

Hanna NIEDŹWIEDZIŃSKA, PhD

Institute of Information Technology, Technical University of Lodz

e-mail: hanna.niedzwiedzinska@p.lodz.pl

ORCID: 0000-0003-1327-3529

Magdalena Klaudia KOWALSKA, MSc

Faculty of Economics and Sociology, University of Lodz

e-mail: magdalena.kowalska@uni.lodz.pl

ORCID: 0000-0002-5821-0305

DOI: 10.15290/oes.2020.01.99.03

EVALUATION OF THE IMPACT OF MACROECONOMIC FACTORS ON INNOVATIVENESS OF ENTERPRISES FROM THE TSL SECTOR IN THE COUNTRIES OF CENTRAL AND EASTERN EUROPE¹

Summary

Purpose – The main objective of the article is to assess the impact of the macroeconomic environment on the innovativeness of enterprises of the TSL sector in the countries of Central and Eastern Europe in 2010-2016 with the forecast for 2017-2018.

Research method – The paper has been divided into the theoretical and practical part. The first part is based on the subject literature and refers to the theoretical aspect of innovation and innovativeness of enterprises. The second part is empirical. Two synthetic indicators were created – a synthetic index of innovativeness of enterprises operating in the TSL sector and conducting their activities in the countries of Central and Eastern Europe, and a synthetic macroeconomic indicator of the countries of Central and Eastern Europe. Next, a forecast based on the extrapolation of the trend was made and the relationships between the analyzed synthetic indicators were examined using the Ordinary Least Squares Method.

Results – Based on the research, it can be concluded that in Central and Eastern Europe there is a statistically significant relationship between the synthetic macroeconomic indicator and the synthetic indicator of the innovativeness of enterprises in the TSL sector.

Originality – Evaluation of the impact of macroeconomic factors on the innovativeness of enterprises of the TSL sector in the countries of Central and Eastern Europe.

Keywords: innovations, innovativeness of enterprises, enterprises of the TSL sector, macroeconomic factors, Central and Eastern Europe

JEL Classification: O12, O31, O32, F0

¹ Article received on 27 June 2019, accepted on 2 December 2019.

1. Introduction

Economic entities operate on the market in mutual dependence with the environment (macro and micro). The effectiveness of their functioning is largely conditioned by the degree of adaptation to various elements of the environment. Nowadays, enterprises, in order to function and develop, must actively react to changes taking place in the environment. Enterprises from the TSL sector (Transport-Shipping-Logistics), like all other economic entities, undertake activities that are aimed at adapting to the changes taking place in the environment and improving their competitive position on the market. Enterprises implement new ideas and innovations, which translates into financing research on new technologies, in a self-perpetuating mechanism of searching for new solutions and, at the same time, developing on a micro (enterprise development) and macro (economic development of the country) scale.

The main aim of the article is to assess the impact of the macroeconomic environment on the innovativeness of enterprises of the TSL sector in the countries of Central and Eastern Europe in 2010-2016 with the forecast for 2017-2018.

The level of innovativeness of the TSL sector enterprises, especially internationally, is poorly discussed and requires a number of research activities. The authors have attempted to fill the gap in research related to the level of innovativeness of the TSL sector companies in Central and Eastern Europe.

2. The essence of innovation

The concept of innovation has a very broad meaning and indefinite character. It is an interdisciplinary category, described and considered from many perspectives using various methods and techniques of scientific analysis [Duraj, Papiernik-Wojdera, 2010].

The literature on the subject distinguishes a narrow (Latin: *sensu stricto*) and a wide (Latin: *sensu largo*) way of defining the concept of innovation. In the narrow perspective, innovation is a complete novelty, the first application of the invention, whereas the broad approach emphasizes its process character and includes factors determining the processes of creating and developing new values [Niedzielski, Rychlik, 2006].

The broad approach to the concept of innovation was presented, among others, by Schumpeter [1960], Drucker [1992], Kotler [1999], Schippers, West and Dawson [2015]. Schumpeter [1960] described innovation as “one of the basic factors of economic development”, which includes [Szafranowicz, 2019]:

- introduction of new products,
- application of new production methods,
- opening new sales markets,
- acquiring new sources of supply of raw materials and other resources,
- creating new market structures within a given type of activity.

The relationship between innovation and development is also emphasized by Drucker. He puts emphasis on the economic and social dimension of innovations that permeate all spheres of business operations. According to Drucker [1992], innovation is “an art that gives resources a new opportunity to create wealth”. In marketing terms, in turn, innovation is perceived as “an idea, product or technology element developed, implemented and presented to customers who perceive it as new or innovative” [Kotler, 1999]. Schippers, West and Dawson [2015] define innovation as “intentionally presenting and applying ideas, processes, products or procedures that are new to a given job, work team or organization and which are designed to bring benefits. Innovation includes creativity and the use of its products”.

The narrow approach to the term innovation was presented, among others, by Mansfield [1968], Freemann [1982], Kuznets. According to Mansfield [1968], “innovation is the first application of the invention”. Freeman [1982] described innovation as “the first commercial introduction (application) of a new product, process or device”. Innovation, according to Kuznets, is “the use of new or old knowledge initiating the application of the invention” [Sopińska, Mierzejewska, 2017].

The literature on the subject by Polish researchers also distinguishes a narrow and a broad approach to the concept of innovation.

The broad approach to the concept of innovation was presented, among others, by Białoń [2010], Bal-Woźniak [2012], Sopińska and Mierzejewska [2017]. According to Sopińska and Mierzejewska [2017], perceiving innovation broadly means “creative changes not only in technology and the social system, but also in the structure of the economy, and even in the natural environment”. In contrast, Bal-Woźniak [2012] defines innovation as “the management process, covering various activities that lead to the creation, development and introduction of new values in products or new combinations of resources that are new to the entity creating or introducing them”. Białoń [2010] treats innovations as “processes changing economic and social systems, the effect of which is, among others, an increase in the usability of products, services and technological processes”.

Among Polish scientists, proponents of the narrow approach to innovation include, among others: Piaseczny and Więckowski [1981], Duraj and Papiernik-Wojdera [2010] and Baruk [2013]. According to Piaseczny and Więckowski [1981], innovation is “a discovery resulting from the invention of people causing progressive changes in certain states of affairs”. Duraj and Papiernik-Wojdera [2010] recognize innovation as “transforming ideas into specific products or services that meet specific needs while generating profit, increasing capital and building the company’s competitive advantage”. According to Baruk [2013], innovation is “a change for the first time implemented and intentionally designed by man. This change may concern: the product, the production process, work organization, management methods or marketing, and its goal is to achieve socio-economic benefits”.

The definitions presented above demonstrate different approaches to innovation, often depending on the aspect in which innovations were analyzed by their authors. They prove that it is not possible to create one universal definition of innovation, but only to identify the determinants that it should have.

For the purposes of this study, the authors assumed that innovation is a purposeful, beneficial change in any area of the enterprise's activity, the aim of which is to improve the effectiveness of the enterprise's operation and / or increase the usability of its effects for the environment. The study was conducted based on the definition of innovation presented by the OECD, which assumes that innovation is "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" [www 1] and on the following classification of innovations [Podręcznik Oslo..., 2008]:

- technological product innovation,
- technological process innovation,
- organizational innovation,
- marketing innovation.

3. Innovativeness of the TSL sector enterprises

The innovativeness of enterprises is defined in a very diverse way by Polish and foreign researchers. Table 1 presents selected definitions of innovativeness of enterprises. Most researchers describe the enterprise's search for new solutions as a response to changes in the environment (both changes in customer needs and changing elements of the organizational environment – e.g. in technology). The authors of the concept of innovativeness of enterprises define it as a process whose final stage is the implementation of a new idea. Therefore, the innovativeness of enterprises is not only the ability of an organization to create an idea, but, due to the fact that it should lead to economic and social benefits, it must end with the introduction of innovation on the market.

TABLE 1

Enterprise innovativeness – selected definitions

Definition of innovativeness of enterprises
“Innovativeness is the process of introducing qualitative changes in the sphere of technology, work organization, management and marketing. These changes lead to the creation of a new product or its significant modernization or affect the production process. The economic result of innovation is the improvement of operational efficiency” [Nowa encyklopedia ..., 1998].
“Innovativeness of enterprise is the ability to create new and improve the existing products, processes, management systems and organizations” [www 2].
“Innovativeness is treated as an attribute of a company, its ability to introduce innovations that can be measured and evaluated. It's the ability to create something new or make significant changes” [Hilami et al., 2010].
“Innovativeness of enterprise includes the willingness (tendency) to be innovative and the ability to introduce new products, services or ideas up to their implementation, which leads to better business results” [Dobni, 2010].

“Innovativeness is associated with a process, action that results in innovation” [Grzybowska, 2012].
“Innovativeness of enterprise is understood as the ability to generate and introduce new technical, organizational and social solutions to the global market” [Łyżwa, 2014].

Source: own elaboration on the basis: [*Nova encyclopedia* ..., 1998; Hilami et al., 2010; Dobni, 2010; Grzybowska, 2012; Łyżwa, 2014; www 2].

The TSL sector has been quite widely analyzed in the literature on the subject. However, there is a lack of detailed research showing the level of innovativeness in this sector. Most of the information regarding the innovativeness of the TSL sector enterprises refer to specific solutions proposed by transport and forwarding enterprises as well as specialized logistics operators. A lot of attention is drawn to new market services, new rules for process organization or innovativeness solutions supporting the implementation of logistics services (table 2). However, the level of innovativeness of the TSL sector enterprises, especially internationally, is poorly discussed and requires a number of research activities.

TABLE 2

Examples of innovative activities in the TSL sector

Type of innovation	Innovative activities
Technological (product + process)	Just-in-Time Service, JiS
	Cross-Docking Service
	Track & Trace
	New methods of transshipment
	Automatic identification systems – barcodes, RFID
	GPS
Organizational	Electronic collaboration platforms, e.g. T-Scale, MonZa
	Integration by the 4PL operator
	Creating relationships – cooperation agreements, consortia, clusters
Marketing	Sale of services through transport exchanges
	Customer needs and satisfaction research
	Loyalty programs

Source: [Przybylska, 2016].

4. Purpose and methodology of the study

The aim of the study is to assess the impact of the macroeconomic environment on the innovativeness of enterprises in the TSL sector in the countries of Central and Eastern Europe in 2010-2016 with the forecast for 2017-2018.

The research area includes enterprises operating in: Bulgaria, Croatia, the Czech Republic, Estonia, Lithuania, Latvia, Poland, Romania, Slovakia, Slovenia and Hungary (the common feature of these countries is their membership in the European Union).

The data used in the analysis come from the European Statistical Office (Eurostat). The research period is 2010-2016 (the need to narrow the analysis down to such a short period results from the availability of the necessary data for analysis). The survey was based on the Statistical Classification of Economic Activities in the European Community – section H – transport and storage, which includes the following departments [www 3]:

- 49 – land transport and pipeline transport,
- 50 – water transport,
- 51 – air transport,
- 52 – storage and service activities supporting transport,
- 53 – postal and courier activities.

The assessment of the impact of the macroeconomic environment on the innovativeness of enterprises in the TSL sector in Central and Eastern Europe in 2010-2016 has been made on the basis of two synthetic indicators – a synthetic macroeconomic indicator of Central and Eastern Europe and a synthetic index of innovativeness of enterprises conducting their activities in the countries of Central and Eastern Europe.

A synthetic macroeconomic indicator of Central and Eastern Europe consists of the main macroeconomic indicators, which, according to the authors, describe the state of the economy of the countries of Central and Eastern Europe.

A synthetic index of innovativeness of enterprises conducting their activities in the countries of Central and Eastern Europe consists of the main financial indicators, which, according to the authors, have a significant impact on the level of enterprise innovation. These are: turnover or gross premiums written, investment rate, expenditure on R&D and indicators which were selected based on the literature of the subject, defining and determining the types of innovations – product, process, organizational and marketing. The selection and number of indicators was limited due to the availability of data on all departments of the H sector – transport and storage.

The integrated macroeconomic indicator for Central and Eastern European countries for 2010-2016 was calculated in accordance with the standardized sums method, taking into account the assumption that the macroeconomic indicator of Central and Eastern European countries is equal to the sum of sub-indices:

- stimulants:
 - x1 – gross domestic product (GDP) [million euro],
 - x2 – trade balance [million euro],
- destimulants:
 - x3 – unemployment rate [percentage],
 - x4 – harmonized index of consumer process (HICP) [percentage].

The integrated innovativeness indicator of enterprises from the TSL sector operating in Central and Eastern Europe in 2010-2016 was calculated in accordance with the standardized sums method, taking into account the assumption that the innovativeness of enterprises in the TSL sector is equal to the sum of sub-indices:

– stimulants:

- y1 – enterprises [number],
- y2 – turnover or gross premiums written [million euro],
- y3 – investment rate (investment/value added at factors cost) [percentage],
- y4 – expenditure on R&D [million euro],
- y5 – product and process innovation [number],
- y6 – organization and marketing innovation [number].

Selected diagnostic variables (presented in the form of stimulants and destimulants) differ in units, therefore it is necessary to normalize the variables – deprivation of variable titres and unification of orders of magnitude in order to achieve comparability. In order to normalize the variables, the unitarization method was applied. The procedure of unitization of variables requires the following formula [Dziewięcki, 2014]:

– stimulants:
$$S = \frac{x_{ij} - \min x_i}{\max x_i - \min x_i}$$

– destimulants:
$$D = \frac{\max x_i - x_{ij}}{\max x_i - \min x_i}$$

where:

S, D – normalized value of a characteristic for the examined unit,

x_{ij} – value of the j-th feature for the examined unit,

max – the maximum value of the j-th feature,

min – the minimum value of the j-th feature.

The synthetic macroeconomic indicator of Central and Eastern European countries and the synthetic index of innovativeness of enterprises operating in the Central and Eastern European countries were created assuming the same impact of indicators on the aggregate value based on the following formula [Nowak, 1995]:

$$S_j = \frac{1}{n} \sum_{i=1}^n S_{ij},$$

where:

S_j – aggregated meter for j-th year,

n – number of indicators used in the model.

Then, a statistical regression analysis was carried out. In order to determine the linear functional dependence – the impact of the macroeconomic environment on the development of the explained variable, as the innovativeness of enterprises of

the TSL sector in the countries of Central and Eastern Europe in 2010-2016 (Y) – an econometric model was constructed. The analysis was carried out using Ordinary Least Squares Method. The linear regression model adopted the following form [Misztal, 2015]:

$$Y = \alpha_0 + \alpha_1 X_1 + \varepsilon,$$

where:

Y – explained variable (integrated indicator of innovativeness of enterprises from the TSL sector in the countries of Central and Eastern Europe),

X₁ – explanatory variable (integrated macroeconomic indicator of Central and Eastern European countries),

α_0, α_1 – model parameters,

ε – random component (the rest of the model).

The study was extended by adding the projection of synthetic indicators for 2017-2018 based on the method of extrapolating the trend, assuming that the indicators should not change significantly compared to the previous period.

5. The result of research

The study was conducted on the TSL sector enterprises which carried out their activities in Central and Eastern Europe in 2010-2016. The research sample is presented in table 3. The average number of enterprises in the research period was 323,911. In 2010, 310,799 companies from the TSL sector operated in Central and Eastern Europe, while in 2016, there were 349,375 of them (an increase by 38,576 enterprises).

TABLE 3

Research sample

Country	Year						
	2010	2011	2012	2013	2014	2015	2016
Bulgaria	19 084	19 062	19 003	19 461	20 304	21 223	22 711
Croatia	10 853	9 815	9 208	8 839	8 642	8 562	8 372
Czech Republic	39 341	41 153	40 064	38 944	38 610	38 159	38 439
Estonia	4 027	4 232	4 479	4 761	4 842	5 052	5 244
Hungary	30 731	30 254	28 578	26 730	26 137	27 039	27 668
Latvia	5 570	5 426	6 303	6 560	6 951	7 307	7 654
Lithuania	6 792	7 331	9 843	10 776	11 595	12 314	13 603
Poland	138 649	145 939	141 739	135 210	140 736	145 993	153 586
Romania	32 774	31 713	34 064	36 127	39 666	41 746	44 504
Slovakia	14 290	16 783	16 734	16 389	16 578	18 039	19 020

Country	Year						
	2010	2011	2012	2013	2014	2015	2016
Slovenia	8 688	8 510	8 491	8 432	8 313	8 445	8 574
Total	310 799	320 218	318 506	312 229	322 374	333 879	349 375

Source: own elaboration on the basis: [www 3].

As a result of the study, synthetic innovativeness indicators of enterprises from the TSL sector conducting their activity in the countries of Central and Eastern Europe (2010-2016) were obtained (table 4). Integrated indicators can take values from 0 to 1 (the higher the level of indicator, the higher the level of innovativeness of the company).

TABLE 4

Synthetic indexes of innovativeness of the TSL sector – Central and Eastern Europe (2010-2016)

Year	Synthetic indexes of innovativeness of the TSL sector										
	Bulgaria	Croatia	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia
2010	0.404	0.312	0.310	0.455	0.557	0.130	0.147	0.400	0.368	0.149	0.589
2011	0.350	0.228	0.698	0.637	0.425	0.337	0.307	0.433	0.383	0.310	0.528
2012	0.267	0.122	0.599	0.680	0.248	0.611	0.354	0.279	0.403	0.325	0.255
2013	0.232	0.233	0.486	0.599	0.361	0.539	0.572	0.328	0.373	0.560	0.285
2014	0.230	0.658	0.303	0.283	0.444	0.468	0.574	0.544	0.459	0.501	0.342
2015	0.427	0.532	0.350	0.272	0.511	0.689	0.524	0.580	0.643	0.559	0.344
2016	0.815	0.600	0.504	0.353	0.581	0.845	0.681	0.676	0.671	0.589	0.339

Source: Source: own elaboration on the basis: [www 3].

The highest value of the integrated index of innovativeness of enterprises in the TSL sector can be observed in (table 2): Latvia (2016) – 0.845; Bulgaria (2016) – 0.815; the Czech Republic (2011) – 0.698.

The lowest value of the integrated index of innovativeness of enterprises in the TSL sector can be observed in (table 2): Croatia (2012) – 0.122; Latvia (2010) – 0.130; Lithuania (2010) – 0.147.

The individual integrated innovativeness indicators of enterprises from the TSL sector conducting their activity in the countries of Central and Eastern Europe (2010-2016) made it possible to create a synthetic index of innovativeness of enterprises from the TSL sector conducting their activity in the countries of Central and Eastern Europe (2010-2016 together with the forecast for 2017-2018) (table 5). Taking into account the results of the study, the synthetic index of innovativeness of enterprises from the TSL sector conducting their activity in the countries of Central and Eastern Europe (2010-2016) in 2010-2011 is characterized by an upward trend.

In 2012, there was a decline in the index, but in the years from 2013 to 2016, an increase could be observed – the development of innovativeness of enterprises from the TSL sector in Central and Eastern Europe. The indicator forecast displays an increase in innovativeness of enterprises from the TSL sector in the countries of Central and Eastern Europe in 2017-2018.

TABLE 5
Synthetic indicator of innovativeness of the TSL sector – Central and Eastern Europe (2010-2016 with the forecast for 2017-2018)

Year	Synthetic indicator of innovativeness of the TSL sector – Central and Eastern Europe
2010	0.347
2011	0.421
2012	0.377
2013	0.415
2014	0.437
2015	0.494
2016	0.605
2017	0.611
2018	0.617

Source: own elaboration on the basis: [www 3].

As a result of the study, synthetic macroeconomic indicators of the countries of Central and Eastern Europe were obtained (table 6).

TABLE 6
Synthetic macroeconomic indicators – Central and Eastern Europe (2010-2016)

Year	Synthetic macroeconomic indicators of the TSL sector										
	Bulgaria	Croatia	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia
2010	0.450	0.570	0.272	0.431	0.380	0.460	0.393	0.238	0.391	0.269	0.394
2011	0.485	0.472	0.329	0.530	0.298	0.453	0.411	0.213	0.321	0.174	0.373
2012	0.423	0.340	0.281	0.544	0.392	0.540	0.556	0.248	0.288	0.364	0.306
2013	0.481	0.348	0.380	0.655	0.268	0.680	0.670	0.461	0.284	0.503	0.283
2014	0.577	0.446	0.536	0.802	0.307	0.748	0.756	0.571	0.248	0.634	0.451
2015	0.700	0.589	0.676	0.865	0.320	0.820	0.780	0.764	0.184	0.692	0.599
2016	0.873	0.794	0.837	0.872	0.415	0.878	0.836	0.860	0.324	0.869	0.700

Source: own elaboration on the basis: [www 3].

The highest value of the integrated index of macroeconomic indicators of the countries of Central and Eastern Europe can be observed in (table 6): Latvia (2016) – 0.878; Bulgaria (2016) – 0.873; Estonia (2016) – 0.872.

The lowest value of the integrated index of macroeconomic indicators of the countries of Central and Eastern Europe can be observed in (table 6): Romania (2015) – 0.184; Slovakia (2011) – 0.174; Poland (2011) – 0.213.

The synthetic macroeconomic indicator of the countries of Central and Eastern Europe (2010-2016 together with the forecast for 2017-2018) is characterized by an upward trend in 2011-2016 and in the forecast for 2017-2018 (table 7).

TABLE 7

**Synthetic macroeconomic indicator – Central and Eastern Europe
(2010-2016 with the forecast for 2017-2018)**

Year	Synthetic macroeconomic indicator – Central and Eastern Europe
2010	0.386
2011	0.369
2012	0.389
2013	0.456
2014	0.552
2015	0.635
2016	0.751
2017	0.823
2018	0.856

Source: own elaboration on the basis: [www 3].

As a result of the estimation with the Ordinary Least Squares Method, the following equation was created in which the explanatory variable is statistically significant: Y (synthetic indicator of innovativeness of TSL sector enterprises (Central and Eastern Europe)) = $0.175 + 0.526 X1$ (synthetic macroeconomic indicator (Central and Eastern Europe)).

The results of the estimation indicate a large fit of the analyzed explanatory variable to the model (coefficient of determination = 0,932). Functional dependence of the synthetic index of innovativeness of the TSL sector (for Central and Eastern Europe) occurs when the explanatory variable is a synthetic macroeconomic indicator (for Central and Eastern Europe) (table 8).

TABLE 8

**Results of Ordinary Least Squares Method in the period of 2010-2018 –
the impact of the macroeconomic environment on the innovativeness of
enterprises of the TSL sector in the countries of Central and Eastern Europe**

Dependent variable	OLS	Co-efficient	SD	P- value	R ²	DW
Synthetic indicator of innovativeness of the TSL sector – Central and Eastern Europe	Constant	0.175	0.032	0.0010***	0.932	2.421
	Synthetic macroeconomic indicator – Central and Eastern Europe	0.526	0.053	2.34e-05***		

Source: own elaboration on the basis: [www 3].

6. Conclusions

The study was conducted on enterprises from the TSL sector, which operated in Central and Eastern Europe in the years 2010-2016.

As a result of the study, individual synthetic indicators of innovativeness of the TSL sector enterprises operating in Central and Eastern European countries were estimated (2010-2016). The highest level of innovativeness index of enterprises in the TSL sector was observed in 2016 in Latvia, which could be due to the introduction of new services, new rules for process organization or innovativeness solutions supporting the implementation of logistics services. The lowest level of innovativeness index of enterprises in the TSL sector was observed in 2012 in Croatia, which means that in 2012 Croatian enterprises in the TSL sector invested insignificantly in the development of innovativeness (low expenditure on innovation, no implementation of new services, processes). Individual integrated innovativeness indicators of enterprises from the TSL sector operating in the countries of Central and Eastern Europe (2010-2016) made it possible to create a synthetic indicator of innovativeness of enterprises from the TSL sector operating in the countries of Central and Eastern Europe (2010-2016 with the forecast for 2017-2018). Taking into account the results of the study, this indicator in the years 2010-2011 and 2013-2018 is characterized by an upward trend – the development of innovativeness of enterprises from the TSL sector operating in the countries of Central and Eastern Europe, which should be viewed as a positive phenomenon.

Individual synthetic macroeconomic indicators of Central and Eastern European countries (2010-2016) were also estimated for the needs of the study. The highest level of the macroeconomic indicator was observed in 2016 in Latvia, which means that the state of the economy in this period was rated best, while the lowest in 2011 in Slovakia, which means that the state of the economy in this period was rated the worst. On the basis of individual integrated macroeconomic indicators of the countries of Central and Eastern Europe (2010-2016) a synthetic macroeconomic

indicator of the countries of Central and Eastern Europe (2010-2016 together with the forecast for 2017-2018) was created. It is characterized by an upward trend in 2011-2016 and in the forecast for 2017-2018, which should be viewed as a positive phenomenon.

In the final stage of the study, the relationships between the analyzed synthetic indicators were examined using the Ordinary Least Squares Method. It led to the conclusion that in Central and Eastern Europe there is a statistically significant relationship between the synthetic macroeconomic indicator and the synthetic indicator of the innovativeness of enterprises in the TSL sector.

Further research will be devoted to extended analysis concerning the impact of individual components of the synthetic macroeconomic indicator of Central and Eastern European countries on the innovativeness of enterprises of the TSL sector in the countries of Central and Eastern Europe.

References

- Bal-Woźniak T., 2012, *Innowacyjność w ujęciu podmiotowym. Uwarunkowania instytucjonalne*, PWE, Warszawa.
- Baruk J., 2013, *Innowacje jako czynnik sukcesu organizacji*, „Zarządzanie i Finanse”, nr 4(1), s. 7-16.
- Białoń L., 2010, *Zarządzanie działalnością innowacyjną*, Placet, Warszawa.
- Dobni C.B., 2010, *The relationship between an innovation orientation and competitive strategy*, “International Journal of Innovation Management”, vol. 14, no. 2, pp. 331-357, DOI: 10.1142/S1363919610002660.
- Drucker P., 1992, *Innowacje i przedsiębiorczość. Praktyka i zasady*, PWE, Warszawa.
- Duraj J., Papiernik-Wojdera M., 2010, *Przedsiębiorczość i innowacyjność*, Difin, Warszawa.
- Dziekański P., 2014, *Koncepcja wskaźnika syntetycznego oceny poziomu rozwoju gmin wiejskich województwa świętokrzyskiego w warunkach globalizacji*, „Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego w Warszawie. Problemy Rolnictwa Światowego”, t. 14(29), z. 3, s. 61-70.
- Freeman C., 1982, *The Economics of Industrial Innovation*, Printer, London.
- Grzybowska B., 2012, *Innowacyjność przemysłu spożywczego – ujęcie regionalne*, Wydawnictwo UWM, Olsztyn.
- Hilami M.F, Ramayah T., Mustapha Y., Pawanchik S., 2010, *Product and Process Innovativeness: Evidence from Malaysian SMEs*, „European Journal of Social Science”, vol. 16(4), pp. 557-568.
- Kotler P., 1999, *Marketing. Analiza, planowanie, wdrażanie i kontrola*, Wydawnictwo Felberg SJA, Warszawa.
- Łyżwa E., 2014, *Innowacyjność przedsiębiorstw a konkurencyjność regionów*, Wydawnictwo Uniwersytetu Jana Kochanowskiego, Kielce.
- Mansfield E., 1968, *Industrial Research and technological Innovation*, W.W. Norton, New York.

- Misztal A., 2015, *Analiza czynników zwnętrznych determinujących rentowność przedsiębiorstw*, „Zeszyty Naukowe Ostrołęckiego Towarzystwa Naukowego”, nr 29, s. 223-231.
- Niedzielski P., Rychlik K., 2006, *Innowacje i kreatywność*, Uniwersytet Szczeciński, Szczecin.
- Nowa encyklopedia powszechna*, 1998, Wydawnictwo PWN, Warszawa.
- Nowak E., 1995, *Rachunkowość menedżerska*, Wydawnictwo Akademii Ekonomicznej im. Oskara Lanego we Wrocławiu, Wrocław.
- Piaseczny L., Więckowski J., 1981, *Ekonomika przedsiębiorstwa*, PWE, Warszawa.
- Podręcznik Oslo. Zasady gromadzenia i interpretacji danych dotyczących innowacji*. OECD, 2008, Ministerstwo Nauki i Szkolnictwa Wyższego, Departament Strategii i Rozwoju Nauki.
- Przybylska E., 2016, *Innowacyjność branży TSL*, „Zeszyty Naukowe Politechniki Częstochowskiej”, nr 24, t. 2, s. 235-245.
- Schippers M.C., West M.A., Dawson J.F., 2015, *Team Reflexivity and Innovation: The Moderating Role of Team Context*, “Journal of Management”, no 41, iss. 3, pp. 769-788, DOI: 10.1177/0149206312441210.
- Schumpeter J., 1960, *Teoria rozwoju gospodarczego*, PWN, Warszawa.
- Sopińska A., Mierzejewska W., 2017, *Otwarte innowacje produktowe realizowane przez przedsiębiorstwa działające w Polsce. Podejście zasobowe*, Oficyna Wydawnicza SGH, Warszawa.
- Szafranowicz M., 2019, *Innowacje produktowe i ich uwarunkowania na przykładzie Protektor S. A.*, „Studia i prace Kolegium Zarządzania i Finansów”, z. 171, s. 115-134.
- www 1, https://read.oecd-ilibrary.org/science-and-technology/oslo-manual-2018_9789264304604-en#page27 [date of entry: 20.09.2019].
- www 2, <http://imik.wip.pw.edu.pl/innowacje7/strona9.htm> [date of entry: 20.09.2019].
- www 3, https://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=PL&IntPcKey=18512354&StrLayoutCode=HIERARCHIC [date of entry: 20.04.2019].