripheral areas. In countries, that are rural per se, such as parts of Ireland, this is uncontroversial. However, to answer RQ 1, the migrants interviewed in our study did not select the Opolskie Voivodeship deliberately in terms of starting their own business. The fact that their businesses were in this peripheral area results from their circumstances, which might be them living or studying in this area, or is connected to private or sentimental matters. Nonetheless, one of the respondents indicated that she has her customers in the Opolskie Voivodship. It is interesting that respondent no. 3 revealed that she received assistance from support infrastructure when starting up her business. This may have practical implications for decision-makers. It draws attention to the willingness and openness of migrants to cooperate with offices or entities supporting migrant businesses. The offer of assistance to migrants aimed at activating them by starting up their own businesses could therefore be expanded. To answer RQ 2, two types of motives for starting a business were identified: external and internal. Regarding RQ 3 the following barriers were identified: personal, market, administrative, legal, and socio-cultural.

Entrepreneurial activities in peripheral regions are becoming increasingly important in the public and academic debate, also in Poland. Although large cities and metropolitan areas are the attraction points for crowds of people and herewith for migrants, it is above all peripheral regions that are dependent on brain gain. Our study has contributed to closing the knowledge gap by addressing the questions mentioned above. Based on this, we were able to indicate that for almost all respondents the so-called socio-spatial embeddedness played a role both in the question about the choice of the region and in the question about the reasons for the business foundation. Human relations and a sense of belonging through sentiment were the reasons that created a deep attachment to the peripheral region of Opolskie Voivodeship. Here, our studies are in line with Yeung (2008), and Henn (2014) and show that socio-spatial embeddedness plays a crucial role in business creation. With reference to studies of Kordel *et al*., 2022 and Elo *et al*., 2019, our study revealed that peripheral regions can be attractive to migrants setting up businesses, *e.g*., when it comes to customer base and trying oneself out in the role of an entrepreneur. Finally, in line with studies of Terstriep *et al*. (2022) on migrant start-ups in Berlin, we illustrated that being embedded in a region and being among like-minded people can help to overcome crises and make businesses more resilient.

CONCLUSIONS

The research shows that migrant entrepreneurship can be analysed on several levels with some simplification. The first level is the successful migrant entrepreneurs. They started a business that brings them considerable profits; they develop it by increasing employment or implementing innovation or at least inventions, acquiring new markets, etc. They entered CoR with a specific view of starting a business or with a business idea already in place. The second group are migrants who worked full-time but wanted to try their hand at creating their own business. This was often dictated by the desire to leave dependent employment related to the secondary labour market, *i.e.* those related to unattractive manual work with low prestige and low wages. The third group are people who were 'forced' by the labour market to start a business operation, which is known as necessity-driven entrepreneurship.

As with all studies, also our study comes with limitations. We make no claim to the representativeness of the study. We have presented a small sample of respondents and a great diversity due to their CoO, industries, company size, as well as duration of stay. This can simply be explained by the difficulty in attracting respondents. Notably, some respondents were excluded from the research due to their dual citizenship. The language barrier is the next challenge when conducting research with migrants in general and in our case with migrant entrepreneurs.

We were not able to shed enough light on some topics, but we were able to identify further fields of future research. Further studies could deepen the understanding of the process of attracting migrants to peripheral regions. In the past, some studies on migrants and 'left-behind places' have been conducted (David *et al*., 2015). However, these migrants, like our sample, had in beforehand ties to the analysed regions. It would be interesting to analyse whether the already established migrant businesses in peripheral regions could attract further migrant entrepreneurs from outside the regions. Next, the group currently requiring special attention in further studies, due to their size and activity in the labour market in Poland are refugees from Ukraine. The analysis of the situation of migrants and refugees from a post-communist country starting their economic activity in another post-communist country, where economic migration is quite a new phenomenon, seems of high interest. Hereby, a focus could lie on the similarities of entrepreneurial cultures and the path dependence of entrepreneurial ecosystems due to similar political and historical circumstances. Another aspect could focus on the openness of the native population in peripheral regions towards foreign populations. It could discuss whether there are tensions here when it comes to migrant entrepreneurship, or whether people are contented when they encounter cultural diversity when it comes to, *e.g.* food diversity.

In view of our results, we suggest policymakers that they should first develop an agenda attracting migrants as a group. Already in the early 2000s, there was discussion about the need to address brain gain proactively and to have strategic plans for it (David, 2015). For migrants, who mostly move to the metropolitan regions, the peripheries can bring advantages when entering the labour market and self-employment. Because of the lower human capital, people can try here things out and implement creative ideas. Second, policymakers should establish migrant entrepreneurs in peripheral regions as integration points for those who want to become self-employed. In terms of chain migration, migrants who have already made it to peripheral regions could attract other migrants and in that sense be seen as door-openers and pioneers to follow. Thirdly, they should actively address the openness of migrants to reach out to support infrastructures for business creation. An inclusive entrepreneurial ecosystem could ensure that migrants dare to make use of support measures, so that more opportunity-driven businesses make it to the markets.

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The impact of renewable energy sources on generating jobs: The case of Poland

Magdalena Wysocka

ABSTRACT

Objective: The aim of the article is to identify and assess the impact of Renewable Energy Sources (RES) on job creation.

Research Design & Methods: The study offers an overview of an empirical nature. A review of pertinent literature allows the author to identify, classify, and summarize the most recent scientific reports, both theoretical and empirical, with regard to that particular area of enquiry. Relying on the methodology of systematic literature review, it has been possible to distinguish a database of scientific studies (Scopus, Research Gate, and Google Scholar databases) and studies-reports by, e.g. ILO, IRENA, REN21, EurObserv'ER, Eurostat and Statistics Poland; most applicable studies were subsequently selected to be analysed and verified in terms of their usefulness for further research. The empirical part of the article includes tabulated figures showing employment changes for particular RES technologies and by means of three basic parameters, it illustrates the condition of the labour market in Poland. The strength and direction of the relationship between the analysed variables were computed using Pearson's linear correlation coefficient.

Findings: A review and study of relevant literature yielded synthetic knowledge concerning the impact of renewable energy sources on job creation. The research demonstrated a positive correlation between the number of employed in RES and the activity rate, as well as the employment rate while displaying a negative correlation with the unemployment rate.

Implications & Recommendations: Using up-to-date assessments of job opportunities resulting from the energy transition should inspire politicians and energy sector managers to develop integrated energy, environmental, and labour market policies aimed at sustainable development and job creation in the green economy.

Contribution & Value Added: A critical review of the literature on the subject and the presented results of empirical research enrich knowledge on the impact of renewable energy on employment and the reduction of greenhouse gas emissions to the atmosphere. Updated knowledge allows for a better understanding of the relationship between employment and national renewable energy policy.

Article type: research article

Keywords: energy transition; renewable energy sources; renewable energy; labour market; employment; unemployment

JEL codes: F66, J21, Q29

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INTRODUCTION

Since the Paris Agreement of 2016, numerous countries around the world have embarked on reducing their greenhouse gas emissions. New technologies to mitigate pollution are constantly being sought. Such solutions are also being pursued in individual European Union (EU) states, and it is expected that emissions will have been significantly reduced by 2030, ultimately achieving climate neutrality by 2050. This is a major challenge for Poland, as hard coal and lignite are the dominant fuels used in electricity production (47.8% and 29.0% respectively in 2018; GUS, 2019). Another

factor necessitates the departure of fossil fuels to be accelerated, as an analysis by McKinsey & Company demonstrates that about two-thirds of the capacity of coal-fired power plants in Poland relies on facilities which are more than 30 years old. With an expected life cycle of up to 60 years, this means that the installations and technologies will have reached terminal obsolescence by 2050 and should be replaced by zero-emission technologies (Engel *et al*., 2020).

Changes of this kind do not remain unnoticed by employees in the power generation industry. The increasing use of renewable sources to obtain energy has raised hopes as well as fears among the workers in the sector. It is hoped that new jobs will be created in the renewable energy sector (RES), while the loss of jobs in the fossil energy sector is a major concern. A 2018 report by the International Labour Organization (ILO) shows that if the long-term goal set out in the Paris Agreement is achieved, around 24 million new jobs will be created at the global level (ILO, 2018).

Strategic aspects of renewable energy sources are also highlighted in the European Commission's study on smart, sustainable and inclusive growth. The flagship initiatives of the Europe 2020 Strategy recommend, among other things, a transition to a low-carbon economy and increased use of renewable energy sources, as well as programmes to promote new skills and jobs (European Commission, 2010). In turn, the applicable Directive of the European Parliament and of the Council of Europe emphasizes that the objective of increased use of energy from renewable sources is to reduce greenhouse gas emissions. Furthermore, it is assumed that the implementation of the recommendations stipulated in the directive will contribute to, for example, improved energy supply security, stimulate technological development and innovation, ensure better protection of the natural environment, as well as create new jobs and boost employment which, in turn, should lead to regional development (Parlament Europejski, 2018).

Local plans and strategies have been developed in individual countries and regions of the European Union. In Poland, state-level instruments include the National Renewable Energy Action Plan, the Renewable Energy Sources Act of 20 February 2015, the National Energy and Climate Plan 2021–2030 and the Draft Energy Policy of Poland until 2050 (Ministerstwo Aktywów Państwowych, 2019; Ministerstwo Gospodarki, 2015), while in the regional dimension particular provinces have adopted their own strategies (Zarząd Województwa Warmińsko-Mazurskiego, 2020).

The National Energy and Climate Plan for 2021-2030 envisions *e.g*. a 21-23% share of RES in gross final energy consumption, whereby this target is contingent on the allocation of additional EU funds for energy transformation in Poland. Simultaneously, the share of hard coal and lignite in electricity production is to be reduced from the current 77% to 56-60% in 2030 (Ministerstwo Klimatu i Środowiska, 2019). In the context of these not-very-optimistic plans, it is important to demonstrate the impact of the RES sector's development on the situation on the labour market. The aim of the research presented in this article was to assess if employment in renewable energy sources leads to an improved situation in the labour market. The research problem was formulated as a general query, *i.e.* whether the development of renewable energy sources contributes to new jobs. In order to advance an answer, the following specific questions were explored:

- What is the global employment trend in RES?
- How have employment rates changed across RES technologies?
- How has employment evolved in the fossil fuel and RES sectors in Poland?
- How have the basic labour market parameters changed in Poland?
- What correlations have occurred between employment in RES and labour market parameters in Poland?

Given the objective and the specific questions, the following hypothesis was put forward: there is a positive relationship between employment in RES and the situation on the labour market in Poland.

The article is divided into sections. It begins with an introduction to the topic of the impact of renewable energy sources on generating jobs. Then, the latest literature was reviewed. The next part of the article explains the research methodology. The main part of the article are the results of empirical research. The article ends with the final conclusions.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Carbon dioxide emissions have been exceeding acceptable standards for years. Hence, one of the many contemporary challenges is the transformation of the energy sector towards increased efficiency and the use of renewable energy sources. According to the International Energy Agency (IEA), in 2019, the energy sector accounted for 41% of global energy-related CO_2 emissions (International Energy Agency, 2020). In Europe, energy consumption in EU countries accounts for 75% of CO_2 emissions (European Commission, 2021a), while around 413 million tonnes of greenhouse gases were emitted that year in Poland (GUS, 2021). In the study of Firoiu *et al*. (2021), Poland was included, together with 9 other EU countries, in the subset with the highest average value of primary energy consumption and the lowest average value of energy efficiency. The unfavourable effects of the implementation of the climate and energy policy in the context of the country's energy security also emerged in the research by Pach-Gurgul and Ulbrych (2019). The authors showed the deterioration of Poland's position among the countries of the Visegrad Group. As a response to the magnitude of those emissions, the recommendations of the Renewable Energy Directive set the share of RES in the energy mix at 40 % by 2030 (European Commission, 2021b). However, the analysis of RES in the context of sustainable development goals (SDG) indicates difficulties in achieving the adopted assumptions in the 2030 perspective. They result mainly from socio-economic policies implemented in individual countries, reduced flow of funds for the development of RES to developing countries, low energy efficiency, crisis situations, such as the Covid-19 pandemic, climate change and armed conflicts (He *et al*. 2020; United Nations 2022).

The impact of renewable energy on the labour market is extensively presented in the literature. However, a consensus among the researchers is lacking. The diversity of opinions and conclusions should mainly be attributed to:

- distinct research methodologies and availability of data (Moummy *et al*., 2021; O'Sullivan & Edler, 2020);
- types of renewable energy, financing modalities (co-financing), and subsidies earmarked for the renewable sources sector (Mu *et al*., 2018);
- the timeframe in which particular relationships are evaluated (short- and long-term analyses) (Khobai *et al*., 2020; Musa & Maijama'a, 2020);
- the costs of implementing renewable energy and energy efficiency technologies (Apergis & Salim, 2015);
- investment volumes and support policies for renewable energy (*e.g*. tax incentives, tax exemptions, reducing energy dependence on foreign sources) (Yilanci *et al*., 2020).

Example results of studies on the impact of RES on job creation are summarised in Table 1.

It follows from the literature review that a positive relationship occurs between RES and employment. The first studies listed in the table examined changes in employment in EU countries between 1995 and 2009. The results demonstrate that positive changes occurred in 21 out of 27 EU member states. The job pool increased by a net total of 530 000 positions, whereby two-thirds of those new jobs were created directly in those Member States that saw changes in the electricity and gas supply sector, while the remainder were generated in other Member States (indirect employment) (Markandya *et al*., 2016). In turn, Garrett-Peltier (2017) showed that USD 1 000 000 spent on fossil fuels generates 2.65 full-time jobs, and as many as 7.49 and 7.72 full-time jobs in the renewable energy sector, meaning that each USD 1 000 000 reallocated from so-called brown to green energy will result in a net increase of five jobs. In their respective studies, Khobai *et al*. (2020) and Musa and Maijama (2020) also demonstrated a positive relationship between renewable sources installations and employment growth, even though such effects were observed over a longer period of time.

Other studies show no relationship between the analysed variables (Bohlmann *et al*., 2019; Moummy *et al*., 2021; Mu et *al*., 2018). The cited studies showed an increase in employment in RES at the expense of jobs in fossil energy. For example, Mu *et al*. (2018) report that producing 1TWh of renewable energy (solar and wind) generates up to 45.1 thousand and 15.8 thousand direct and indirect jobs (respectively), but at the same time, they determined an equivalent employment reduction in the traditional energy

industry and other indirect jobs. It is claimed in the conclusions from the study that the results do not warrant any decided claim that the development of renewable energy involves a net increase in jobs.

Table 1. Impact of renewable energies on employment

Author	Research method	Research territory (country)	Result
Markandya *et al*. (2016)	Input-output (I-O) model	EU countries	Positive impact
Mu et al. (2018)	Computable general equilibrium (CGE) model	China	Lack of unequivocal findings
Garrett-Peltier (2017)	Input-output (I-O) model	United States of America	Positive impact
Moummy *et al*. (2021)	VAR model, introduced by Christopher Sims.	Morocco	Moderate impact (minor)
Bohlmann *et al*. (2019)	Computable general equilibrium (CGE) model	South Africa	Marginal impact
Khobai *et al*. (2020)	Autoregressive distributed Lag (ARDL) model	South Africa	Positive impact in the long term; in the shorter term – relationship insignificant
Khodeir (2016)	Autoregressive distributed Lag (ARDL) model	Egypt	Positive impact in the long term; moderate impact in the short term
Musa and Maijama (2020)	Toda and Yamamoto causality test	Nigeria	Positive impact in the long term
Rafiq *et al*. (2018)	Econometric techniques and time series estimation techniques	41 countries	Averaged result - negative impact
Apergis and Salim (2015)	Granger causality tests	80 countries	Averaged result - positive impact
Yilanci *et al*. (2020)	Fourier ADL Cointegration Test	12 OECD countries	Averaged result – positive impact
O'Sullivan and Edler (2020)	Input-output (I-O) model	Germany	Positive impact
Van der Zwaan *et al*. (2013)	Integrated evaluation model TIAM-ECN	Middle East countries	Positive impact
Wei *et al*. (2010)	Analytical model	United States of America	Positive impact
Grafakos *et al*. (2020)	Value chain analysis; Input-output (I-O) model	Mexico; Indonesia; Rwanda	Positive impact
Bukowski and Śniegocki (2015)	Input-output (I-O) model	Poland	Positive impact
Ulrich *et al*. (2012)	Input-output (I-O) model	Germany	Positive impact
Ram *et al*. (2021)	Analytical model	92 countries	Positive impact

Source: own elaboration of Apergis and Salim, 2015; Bohlmann *et al*. 2019; Bukowski and Śniegocki 2015; Garrett-Peltier, 2017; Grafakos *et al*., 2020; Khobai *et al*., 2020; Khodeir, 2016; Moummy *et al*., 2021; Mu *et al*., 2018; Musa and Maijama, 2020; Markandya *et al*., 2016; O'Sullivan and Edler, 2020; Rafiq *et al*. 2018; Ram *et al*., 2021; Ulrich *et al*., 2012; Van der Zwaan *et al*., 2013; Wei *et al*., 2010; Yilanci *et al*., 2020..

Other studies show that a positive correlation between RES and job creation occurs only in the long term but proves marginal in the short term (Khobai *et al*., 2020; Khodeir, 2016; Musa & Maijama, 2020). On the other hand, Rafiq *et al*. (2018) demonstrated that an increase in renewable energy consumption coincides with higher unemployment, which decreases significantly with non-renewable energy consumption (fossil fuel consumption). The authors of the study conjecture that this unfavourable outcome for the labour market may be due to the capital-intensive nature of energy production from renewable sources.

In a study conducted in 12 OECD countries, Yilanci *et al*. (2020) arrived at discrepant results. The averaged result indicated a positive relationship, although negative, positive and zero impact were noted in individual countries.

Van der Zwaan *et al*. (2013) estimated potential job figures in the renewable energy sector in Middle Eastern countries. The calculations relied on the premise that RES in that region (mainly

wind and solar farms) will generate 210 GW of power by 2050, accounting for 60% of the total demand for electricity. According to their calculations, about 155 000 direct and 115 000 indirect jobs will have been created by mid-century.

Wei *et al*. (2010) analysed the impact of RES on job creation by 2030. In their analytical model, the computations were made with respect to renewable energy, energy efficiency, carbon capture and storage, as well as nuclear energy, with job losses in the coal and gas industry taken into account. In their conclusions, the authors state that all non-fossil fuel technologies create more jobs per unit of energy than coal and natural gas and that reducing greenhouse gas emissions into the atmosphere to 30% in 2030 should result in more than 4 million full-time jobs. In the same timeframe, another 500 000 jobs may be created by increasing nuclear power share to 25% and CCS (CO_2 Capture and Storage) to 10% of the total output.

Research conducted by Global Green Growth Institute experts in Mexico, Indonesia, and Rwanda shows that investments in RES yield new jobs at different stages of the value chain, not only in the RES sectors, but also throughout the economy by virtue of the domino effect. If the adopted targets for reducing CO_2 emissions into the atmosphere are indeed met by 2030, approximately 370 000 new direct jobs, 170 000 indirect jobs, and 110 000 induced jobs will be created in Mexico. In Indonesia, this will amount to between ca. 2.1 and 3.7 million direct jobs and the same quantity of indirect jobs. In Rwanda, on the other hand, the estimate for direct new jobs ranged from 14 000 to 31 000. The substantial discrepancies in estimations have resulted from analysing various RES investment scenarios that would translate into minimised GHG emissions and climate neutrality (Grafakos *et al*., 2020).

These remarks concern the findings from studies that examined new jobs solely in the electrical power sector obtained using a number of technologies and sources. However, publications on renewable energy also include research which relies on a cross-sectoral, comprehensive approach to the entire energy system, operating under the premise that 100% of energy is obtained from renewable sources. Nonetheless, the dominant role of electricity in all energy sectors should be emphasized. For example, a holistic study was carried out by Ram *et al*. (2021) to assess job creation in the 2050 horizon in industries such as electricity, heating and transport. The researchers determined prospective direct employment in energy generation, storage, transmission, and distribution. Based on the results, the authors concluded that renewable energy technologies have the potential to create a significant number of jobs in global energy. They also underlined that a quantitative increase in employment would be accompanied by a qualitative effect, as positions in new energy technologies require employees with higher skills.

According to the latest studies published via One Earth, 50 countries around the world will witness an almost 80% decrease in employment in fossil fuel extraction (coal, oil, and gas extraction) by 2050. It is anticipated then these job losses will be offset by new jobs in the RES sector, resulting in a likely employment increase in the sector to around 22-25 million people (Pai *et al*., 2021).

A literature review demonstrates that employment is most often estimated based on input-output (I-O) modelling. At the same time, it must be noted that when modelling RES impact on employment in the long term, individual researchers take into account many variables, *e.g.* energy prices, public spending on RES development, regional climatic conditions, exports and imports of RES technologies, job retention time, labour productivity, learning rate in new technologies, economies of scale, sources and amounts of financing, including subsidies for renewable technologies, fiscal thresholds, and development of renewable technologies, whereby labour intensity is reduced and productivity increases (Meyer & Sommer, 2014).

RESEARCH METHODOLOGY

The research presented in this article was carried out in two stages, the first of which involved a study of literature spanning scientific publications concerned with the impact of employment changes in the renewable energy sector on labour markets. The aim of the review was to identify, classify, and summarize the most recent scientific reports, both theoretical and empirical, on the issue in question. Using the methodology of a systematic literature review, a database of scientific studies was extracted and applicable studies were selected and analysed to verify their usefulness for further research.

In the course of investigations, Scopus database studies dating from 2000-2021 were searched. Publications were then selected using keywords: renewable energy sources, employment, and labour market. The first, second, and third queries in titles and abstracts identified 82 207, 1 435, and 123 studies, respectively. Following content analysis of all selected abstracts, 79 articles were qualified for detailed analyses, while the remainder were rejected as they diverged significantly from the research problem or failed to clearly specify the analysed employment modality and the type of RES technology.

The following stage consisted of secondary research. With the research object in mind, statistical data were compiled to analyse changes in the volume and structure of employment in total and with respect to individual RES technologies, as well as assess the consequences for the labour market. The data were collated based on statistical figures provided primarily in IRENA, REN21, ILO, EurObserv'ER reports, as well as in Eurostat and Statistics Poland studies. Further analysis was conducted using methods of descriptive statistics. The strength and direction of the relationship between the analysed variables were determined by Pearson's linear correlation coefficient. Changes in total employment, particularly in RES technologies, were compared in the global dimension, while correlations between the number of RES employees and labour market parameters were examined by reference to the labour market in Poland. The analysis targeted the timeframe between 2009 and 2018.

By way of additional observation of the research premises stated above, it should be emphasized that the methodology to estimate employment in the RES sector presents researchers with at least three essential problems. The first is a conceptual one and concerns the identification of activities that create new employment. The choice of methods for operationalizing employment is another issue, and the third relates to the accuracy of measuring the variables analysed (Allan *et al*., 2017). The location and the types of work performed decide whether direct, indirect, or induced employment is determined and whether it is calculated as gross or net output. These distinctions are very important because, first, gross estimates do not take into account job losses in alternative sectors, such as fossil fuel extraction, and second, they eliminate double-counting (Pai *et al*., 2021; Van der Zwaan *et al*., 2013; Wei *et al*., 2010). Another important element is the duration of employment, which differs for the production and installation of equipment (temporary employment relating only to the volume of power output) and the operation and maintenance activities, which generate and sustain employment over the entire lifetime of a RES source and tends to be associated with the total installed capacity (IRENA and ILO, 2013; Lambert & Silva, 2012). In these respects, significant differences in employee figures are observed. For example, a study by Bukowski and Śniegocki (2015) showed that the construction of a 10 MW onshore wind farm requires 114 people. These are, of course, new jobs, but they are created and last only for the duration of the construction undertaking. On the other hand, the number of permanent jobs, *i.e.* existing throughout the operation of that renewable energy source, was estimated at five people. The calculations of the aforementioned authors also demonstrate that the largest number of jobs in wind energy is created in turbine manufacturing and wind farm construction and that each direct job generates approximately 1.5 indirect jobs.

RESULTS AND DISCUSSION

The European Union's climate and energy policy is aimed at minimizing CO_2 emissions. The effectiveness of this policy will depend on the degree of extraction and combustion of solid fossil fuels in all member states. The objectives adopted, *e.g.* in the legislative package Fit for 55, which defines the ways and means to achieve climate neutrality (European Commission, 2021a), in the directive concerning the share of renewable energy in the EU energy mix (up to 40% by 2030) (European Commission, 2021b) and in the communication entitled *The European Green Deal* with its detailed vision of Europe as a climate-neutral continent by 2050 (European Commission, 2019), are a major challenge for Poland, where electricity generation relies primarily on hard coal and lignite. Changes in extraction, import, and consumption of either type of coal are shown in Figures 1a-d.

The data in Figure 1a show a consistent decline in hard coal production. In relation to 2017, hard coal production in 2018 decreased by 3.3%, reaching 18.3% in the analysed period (2009-2018). At the same

time, it is noted that in the period in question, Poland imported hard coal, mainly from Russia; of the 12.8m tonnes purchased in 2020, 9.1m tonnes came from that country (Kaszyński *et al*., 2021). It should also be added that Poland is an exporter of hard coal, though its volume has decreased over the years. In 2020, 4.6 million tonnes were exported, compared with 8.4 million tonnes in 2009 (a decrease of 45.2%). Therefore, in total, there was a greater volume of hard coal available each year, which fully met domestic demand, including some marginal reserves. With 74.8 million tonnes available in 2018, 75.8% was used for conversion to other energy carriers, while direct consumption accounted for 24.0%. A comparison of domestic hard coal consumption in 2018 and 2009 demonstrates a slight increase.

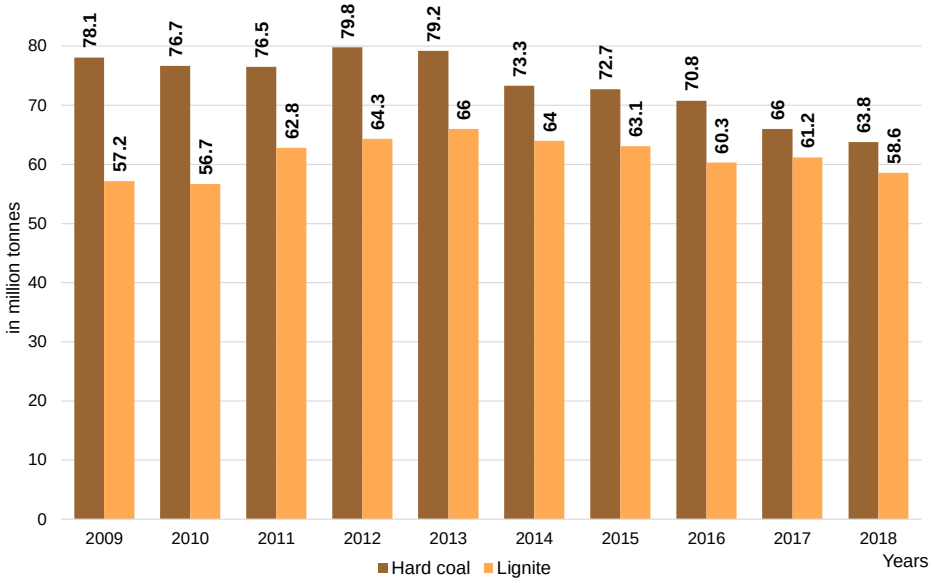

Figure 1a. Coal balance in Poland: Comparison between portfolio and CAC 40 Index
Source: own elaboration based on Statistics Poland, 2010-2021.

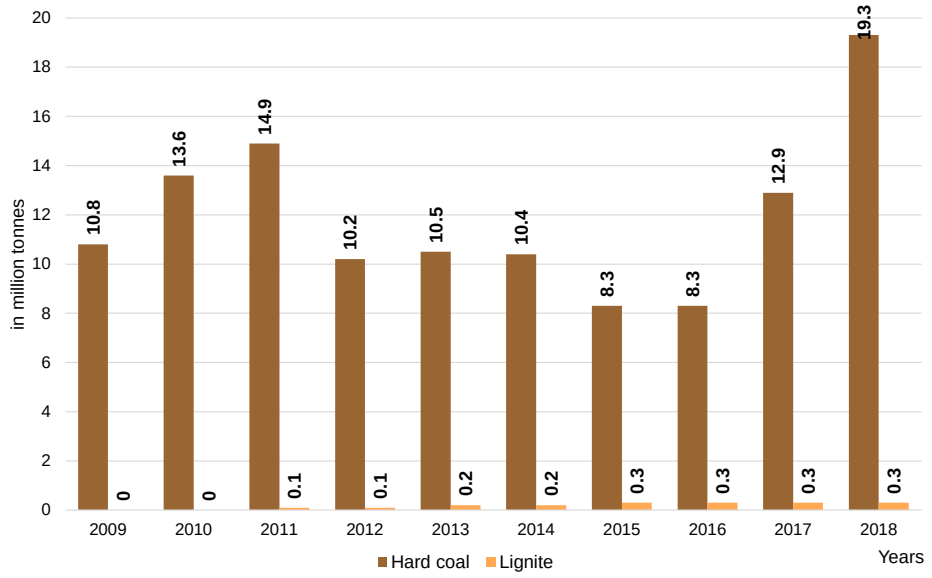

Figure 1b. Coal balance in Poland: Coal mining from imports
Source: own elaboration based on Statistics Poland, 2010-2021.

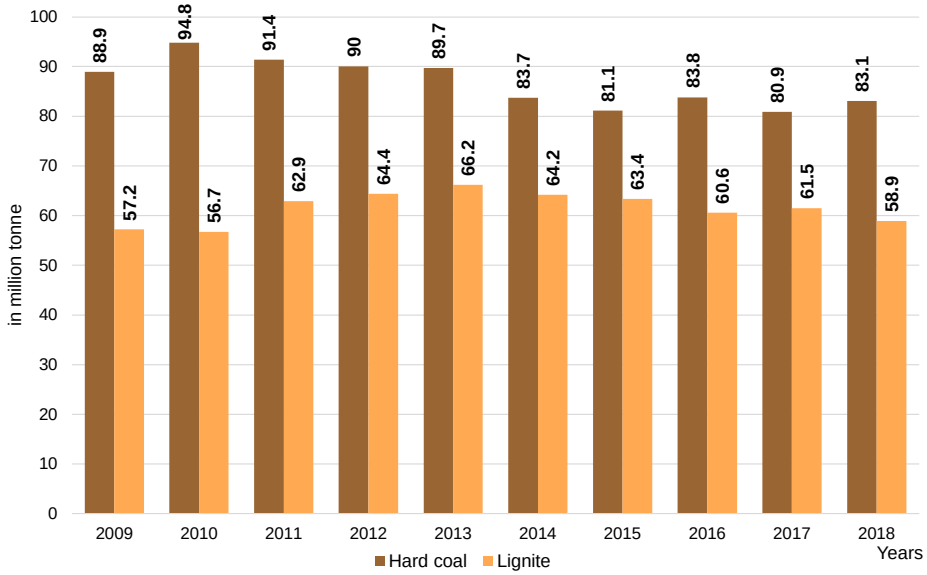

Figure 1c. Coal balance in Poland: Total coal
Source: own elaboration based on Statistics Poland, 2010-2021.

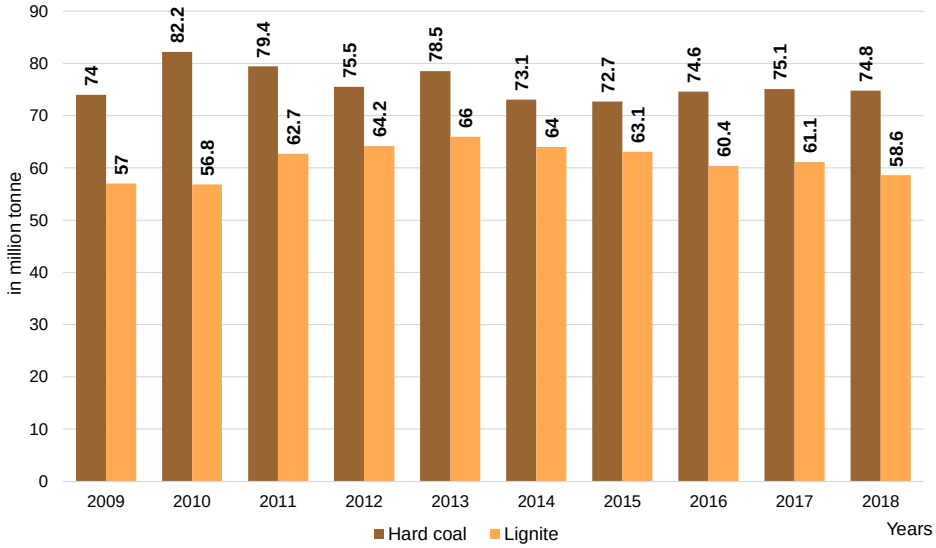

Figure 1d. Coal balance in Poland: Coal domestic consumption
Source: own elaboration based on Statistics Poland, 2010-2021.

Similar downward trends were observed in the extraction and consumption of lignite. Incidental import and export transactions in the analysed period had no impact on the resources of this raw material. Compared to 2009, domestic output and consumption in 2018 slightly increased by 2.4% and 2.8%, respectively. It should be emphasized, however, that extraction of lignite tended to increase until 2013, and significant decreases occurred only from 2016 onwards. The dynamics of changes in domestic consumption of both raw materials are presented in Figure 2.

Even though mining and consumption of hard coal and lignite have decreased, Poland is still a significant producer of both solid fuels (Table 2). In the global listing of hard coal producers, Poland has invariably ranked in tenth place since 2013 and was second among European countries. Lignite mining put Poland in similarly high positions, as the country has ranked fourth in the world as of 2018 and third in Europe as of 2015.

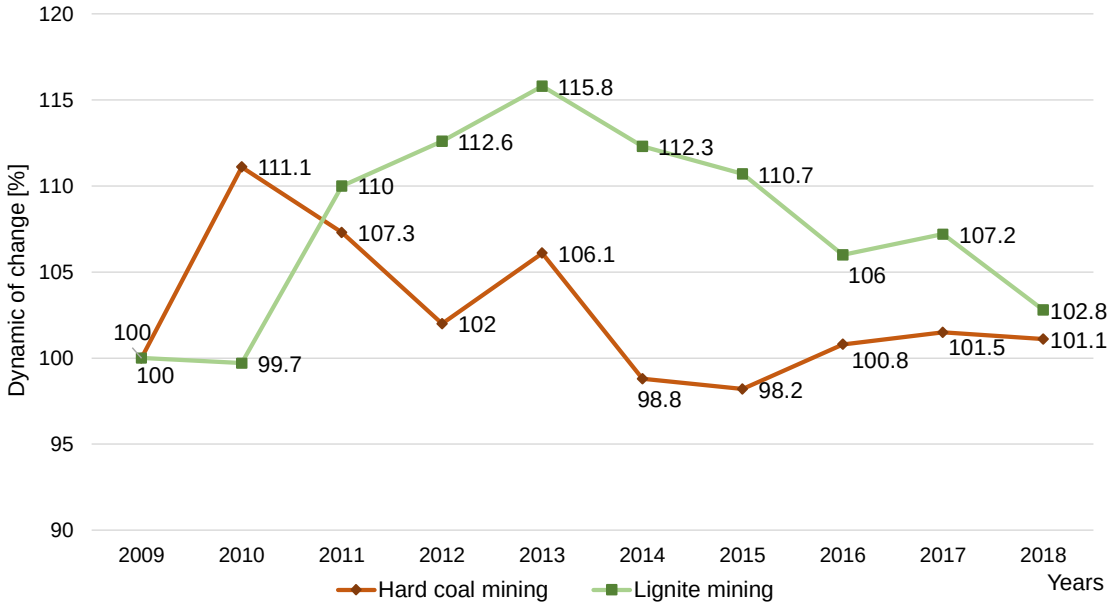

Figure 2. Dynamics of changes in the amount of coal consumed in Poland (in %)
Source: own elaboration based on Statistics Poland, 2010-2021.

Table 2. Poland in the world and Europe by coal output

Specification		units	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Hard coal mining	in % of the world	%	1.5	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.0	0.9
	place in the world	-	9	9	9	n.a.	10	10	10	10	10	10
Lignite mining	in % of the world	%	6.2	6.7	5.7	n.a.	7.2	7.9	7.7	7.8	7.4	7.3
	place in the world	-	7	7	8	n.a.	n.a.	4	5	5	5	4
Hard coal mining	in % of Europe	%	n.a.	18.4	19.6	n.a.	18.5	16.3	17.6	17.9	15.6	14.5
	place in Europe	-	n.a.	2	2	n.a.	2	2	2	2	2	2
Lignite mining	in % of Europe	%	n.a.	10.5	n.a.	n.a.	n.a.	n.a.	11.7	n.a.	11.6	11.4
	place in Europe	-	n.a.	4	n.a.	n.a.	n.a.	n.a.	3	n.a.	3	3

Source: own elaboration based on Statistics Poland, 2010-2019.

Regrettably, the figures presented in Table 2 are not optimistic given the objective of decarbonizing the economy by systematically reducing greenhouse gas emissions, including carbon dioxide (CO_2). It appears that Poland is unlikely to achieve the CO_2 emission limits recommended in the EU Directives by 2030 and 2050 with the current national schedules of eliminating fossil fuels used to generate electrical power. The emission of gaseous air pollutants relative to the extraction of hard coal and lignite is presented in Figure 3. The figures indicate a positive trend, as in the analysed time interval, the total emission decreased by 4.5% and CO_2 emission by 26.5%. The reduction in total greenhouse gas emissions is due to less coal being mined, as well as to the retention of gases in pollution reduction facilities. For example, in 2019, the entire mining and quarrying sector retained 190.4 thousand tonnes of gases produced (excluding carbon dioxide abatement).

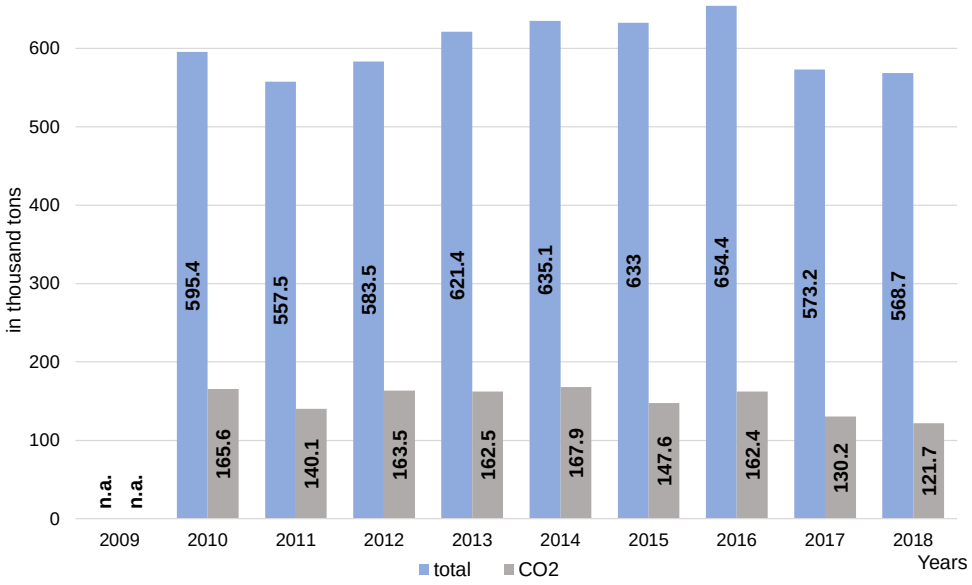

Figure 3. Greenhouse gas emissions in hard coal and lignite mining in Poland
Source: own elaboration based on Statistics Poland, 2010-2021.

European Union studies, followed by those conducted by individual member states with respect to climate and energy policy, indicate that one of the measures to achieve climate neutrality is the development of renewable energy sources (RES). Obtaining energy from such sources may be examined from various standpoints. For instance, an economics-oriented approach will focus on, for example, the costs of energy generation, the degree of elimination of environmental pollution (which will be important in the ecological perspective), the technical dimension (which will prioritize the use of technologies without greenhouse gas emissions), while the impact of electricity generation from renewable sources on the creation of new jobs will serve to elucidate the social aspect. Given the aims of this study, analyses were concerned with changes in employment in the renewable energy sector. Table 3 presents them globally by energy generation technology.

Table 3. Global employment in renewable energy by technology

Specification	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Solar photovoltaics	0.30	0.35	0.82	1.36	2.27	2.49	2.77	3.09	3.37	3.68
Bioenergy[a]	1.50	1.50	2.50	2.40	2.50	2.99	2.88	2.74	3.05	3.18
Hydropower[b]	n.a.	n.a.	0.04	1.66	2.21	2.04	2.16	2.06	1.99	2.05
Wind energy	0.50	0.63	0.67	0.75	0.83	1.03	1.08	1.16	1.15	1.16
Solar heating /cooling	0.30	0.32	0.90	0.89	0.50	0.76	0.94	0.83	0.81	0.80
Others[c]	n.a.	n.a.	0.13	0.22	0.23	0.19	0.20	0.24	0.16	0.18
Total	3.00	3.50	5.00	7.30	8.50	9.50	10.0	10.1	10.5	11.1

Note: a – includes liquid biofuels, solid biomass, and biogas; b – direct jobs only (years 2012-2018), 2011 – only small hydropower; c – 'other' include geothermal energy, concentrated solar power, heat pumps (ground-based), municipal and industrial waste, and ocean energy. Column totals do not match due to rounding.
Source: own elaboration based on IRENA and ILO, 2021; REN21, 2010; REN21, 2011; REN21, 2012.

The volumes shown above are indicative of positive developments in the number of direct and indirect jobs in the renewable energy sector. Between 2009 and 2018, there was almost a fourfold increase in total employment. In 2018, the largest number of people worked in energy generation by means of PV (an increase of 3.4 million persons). This activity saw a consistent employment increase over each year of analysis. Comparable positive changes occurred in the number of people employed in bio-production (from liquid biofuels, solid biomass and biogas) and involved in obtaining energy

from aquatic sources (increases by 1.7 and 2.0 million persons, respectively). As for the remaining sources, changes in employment were not that significant, but they were nevertheless positive.

Furthermore, employment in Poland was analysed in the light of changes in global employment in renewable energy production (Table 4), showing that changes in total employment are proportionally similar. Comparing the final and initial years of analysis, employment in energy production from all renewable sources multiplied by a factor of 4.5. In 2018, the largest number of employees were involved in energy production from biofuels and biomass (increases by 36.0 and 22.6 thousand people, respectively). Employment in power generation from other renewable sources rose with some distortions, but the number of employees was not significant in the overall employment balance.

Table 4. Total employment in RES and by technology in Poland (in thousands)

Specification	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	19.1	28.5	34.6	33.8	34.9	33.1	84.7	81.8	73.9	85.8
Biomass	7.0	7.5	21.8	20.5	19.5	18.5	33.5	26.1	25.9	29.6
Wind	3.0	7.0	1.6	2.8	3.0	2.5	12.1	11.4	8.0	3.0
Biofuels	5.2	9.6	6.5	5.5	7.5	5.9	29.5	34.8	31.4	41.2
Heat pumps	n.a.	1.5	n.a.	0.6	0.7	0.7	2.0	2.2	3.0	2.6
PV	0.1	<0.05	0.1	0.4	<0.05	0.3	1.2	1.5	1.1	3.1
Hydro	0.3	0.3	1.0	1.0	1.0	2.0	1.3	3.1	1.1	1.0
Biogas	1.0	1.0	0.5	0.3	0.5	0.4	2.5	1.3	2.3	2.7
Waste	n.a.	<0.05	<0.05	0.05	<0.05	<0.05	<0.1	<0.1	0.7	0.2
Solar thermal	2.0	1.3	2.2	2.5	2.5	2.6	2.3	1.1	0.3	2.2
Geothermal	0.6	0.2	1.0	0.2	0.2	0.2	0.3	0.2	0.1	0.2

Source: own elaboration based on The State of Renewable Energies in Europe – Edition 2011-2019.

In the ranking of the EU member states per number of employees in particular renewable energy technologies, Poland leads in biofuel energy employment, occupies leading positions in energy production from biomass and, in recent years, from solar thermal as well. As for employment involving other renewable energy sources, Poland placed lower throughout the analysed period (Table 5). Among all EU member states, Germany is the leader in the total number of people employed in the renewable energy sector. In 2018, they ranked the highest in total employment, as well as in energy production from biomass, wind, PV, biogas, and waste (Table 6).

Table 5. Poland among the EU Member States by employment in RES

Specification	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	13	10	10	10	9	9	6	6	6	6
Biomass	8-9	8	5	5	7	8	2	3	4	3
Wind	7-10	7	17	12	12	12-13	4	6	6	12
Biofuels	5	5	6	5	3	5	1	1	2	1
Heat pumps	n.a.	6-7	n.a.	16	13-14	13-15	10-11	10	9	11
PV	18-20	20-27	19	17	23-28	20-21	13-14	11	13-14	6
Hydro	11-14	13-14	9	9	9	7	14-15	5	16	18
Biogas	8	7	8-9	9	7-9	9	5	14-15	6	6
Waste	n.a.	15-27	19-27	14-27	17-28	15-28	16-28	16-28	10-11	15-17
Solar thermal	7	10	7	7	6	7	4	8-9	9	3
Geothermal	9	7-10	10-11	6-7	6-8	6-7	7-8	7-9	11-15	11-12

Source: own elaboration based on The State of Renewable Energies in Europe – Edition 2011-2019.

Figure 4 illustrates the employment shift in fossil fuel extraction and energy production from renewable sources. The data show a definite decreasing trend in the number of employees working in the coal mining sector with a simultaneous increase in those employed in the renewable energy sector. In the analysed period, both variables demonstrated a very strong correlation, with Pearson's linear correlation

coefficient amounting to -0.942227993. The results presented here should be assessed in positive terms, although it is reasonable to expect a greater intensity of employment reduction in the fossil fuel sector.

Table 6. EU employment leaders by RES technology

Specification	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	DE	DE	DE	DE	DE	DE	DE	DE	DE	DE
Biomass	DE	DE	DE	DE	DE	DE	DE	DE	DE	DE
Wind	DE	DE	IT-ES	DE	DE	DE	DE	DE	DE	DE
Biofuels	DE	ES	FR	FR	FR	FR	EN	EN	RO	EN
Heat pumps	n.a.	DE	n.a.	FR	FR	FR	IT	IT	ES	ES
PV	DE	DE	DE	DE	DE	DE	GB	GB	DE	DE
Hydro	IT	IT	DE	DE	DE	DE	IT	DE	ES	IT-AT
Biogas	DE	DE	DE	DE	DE	DE	DE	IT	DE	DE
Waste	DE	DE	DE	DE	GB*	NL*	DE	DE	GB	DE
Solar thermal	DE	DE	DE	DE	DE	DE	ES	ES	ES	ES
Geothermal	FR	IT	DE	IT	IT	IT	FR	IT	IT	IT

Note: AT – Austria; GB – Great Britain; DE – Germany; FR – France; ES – Spain; NL – Netherlands; PL – Poland; IT – Italy; RO – Romania. * no data available for DE.
Source: own elaboration based on The State of Renewable Energies in Europe – Edition 2011-2019.

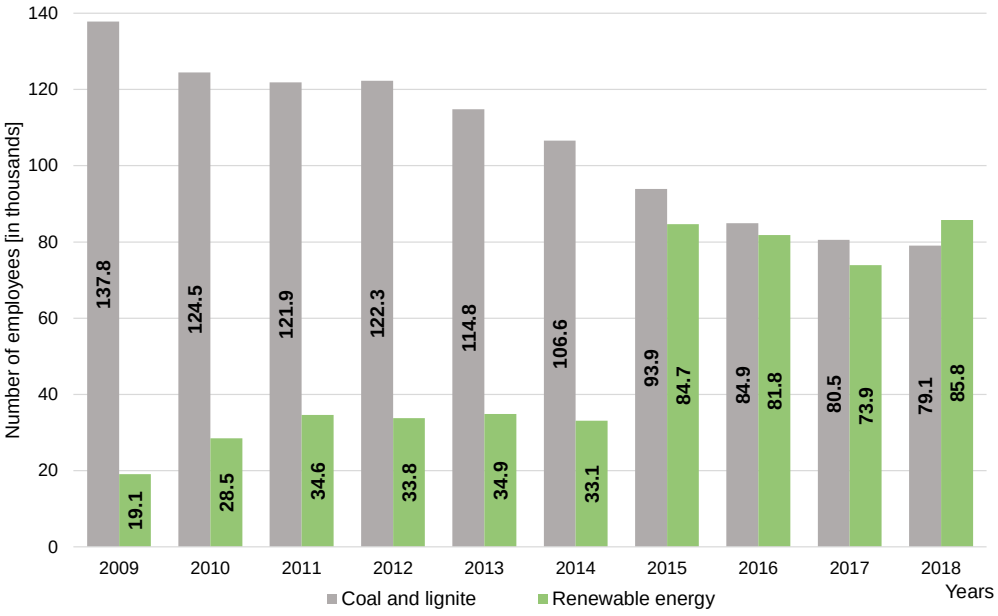

Figure 4. People employed in coal and lignite mining and renewable energy in Poland
Source: own elaboration based on Statistics Poland, 2010-2019;
The State of Renewable Energies in Europe – Edition 2011-2019.

To show the impact of employment in the RES sector on the labour market, three basic parameters describing the population's activity on the labour market were compared, *i.e.* activity rate, employment rate and unemployment rate (Figure 5). Table 7 presents values of Pearson's linear correlation coefficient between those labour market parameters and the number of employed in RES categorized by technology.

The figures shown in the table indicate a positive relationship between the number of total employees, the labour force activity rate, and the employment rate, as well as a negative relationship with the unemployment rate. The correlations are strong: labour force activity rate and employment for Biomass and Waste are correlated strongly or very strongly. Moreover, a strong or very strong linear relationship is observed between the employment rate (positive correlation) and the unemployment rate (negative correlation) in conjunction with employment in Biofuels, Heat pumps, PV, and Biogas

technologies. Based on these figures, one may conclude that there is a positive relationship between employment in renewable energy sources and the economic activity of Poles.

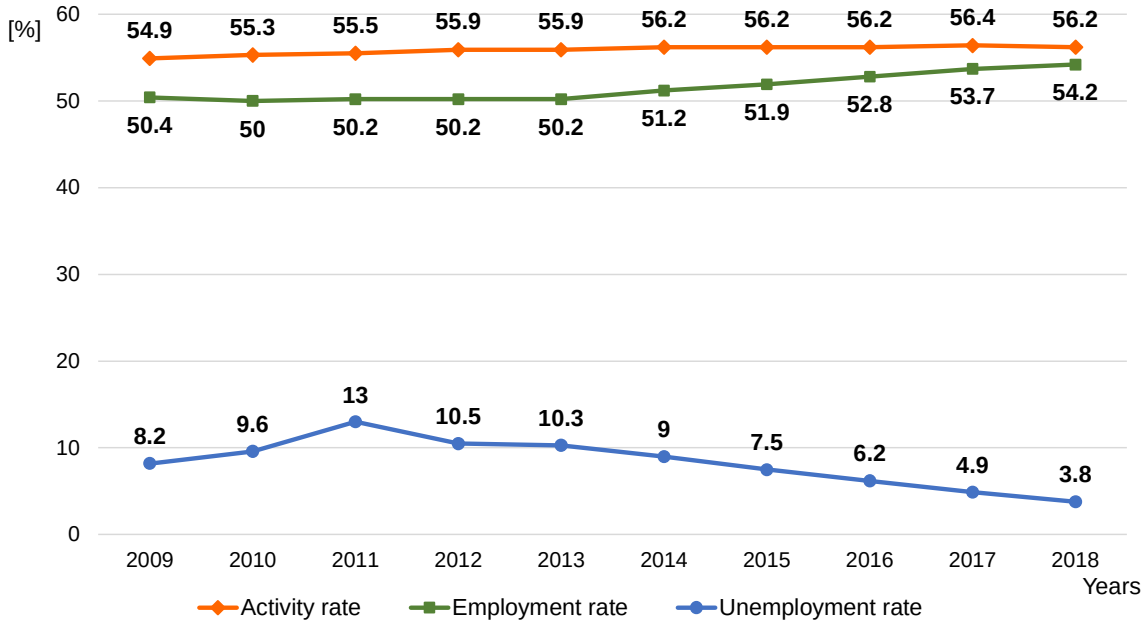

Figure 5. Labour market indicators in Poland
Source: own elaboration based on Statistics Poland, 2010-2019.

Table 7. Relationship between the number of employed persons and labour market measures in Poland

Specification	Labour market indicators		
	Activity rate	Employment rate	Unemployment rate
Total	0.748763940	0.879324959	-0.759564228
Biomass	0.832609651	0.680428519	-0.436239647
Wind	0.380727978	0.400282895	-0.450152582
Biofuels	0.641999685	0.93195998	-0.861648364
Heat pumps	0.457772049	0.879220167	-0.923425074
PV	0.548232097	0.869902338	-0.801572653
Hydro	0.628997711	0.396196811	-0.249338076
Biogas	0.445764392	0.82779799	-0.830522975
Waste	0.914563063	0.589813183	-0.558113795
Solar thermal	0.14565853	0.461138001	-0.479693572
Geothermal	0.75102618	0.364353114	-0.157976214

Source: own elaboration.

CONCLUSIONS

The assumed research aim was achieved in its entirety, and the formulated hypothesis was positively verified. The conducted literature review and empirical research permit both detailed and general conclusions. With regard to the former, the following should be stated:

- the development of renewable energy sources does generate new jobs globally, in Europe, and Poland;
- all renewable energy technologies create more jobs per unit of energy than fossil fuels;
- successive development of RES facilities results not only in an increase in employment, but also contributes to a reduction of greenhouse gas emissions, including CO_2;
- production and exploitation of renewable sources is conducive to new jobs at various stages of the value chain, *i.e.* not only in the RES sectors, but also in other sectors of the economy as it creates indirect and induced jobs;

- there is a very strong negative linear correlation between the number of employees working in the coal mining sector (hard coal and lignite) and the number of people working in the renewable energy sector;
- although extraction and consumption of both types of coal have consistently dropped, Poland is still a significant producer of these fuels on a global scale and on the European market;
- due to the reduced use of fossil fuels and the efficient retention of gases by pollution abatement facilities, there is a positive trend in the reduction of greenhouse gas emissions into the atmosphere;
- globally, the majority of employees are involved in energy production through PV, whereas in Poland they are concentrated in the biofuels industry. Germany is the leading European state with the highest employment in energy production for five out of 10 RES technologies analysed in the last year of the period under investigation;
- throughout the said period, the Polish labour market demonstrates a positive relationship between the total number of employed persons, activity rate and the employment rate, as well as a negative relation with the unemployment rate.

Furthermore, a number of general conclusions – which incorporate certain methodological and conceptual issues – may be drawn:

- there is a lack of systematic public statistics regarding the RES sector in Poland as well as in other countries around the world, which renders multifaceted comparisons and comparisons between individual countries problematic and sometimes impossible;
- the assessment of RES impact on job creation and, consequently, on the labour market, is somewhat hampered, as many studies do not provide estimation methods or the type of employment analysed;
- multifaceted RES analyses can be carried out using available methodologies which offer specific procedures and methods/models, although they cannot be uncritically integrated into authorial research, as each model represents a certain simplification and does not take into account all the variables involved in the broadly defined technological, economic, cultural, geographical, and competence-related circumstances of potential employees;
- renewable energy sources constitute state-of-the-art technologies, which require operating personnel to possess novel and very often digital skills. Therefore, plans for RES deployment in a specific region should take into account the balance of occupations, required skills, and plans for retraining and professional development of potential employees along the entire value chain;
- in view of the fact that the transition from fossil fuel-based energy production towards renewable sources will inevitably impact employment (resulting in a positive or negative net effect), it is necessary to draft strategic national and regional plans aimed at sustainable development and improved quality of life, in which worthwhile jobs in the green economy will play a part.

In conclusion, it may be stated that the transition to a low-carbon economy is economically and socially justifiable because – as this study demonstrated – the increased share of renewable energy in the energy mix produces a positive net effect in the form of new jobs. The reported shortcomings in estimating job availability, the complexity of the issue itself, and the dynamic changes in RES technologies and in the labour market, undoubtedly translate into certain limitations of this study, hence its findings should be approached with due caution. Nevertheless, the author is convinced of the necessity for repeated research, in which the new knowledge that relies primarily on empirical insights may be useful, primarily for political decision-makers and heads of businesses, facilitating more accurate decisions and, secondly, may contribute to the improvement of methodologies and encourage further investigations.

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Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Economic growth and decent work as a goal of sustainable development in the European Union in the pre-pandemic and pandemic period

Krzysztof Adam Firlej, Chrystian Firlej, Lidia Luty

ABSTRACT

Objective: The research objective of this article is to compare the European Union member countries in terms of achieving the sustainable development goal of economic growth and decent work during the Covid-19 pandemic.

Research Design & Methods: The study used a set of quantitative data, the realization of indicators proposed for Goal 8 of the document *Transforming Our World: The 2030 Agenda for Sustainable Development* signed at the summit in New York, 25-27 September 2015 by the leaders of the UN member countries for all 27 EU member states. The analysis was based on the tools of multivariate statistical analysis, a model method for linear ordering of objects proposed by Ching-Lai Hwang and Kwangsun Yoon – the technique for order of preference by similarity to ideal solution (TOPSIS).

Findings: The grouping of member countries according to the degree of implementation of the above-mentioned indicated a very good position of five countries with the highest value of the synthetic measure (Netherlands, Ireland, Luxembourg, Denmark, Sweden) and a good one for Germany, Belgium, Finland, Austria, France, Slovenia, the Czech Republic, and Malta. Bulgaria and Greece fared particularly negatively against the analysed group of countries. The hypothesis stating that under the conditions of the Covid-19 pandemic most of the indicators for achieving Sustainable Development Goal 8 worsened in most European Union member states was verified positively. In the era of the Covid-19 pandemic, varying percentage changes were observed in individual indicators of achieving the above-mentioned goal in the studied group of countries.

Implications & Recommendations: The results obtained under the individual indicators of Sustainable Development Goal 8 indicate the need for differentiated economic policy measures in individual countries for improving the situation in selected areas of the economy. These require a pragmatic and holistic approach that takes into account, on the one hand, local development conditions and the possibility of economic improvement, and, on the other hand, the need to ensure the health and well-being of the population under the risk of a recurrence of the Covid-19 pandemic.

Contribution & Value Added: The value added of the work is the classification of the European Union member countries according to their progress in achieving the Sustainable Development Goal of economic growth and decent work (SDG 8) and the analysis of changes in indicators monitoring changes in these areas under conditions of the Covid-19 pandemic.

Article type:	research article
Keywords:	economic growth; decent work, sustainable development goal, Covid-19 pandemic, European Union countries
JEL codes:	O11, Q01

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INTRODUCTION

The outbreak of the Covid-19 pandemic has significantly affected all areas of economic life and caused many changes in the functioning of societies around the world. The threat of Covid-19 spreading internationally was announced by the World Health Organization (WHO) in January 2020, and the onset of the pandemic in March 2020 (WHO, 2020). The spread of the Covid-19 pandemic placed an undue burden on public health systems (Yuk-Chiu Yip, 2021) and caused the most serious public health crisis since the 1918 influenza pandemic in Spain (Silva & Pena, 2021). The experience of the Covid-19 pandemic is likely to change the rules of health systems indefinitely (Nicola *et al*., 2020a). Forced to respond quickly to rapidly increasing infection rates and public health risks, governments around the world have taken measures including closing borders, restricting travel, establishing quarantines, mandating the wearing of masks, or differentiating regions and countries in terms of epidemiological risk (Blavatnik School of Government & University of Oxford, 2020; Oliu-Barton & Pradelski, 2021; Pan *et al*., 2020; Sjödin *et al*., 2020). It was recommended that employees be directed to work from home, and when this was not possible, employers were required to create conditions that allowed for social distancing (Callaway *et al*., 2021). To date, remote work has not been particularly widespread (Kossek & Lautsch, 2018) and as a result of the outbreak of the Covid-19 pandemic, it has become normal practice (Lee & Lee, 2021; Wang *et al*., 2021), except in industries where this is not possible (Phillips, 2020). Moreover, many schools and universities have moved to remote learning (Leigh *et al*., 2021; Morgan, 2020; Rahiem, 2020). These activities have undergone numerous modifications to accommodate the subsequent phases of the pandemic (Dai & Wang, 2020).

The Covid-19 pandemic had a devastating impact not only on the health of the population but also led to huge perturbations in the functioning of the European and global economies. It caused supply and demand shocks in many countries. Health and economic problems have reduced household incomes, increased unemployment (Brzezinski, 2021) and caused a decline in the gross domestic product (GDP; Beckman *et al*., 2021). All European Union member states have experienced a decline in economic growth (Baneliene, 2022). Production, consumption and trade patterns were affected directly as a result of freezing the economy and introducing social distancing measures (Espitia *et al*., 2021). The pandemic turmoil caused severe turbulence in many parts of the economy covering: primary sectors, which include industries involved in the extraction of raw materials, secondary sectors involved in the production of finished products, and tertiary sectors, affecting all service delivery industries (Nicola *et al*., 2020b). Industries that alternated between freezing and thawing were particularly affected, such as food service (Madeira *et al*., 2020), tourism (Zenker & Kock, 2020), hospitality (Gursoy & Chi, 2020) and long-haul transportation (Rothengatter *et al*., 2021). During the Covid-19 pandemic, the financial performance of economic agents around the world deteriorated significantly, but this was less pronounced in countries with better health systems and more mature financial systems and institutions. To stabilise macroeconomic indicators, some countries carried out monetary expansion (Ceylan *et al*., 2020), while the European Central Bank (2020) and the European Union (The Council of the EU, 2020; European Commission, 2020) proposed aid programs aimed at pulling the European economy out of the crisis.

The Covid-19 pandemic took all European Union member states by surprise, wreaking havoc on their economies. The global nature of the pandemic's impact was naturally noticeable in the issues related to the implementation of the Sustainable Development Goals with a special focus on Goal 8 on measures for economic growth and decent work. The research objective of this article is to compare the European Union member countries in terms of the realization of the Sustainable Development Goal on economic growth and decent work during the Covid-19 pandemic. We adopted the research hypothesis stating that under the conditions of the Covid-19 pandemic, most of the indicators of the realization of the Sustainable Development Goal on economic growth and decent work deteriorated in most European Union member countries.

The structure of the article includes several integral parts. In the next part, a query of the literature on the subject was carried out and the research hypothesis was developed. The next part covers research methodology, including research methods and selected variables. The results and discussion

are presented in the next section. The last part contains conclusions from the research, including recommendations for economic policy.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Promoting Economic Growth and Decent Work as a Sustainable Development Goal

In September 2015, the United Nations General Assembly approved the Sustainable Development Goals (SDGs). The entity responsible for setting the goals and targets was the Open Working Group on the Sustainable Development Goals. The group included 30 representatives from five UN regions, who were also supported by the business community (Firlej, 2021). The adopted goals represent a blueprint for a global partnership for peace, development and human rights and cover the period 2016-2030. The 2030 Agenda is a follow-up to the Millennium Development Goals (MDGs) adopted in 2001, which constituted the international development agenda for 2001-2015 (Frey & MacNaughton, 2016). The Sustainable Development Goals (SDGs) are a set of 17 main goals consisting of several specific objectives and indicators to help measure whether a goal has been met (Measuring progress towards the Sustainable Development Goals – SDG Tracker, 2022; Pradhan, 2021). The European Union actively participates in the implementation of Agenda 2030, and the projects it implements correspond to the UN guidelines (Pleśniarska, 2019). A search of the literature on the subject indicates the growing interest of researchers in the topic of determinants of implementation of the Sustainable Development Goals, which can include studies on integration (Stafford-Smith *et al*., 2017); predicaments and strategies (Bali Swain & Yang-Wallentin, 2020); collaborative governance, among others. The multifaceted and diverse research approaches used by various authors indicate the complexity of the issue of determinants of the effective implementation of Sustainable Development Goals. Another group is research on the interactions between SDGs, which by their scope, generate synergies and trade-offs (Anderson *et al*., 2021; Warchold *et al*., 2021) and are often studied within selected areas, such as marine-related goals (Singh *et al*., 2018); climate action goals (Fuso Nerini *et al*., 2019); social goals (Scherer *et al*., 2018).

The subject of interest in this research is Sustainable Development Goal 8 (SDG8), the scope of which includes 'promoting sustained, inclusive and sustainable economic growth and full and productive employment and decent work for all' (United Nations General Assembly, 2015). This goal focuses mainly on sustainable growth and full and productive employment with an emphasis on ensuring decent work for all people. Achieving sustainable economic growth requires providing conditions conducive for people to engage in quality work that stimulates the economy while respecting the well-being of the environment. It postulates the need to create new work opportunities and ensure decent working conditions for the entire working-age population. It is important to increase access to financial services, which will significantly affect the proper management of the capital held (Goal 8, 2022). Achieving the Sustainable Development Goals, in particular SDG 8, is a challenge in EU member states.

The analysis of indicators related to SDG 8 makes it possible to assess the chances of achieving it within the set timeframe and provides guidance for possible measures to improve the results obtained. In the literature, one can find empirical studies conducted based on all or selected indicators of the aforementioned goal, which were carried out for selected areas and periods using various econometric tools. Among the studies on European Union member countries (and others), one can mention an analysis of labour market inequality in the EU (Jianu *et al*., 2021); a partial order analysis of Eurostat SDG 8 data in the EU (Carlsen, 2021); an assessment of SDG 8 implementation in G20 countries (Lapinskaitė & Vidžiūnaitė, 2020); nowcasting and monitoring SDG 8 in Austria (Bilek-Steindl & Url, 2022).

RESEARCH METHODOLOGY

The scope of the study covered the years 2016, 2018, 2020. A synthetic measure proposed by Hwang (Hwang & Yoon, 1981) was used to assess progress toward SDG 8 in one year. The Technique for Order Preference using Similarity to Ideal Solution found great recognition in many fields including economics or management. This method is equivalent to Hellwig's taxonomic method of ordering

objects, which considers both the best and worst alternatives of the possibility of measuring the adopted diagnostic variables.

The study adopted a three-stage algorithm of procedure. Firstly, the characteristics describing the phenomenon under study were selected using SDG 8 (Eurostat, 2020) specific indicators (Table 1), and then their nature was identified. Such characteristics as real GDP per capita, investment share of GDP, employment rate, resource productivity, and domestic material consumption were taken as stimulants, *i.e.*, characteristics whose higher values qualify the object under study as better for the task at hand.

Table 1. Selected variables for the analysis

Variable / Measure [character]			
X_1	Real GDP per capita (Thousand EUR) [*S*]	X_6	People killed in accidents at work (number per 100.000 employees) [*D*]
X_2	Investment share of GDP (%) [*S*]	X_7	In work at-risk-of-poverty rate (%) [*D*]
X_3	Young people neither in employment nor in education and training (NEET) (%) [*D*]	X_8	Inactive population due to caring responsibilities (%) [*D*]
X_4	Employment rate (%)[*S*]	X_9	Resource productivity and domestic material consumption (DMC) (EUR/kg) [*S*]
X_5	Long-term unemployment rate (%) [*D*]		

Source: own elaboration.

The study assumed that each variable contributed the same portion of information to the evaluation of the objects under study, the weights of all variables were the same and equal to one. In addition, basic numerical characteristics and linear correlation coefficients were determined for the diagnostic variables (Tables 2 and 3).

Almost all variables (exception variable X_4) in the studied group of objects are not quasi-constant variables, as evidenced by the determined coefficients of variation. The average value of real GDP per capita (X_1) in 2018 compared to 2016 increased by 5%, and in 2020 it was 2% lower than in 2018. A positive trend was noted for the investment share of GDP (X_2), resource productivity, and domestic material consumption (X_9). In contrast, the average number of young people neither in education nor in education and training (X_3), after declining by 12% in 2016-2018, increased by 6% in 2018-2020. The average employment rate (X_4) declined slightly in 2018-2020, when it increased by 4% in 2016-2018. The inactive population due to caring responsibilities (X_8) followed the same trend. Such variables as long-term unemployment rate (X_5), people killed in accidents at work (X_6), and in-work at-risk-of-poverty rate (X_7) showed a decreasing trend in the years under study, with a lower trend in recent years.

Table 2. Selected variables for the analysis and descriptive statistics in the years 2016 (a), 2018 (b) and 2020 (c)

Variable	Min			Max			Median			Mean			CV*		
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
X_1	5.91	6.33	6.38	84.75	84.04	82.25	20.13	22.26	20.33	25.83	27.23	26.57	0.66	0.63	0.65
X_2	11.01	11.15	11.66	35.81	28.24	39.68	20.00	21.05	21.85	20.72	21.13	22.31	0.21	0.16	0.23
X_3	6.30	5.70	5.70	24.30	23.40	23.30	13.30	11.60	12.00	13.73	12.03	12.74	0.36	0.35	0.31
X_4	55.90	59.00	58.30	80.60	81.80	80.80	71.10	74.70	74.80	70.52	73.45	73.41	0.08	0.08	0.08
X_5	1.20	0.70	0.60	15.40	12.50	10.50	3.10	2.10	1.80	4.25	2.85	2.29	0.70	0.83	0.85
X_6	0.50	0.60	0.48	6.32	4.33	3.53	2.13	1.96	2.01	2.45	2.13	1.97	0.54	0.45	0.44
X_7	3.10	3.10	3.10	18.90	15.30	14.90	8.30	8.00	7.80	8.53	8.03	7.86	0.41	0.36	0.34
X_8	5.10	4.30	4.50	46.40	52.30	54.20	24.90	24.70	22.90	23.18	25.22	24.36	0.51	0.49	0.55
X_9	0.35	0.35	0.34	4.17	4.60	5.23	1.43	1.38	1.58	1.79	1.82	1.87	0.59	0.61	0.64

Note: * CV-Coefficient of Variation; The analyses indicated that the indicators in 2020 were generally not significantly correlated. A very strong positive correlation occurred between real GDP per capita (X_1) and resource productivity and domestic material consumption (X_9). In contrast, strongly negatively correlated with employment rate (X_4) were: young people neither in employment nor in education and training (X_3) and long-term unemployment rate (X_5).
Source: own elaboration.

Table 3. Correlation between variables in the year 2020

Variable	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
X_2	0.236							
X_3	-0.455*	-0.194						
X_4	0.141	0.386*	-0.752***					
X_5	-0.212	-0.514**	0.621**	-0.759***				
X_6	-0.169	0.068	0.334	-0.169	-0.072			
X_7	-0.100	-0.286	0.389*	-0.449*	0.313	0.333		
X_8	-0.406*	-0.090	0.194	-0.003	0.009	0.101	-0.041	
X_9	0.741***	-0.009	-0.266	-0.034	-0.006	-0.273	-0.064	-0.410*

Note: Levels of significance: * p < 0.05. ** p < 0.01. *** p < 0.001.
Source: own elaboration.

In the second stage, the variables were normalised (Hwang & Yoon, 1981):

$$z_{\text{ij}} = \frac{x_{\text{ij}}}{\sqrt{\sum_{i=1}^{n} x_{\text{ij}}^2}} \tag{1}$$

where:

$x_{\text{ij}}, z_{\text{ij}}$ - Actual and normalised values of feature j for object *i* ($i = 1,..,n, j = 1,2,..,m$).

Then the coordinates of the pattern ($[z_j^+]_{j=1,..,m}$)and anti-pattern ($[z_j^-]_{j=1,..,m}$) of the development were determined:

$$z_j^+ := \begin{cases} \max\limits_i \{z_{\text{ij}}\}, X_{\text{j}} \in S \\ \min\limits_i \{z_{\text{ij}}\}, X_{\text{j}} \in D \end{cases} \quad i \qquad z_j^- := \begin{cases} \min\limits_i \{z_{\text{ij}}\}, X_{\text{j}} \in S \\ \max\limits_i \{z_{\text{ij}}\}, X_{\text{j}} \in D \end{cases} \tag{2}$$

where:

S, D - the set of stimulants and the set of destimulants, respectively.

In the next stage, the values of the synthetic variable were determined:

$$Q_i = \frac{d_i^-}{d_i^- + d_i^+} \tag{3}$$

where:

$$d_i^- = \sqrt{\sum_{j=1}^{m} (z_{\text{ij}} - z_j^-)^2}\,,\ d_i^+ = \sqrt{\sum_{j=1}^{m} (z_{\text{ij}} - z_j^+)^2}.$$

The largest value Q_i indicates the best object.

The values of the synthetic measure made it possible to organise the countries and make a typology of the studied objects into groups*:

- Group1: $Q_i \in (\bar{Q} + S_Q, \max\limits_i Q_i]$
- Group 2: $Q_i \in (\bar{Q}, \bar{Q} + S_Q]$
- Group 3: $Q_i \in (\bar{Q} - S_Q, \bar{Q}]$
- Group 4: $Q_i \in [\min\limits_i Q_i, \bar{Q} - S_Q]$

(4)

where:

$\bar{Q},\ S_Q$ - arithmetic mean, the standard deviation of the synthetic variable Q;

Group 1 - countries with the highest value of the synthetic measure;

Group 2 - countries with a high value of the synthetic measure;

Group 3 - countries with a low value of the synthetic measure;

Group 4 - countries with the lowest value of the synthetic measure.

The sustainable development goals presented in table 1 concern such areas as health, food, education, and gender equality.

RESULTS AND DISCUSSION

According to the described model method of object ordering, the EU countries were classified in terms of the measure of assessment of labour market inequality in each country studied (Figure 1). In addition, four groups of EU countries were distinguished in terms of the labour market situation in 2020 (Figure 1, Figure 2). Analysis of the dynamics of indicators in groups of similar countries gave a broader and more accurate picture of the factors affecting the EU labour market over the 2016-2020 period, including changes caused by the Covid-19 pandemic (Figure 3).

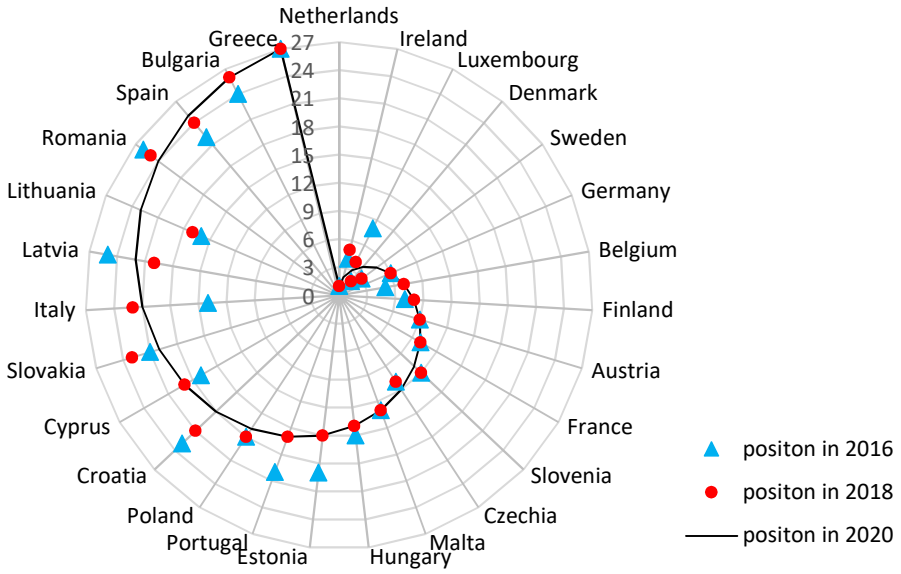

Figure 1. Ranking of European Union countries in terms of the level of achievement of SDG 8 in 2020
Source: own elaboration based on the results.

In the years under study, the highest-ranked country was the Netherlands, with Greece in last place (Figure 1). In 2018, nine countries (Belgium, Bulgaria, Cyprus, Finland, Ireland, Italy, Lithuania, Slovakia, and Spain) were ranked lower than in 2016. In comparison, countries such as the Czech Republic, Denmark, Latvia, Lithuania, Spain, and Sweden were ranked lower in 2020 compared to 2018. Compared to 2016, seven countries improved their ranking in 2018 (Croatia, Estonia, Hungary, Latvia, Luxembourg, Portugal, and Romania). Eight countries ranked higher in 2020 compared to 2018 (Croatia, Ireland, Italy, Luxembourg, Poland, Romania, Slovakia, and Slovenia). Countries that did not change their position between 2018 and 2020 turned out to be: Austria, Belgium, Bulgaria, Cyprus, Estonia, Finland, France, Germany, Greece, Hungary, Malta, Netherlands, and Portugal.

Within the ordered set of countries, a topological classification of similar objects was carried out using the basic characteristics of the distribution of the synthetic measure determined according to formula (3) in 2020. The first group consisted of five EU countries, whose distinguishing characteristics were high values of real GDP per capita and the employment rate, as well as the highest average share of investment in GDP and resource productivity and domestic material consumption (Figure 2). For these countries, low values were recorded for the indicators: young people not in employment, education or training (NEET), long-term unemployment rate, people killed in accidents at work, and population that is inactive (not working) due to care responsibilities. The average rate of working people at risk of poverty in the countries in this group is 7.5%, lower than the EU average. In the comparison of 2020 to 2018, the average value of the index of real GDP per capita (X_1) for group (1) countries was EUR 55 284, this is twice the EU average (EUR 26 390). The factors that reached higher values than the EU average in group (1) turned out to be the indicators: investment share of GDP (X_2), the employment rate (X_4) and resource productivity and domestic material

consumption (DMC) (X_9). The fact that all indicators considered destimulants achieved lower average wattages than the EU average was noteworthy within group (1).

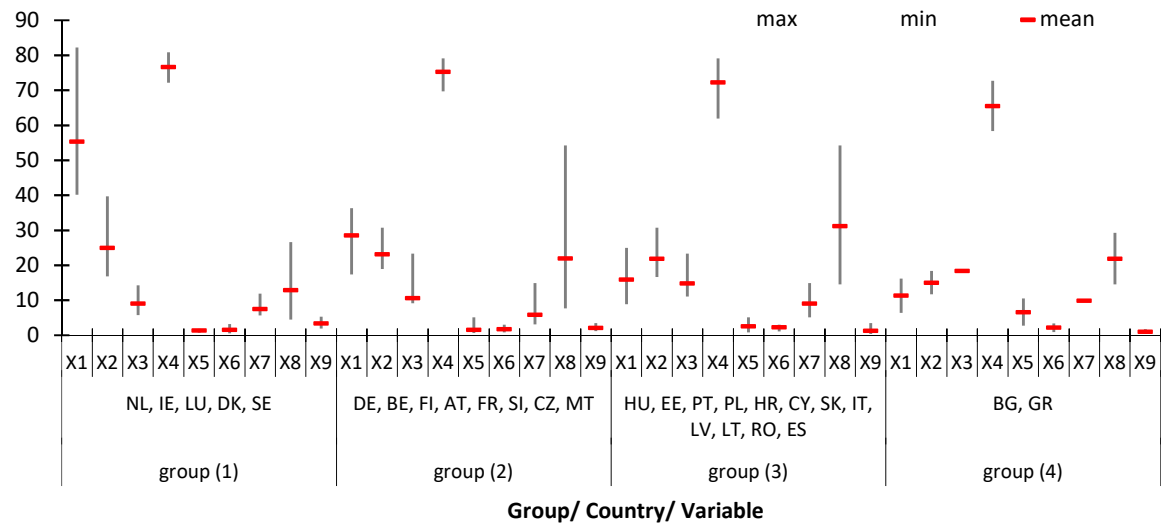

Figure 2. Numerical characteristics of features in groups of similar countries in terms of the level of achievement of SDG 8 in 2020

Note: Designations as in Table 1. AT: Austria, BE: Belgium, BG: Bulgaria, CY: Cyprus, CZ: Czechia, DE: Germany, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, FR: France, GR: Greece, HR: Croatia, HU: Hungary, IE: Ireland, IT: Italy, LT: Lithuania, LU: Luxemburg, LV: Latvia, MT: Malta, NL: Netherlands, PL: Poland, PT: Portugal, RO: Romania, SE: Sweden, SI: Slovenia, SK: Slovakia.
Source: own elaboration.

The second group consisted of eight countries. The highest value for this group was achieved by indicator X_4 – employment level. Its average value in this group was 75.3%. This is 3.6 percentage points higher than the EU average (71.7%). In the indicated group, the indicators that achieved higher average values than the EU average turned out to be the following: real GDP per capita (X_1), investment share of GDP (X_2), the employment rate (X_4), people killed in accidents at work (number per 100 000 employees) (X6), and inactive population due to care giving responsibilities (%) (X_8). In group (2), only one indicator considered a destimulant (X_6 – people killed in accidents at work (number per 100 000 employees) achieved a higher average score (1.75%) than the EU average (1.71%). Indicator X_9 (resource productivity and domestic material consumption (DMC)) was almost the same (EUR 2.062/kg) as the EU average (EUR 2.080/kg).

The third group included the largest number of countries – twelve. The highest value in the fourth group was again the X_4 index. For the countries in the fourth group, the average value of the X_4 indicator was 72.2%, which was 0.5 percentage points higher than the EU average. The average value of indicator X_1 (Real GDP per capita), which turned out to be lower by as much as EUR 10 510 compared to the EU average (EUR 26 390) was noteworthy for group (3). The indicators in group (3) that achieved higher average values than the EU average were: young people not in employment, education or training (NEET) (X_3), the employment rate (X_4), long-term unemployment rate (X_5), people killed in accidents at work (number per 100 000 employees) (X_6), in-work at-risk-of-poverty rate (X_7) and inactive population due to care giving responsibilities (X_8). Indicator X_5 reached a similar value (2.51%) to the EU average (2.5%). The X_8 indicator, on the other hand, reached almost twice the average value (31.2%) of the EU average (17.2).

The final, fourth group, consisted of only two countries – Bulgaria and Greece. Similarly to the third group, the average value of the X_1 indicator (EUR 11,290) was lower in group (4) than the EU average (EUR 26,390). The highest value was achieved by indicator X_4, whose average value for the groups was 65.5% which was 6.2 percentage points lower than the EU average. The indicators in group (4) that achieved higher average values than the EU average were: young people not in employment, education or training (NEET) (X_3), long-term unemployment rate (X_5), people killed in

accidents at work (number per 100 000 employees) (X_6), in-work at-risk-of-poverty rate (X_7) and inactive population due to care giving responsibilities (X_8). Within group (4), the average value of indicator X_5 (long-term unemployment rate) reached almost 2.5 times the (average) result (6.6%) than the EU average (2.5%), and indicator X_8, whose average value of 21.85% was 4.65 percentage points higher than the EU average. In addition, within group (4), all indicators considered destimulants achieved a higher average score than the EU average.

In 2020, the leader of the group with a high degree of SDG8 implementation was the Netherlands, which maintained its leading position among EU countries relative to 2016 and 2018. The effectiveness of the Netherlands in terms of SDG8 implementation, like the other countries classified in Group 1 (Ireland, Luxembourg, Denmark, Sweden), was confirmed in the work of another team of researchers in calculations for 2019 (Jianu *et al*., 2021). However, differences in the ranking of countries are apparent (*e.g*., Ireland in the first place and the Netherlands in sixth place). In the same research, France, Germany, Belgium, Finland, and Austria were ranked high in the second group (as in the conducted research). In the compared studies, the size of groups 3 and 4 and the countries assigned to them varies widely. Nevertheless, both studies unanimously confirmed Bulgaria's weakness in SDG8 implementation. The aforementioned differences may be due to the different optics of the econometric studies, as well as the time horizon considered in the aforementioned study.

Lapinskaitė and Vidžiūnaitė (2020) also proved the high activity of Germany and France in the aforementioned area (ninth and tenth place, respectively) among the G20 countries in 2013-2018. In the same study, a noticeably weaker result was obtained by Italy (15th place), which is similar to the present research, where it was assigned to the group of moderate SDG8 implementation, ranking 21st among the European Union countries. Another work (Carlsen, 2021) includes a study involving simultaneous analysis of the five main (in the author's opinion) SDG8 indicators (real GDP per capita, investment share of GDP, young people neither in employment nor in education and training, employment rate, long-term unemployment rate) in European Union member countries in 2010, 2015, and 2019. Limiting this study to selected indicators drastically reduces or even prevents the possibility of comparison with the results obtained in this research, although minor similarities can be observed. In 2019, as many as 10 countries were the same as those classified collectively in the groups with very high (1) or high (2) SDG8 implementation. In both surveys, Bulgaria's score was unanimously the weakest. Drawing conclusions based on this comparison seems unauthorized, although it is relevant for undertaking possible further research in the area of the role of individual indicators in SDG8 implementation.

No empirical studies covering the implementation of SDG8 during the Covid-19 pandemic in the European Union have been presented in the available literature to date, making it impossible to directly compare the results obtained in completed studies at this time with other works on the same topic.

The economic recession caused by the Covid-19 pandemic was reflected in the deterioration of indicators monitoring the implementation of Sustainable Development Goal 8 in many European economies. The reduction in the activity of both the demand and supply side of the market significantly determined the formation of the socio-economic crisis. Consumers worried about their health and loss of employment reduced demand for consumer goods and services. On the other hand, manufacturers and retailers were forced to reduce the scope of their business activities due to government restrictions. As illustrated by the decline in GDP per capita, the economic downturn was a determinant of the decline in investor activity in the market (measured as the share of investment in GDP). Operating in an environment of uncertainty, the deterioration of many macroeconomic indicators or the rupture or restriction in the area of international supply chains constituted a barrier to making investments. In many European countries, the Covid-19 pandemic had a devastating effect on the labour market, reflected in a decline in employment and an increase in unemployment. Young people, whose labour market situation has deteriorated due to the numerous openings and closings of industries (*e.g*., catering, hospitality, tourism), which are often popular destinations for their employment, have been particularly affected.

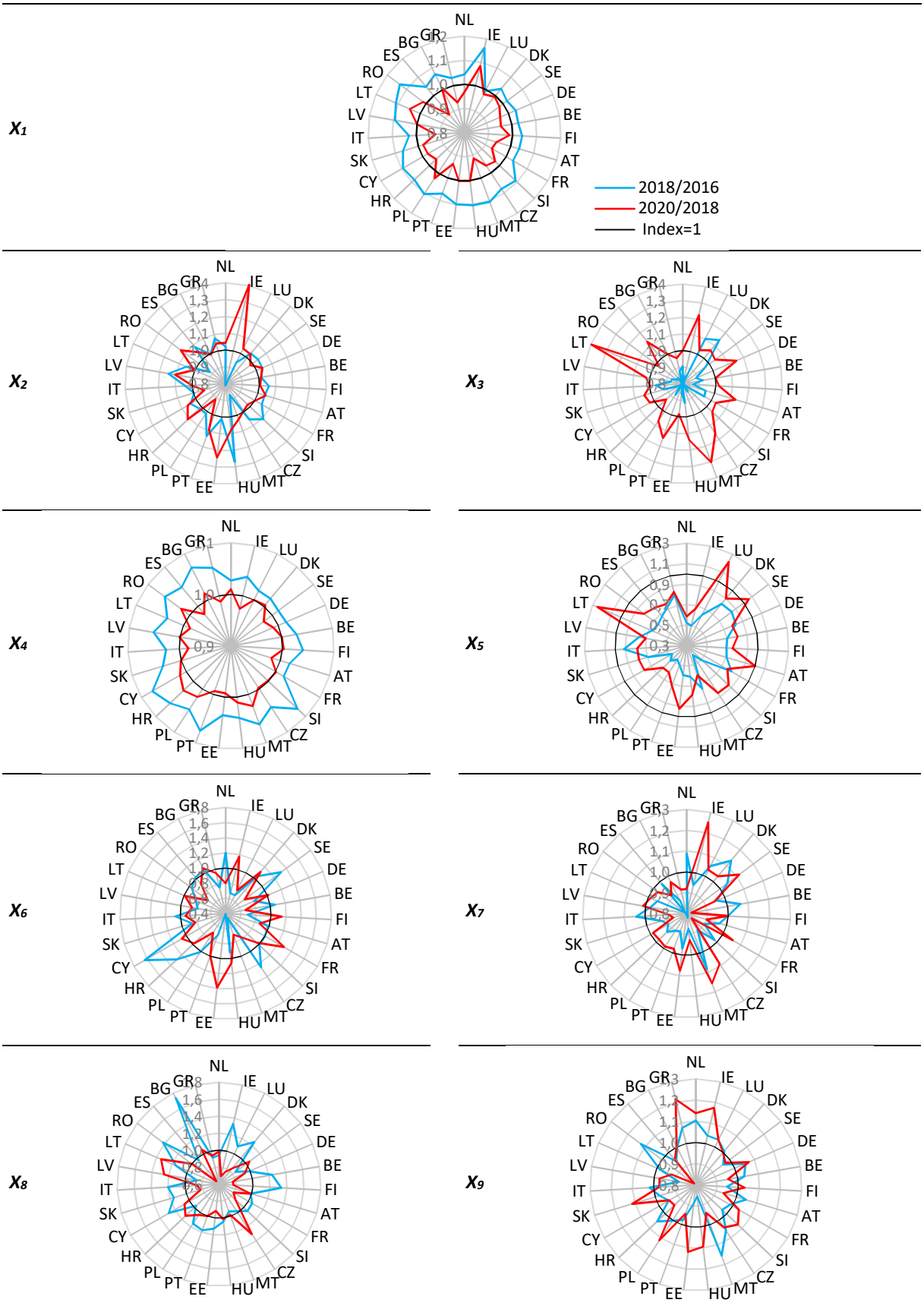

Figure 3. Trait indices for EU countries

Note: abbreviations as in Figure 2.

Source: own elaboration in Statistica.

In almost all EU countries, real GDP per capita (X_1) increased by at least 3% in 2018 compared to 2016. Only in Luxembourg did real GDP per capita decline (1%) during the period. Between 2018 and 2020, increases in the X_1 index were recorded only in Ireland (by 8%), Lithuania (by 5%), Poland (by 3%), Romania (by 1%), and Bulgaria (by 1%). In three countries, namely Hungary, Estonia, and Latvia, it remained at the same level. In the remaining countries, GDP per capita declined and there were changes ranging from 1% (Denmark, Finland) to 10% (Spain). In the EU, real GDP per capita fell by 4% between 2020 and 2018. Therefore, it can be concluded that in the economic area, the pandemic will result in significant changes and may even represent a turning point in the economic history of the 21st century (Laskowski, 2020). According to forecasts, GDP growth rates will vary from country to country, but the EU is expected to return to a path of economic convergence. At the beginning of 2023, real GDP should approach the sustainable growth trend that the EU economy was expected to follow even before the pandemic (Gorynia & Polowczyk, 2022).

The share of investment in GDP (X_2) declined between 2016 and 2018 only in countries such as Ireland, Luxembourg, Malta, and Romania. The largest increase in X_2 during these years was recorded in Hungary (27%). Within the X_2 indicator, growth of more than 10% was recorded in Ireland (41%), Estonia (24%), Romania (13%), Latvia (11%), and Hungary (11%). In the period under review (2018-2020), the largest percentage decrease of this magnitude occurred in Poland and Slovakia, it was a decrease of 9% and 7%, respectively. In addition, decreases of up to 2% were recorded only in: Sweden, Slovenia, the Czech Republic, and Bulgaria. In the remaining countries, the share of investment in GDP remained unchanged or increased slightly. However, forecasts by international institutions indicate that the GDP of eurozone economies will not reach pre-pandemic levels (Laskowski, 2020).

In the first analyzed period (2016-2020) young people not in employment, education, or training (X_3) recorded an increase in only two countries – Denmark (14%) and Luxembourg (10%). The highest increase in the X_3 indicator between 2018 and 2020 was recorded in Lithuania (40%). More than a 20% increase in the X_3 indicator was also recorded in Ireland (22%) and Malta (30%). The largest decrease in the X_3 rate between 2018 and 2020 was recorded in Croatia (6%). In countries such as Belgium, Bulgaria, the Netherlands, and Italy, the X_3 index remained at the same level. Over the past decade, the number of young people not in employment, education or training (NEET) has reached very high levels in many European countries (Assmann & Broschinski, 2021).

Between 2016 and 2018, the X_4 indicator (the employment rate) increased by 7-8% in the following countries: Slovenia (8%), Cyprus (8%), Portugal (7%), and Bulgaria (7%). The change from 2018 to 2020 in all countries was a maximum of 3%. The highest positive change was in Croatia, where the X_4 indicator increased by 3%. A 2% change occurred in Malta, Poland, and Romania. The highest (3%) decline occurred in Ireland. Declines of 2% were recorded in Austria, Spain, Sweden, and Italy. Belgium, Finland, France, Slovenia, the Czech Republic, Slovakia, Latvia, Denmark, and Luxembourg saw no significant change in X_4. Unfortunately, Covid-19 continues to have devastating effects worldwide, causing high levels of unemployment and disconnection from work and school (Rosenberg *et al*., 2022). To survive in the market during the economic crisis, companies often choose to reduce their workforce despite the awareness of the loss resulting from the attrition of a suitably skilled workforce (Piątkowski, 2010).

In 2018, compared to 2016, the long-term unemployment rate (X_5) achieved the largest decline in three countries: the Czech Republic (59%), Poland (54%), and Cyprus (53%). The largest decrease (42%) between 2018 and 2020 was recorded in the Netherlands. In addition, high decreases were recorded in countries such as Ireland (33%), Malta (39%), Poland (38%), and Croatia (38%). The highest increases in the X_5 index during the period under review were recorded in Lithuania (25%) and Luxembourg (21%). A slight increase (6%) was also recorded in Sweden. The only country with no change was Austria. The labour market situation in the European Union improved markedly in Q2 2021, as evidenced by the creation of some 1.5 million jobs. However, employment in the EU still has not reached pre-pandemic levels. In addition, areas of labour market shortages are emerging, especially in sectors where activity is growing the most (*e.g*., IT, motor transport, courier deliveries) (Gorynia & Polowczyk, 2022).

Persons killed in occupational accidents (X_6) in 2018 compared to 2016 increased (most) in the following countries: Cyprus (64%), Sweden (31%) and Croatia (28%). The highest increase (39%) in the X_6 indicator in the years 2018 and 2020 was recorded in Estonia. Countries with a significant increase

in the X_6 rate also turned out to be France (29%), Ireland (17%) and Denmark (12%). The largest decrease in the X_6 index was recorded in Belgium (34%), Romania (31%) and Malta (30%). The only country with no change for the X_6 indicator was Portugal.

In 2018, compared to 2016, the in-work at-risk-of-poverty rate (X_7) increased the most in Denmark (13%), the Netherlands (9%), and Malta (8%). Between 2018 and 2020, the largest increase (25%) in the X_7 index was recorded in Ireland. An increase of more than 10% in this indicator was also seen in Sweden (11%) and Malta (16%). The highest decrease in the X_7 index was seen in Belgium, at 18%. Declines above 10% were recorded in countries such as Slovenia (17%), Slovakia (13%), Italy (11%), and Austria (10%). Finland turned out to be the country with no change in the X_7 rate. The results show that although the pandemic has negatively affected unemployment and inefficiency rates, there is a strong recovery in the labour market (Sazmaz *et al*., 2021).

Inactive population due to caregiving responsibilities (X_8) in 2018 compared to 2016 saw the largest decreases in the following countries: Sweden (16%), Latvia (14%), the Netherlands, and Malta (6%). Between 2018 and 2020, the largest increases in the X_8 indicator were recorded in Lithuania (34%), the Czech Republic (30%), and Latvia (26%). The largest declines within this indicator were recorded by countries such as Spain (35%), Ireland (30%), and Luxembourg (24%). Portugal and Romania saw no change within the X_8 indicator. Having an informal caregiver and inactive status can be associated with unhealthy behaviours and common mental disorders (Tseliou *et al*., 2019).

In 2018, compared to 2016, resource productivity and domestic material consumption (X_9) reached the highest values in Malta (16%), Romania (12%), and the Netherlands (10%). The largest increases between 2018 and 2020, in the X_9 indicator (resource productivity and domestic material consumption) were recorded in countries such as Germany (22%), Ireland (17%) and the Netherlands (14%). The largest decrease (19%) was recorded in Romania. Two countries (Denmark and Bulgaria) showed no change for the X_9 indicator. Understanding how intangible ecosystem benefits (cultural services) are shaped is critical to achieving Sustainable Development Goals (in particular SDG 8.9) (Vaz *et al*., 2019).

CONCLUSIONS

Economic growth and decent work as the focus of one of the Sustainable Development Goals have been hit particularly hard by the outbreak of the Covid-19 pandemic. The research in this article fills the research gap in terms of comparing EU countries in terms of achieving Sustainable Development Goal 8 in the era of the Covid-19 pandemic and before its emergence. The above analysis makes it possible to present the following research conclusions:

1. Grouping of member countries according to the degree of implementation of the aforementioned goal indicated a very good position for five countries (the Netherlands, Ireland, Luxembourg, Denmark, Sweden) and a good one for Germany, Belgium, Finland, Austria, France, Slovenia, the Czech Republic, and Malta. The number of countries ranked together in the aforementioned groups was less than the other two with moderate or poor progress. Bulgaria and Greece fared particularly negatively against the analysed group of countries.
2. The hypothesis stating that under the conditions of the Covid-19 pandemic most of the indicators for achieving Sustainable Development Goal 8 deteriorated in most of the European Union member states was verified positively. In the era of the Covid-19 pandemic, differentiated percentage changes were observed in individual indicators of realization of the above-mentioned goal in the studied group of countries. This indicates the varying impact of the Covid-19 pandemic on the EU economies, which could be due to at least the percentage of the infected population and the extent of the restrictions implemented in connection with it.
3. The results obtained under the various indicators of Sustainable Development Goal 8 indicate the need for differentiated economic policy actions in individual countries to improve the situation in selected areas of the economy. They require a pragmatic and holistic approach that takes into account, on the one hand, local development conditions and the possibility of economic improvement, and on the other hand, the need to ensure the health and well-being of the population under the risk of a recurrence of the Covid-19 pandemic.

4. This study has some limitations. Due to limited data availability, the study considers only one year (2020) of the entire period of the EU economy's struggle with the impact of the Covid-19 pandemic. This implies the need for future studies supplemented by 2021-2022.

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The contribution share of authors is equal and amounts to 33.(3)% for each of them. KAF – conceptualization, literature writing, discussion, conclusion. CF – conceptualization, literature writing, discussion, conclusion. LL – methodology, calculations.

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The Belorussian IT sector as a panacea for the shortage of specialists in the labour market of selected post-communist countries

Zofia Gródek-Szostak, Karolina Kotulewicz-Wisińska, Rafał Lisiakiewicz, Wojciech Zysk

ABSTRACT

Objective: The objective of the article is to analyse the status of IT specialists in the labour market of selected post-communist countries: Belarus, Poland, Lithuania, Latvia, Estonia, and Ukraine.

Research Design & Methods: The article used own calculations made based on available statistical data from the World Bank, European Commission, Polish Agency for Enterprise Development, Belstat, Ukrstat, and UNCTAD. A descriptive method was also used, as well as deductive reasoning, studying the literature of the subject, and analysis of source texts.

Findings: The article demonstrates that despite the difficult socio-political situation and the deteriorating condition of the Belorussian economy, IT specialists from this country can be a panacea for staff shortages in the labour market in neighbouring countries, i.e. in Poland, Ukraine, and the Baltic States. The article also analyses the offers of the above-mentioned post-communist countries that received migrants from the Belorussian IT industry.

Implications & Recommendations: We show that Poland has significant economic potential (and economic ties) in terms of incentives for employees of the Belarusian IT sector. The potential of the rest of the studied countries is in total comparable to that of the Republic of Poland – compared with Lithuania, Latvia, Estonia, and Ukraine. Relocation of Belarusian IT specialists may contribute to the improvement of competitiveness and innovation of the host countries.

Contribution & Value Added: The interest of the countries neighbouring Belarus in the process of encouraging Belarusian IT specialists to emigrate from their homeland has been confirmed and there are very few studies on similar topics in the literature. Moreover, the conclusions drawn from the conclusions of the study may serve as recommendations for specific actions at the government level.

Article type: research article

Keywords: IT sector; post-communist countries; Belarus; Poland; competitiveness and innovation

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INTRODUCTION

In recent years, the dynamic transformation process has resulted in changes in business models, organization, and operational processes of enterprises (Dolan *et al*., 2015). According to the OECD report (Spezia *et al*., 2016) the skillset necessary for employees to perform their professional tasks is changing due to the increasing use of Information and Communication Technologies (ICT) since the digital work environment increases analytical and interactive requirements. As emphasized by Lucas *et al*. (2013), digital transformations are supported by the so-called 'Transformational IT' that has the potential to shape and transform the economy by changing processes, creating new organizations, or enabling market entry. It changes social relationships and user experiences, and the process of acquiring new customers. Among

the main technological drivers of change are: skills, technological innovations such as mobile Internet and cloud technology, computing power and Big Data, Internet of Things, robotics, and artificial intelligence (Leopold *et al*., 2016). Today, these technological innovations are being promoted in the context of Industry 4.0 and other digitalization initiatives. In recent decades, increasing IT investments have been observed to induce major changes in new business processes, skills and industry and organizational structures, resulting in an overall increase in productivity (Brynjolfsson & Hitt, 2000).

It is estimated that by 2020 the shortage of digital specialists in Europe will be approx. 756 000 (Berger & Frey, 2016). However, based on quantitative modelling, a report published by the BCG group predicts a net increase of approx. 350 000 jobs in Germany by 2025, with significant job growth expected in systems design, IT and data science and the highest growth of approx. 70 000 new jobs for industrial data scientists (Lorenz *et al*., 2015). Evidence from the research available in the literature suggests that increasing digitization, automation, and broadly understood technological changes have led to the emergence of jobs requiring higher qualifications (Gallie, 1991).

The IT sector has a specific character, which distinguishes it from other sectors of the labour market, as well as regional specificity. The development of technology drives the search for IT specialists; the IT outsourcing market in Central and Eastern Europe is growing much faster (20-25% y/y) than the global market (5%). Combined with the dynamic growth in revenues of software development companies, the sector sees an increasing number of mergers and acquisitions. Over the past four years, over 70 custom software development company M&A transactions have been recorded in the region. The execution and innovation of successful software development projects are rooted in people's talent and finding great talent remains one of the biggest challenges in the industry.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

In the European Union, the importance of the IT sector depends on the number of enterprises and the number of specialists employed in the sector. For example, according to research conducted in previous years, developed countries are increasingly dependent on the IT sector (Maryska *et al*., 2012). Other researchers point out that there is a relationship between GDP and the results achieved by the IT sector (Vu, 2011; Ho *et* al., 2011; Warr & Ayres, 2012; Sylwestrzak, 2018; Fernandez-Portillo *et al*., 2020; Vu *et al*., 2020). In addition, it has been observed that developed countries introduce innovations to increase their competitiveness, while developing countries take measures to increase the use of the IT sector to stimulate economic growth (Savulescu, 2015).

In connection with the above, the IT market, both domestic and European, attracts the attention of the media and experts. On the one hand, universities are encouraged to educate more and more graduates, on the other hand, there is a growing gap between the needs of this market in terms of a qualified workforce and the supply of specialists. It is estimated that the shortage of IT specialists on the European market may reach 1 million; in Poland, there is talk of a shortage of over 100 000 specialists (Rasińska, 2016). Currently, more than 85% of jobs within the European Union require at least basic digital skills (CEDEFOP, 2018).

The gap of IT specialists in the EU has been one of the most important challenges in the eyes of the European Commission for several years. Already in the documents from 2016, there is a statement that without reducing the gap of IT specialists (then estimated at 756 000 people) 'Europe will not be able to cope with the digital transformation' (European Commission, 2016). Unfortunately, this problem has still not been solved and still occupies a high position on the list of priorities of the European Commission (European Commission, 2021). In the strategic document 'Europe's Digital Decade' presented in 2021, the European Commission set a goal: 80% of the population with at least basic digital skills and 20 million IT professionals in 2030 (European Commission, 2021).

IT specialists are currently the fourth most sought-after group of employees. According to ManpowerGroup (2021), this is a group that has been consistently climbing the ranking of the most sought-after specialists for the last few years, which means a deepening shortage in IT-related professions. Due to the shortage of specialists in the domestic market of Central and Eastern European countries,

decision-makers more and more often create conditions for an attractive relocation of IT specialists from other countries, most often neighbouring ones.

Due to the political and economic situation, Belarus is becoming less and less attractive as a place for innovative business. Therefore, it is a particularly attractive country as a source of IT specialists in the region, and countries with a post-communist origin similar to Belarus, *e.g*., Poland, Lithuania, Latvia, Estonia, and Ukraine are competing to recruit high-quality IT employees from there.

The article uses own calculations made based on available statistical data (World Bank, The European Commission, Polish Agency for Enterprise Development, Belstat, Ukrstat, and UNCTAD), a descriptive method was also used, as well as deductive reasoning, studying the literature of the subject and analysis of source texts.

The article aims to diagnose the status of IT specialists in the labour market of selected post-communist countries: Belarus, Poland, Lithuania, Latvia, Estonia, and Ukraine. To achieve the set goal, research hypotheses were defined:

H1: The potential and qualifications of the employees of the Belarusian IT sector make it possible to overcome the shortages of specialists in the labour market of selected post-communist countries: Belarus, Poland, Lithuania, Latvia, Estonia, and Ukraine.

H2: Relocation of Belarusian IT specialists improves the competitiveness and innovation of the host economies.

H3: The activity of the employees of the Belarusian IT sector impacts the level of self-employment in the markets of the selected post-communist countries.

RESEARCH METHODOLOGY

This part of the article will present a description of the economic potential and current conditions for the development of economic relations of Poland with Belarus, Lithuania, Latvia, Estonia, and Ukraine.

The selected neighbouring countries have a joint potential comparable to the economic potential of Poland, as evidenced by the data included in Table 1.

Table 1. The share of Poland and selected countries of its Eastern Neighbourhood in the global area, population and GDP in 2019, in %

Country	Area	Population	GDP
Poland	0.24	0.50	0.68
Belarus	0.16	0.12	0.07
Estonia	0.03	0.02	0.04
Lithuania	0.04	0.04	0.06
Latvia	0.04	0.02	0.04
Ukraine	0.46	0.59	0.18

Source: own elaboration of World Bank (2021a).

In 2019, the area of the countries presented accounted for approx. 73% of the total area of the world (together with Poland, 0.97% in total), and the number of inhabitants is approx. 0.79% of the world's population (with Poland in total, approx. 1.47%) In the analysed year, these countries accounted for only 0.39% of the world's GDP, and Poland – 0.68%. It was the result of various factors, including diversified effects of economic transformation, the shaping of diversified economic structures, and the diversified degree of use of the opportunities resulting from the active division in the international division of labour (Table 2).

The economies of the analysed countries differ in terms of the share of the private sector. Excluding Poland, this share is relatively highest in Estonia, Latvia and Lithuania, and lowest in Ukraine, and Belarus. Ukraine and Belarus are characterized by the highest share of agriculture in generating national income. On the other hand, Poland, like most countries, is characterized by a comparable share of industry in generating GDP. An exception in this respect is Belarus, where this share is, respectively,

higher by 2.65 pp compared to Poland. The studied former Soviet republics differ in terms of the share of services in the economy. The highest share of services in generating national income is found in Latvia, Estonia, and Lithuania, and the lowest in Belarus.

Table 2. The structure of the economy of Poland and neighbouring countries in 2019, in %

Country	The share of the private sector in generating GDP	Structure of GDP creation			Demand structure	
		Agriculture	Industry	Services	Consumption	Accumulation
Poland	72.3	2.35	28.65	57.52	75.54	19.75
Belarus	24.6	6.78	31.30	48.82	70.91	28.98
Estonia	70.4	2.49	22.04	62.48	68.87	27.69
Lithuania	57.0	3.22	25.26	61.38	78.45	22.38
Latvia	69.9	3.72	18.56	64.73	77.33	17.46
Ukraine	47.0	9.01	22.56	54.43	95.23	13.00

Source: own elaboration of World Bank (2021b), European Commission (2021), eu4business (2021), and PARP (2021).

Table 3. The economic potential of the analysed former Soviet republics and the degree of its realization compared to Poland in 2019 (basic indicators, Poland = 100%)

Category		Belarus	Estonia	Lithuania	Latvia	Ukraine	Poland
Area		66.39	14.46	20.85	20.66	193.02	100
Population		24.81	3.50	5.04	7.36	116.91	100
GDP		10.59	5.28	5.72	9.17	25.81	100
Participation in trade in goods	**Import**	15.99	7.56	14.50	7.20	24.63	100
	Export	13.02	6.68	13.16	5.74	19.87	100
Participation in trade in services	**Import**	13.30	12.89	17.67	8.00	35.02	100
	Export	13.35	10.99	18.34	8.76	24.03	100
Cumulative production capital resources	**Inflow**	9.78	23.03	7.38	5.97	23.22	100
	Outflow	-0.32	92.26	7.18	-7.55	30.39	100

Source: own elaboration of World Bank (2021b) and UNCTAD (2021).

Furthermore, among the analyzed countries, Poland can be considered a leader both in terms of the broadly understood economic potential and the degree of its realization, including through participation in the international division of labour (Table 3).

From the point of view of the size of the economic potential and the degree of its use, Poland and its eastern neighbours do not constitute a homogeneous group. This set of countries can be divided into three groups. Firstly, there is Ukraine with its significant potential, exceeding the economic potential of Poland, but using it less effectively than Poland. Secondly, there are countries with relatively small potential, which they do not use effectively. For example, Belarus pursues a policy of strictly autonomous economic development. Due to this state of affairs, the economy of Belarus is characterized by considerable disproportions, even compared to Ukraine. On the other hand, in Poland, Estonia, Latvia, and Lithuania, economic growth depends mainly on the service sector, and then on the industry sector (Table 4).

The above-mentioned conditions affect the development of innovation and competitiveness of the discussed countries. As can be seen from the data in Table 4, the ICT sector in Poland has the largest share in the added value. The Belarusian ICT sector ranks second in terms of the value of this index. Compared to the analyzed former Soviet republics, Poland has a high number of people employed in the ICT sector.

Table 4. The importance of the IT sector in Poland and in neighbouring countries

Category	Belarus	Estonia	Lithuania	Latvia	Ukraine	Poland
Share of the ICT sector in GDP, % (2018)	5.6	5.38	3.13	4.92	3.90	3.59
Share of ICT in value added, % (2018)	6.5	5.22	3.94	4.88	4.60	7.72
Share of employees in the ICT sector (2018)	2.7	6.5	3.3	3.7	1.73	3.4
No. of employees in the ICT sector, in thousand (2018)	100.7	42.4	44.5	33.0	283.0	553.9
Share of the ICT sector in exports of goods, % (2018)	0.75	8.51	3.48	8.44	0.98	6.91
Share of the ICT sector in import of goods, % (2018)	3.61	8.48	4.89	8.24	5.80	8.52
Share of the ICT sector in exports of services, % (2018)	20.79	11.11	–	13.91	21.85	10.92
Share of the ICT sector in import of services, % (2018)	5.24	8.93	–	10.70	4.10	9.28

Source: own elaboration of World Bank (2021d), UnctadStat (2021), Belstat (2021), and Ukrstat (2021).

RESULTS AND DISCUSSION

Characteristics of the current social and political situation and the state of the economy in Belarus

In 2021, Belarus is struggling with the problems that appeared both in 2020 and in previous years. The deteriorating state of the economy, the COVID-19 pandemic, the poor political and social situation, international protests against totalitarian rule, as well as the existing and planned international sanctions determine the further course of events. Among the possible scenarios for the development of the situation in Belarus, a combination of political, social, and especially economic and financial events, which may significantly affect the level and structure of labour migration cannot be excluded.

The deteriorating social mood among Belarusian citizens, brutal and cruel repression of the society's awakened aspirations, the persistent social tension, uncertainty of tomorrow, and instability in the internal situation resulting from the changes that took place after the rigged presidential elections and mass violent civil protests are among the socio-political causes of migration, including that of IT specialists. Of course, IT scientists became part of political protests. A sign of the involvement of the IT sector in politics was the candidacy of the president, founder, and head of the Belarusian Hi-Tech Park, Valerij Tsepkalo. The IT professionals played an active role in Tsepkalo's campaign as well as in the campaign of another candidate, Viktar Babarika (Sergei, 2020). Previously, in 2005, he was also an advisor to the President of the Republic of Belarus and the representative of the President of the Republic of Belarus in the National Assembly of the Republic of Belarus. After the rigged elections, many IT scientists took part in mass protests. As independent experts, they were not afraid of losing their jobs. They protested in the name of civil rights and European values, in opposition to the Soviet military aesthetics of an authoritarian state in which they had no real right to vote. Many IT scientists have volunteered for various solidarity funds set up to help victims of state forces. Several thousand senior executives and other tech industry representatives have signed an open letter calling for the cessation of violence against demonstrators, holding those responsible for the fraudulent election accountable, and holding new, transparent elections. The growing repression, the strengthening of the regime, and the government's efforts to suppress the resistance of society while President Lukashenka postponed the introduction of systemic and constitutional changes. Moreover, the open search for help and favour from Russia has a detrimental effect on the socio-political situation in Belarus. Moreover, it can be clearly observed that Belarusian authoritarianism is rapidly radicalizing, independent media are being liquidated, and protest participants, trade union activists, lawyers, students, human rights defenders and journalists are intimidated and repressed. Brutality is followed by several-year incarceration sentences, and the number of political prisoners is growing. The date of the constitutional referendum has also been postponed – to early 2022.

The state of the economy was a catalyst for past events in Belarus and will also remain a problem in the coming years. The weakness of the Belarusian economy is systemic. It is an antiquated, post-

Soviet model of central planning, state ownership of most means of production, and a classic dependence on Russia. Forecasts of the International Monetary Fund (IMF, 2021) indicate that in 2021 economic growth in Belarus will be negative (-0.4%). World Bank forecasts predict a deepening recession in 2021 related to the lack of structural reforms, declining domestic demand, and possible economic sanctions. Recently announced tax increases to curb the fiscal deficit and pension system will negatively impact the already troubled private sector, which has suffered from a lack of support during the COVID-19 shock. Slow economic growth is also expected to reduce imports and the current account deficit. This perspective depends on the availability of external financing, especially from Russia. The following years 2022-2023 will be even more difficult, as the repayment of bilateral loans to Russia is due in 2022, and the repayment of the capital of Eurobonds and a loan for a nuclear power plant in 2023. In addition, it is estimated that in 2021, poverty indicators in Belarusian society will increase by 0.1 percentage point (World Bank, 2021c). It is worth emphasizing that the economic factor is an important instrument of influence used by Russia on Belarus. Manipulating the supplies of raw materials and credits or taking over the transit of Belarusian petroleum products will continue to deepen Belarus' economic dependence on Russia. This is particularly important in the context of Russia's dissatisfaction related to the unstable internal situation in Belarus.

In recent years, starting from 2016, Belarus was observed to progress in the economic freedom index ranking. There has been progress in areas such as investment and monetary freedom, property rights, and government conscientiousness (OECD, 2020). In 2020, Belarus was ranked 41st among European countries, although its overall result is well below the regional average and slightly below the global average. For the first time, the Belarusian economy was included in the group of countries characterized by moderate economic freedom. Belarus's GDP growth has not yet reflected this, mainly due to the poor recovery after the economic recession in 2015-2016 and low energy commodity prices (Heritage, 2021).

With the increase in global oil prices and the demand for Belarusian industrial goods from Russia, the Belarusian government will have a chance to take additional reform measures aimed at strengthening the effectiveness of the judiciary and government actions, which will help raise the level of economic freedom in Belarus.

However, the economic situation is likely to deteriorate in 2021. The debt of major enterprises (mostly state-owned) will exceed GDP, foreign investors are withdrawing, exports are falling, and the massive withdrawal of savings from banks is accompanied by the devaluation of the Belarusian rouble and an increase in inflation (7.7% in January 2021). The slowdown in the development of the IT industry, which has been rapidly developing since the 1990s, can be particularly severe, generating 6.5% of GDP in 2019, comparable to agriculture or transport (it was expected to be 10% in 2023). This fastest-growing sector of the economy is currently 'in retreat' as companies and employees are moving, among others to Ukraine, Lithuania, and Poland. This may not only hit the economy but also affect the country's image and deteriorate the investment climate.

In Belarus, the state budget subsidizes primarily industrial sectors that are important from the economic point of view. The Belarusian Innovation Fund offers vouchers worth up to 25,000 USD and grants of up to 10,000 USD (Belinfund, 2021). The Belarusian state plays an active regulatory role in the use of the available production potential. In the most important economic matters, decisions are made personally by the president of Belarus, who has the necessary powers. The political system and social conditions have a negative impact on innovative enterprises that take risks and often stay ahead of the regulations that would regulate the sphere of innovation.

Summing up, it should be mentioned that after the recent events of May 23, 2021, related to the abduction of the Belarusian opposition activist Roman Protasiewicz (Consilium, 2021a) from an airplane flying over Belarus, the international community – especially EU countries (European Parliament, 2021), the USA and the United Kingdom – is considering the introduction of severe, targeted economic sanctions (Newsbeezer, 2021), They may include sectors of strategic importance to the Belarusian economy, such as the processing and export of crude oil, processing potassium salts used in the production of fertilizers, the metallurgical industry, the wood industry, the automotive industry, tobacco industry and the banking sector, including blocking access to the SWIFT system and restricting Belarus' access to

many financial products, *e.g*., certain loans and bond issues (Consilium, 2021b). As a result, there may be a shortage of foreign exchange inflows from exports, which will impact the stability of the financial market and probably result in the devaluation of the Belarusian currency, followed by high inflation.

The above-mentioned socio-political problems of Belarus, as well as those related to the country's weakening economy and financial instability in the foreseeable future can cause further migration of the population, and in the case of highly qualified specialists, even a *bona fide* exodus. Moreover, Lukashenka's regime can plan to ease social tensions by not blocking, or even facilitating emigration towards socially active, young, and well-educated people, including IT specialists.

International conditions for the development of the IT sector in Belarus and reasons for the emigration of Belarusian IT specialists

There is interesting research available on the prospects for the development of the IT sector in Belarus and the possible migration of employees in this sector, *e.g*., as part of the International Political Economy. It demonstrates a strong relationship between the type of political regime and economic policy, along with economic development. This dependence is especially emphasized in the case of authoritarian regimes seeking to control or influence most of the social processes in the country, primarily political but also economic. However, the relationship between the type of political regime and economic relations in the international dimension, *e.g*. openness to cooperation with foreign countries, is not clear-cut. First of all, it is emphasized that nondemocratic regimes are generally more closed to international cooperation than democracies. However, unlike democracies, highly institutionalized and stable authoritarianism can strategically plan and implement these plans in the long term. In some cases, they can be quite liberal in terms of international economic cooperation and favour it (Weeks & Crunkilton, 2017). Research for the development of a climate fostering international cooperation, including foreign investment also shows that consolidated authoritarianism, on a par with democracies, can effectively create favourable conditions for the development of investment and international cooperation. Hybrid regimes, such as unconsolidated democracies or unconsolidated authoritarianism, are much worse at creating favourable conditions for doing business and cooperating with foreign countries (Bayulgen, 2010). Moreover, research shows that authoritarian regimes in general are much less prone to international cooperation than democracies, even doubly lesser in the case of cooperation with democracies, compared to democratic countries. This propensity to conclude cooperation agreements with other authoritarian systems can be even four times lower than that of democratic states (Mansfield *et al*., 2002). Finally, one of the basic relationships between authoritarian systems and their economies is their will to control economic processes, aimed at eliminating all groups of influences, as well as phenomena that threaten power, including economic ones (Kneuer, 2007). In addition, scientific research highlights the fact that authoritarian systems are less susceptible to economic pressure (Blanchard & Ripsman, 2008). Therefore, they pay less attention to economic interests and can sacrifice them for the benefit of other interests.

Therefore, the reason for the great success behind the development of the IT sector in Belarus was, paradoxically, the economic underdevelopment of the country. It was this factor that made the authorities more willing to support the idea of establishing a sector that could become the country's showcase. Belarus is an example of a country where no real systemic transformation was carried out after the collapse of the USSR. This very clearly increased the investment attractiveness of this country, which for investors appeared to be non-transparent in terms of procedures, with a small share of the private sector in which investors could operate (Westernhagen, 2002). Moreover, it is indicated that in Belarus, as in any authoritarian country, business is dependent on politics. On the one hand, the authorities discredit business as a group that can potentially influence the perception of power. On the other hand, however, the government can create favourable conditions for running a business to promote itself on such activities (Grevtsova, 2018). Therefore, the lack of modernization of the country, combined with the political will, enforced the idea of building a 'Silicon Valley' in Belarus. The High Technology Park (HTP) was something that Lukashenko could accept as he did not consider the IT sector strategic, as is the case with heavy industry or other sectors of the economy (Euronews, 2020).

The success of the Belarusian IT sector is mainly related to international cooperation. The High Technology Park itself is largely based on foreign investments; over 40% of its residents are companies with foreign capital. The amount of direct foreign investment in 2019 amounted to 263 million USD. During the three years of operation, Park 2.0, has attracted a total of over 700 million USD of foreign investment. Moreover, the Park currently houses 107 development centres for international companies.

As mentioned above, after the adoption of Decree No. 8 in 2017, the exports of services increased sharply and in the record-breaking 2019, the Park's exports amounted to 2195 million USD, with a growth rate of 155%. The number of new companies in the Park is also growing at an impressive pace. In just two years after the adoption of the digital decree, the number of Park's residents has quadrupled, from 192 to 969 (HTP, 2020a). A sharp increase in exports of services has been observed in the High Technology Park itself.

The issue of Belarus' openness to international cooperation is of key importance for the condition and further development of the country's IT sector. Therefore, the above-mentioned research on the impact of political conditions on the state of the economy seems to be of key importance for the migration of Belarusian IT specialists as problems in this area can determine the condition of this sector and impact decisions regarding the emigration of IT employees. The IT sector is one of the most dynamically developing sectors in Belarus. In 2015, it was 3.5%, in 2018 it already accounted for approx. 5.5% of the country's GDP (President, 2020), and in 2019 it was already 6.6% (Belstat, 2020), which is a significant number for a country that bases its economy mainly on industry. In 2019, approx. 54.2 thousand IT specialists were recorded in Belarus and approx. 1.5 thousand IT companies (as previously mentioned, however, these are estimated data). Belarusian IT companies cooperate with clients from over 50 countries worldwide. In 2018, IT accounted for 2.2% of total employment and 14.5% of all new jobs in the country (Murphy, 2020). The main sales of Belarusian IT companies go to foreign markets. Over 90% of the software produced in the Park is exported: 49.1% – to European countries, 44% – to the USA and Canada, 4.1% – to Russia, and other Commonwealth of Independent States (CIS) countries (Belarus, 2021).

The Belarusian IT sector consists in 60.5% of outsourcing companies and in 39.5% of production companies (data for 2018). Belarusian outsourcing tycoon EPAM (Effective Programming for America) Systems is a leading global provider of digital platform engineering and software development services. EPAM has offices in North America, Europe, and Asia and was on Fortune's list of 100 fastest-growing companies in 2019. International giants such as Google and Yandex also have R&D centres in Belarus.
There are many indications that the motivations for the emigration of Belarusian IT sector employees will be related to geopolitical issues as the Belarusian authorities pursue a policy of manoeuvring between Brussels and Moscow and curbing Russia's influence. On the one hand, it can cause greater concessions to Brussels and thus improve the business climate in Belarus. Thus, the more oppressive the regime, the greater the citizens' motivation to emigrate. Research among investors indicated that the Belarusian government favoured Western investors to restrict the influence of Russian investors and ties to Russia. However, on the other hand, IT is developing dynamically, due to the greater impact not of the financial but of the intellectual component on its development. This is due to the country's backwardness, the lack of private investment funds and the statist policy of the state. The main feature of the Belarusian IT sector is its specialization in software outsourcing, and not in developing IT products for domestic consumption. This makes the sector export-oriented and cosmopolitan, unlike the industry in Belarus, which operates under an authoritarian regime. Thus, in the absence of raw material resources, the main mechanism of adapting the IT entrepreneurship environment to the conditions of the authoritarian-personalistic regime is the concentration of investments on the development of the intellectual property market, while at the same time founding the IT sector on outsourcing. Such development can only take place in the absence of factors limiting its expansion in the international arena. The presented thesis is also confirmed in relation to other countries. Among the ten most developed IT outsourcing countries, there is not a single mature democracy (India, Bulgaria, China, Argentina, Philippines, Egypt, Chile, Brazil, Indonesia, Thailand). In countries with authoritarian tendencies, citizens more often invest in areas that cannot be easily controlled by the state and which can flexibly react to its oppressiveness. The increasing oppressiveness of the system, combined with closing off to cooperation with regions important for the development of the IT sector in Belarus (the West), will prompt citizens to emigrate.

The data on the development of the Belarussian IT sector confirm the previously quoted research results regarding the political conditions of economic development, especially in authoritarian regimes. During the time of relative political and economic stability in Belarus, there was a rapid increase in new companies in the Park: from 33 in 2017, to 268 in 2018, to 319 in 2019, and down to 236 in 2020 (Grevtsova, 2018).

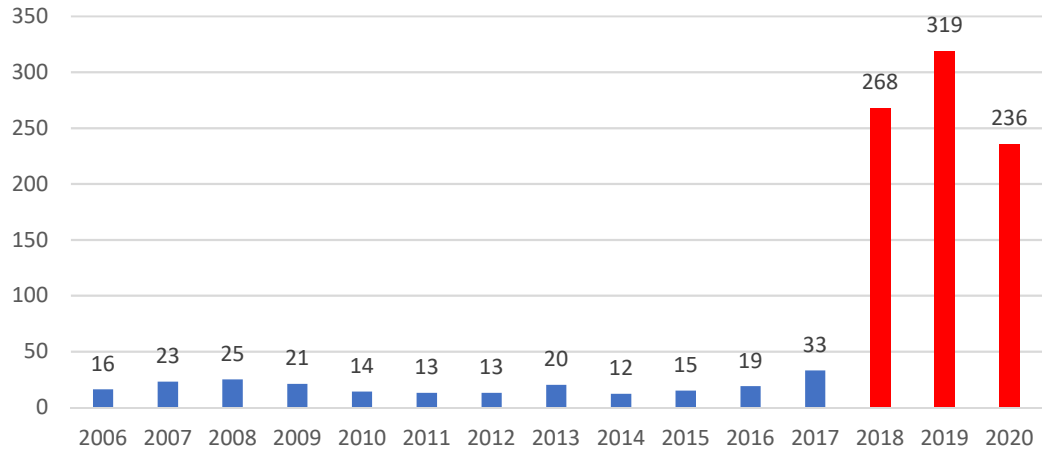

Figure 1. Increase of new companies in the High Technology Park
Source: HTP (2020b).

Experts note that the legislation related to the IT sector has significantly changed Belarus's position in the rankings for ease of doing business, taking it to the 37th place in the 2019 report, which is 26 places higher compared to 2014 (Murphy, 2020). In the 2020 report, Belarus dropped to 49th place (Doing Business, 2019 and 2020). This is noteworthy as this decline could have been related to the growing oppressiveness of the political regime in Belarus. It should also be emphasized that the outdated Belarusian economy is subject to a great level of state control. Approx. 70% of the industry is in the hands of the state and 80% of the banking sector (Rosandic, 2018), therefore, the IT sector has a special position in this system.

Actions taken by selected post-communist countries to recruit IT specialists from Belarus

In this part of the manuscript, the factors attracting employees of the Belarusian IT sector to the studied post-communist countries will be presented and actions taken by selected post-communist countries to recruit IT specialists from Belarus.

The Belarusian IT sector is interested in moving its offices and branches, as well as highly qualified employees, to the Baltic States and Poland. This not only means an increase in the number of employees in the IT sector in these countries, and strengthening them, but also in the available software. This, in turn, can bring about an increase in the competitive potential against the countries that are leaders in this industry. The incentives offered to Belarusian entrepreneurs play an important role in this respect. What Belarusian enterprises care most about is the speed and simplicity of setting up operations in the country of relocation. This is why the regulations of migration processes, quarantine issues, taxes and registration procedures are important.

Ukraine

According to a survey conducted by the dev.by portal in October 2020, Ukraine was the most popular relocation destination among employees of the Belarusian IT sector.

On October 4, 2020, the President of Ukraine, Vladimir Zelenskij, signed the Decree No. 420/2020. On the one hand, this document aims to promote and develop Ukraine's investment potential, and on the other, it is to help attract highly qualified IT specialists and innovators (President, 2021). Pursuant to the decree, on December 23, 2021, the Council of Ministers of Ukraine issued Regulation No. 1302

stating that until December 31, 2021, citizens of the Republic of Belarus who have legally entered Ukraine can stay on its territory for a period not longer than 180 days, for 365 days (KMU, 2020a). The explanatory note added that 'the regulation shall apply to Belarusian citizens who are entrepreneurs, highly qualified specialists, in particular IT and innovation specialists, whose emigration is in the interest of Ukraine, as well as their family members. At the same time, it was emphasized that the amenities are aimed at those who, in accordance with point 2 of Art. 4, part II of the Law 'On Immigration,' apply for an immigration permit as highly qualified specialists and workers, with qualifications necessary for the economy of Ukraine. They shall apply to the State Immigration Service for a temporary residence permit and receive it promptly' (KMU, 2020b).

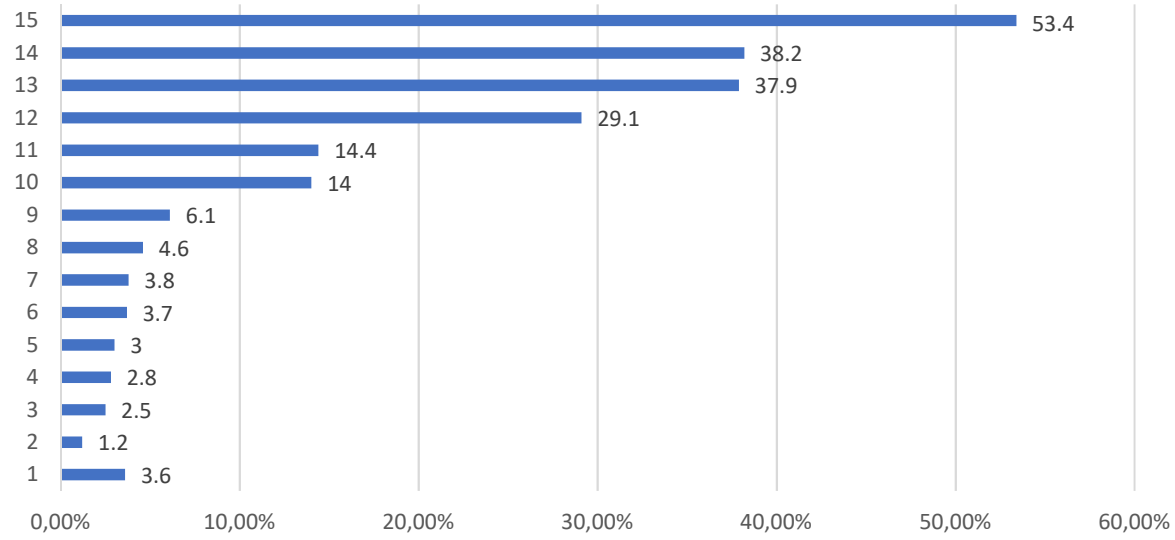

Figure 2. Relocation direction of Belarusian IT workers
Source: Datawrapper, 2021.

At the same time, the decree provided for the following amenities for Belarusian IT workers:

- shortening the period of issuing work permits to foreigners and stateless persons from seven to five days from the date of submitting the documents (the so-called 'silent approval' shall apply);
- streamlining the procedure of registering a natural person as an entrepreneur and uniform taxpayer;
- introducing a pilot project to simplify the registration of temporary residence permits with the possibility of shortening the deadline for issuing the document to three days, without the need to leave the territory of Ukraine.

Moreover, the latter two regulations apply to family members of such persons. Additionally, for all Belarusian citizens who intend to emigrate to Ukraine, the decree provides:

- recognition of documents issued by the Belarusian authorities that are necessary to work in Ukraine;
- efficient operation of a single, dedicated website and hotline to consult Belarusian citizens interested in migrating to Ukraine (Everlegal, 2021).

The above-mentioned information portal was launched in September 2020. This was the result of joint actions undertaken by the Ministry of Digital Transformation of Ukraine, Ukrainian IT associations, such as the European Association of Software Engineering Ukraine (EASE, 2021) or the Ministry of Economy of Ukraine and the Ministry of Foreign Affairs of Ukraine (VCTR, 2021), which developed a project entitled IT Relocate Беларусь (Belarustoukraine, 2021). Ukraine has launched a website that contains complete information about a stay in Ukraine, as well as legal advice, useful links, and other information. At the same time, Ukrainian companies and organizations have been allowed to offer services that support relocation. For this purpose, they can post relevant information on the project website.

Moreover, as reported by Ukrinform, on November 18, 2002, the Ukrainian government supported the bills 'On amending certain legislative acts of Ukraine to improve migration legislation'

and 'On amending the Code of Administrative Offenses of Ukraine,' which simplify the procedure for extending the period of stay in Ukraine for foreigners and stateless persons who have legally entered and stayed in the territory of Ukraine, as well as the procedure for replacing a temporary residence permit in the territory of Ukraine (Ukrinform, 2021).

Ukraine has attracted Belarusian IT workers not only by introducing the above-mentioned amenities, but also with a number of other benefits (Belarustoukraine, 2021):

- access to the 4G network;
- average monthly salary in the IT industry – 2300 USD;
- the presence of Top-5 IT companies;
- execution of the state digitization process;
- no language barrier;
- competitive prices for the lease of an apartment or office;
- presence of 5600 service and technology companies on the Ukrainian market.

Among other advantages of Ukraine, employees of the Belarusian IT sector have mentioned (Investment, 2020:

- favourable taxation of business;
- well-developed IT infrastructure in Ukrainian cities and a favourable ecosystem, *i.e*. the existence of IT clusters, IT associations, and the interest of the Ministry of Digital Transformation in developing the industry.

In Ukraine, the development of the 'digital state' continues, the embodiment of which is to be the 'Dia City' project, *i.e*., a business zone, whose residents will be granted numerous preferences in digital business development: special tax regime for companies and employees, simplified state regulations, unique digital services, the possibility of applying some regulations of so-called British law, a supervisory board composed of residents of the business zone, special conditions for currency regulation and simplified regime of currency settlements.

The project has a very ambitious goal: to increase the Ukrainian IT market from 6.2 to 11.8 billion USD and the number of jobs to 450 000 by 2025. The main goal of the project is to create a Ukrainian IT product able to compete with Western countries.

Lithuania

Lithuania is a member country of the EU, NATO, and OECD. Danske Bank has set up its main IT centre in Lithuania, employing over 4 000 specialists. Tech giants like Uber, Unity, and Wix.com are expanding their systems, and big industry players like Wargaming and EPAM Systems will expand in 2021. Lithuania holds third place among the lowest corporate income tax countries in Central and Eastern Europe. It grants 0% profit tax in Free Economic Zones. A company can be registered here in one day with an electronic signature. Moreover, Lithuania holds the first place in the world for public WiFi speed and ranks ninth globally in 4G availability, fourth in cybersecurity, as well as fourth in the EU for digital public service offer for enterprises.

The Lithuanian labour market is struggling with a shortage of qualified specialists, especially in the field of IT, which is why specialists from Belarus are welcome to fill this niche (Baltic-course, 2020). In this competition for the Belarusian IT sector, Lithuania's main competitors are Poland, Latvia, and Ukraine. The latter offers little expenses but has serious problems with the business sphere. Poland and Latvia offer similar conditions to Lithuania, therefore 'soft' factors prevail city life conveniences, a harmonious migration and integration process, the presence of investment-attracting structures (Trusiewicz, 2020). Lithuanians admit that Poland has one distinct competitive advantage in this respect: the language. Many Belarusians speak Polish and hold the Pole's Card, which greatly facilitates work and life in Poland. Therefore, Lithuanians are looking for other incentives. The entity supporting the Belarusian IT sector in relocation is Invest Lithuania, offering a simplified procedure of quick relocation and investment, eliminating excess paperwork, simplified visa issuing procedure and employee qualification requirements.

Latvia

Latvia is a member of the EU, NATO, OECD, and the World Trade Organization. A company can be registered here within one day; the majority of employees in the ICT sector are (at least) trilingual, speaking Latvian, English, and Russian. Daugavpils, the second largest city in Latvia with more than 80,000 inhabitants, is a four-hour drive from Minsk, the capital of Belarus. On the other hand, Riga, the third largest city in Northern Europe and the largest Baltic metropolis can be reached by car in six hours. Latvia is home to the largest ICT centre in the Baltic States, with over 6500 companies and 40,000 employees. ICT turnover in 2019 amounted to EUR 3.7 billion and represents 4.3% of GDP. In 2019, Latvia had the 16th fastest Internet in the world. Approx. 70% of start-ups established in Latvia are related to FinTech. Working in Latvia is also easy as the country ranks 19th in the world for ease of doing business (Doing Business, 2021) and 16th in the world for ease of paying taxes, making it easier for new and existing businesses to launch and scale. More than 75,000 Belarusians live in Riga, and several large Belarusian enterprises operate there. Thanks to community centres, schools, and cultural groups, Belarusian culture can be studied and maintained in a tightly-knit community.

In cooperation with the Office for Citizenship and Migration (OCMA), the Latvian Investment and Development Agency (LIAA) set up a special team to process visa applications from Belarus more quickly. Visas and residence permits available to Belarusians under the accelerated LIAA programme include entry visas for founders of innovative and scalable enterprises and their families, the EU Blue Card for highly qualified workers and their families, and a temporary visa, *i.e*. a residence permit for people who do not meet the first two requirements.

Latvia is encouraging the best minds of the Belarusian high-tech sector to relocate, offering easier-to-obtain visas, less bureaucracy in opening bank accounts, and special incentives for start-ups. The Latvian IT industry expects the arrival of Belarusians with mixed feelings. On the one hand, the industry is concerned that the privileges offered to newcomers are disrupting market relationships. On the other hand, they are strongly motivated to recruit the most talented employees thanks to the earnings as in Latvia the salaries of IT specialists are more competitive than in Belarus.

Estonia

Estonia is the country with the greatest digital opportunities worldwide. In total, 99% of financial transactions are digital. Electronic ID and Blockchain are widely used in FinTech applications. Over 80 fintechs, from innovative start-ups such as TransferWise to Guardtime, the leader of blockchain, make Estonia a global centre of excellence for fintechs. It is the most cybersecurity-advanced country in Europe, with unique knowledge on R&D and management of cybersecurity solutions and systems. Home to NATO, CCDCOE, Guardtime, and Malwarebytes, Estonia is trusted for the security of the digital economy.

In Estonia, there are no nationality exceptions in the visa application process under the Foreigners Act.

Poland

Poland has launched a special information service for the programme Poland: Business Harbor whose coordinators are GovTech Polska in the Chancellery of the Prime Minister, the Ministry of Development and the Polish Investment and Trade Agency, in cooperation with the Polish Agency for Enterprise Development and the Startup Hub Poland Foundation. The programme is aimed at three groups of beneficiaries: freelancers, *i.e*., individuals who want to move, start-ups, and enterprises. As part of the path for freelancers, regulations are being proceeded to allow Belarusians to set up a business in a much easier way. This is not a typical course of action for immigrants of other nationalities; it is an offer prepared especially for the needs of activating Belarusians. The path for start-ups includes individual help to efficiently transfer their business operations to Poland. The programme is coordinated by the Startup Hub Poland Foundation as a partner of Poland: Business Harbor. The path for enterprises is a programme coordinated by the Polish Investment and Trade Agency. Currently, software houses, as well as other IT companies interested in placing job offers on the project website through which Belarusians interested in working in one of the listed companies can apply directly. Poland has also prepared a special offer for families of IT employees who decide to work in our country. It covers not only visa matters, but also the

possibility of employment, setting up a business, and additional hours of the Polish language at school for the youngest family members. The 'special treatment' programme has also been implemented, *i.e.* as part of the government's cooperation with the Polish Hotel Holding (Gliwa, 2020), those ready to move to Poland can get accommodation on preferential terms (PAIH, 2020).

Apart from Estonia, each of the analysed countries creates a favourable environment to attract specialists from the Belarusian IT sector. According to GovTech (GovTech, 2021), after half a year of the programme Poland: Business Harbor encouraging the local strong IT sector to relocate, the percentage increased to 43%. Approximately 7% of the entire sector of Belarus has already moved to Poland, supporting the national economy and meeting the growing demand of Polish companies from the digital sector. At the same time, for almost two-thirds of IT specialists considering leaving Belarus, Poland has become the first choice, far ahead of other countries. Approx. 15% of IT specialists went to Ukraine, which ranks second, and approx. 10% to the third country in the ranking, Lithuania. Preliminary research conducted in 2020 showed that Ukraine could be very popular among Belarusian IT specialists. In early 2021, a study of the 'IT in Belarus' portal on the emigration of employees of the Belarusian IT sector was published, which indicated that Poland became the main destination for the emigration of Belarusian specialists. The research also indicated that by April 2021, 15% of IT specialists could have left Belarus.

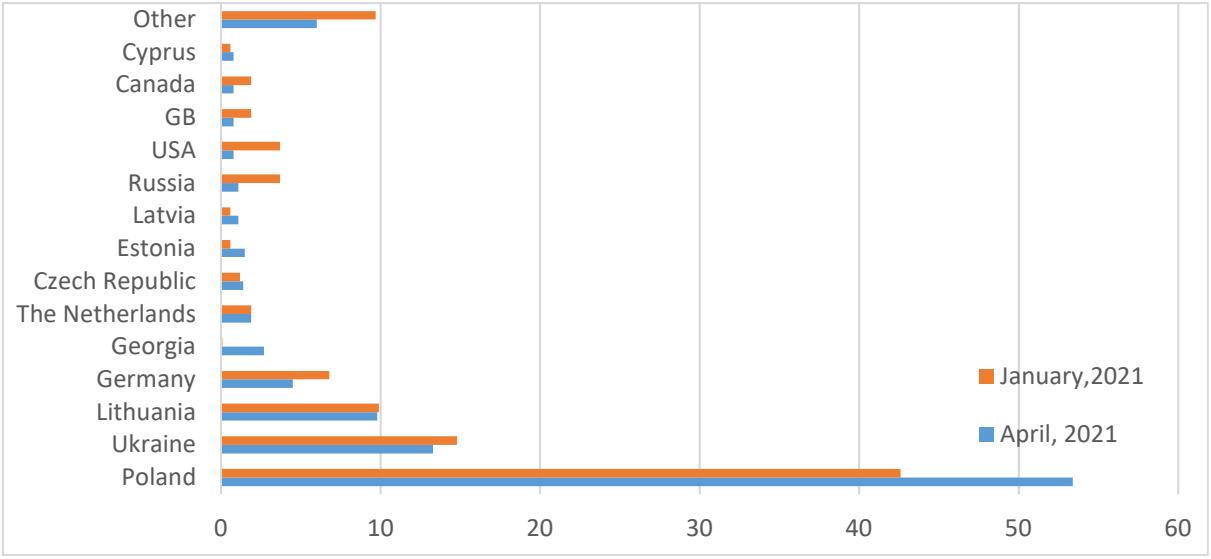

Figure 3. Purpose of trips by country, in %
Source: Aprel, 2021.

It is also noteworthy what kind of specialists leave Belarus. It turns out that IT is senior specialists who most willingly leave the country, which could not be a good prognosis for the IT sector in Belarus. At this point, it should be emphasized that these highly skilled professionals can be valuable employees in migrant destination countries.

When asked about a possible return to the country, the respondents provided very interesting answers. Approx. 33% of IT specialists have not yet decided if and when to return to Belarus. One-third of specialists who left do not exclude the possibility of returning, but on condition that the situation in the country returns to normal. Most respondents in this category are ready to wait no more than a year or two for normalization. Four said they would return anyway as they feel uncomfortable abroad. Finally, 30% will not come back at all. These data show how important political conditions are for the economy, in particular when it comes to a very innovative sector such as IT.

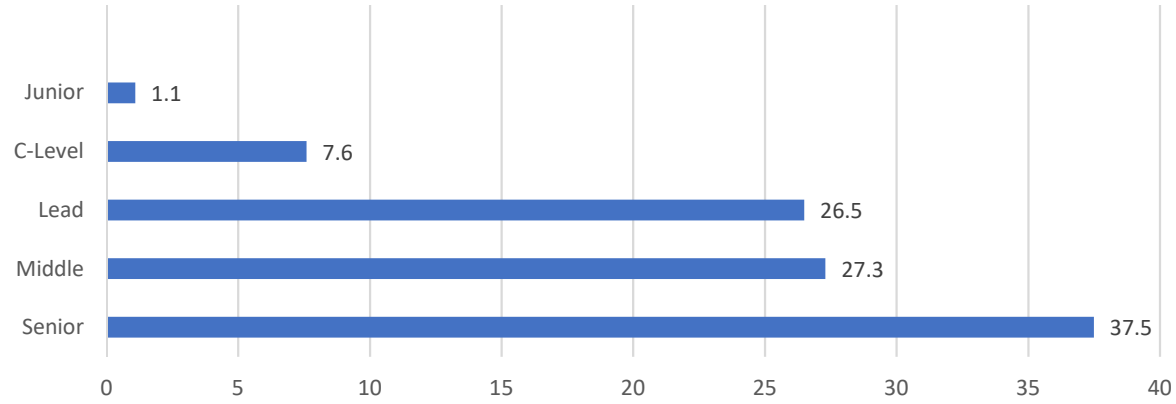

Figure 4. Type of IT specialists leaving Belarus, in %
Source: Aprel, 2021.

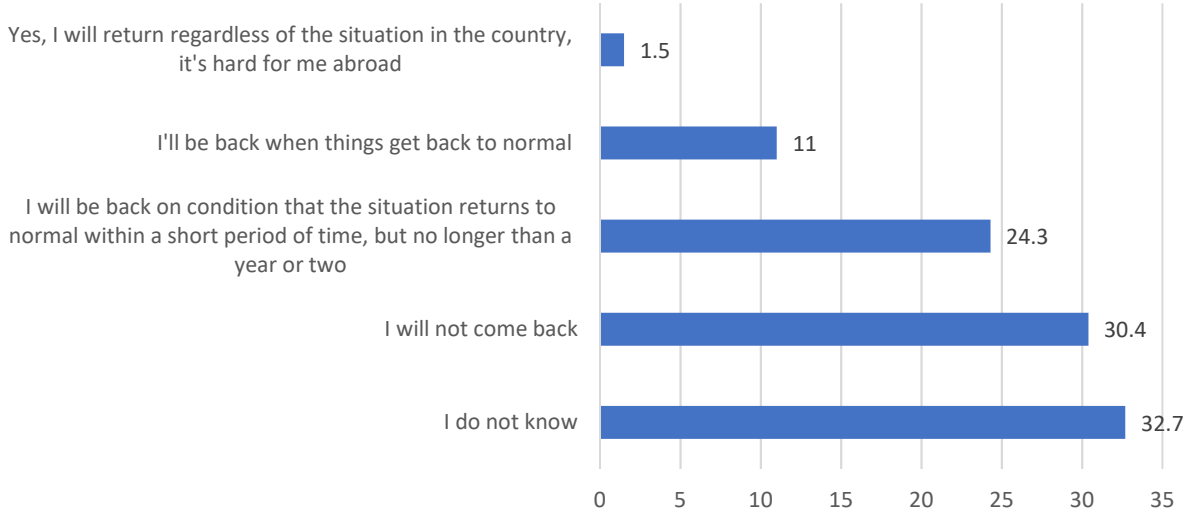

Figure 5. Planned returns, in %
Source: Aprel, 2021.

CONCLUSIONS

The political crisis in Belarus is an opportunity for the IT industry in the post-communist countries of Central and Eastern Europe. Attracting experienced professionals and technologically advanced companies can help in the development of hi-tech, as well as increase the innovation and economic competitiveness of the analysed countries. The potential of these markets is huge.

Google announced that it intends to invest up to 2 billion USD in the Google Cloud region in Poland. Microsoft is also interested in Poland; the American company announced a year ago a comprehensive investment plan worth 1 billion USD, the aim of which is to accelerate innovation and digital transformation for the development of the Polish Digital Valley. This is only one of the many examples of interest in Poland among international corporations, but it certainly demonstrates how big a chance for development the Polish IT sector has.

Both surveys and the current migration flows of the immigration preferences of Belarusian IT sector employees indicate that they are looking for stable markets with good development prospects. At the same time, these studies indicate that cultural proximity and simplified procedures could be among the most important factors when it comes to immigration destination choices. The challenge for future research is the question of the stability of these choices and whether, *e.g.*, the

destinations of current migrations are permanent, or whether the migrants will not move on to the countries of Western Europe.

The aim of the manuscript was to analyse the status of IT specialists in the labour market of selected post-communist countries: Belarus, Poland, Lithuania, Latvia, Estonia, and Ukraine. The interest of the countries neighbouring Belarus in the process of encouraging Belarusian IT specialists emigrating from their homeland has been confirmed. The manuscript has demonstrated that employees of the Belarusian IT sector are an important resource that can compensate for the shortages of specialists in the labour market of selected post-communist countries, such as Poland, Lithuania, Latvia, Estonia, and Ukraine. Belarusian IT specialists are highly qualified, which can improve the competitiveness and innovation of the host economies. Moreover, the data indicate that the most valued specialists were those leaving the country. At the same time, relocations of Belarusian companies to neighbouring countries were observed, as well as an increase in self-employment in the markets of selected post-communist countries, in which Belarusian workers play an active role.

Each study is also associated with certain limitations that affect the presentation of the results; therefore, some generalizations and incompleteness of the data used are unavoidable. To ensure the same level of publication, we limited our research to systemic instruments created by selected post-communist countries to attract IT specialists from Belarus.

It seems that the next areas of research could be topics related to the observed migration of IT specialists from countries affected by the Russia-Ukraine war, as well as from Belarus (which is indirectly involved in this conflict).

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Accrual-based earnings management and organizational life cycles: Two-dimensional analysis

Michał Comporek

ABSTRACT

Objective: The article aims to determine the relationship between the stage of a business life cycle and the scope and directions of accrual-based earnings management (AEM) in industrial companies listed on the Warsaw Stock Exchange (WSE).

Research Design & Methods: The assessment of statistical relationships between the patterns of earnings management in individual stages of an organization's life cycle (OLC) was carried out based on the Kruskal-Wallis test by ranks and the Mann-Whitney U test. The extraction of discretionary accruals was performed based on the Modified Jones model, while the Dickinson model evaluated OLC stages. The study investigated 297 industrial listed companies listed on the Warsaw Stock Exchange in the 2012-2020 period.

Findings: Empirical studies have shown that strategies of intentionally lowering the net result prevailed in the research sample. The scope of the AEM practices, estimated by discretionary accruals, was the largest in industrial companies in the growth and maturity phase. The frequency of big bath reporting was related to the OLC phases, with net losses exceeding 20% of total assets being most often reported among companies in the decline stage. On the other hand, the frequency of reporting small net incomes was even across all tested subpopulations.

Implications & Recommendations: The research indicates the need to continue scientific research on the issues of measuring the quality of reported accounting data and prediction tools of various techniques for shaping the financial result. Understanding the underlying motives and determinants that drive enterprises to performance management is a prerequisite for preventing this type of activity in business practice.

Contribution & Value Added: The article presents an innovative approach to assessing relationships between AEM and the OLC stages. It referred to examining the frequency of specific techniques of AEM (*e.g.* big bath and small net income) in companies characterized by specific patterns of generated cash flows.

Article type:	research article
Keywords:	accrual-based earnings management; life cycle stage; industrial enterprises; Warsaw Stock Exchange
JEL codes:	G30, M21, M4

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INTRODUCTION

The issues concerning the prerequisites of accrual-based earnings management (AEM) have been an area of interest since at least the 1950s (Erickson *et al*., 2006). Prevailing motives for the implementation of the AEM phenomenon identified in the literature are based on mutually interpenetrating and complementary theories, such as the agency theory (Jiraporn *et al*., 2008; Kałdoński & Jewartowski, 2017; Raoli, 2013;), the contract theory (Holthausen *et al*., 1995), the signalling theory (Fields *et al*., 2001; Smith & Pennathur, 2019), the institutional theory of the business enterprise (Jo, 2019; Stolovy & Breton, 2004;) or the threshold management theory (Degeorge *et al*., 1999; Wang *et al*., 2017). Most of them emphasize that the efforts of the management to meet the expectations of particular groups

of corporate stakeholders are limited by the competence and legal possibilities, and psychological barriers to modifying the reported financial result (Grabiński & Wójtowicz, 2019). However, research shows that managerial decisions in the context of earnings management vary depending on the corporate life cycle stage (*e.g.*, Chen, 2016; Chen, Yang, & Huang, 2010; Hussain *et al*., 2020).

The main objective of this article is to determine the relationship between the stage of a business life cycle and the values of discretionary accruals separated by the Modified Jones model (Dechow *et al*., 1995) in industrial enterprises listed on the Warsaw Stock Exchange (WSE). The outlined research approach aimed to obtain an answer to the question of whether the scope and directions of AEM practices differ significantly based on cash flow patterns suggested by Dickinson (2011). In turn, the minor objective of the article is to examine whether the frequency of reporting small income and big bath depends on the phase of the company's life cycle. The aforementioned two-dimensional perspective of the impact of the firm's life cycle on the strategies of intentional stimulation of the net profit (loss) can be considered a novelty compared to the current literature on the subject. Furthermore, an applied intra-sectoral approach allows for distinguishing specific AEM patterns in companies conducting their business activity in diversified branches of industry (*i.e*., fuels and energy, chemicals and raw materials, industrial production, construction and assembly, consumer goods sector).

This article is divided into three parts. The first part will present the theoretical backgrounds of undertaken issues. The second one will scrutinize the research framework, focusing on research methods or data samples on hand. Finally, the third part will refer to the obtained empirical results, including the verification of hypotheses and further discussion.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The implementation of the accrual principle and the resulting matching principle is accompanied by a certain degree of freedom that managers have in recognizing revenues and profits as well as costs and losses determining the financial result. The cognitive space of AEM refers to the use of the adopted policies (principles) and estimates in accounting that define implementable, often creative and non-standard practices within the framework of the applicable legal conditions. Healy and Wahlen (1999) note that AEM appears when executives use judgment in financial reporting and structuring transactions to alter reported book values to either mislead some groups of the company's stakeholders about the economic performance of the enterprise or to influence contractual outcomes that might depend on implemented accounting practices. The multitude of AEM objectives, contained in stakeholders' expectations and changing over time, both in the layer of forecasting and planning and ex-post evaluation, raises the simultaneous concerns of violating accounting standards in the processing and presenting of economic events.

Preparing a systematic classification of AEM processes in an organization can be tricky, because practically every accounting rule may be integrally associated with the earnings management phenomenon. Thus, earnings management methods can be prioritized due to the consequences (obtained results) arising from implemented actions or due to the manner of achieving the assumed aims of these activities. Following the first of the aforementioned distribution keys, the most important AEM techniques include income smoothing and big bath charges. The purpose of income smoothing is the managerial desire to reduce the fluctuations of reported results from one period to another in such a way as to present the relative stability of reported earnings in the longer term (Fudenberg & Tirole, 1995). However, when earnings are expected to fall below or significantly exceed target earnings, managers can be expected to engage in AEM to decrease the net profit or increase the net loss, implementing the big bath technique. The main motive for undertaking actions classified as a big bath is the conviction that the capital market may treat the reported high financial loss as a one-off event and will focus its attention to a greater extent on the valuation of the company based on forecasts of future profits.

The concepts of the organizational life cycle (OLC) are derived from the theory of biological determinism and are inspired by metaphors and analogies taken from the natural world. The division of the company's life cycle into phases, as well as their number, names and sequences, are contractual (*e.g.*, Drazin & Kazanjian, 1990; Miller & Friesen, 1984; Quinn & Cameron, 1983). The general

principle stated by theoreticians of OLC models assumes that the transition to the next phases of the organization's development is associated with several changes that occur in the enterprise, including changes in the company's organizational structure, management style, and the level of owner's involvement. As emphasized by Kuś and Żurakowska-Sawa (2017), in the last two decades, there has been a noticeable growth of interest in applying the OLC theory in the research in the field of accounting and finance, including the AEM phenomenon.

Previous studies on the relationship between the OLC and the practices of intentional manipulation of the reported earnings provide varied results and conclusions. Michalkova (2021) gathered evidence that tourism companies in the Visegrad countries apply accounting manipulations through AEM practices in a highly differentiated way. Firstly, she proved that enterprises in the introduction stage tend to use income-increasing discretionary accruals to manage earnings upward to the greatest extent. In turn, companies in the growth or decline phases strive to increase earnings slightly, and observed AEM activities had a similar positive value concerning variance. As a rule, firms generating cash flows characteristic for the mature and shake-out phases of the OLC might aim to reduce balance sheet results. Durana *et al*. (2021) tested the impact of the OLC on the earnings management phenomenon based on a sample of companies from the emerging economies of the CEE region. The empirical research underlined that operations aimed at increasing financial results intensified in the group of companies in the start-up and decline phases. This remark was evidenced by high, positive average values of discretionary accruals computed for these enterprises. After reaching satisfactory levels of profitability in the maturity phase, the tested companies changed the direction of intentional impact on the reported financial results, striving to reduce it. This pattern of downward earnings management is explained by the authors predominantly by tax motives. In turn, companies in the shake-out phase implemented AEM practices to the least extent, as discretionary accruals have the lowest variability among all tested OLC phases. An interesting observation is also the insight that the industry effect had a minimal effect on the scope and techniques of AEM practices in the tested sample. Different conclusions were observed by Hastuti *et al*. (2017), who by using the data panel from the Indonesian capital stock exchange, proved that the OLC did not affect the AEM activities significantly. The relevant findings were found by Indraswono and Kurniawati (2020), who gathered pieces of evidence that the values of discretionary accruals statistically differ in the growth-mature and mature-stagnant stages of the OLC. To be precise, the discretionary accruals computed for the firms in the mature phase have a mean value higher than the abnormal accruals estimated for companies in the growth phase. Da Silva Roma *et al*. (2020) found that American and Brazilian firms do not tend to manage earnings similarly across their life cycles. They underlined that companies in the early and late stages of the OLC manipulate earnings to a larger extent than the remaining groups. More specifically, they discovered that enterprises in the introduction or decline stages strive to intensify activities in the field of AEM while mature firms are less involved with this practice. Khuong and Anh (2022) examined public companies in Vietnam and discovered that during a downturn, listed enterprises show deterioration in accrual quality. In general, company executives prefer to reduce the AEM practices in the developing or mature OLC stages, which is explained by the fact that in this stage, firms tend to improve production processes, so the accounting earnings management s behaviour can decrease. Moreover, they proved that boosting reported earnings through accelerating sales and liberalizing credit policy is widespread across the company's life cycle, but in the tested sample, real earnings management (REM) activities are less likely to be used than AEM. Jaggi *et al*. (2022) found that managers intensify the AEM activities to upward the reported level of earnings during the introduction stage to demonstrate better economic results or provide a good base for the estimation of earnings in subsequent periods. In addition, due to the satisfactory actual performance or achievable market expectations for the growth and maturity phases, the lack of use of positive discretionary accruals to increase earnings is characteristic. However, they gathered evidence that managers may be motivated to adjust the reported earnings downward in the growth or maturity OLC stages to save some safety buffer for future volatile periods. Finally, in the decline stage, firms strive to manipulate earnings upward to demonstrate the economic conditions of the company in a positive way. Referring to public enterprises listed on the WSE, Comporek (2022) showed that real earnings management (REM) activities differed in a statistically significant way due to the

phase of the OLC. In the tested sample, a particular intensification of REM activities was noticeable in firms operating in the introduction or decline phases. This assumption was evidenced by high negative values of discretionary operating cash flows and positive values of discretionary production cost estimated for companies classified to the indicated sub-populations. Although these remarks do not apply to direct relationships between the OLC and AEM phenomenon, it should be noted that many researchers stress that managers can use AEM and REM practices alternately, treating them as specific substitutes of intentional impact on the reported earnings in the company (Zang *et al*., 2019).

In the vast majority of the conducted research studies, the category representing the phase of the life cycle of an enterprise is treated as one of the independent variables in regression or logit modelling, explaining the values of discretionary accruals. However, there is a lack of research into the influence of individual OLS phases on the frequency of implementing particular AEM techniques (such as big bath, income smoothing, and window dressing). These prior empirical results made it possible to assume the following research hypotheses:

H1: In the tested sample, enterprises in growth or decline OLC stages are characterized by higher earnings management than companies classified in other OLC phases.

H2: The industry effect had a statistically significant influence on the differences in applying AEM techniques in enterprises classified in a particular phase of the life cycle.

H3: The frequency of large losses and small net incomes depends on the phase of the company's life cycle.

RESEARCH METHODOLOGY

In order to assess the degree of AEM practices in the tested sample, the Modified Jones model was used (Dechow et al., 1995). The mentioned model assumes that the value of discretionary accruals (DACC) is calculated as a residual value from the following regression model:

$$\frac{TACC_{i,t}}{TA_{i,t-1}} = \alpha_1 \left(\frac{1}{TA_{i,t-1}}\right) + \alpha_2 \left(\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{TA_{i,t-1}}\right) + \alpha_3 \left(\frac{PPE_{i,t}}{TA_{i,t-1}}\right) + \varepsilon_{i,t} \quad (1)$$

where:

$TACC_{i,t}$ - total accruals of the company i in year t (calculated as a difference between net income and operating cash flows);

$TA_{i,t}$ - an average value of total assets of the company i in year t;

$REV_{i,t}$ - sales revenues of the company i in year t;

$REC_{i,t}$ - short-term receivables of the company i in year t;

$PPE_{i,t}$ - an average value of the gross property, plant, and equipment of the company i in year t;

α_i - specific regression parameters;

$\varepsilon_{i,t}$ - error term in the regression model.

The measurement of individual techniques of AEM is tricky as there is no conclusive evidence that, for example, all reported significant net losses can be treated as a result of managerial interference in the level of reported financial data. For this reason, there are alternative approaches to the big bath estimation (Behn *et al*., 1998; Elliott & Shaw, 1988; Miller & Skinner, 1998). Following the observations of Barth *et al*. (2008), this article assumes that a net loss greater than 20% of the total assets would testify about the big bath. Similarly, by comparing the values of net financial results and total assets, it is considered that net income is small if it constitutes from 0 to 0.5% of the total assets.

As mentioned earlier, the separation of individual phases of the organization's life cycle was carried out using the Dickinson (2011) approach. Dickinson points out the possibility of using eight cash flow pattern combinations based on a juxtaposition of cash flow balances at the end of the financial year and thus distinguishes five phases of the OLC (Table 1). A broader explanation of the patterns of cash flows in individual phases of the OLC based on economic theory was explained, among others, in the studies of Spence (1979), Jovanovic (1982), and Wernerfelt (1985).

The assessment of statistical relationships between the observed patterns of earnings management in individual stages of OLC was carried out primarily based on the Kruskal-Wallis test which is used to test the null hypothesis that all *k* independent samples come from populations having equal means against the alternative hypothesis that at least one population varies (Sherwani *et al*., 2021). In addition, the study used the Mann-Whitney *U* Test which is used to determine whether two independent samples are selected from populations having the same distribution (Kornacki & Bochniak, 2019). Noteworthy, the one-way analysis of variance ANOVA in this study was not used due to the failure to meet the assumptions regarding the homogeneity of variance and the distribution of results of the dependent variable in each of the analysed groups close to the normal distribution.

Table 1. Cash flow patterns of different OLC stages in industrial companies listed on the WSE in 2012-2020

Cash flow / OLC stage	Introduction	Growth	Maturity	Shake-out			Decline	
Operating cash flow	-	+	+	-	+	+	-	-
Investing cash flow	-	-	-	-	+	+	+	+
Financing cash flow	+	+	-	-	+	-	+	-

Source: own elaboration based on Dickinson (2011).

Empirical research has been carried out among industrial, public companies listed on the WSE (both on the regulated Main Market and the New Connect alternative market), that shares have been permanently traded for at least ten years with the 2011-2020 reference period. Consequently, the study investigated 297 listed companies that provided a sample of 2673 observations.

In addition, the intra-sector division of companies engaged in production activities was carried out based on the WSE sector classification standards, taking into account such variables as revenue structure based on annual reports, the structure of assets, and the Polish Classification of Activities number. In this way, the tested companies could be classified into one of the following groups: fuels and energy (sector 200: 29 enterprises), chemicals and raw materials (sector 300: 45 enterprises), industrial production, construction and assembly (sector 400: 154 enterprises), and consumer goods (sector 500: 69 enterprises). All empirical data was obtained from the Notoria Service database.

RESULTS AND DISCUSSION

The first step of empirical research was to estimate the characteristics of extracted discretionary accruals in the various stages of the company life cycle. Table 2 shows descriptive statistics of DACC separated by the Modified Jones model. The obtained data show that the lowest values of discretionary accruals were characteristic of enterprises in the growth or maturity phases. However, in each of the analyzed stages of OLC, the mean values of discretionary accruals were lower than the median values, which indicates a left-asymmetric distribution of a tested variable (left-sided asymmetry means that statistical observations cluster at feature values greater than the arithmetic mean). It is noticeable that the calculated values of discretionary accruals were characterized by intense or even very intensive volatility determined based on the coefficient of random variation, which requires particular caution in formulating grounds for reliable conclusions on implemented earnings management strategies.

Table 2. Descriptive statistics of discretionary accruals in individual stages of OLC computed for industrial companies listed on the WSE in 2012-2020

Statistical measure / OLC stage	introduction	growth	maturity	shake-out	decline
mean	-0.094	-0.344	-0.336	-0.142	-0.001
median	-0.068	-0.321	-0.329	-0.099	0.011
standard deviation	0.432	0.314	0.249	0.367	0.350
variance	0.186	0.099	0.062	0.135	0.123
CV	-4.596	-0.913	-0.741	-2.585	-350.00

Source: own elaboration.

During the investigation, using the Kruskal-Wallis test, attempts were made to examine whether the calculated values of discretionary accruals differed statistically within individual phases of the organization's life cycle. The null hypothesis of the Kruskal-Wallis test is that the mean ranks of the groups are the same. However, the results of empirical research obtained and presented in Table 3 allow for its rejection. These results mean that the size of the accounting type of earnings management in public companies listed on the WSE differed due to the phase of the company's life cycle reflected by the nature of the generated cash flows. However, the mentioned result of the Kruskal-Wallis test required further multiple comparisons, thanks to which it was possible to determine between which subpopulations there are statistically significant differences in the shaping of the *DACC* variable.

Table 3. The results of Kruskal-Wallis test comparing the distributions of the DACC variable in individual OLC stages in industrial companies listed on the WSE in 2012-2020

OLC stage	N	Mean Rank	Test statistics Kruskal-Wallis H	p-value
introduction	323	1640.44	498.938	**0.000**
growth	452	1075.69		
maturity	1060	1048.26		
shake-out	536	1606.64		
decline	302	1938.43		

Source: own elaboration.

In-depth empirical analyses, using the U Mann-Whitney test, showed potential statistical differences between the *DACC* values in the comparisons between the two groups. These studies showed that the median values of discretionary accruals in individual phases of the enterprise life cycle differed statistically in eight out of ten tested cases (Table 4). In the conducted research, no statistically significant differences in the shaping of the *DACC* coefficients were found, only in the case of comparisons of enterprises in the phases: introduction and shake-out, as well as growth and maturity.

Table 4. Pairwise comparison of the distributions of the DACC variable across OLC stages in industrial companies listed on the WSE in 2012-2020

Sample 1 -Sample 2	N	Mean Rank	Sum of Ranks	Test statistics Mann-Whitney U	p-value
I-G	323	479.54	154893.00	43429.000	**0.000**
	452	322.58	145807.00		
I-M	323	925.52	298942.00	43429.000	**0.000**
	1060	620.84	658094.00		
I-S	323	441.73	142678.00	82776.000	0.282
	536	422.93	226692.00		
I-D	323	279.65	90328.00	38002.000	**0.000**
	302	348.67	105297.00		
G-M	452	758.56	342869.00	238629.000	0.905
	1060	755.62	800959.00		
G-S	452	389.40	176009.00	73631.000	**0.000**
	536	583.13	312557.00		
G-D	452	284.65	128663.00	26285.000	**0.000**
	302	516.46	155972.00		
M-S	1060	681.45	722336.00	160006.000	**0.000**
	536	1029.98	552070.00		
M-D	1060	581.85	616760.00	54430.000	**0.000**
	302	1031.29	311443.00		
S-D	536	376.10	201588.00	57672.000	**0.000**
	302	496.53	149953.00		

Note: I – introduction stage; G – growth stage; M – maturity stage; S – shake-out stage; D – decline stage.
Source: own elaboration.

The intra-sector analysis provided several other results that are worthy of comment. In the companies in the fuels and energy sector (200) and industrial production, construction and assembly sector (400), the lowest average discretionary accruals values were shown concerning companies in the OLC stages: maturity and growth. Interestingly, the mean positive values of *DACC* coefficients extracted by the Modified Jones model were recorded for companies in the decline phase. For companies classified in the chemicals and raw materials sector (300), above-average, negative mean values of discretionary accruals were recorded for enterprises in the: introduction, growth, maturity, and shake-out stages. A similar trend accompanied the *DACC* variable distribution in the consumer goods sector (500) companies (Table 5).

Table 5. Descriptive statistics of discretionary accruals in individual stages of OLC computed for industrial companies listed on the WSE in 2012-2020 (cross-sector comparison)

Sector	Statistical measure / OLC stage	introduction	growth	maturity	shake-out	decline
200	mean	-0.085	-0.348	-0.396	-0.010	0.072
	median	-0.021	-0.248	-0.373	-0.020	0.022
	std. deviation	0.612	0.437	0.375	0.441	0.549
	variance	0.374	0.191	0.140	0.194	0.301
300	mean	-0.183	-0.431	-0.457	-0.213	-0.028
	median	-0.160	-0.424	-0.438	-0.117	-0.077
	std. deviation	0.468	0.399	0.199	0.325	0.328
	variance	0.219	0.159	0.040	0.106	0.108
400	mean	-0.039	-0.296	-0.299	-0.136	0.006
	median	-0.057	-0.274	-0.290	-0.099	0.037
	std. deviation	0.384	0.287	0.245	0.321	0.307
	variance	0.148	0.083	0.060	0.103	0.094
500	mean	-0.139	-0.369	-0.311	-0.184	-0.067
	median	-0.137	-0.365	-0.291	-0.110	-0.035
	std. deviation	0.384	0.247	0.202	0.427	0.345
	variance	0.147	0.061	0.041	0.182	0.119

Source: own elaboration.

Moreover, the statistical tests emphasized that in each of the analysed industry sectors, the calculated values of discretionary accruals differ statistically from the perspective of the phase of the organization's life cycle in which the tested enterprises are found (Table 6).

Table 6. The results of Kruskal-Wallis test comparing the distributions of the DACC variable in individual OLC stages in industrial companies listed on the WSE in 2012-2020 (cross-sector comparison)

Sector	OLC stage					Test statistics Kruskal-Wallis H	p-value
	introduction	growth	maturity	shake-out	decline		
	Mean Rank						
200	154.23	111.04	93.80	161.33	175.97	48.46	**0.000**
300	254.26	181.45	160.23	258.48	307.76	71.66	**0.000**
400	869.04	547.34	531.11	791.43	993.78	268.83	**0.000**
500	379.21	239.54	270.33	382.00	445.88	83.16	**0.000**

Source: own elaboration.

The conducted empirical research allowed for a negative verification of the first hypothesis, stating that growth and decline enterprises are characterized by a higher degree of earnings management, estimated by discretionary accruals. In the conducted analyses, it turned out that the accountant's earnings management scope was by far the largest in companies in the growth and maturity phase. Additionally, gathered shreds of evidence that the OLC stage can be considered an important factor in determining the scope of AEM practices in industrial listed companies from the WSE. However, regardless of the phase of the organization's life cycle, practices in the intentional lowering of the financial result dominated the studied sample. There was also no sufficient evidence to positively verify the

second research hypothesis that the industry effect had a statistically significant influence on the differences in applying AEM techniques in enterprises classified in a particular phase of the life cycle. The empirical research shows that regardless of the sector to which the enterprise has been classified, AEM patterns are similar. However, this remark applies to the problem of shaping the value of discretionary accruals extracted by the Modified Jones model. There is a suspicion that the separation of the discretionary accruals from other models could lead to slightly different conclusions.

The empirical research conducted showed that in 2012-2020 the frequency of reporting large losses on the net profit side of industrial companies listed on the WSE was 8.12% (Table 7). Concerning all tested enterprises, it can be noted that the frequency of net losses exceeding 20% value of the total assets was clearly differentiated depending on the OLC phase. The big bath was the least frequently shown among firms in the following OLC stages, namely: the growth stage (3.10% of all observations in a given subgroup) and the maturity stage (2.64%). In turn, the most frequent occurrence of significant net income losses was characteristic of industrial enterprises in the decline phase (22.85%). Importantly, these proportions differed in relation to the industry sector in which the economic activity was conducted. For example, in the group of companies in the 300 sectors (chemicals and raw materials), 44% of companies in the decline phase reported net losses exceeding 20% of the value of total assets. On the other hand, among the industrial enterprises belonging to the 500 sectors (consumer goods), nearly 20% of companies entering the market (introduction phase) reported the big bath phenomenon in their financial reports.

Table 7. The frequency of reporting big baths in industrial companies listed on the WSE in 2012-2020

Sector	OLC stage	introduction	growth	maturity	shake-out	decline	TOTAL
All tested companies	number of observations	44	14	28	62	69	217
	% of observations (in sub-population)	13.62	3.10	2.64	11.57	22.85	8.12
200	number of observations	5	4	3	9	8	29
	% of observations	12.82	8.16	3.57	16.36	23.53	11.11
300	number of observations	4	1	2	12	11	30
	% of observations	8.51	1.15	1.17	16.00	44.00	7.41
400	number of observations	17	6	13	27	40	103
	% of observations	11.72	2.80	2.53	8.44	20.73	7.43
500	number of observations	18	3	10	14	10	55
	% of observations	19.57	2.94	3.44	16.28	20.00	8.86

Source: own elaboration.

Contrary to the issue of the big bath charges, the frequency of small net incomes was quite similar in the studied subpopulations based on the generated cash flow patterns (Table 8). In the entire tested sample, net income constituting from 0 to 0.5% of the total assets appeared in 8.08% of observations. The phenomenon of income smoothing most often appeared in the group of enterprises in the introduction phase (8.98%) and least often in the case of mature companies (7.08%). Depending on the industry sectors in which the economic activity was conducted, the frequency of small net income in particular sub-populations could differ. Attention should be paid, among other things, to an above-average percentage of companies reporting a low and positive net profit in the group of growing enterprises of the 200 sectors (fuels and energy) or an above-average percentage of companies smoothing incomes in the growth stage, operating in the 300 sectors (chemicals and raw materials).

The empirical analyses allow for positive verification of the third research hypothesis stating that the frequency of large losses and small net incomes depends on the company's life cycle phase. However, it should be clearly emphasized that there is no clear evidence that all reported net losses which exceed the value of 20% of the balance sheet total (defined as the big bath) or fall within the range of 0-0.5% of the total assets (considered as a small net income) should be treated as a result of managerial interference in the level of reported financial data.

The existing literature indicates that different OLC phases may have diversified impacts on implemented AEM techniques. The results of empirical research were consistent with previous evidence confirming that listed companies in the maturity phase and shake-out tend to manipulate earnings downward (Durana *et al*., 2021; Michalkowa, 2021). However, unlike Jaggi *et al*. (2021), no positive average values of discretionary accruals for firms operating in the introduction or decline stages were found in the group of industrial companies listed on the WSE. It has also yet to be shown that companies from the early and late stages of the organization's life cycle intensify their earnings management activities (da Silva Roma *et al*., 2021). However, this inference may be distorted due to the high variability of the discretionary accruals computed for the enterprises in the introduction and decline phases.

Table 8. The frequency of small net income reporting in industrial companies listed on the WSE in 2012-2020

Sector	OLC stage	introduction	growth	maturity	shake-out	decline	TOTAL
All tested companies	number of observations	29	40	75	46	26	216
	% of observations (in subpopulation)	8.98	8.85	7.08	8.58	8.61	8.08
200	number of observations	2	1	4	5	4	16
	% of observations	5.13	2.04	4.76	9.09	11.76	6.13
300	number of observations	6	12	10	8	3	39
	% of observations	12.77	13.79	5.85	10.67	12.00	9.63
400	number of observations	12	19	41	28	14	114
	% of observations	8.28	8.88	7.98	8.75	7.25	8.23
500	number of observations	9	8	20	5	5	47
	% of observations	9.78	7.84	6.87	5.81	10.00	7.57

Source: own elaboration.

The presented results of empirical research may be a signpost for further analyses concerning the quality of the financial result and the phases of the organization's life cycle. From a methodological point of view, it may be worth correlating the OLC phases with the values of discretionary accruals extracted using other research tools, including regression models taking into account leading variables (Dechow *et al*., 2003), thanks to which the values of DACC coefficients would constitute an additive function of changes in revenues also in next period. In turn, expanding the range of tools for predicting the quality of reported financial data, an interesting issue seems to be examining the dependencies between the phases of the company's life cycle and earnings persistence, earnings smoothness, timely loss recognition, or abnormalities of the earnings distribution.

CONCLUSIONS

The company's life cycle can be seen as an important factor shaping each enterprise's organizational culture, leadership styles, and decision-making processes. The conducted research proved that OLC stages also influence managers' opportunistic actions to implement appropriate accrual-based earnings management techniques.

The conducted empirical research shows that the largest deviations of the discretionary accruals values from zero – which may, in principle, indicate the intensification of activities in the field of AEM – were noted in industrial companies in the growth and maturity phase. However, it should be underlined that the strategies of intentionally lowering the net financial result were dominant in all tested sample. On the other hand, the results of empirical analyses emphasize that even industrial companies in the decline phase do not show high, positive values of discretionary accruals.

Slightly different conclusions will be drawn from the analysis of the frequency of reporting big bath and small net incomes in the research sample. When it comes to the unusual big bath charges, net losses exceeding 20% of the total assets were reported particularly often in the companies of the decline phase and relatively often in the enterprises of the introduction and shake-out phases. On the contrary, the frequency of reporting small profits (not exceeding 0.5% of the balance sheet

total) was relatively homogeneous in all analysed sub-populations. In addition, the level and techniques of implementation of AEM practices varied to a greater or lesser extent depending on the industry sector in which the business was conducted.

The performed analyses do not meet the generalization condition for at least two reasons. Firstly, due to the limited nature of the research sample, they cannot be generalized to all industrial enterprises operating in the Polish capital market. Secondly, the applied research methods (such as the adopted method of extracting discretionary accruals or distinguishing the OLC phases) could have influenced the character of the obtained empirical results. However, these analyses drew attention to the need to continue scientific research on the issues of measuring the quality of reported accounting data and prediction tools of various techniques of shaping the financial result. This statement is important as understanding the underlying motives and determinants that encourage managers to implement earnings management is a prerequisite for preventing these activities in business practice.

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