Acta Montanistica Slovaca
ISSN 1335-1788
actamont.tuke.sk

Employment Perspectives and Current Trends in the Mining and Quarrying Industry in the European Union

Ján SIBERT[1], Ivana PETROVSKÁ[2], Karolína BORTÁKOVÁ[3], Katarína ČEREVKOVÁ[4] and Dávid KRASNIČI[5]*

Authors' affiliations and addresses:
[1] Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies
Letná 9, 042 00 Košice, Slovak Republic
e-mail: jan.sibert@student.tuke.sk

[2] Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies
Letná 9, 042 00 Košice, Slovak Republic
e-mail: ivana.petrovska@student.tuke.sk

[3] Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies
Letná 9, 042 00 Košice, Slovak Republic
e-mail: karolina.bortakova@student.tuke.sk

[4] Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies
Letná 9, 042 00 Košice, Slovak Republic
e-mail: katarina.cerevkova@student.tuke.sk

[5] Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies
Letná 9, 042 00 Košice, Slovak Republic
e-mail: david.krasnici@student.tuke.sk

***Correspondence:**
Ján Sibert, Technical University of Košice
Faculty of Mining, Ecology, Process Control and Geotechnologies, Letná 9, 042 00 Košice, Slovak Republic
e-mail: jan.sibert@student.tuke.sk

How to cite this article:
Sibert, J., Petrovská, I., Bortáková, K., Čerevková, K., and Krasniči, D. (2024). Employment Perspectives and Current Trends in the Mining and Quarrying Industry in the European Union. *Acta Montanistica Slovaca*, Volume 28 (4), 929-940

DOI:
https://doi.org/10.46544/AMS.v28i4.11

Abstract
Employment represents a comprehensive field in the mining and quarrying sector. It is related to many aspects of the macroeconomic situation. The two fundamental indicators explored in the analysis are in the forms of the production value and the value added at factor cost. The main employed methodology is a regression analysis technique, where the explained variable is represented by the value added in the mining and quarrying sector. The explanatory variables are the following ones: employment, labour productivity, wage, labour input in industry, and turnover. The examined area includes all the 27 European Union member countries with the other selected European countries. The data set covers the time period from 2011 to the year 2020. The Discussion section offers a comparison with the other research studies. The elementary findings are confirmed in the outcomes related to the research hypotheses and the research questions. All the research hypotheses are rejected, so all the five explored indicators are proved to be statistically significant. Moreover, the research questions demonstrate the potential indicators that will play a key role in future development of the mining and quarrying industry. They will serve as a basement for policymakers in order to create the policies for enhancement macroeconomic area of the examined industrial sector.

Keywords
employment, mining, mining and quarrying sector, regional development, European Union

Introduction

The mining and quarrying industry sector represents an essential sector of the primary sphere of the country economy. For instance, firms in mining industry make crucial contributions on international trade activities, GDP volumes (Civelek et al., 2022) and labour creation of countries (Ključnikov et al., 2022a). Therefore, governments implement some socio-economic, legal and political strategies to increase competitiveness and conditions of markets (Matijová et al., 2023; Soltes and Gavurova, 2015). For instance, governments frequently deliberate the potential influences of the various possibilities on employment in setting policy or in an exploration the particular field for projects in the mining and quarrying industry sector. There are several ways how employment can impact the country economy. It is important to reveal the relations behind this indicator in order to offer the suitable determination of the policy setting processes (Stefko et al. 2016). The fundamental comparison of the current states of the economies can be misleading and also can cause misunderstanding as employment affects many aspects of the macroeconomic situation in each country and not only in the individual countries, but it can be appeared in the various ways in the particular country from the perspective of the regional policies. In the previous decades, the aspects related to the mining and quarrying sector possessed a huge variety of linkages to regional employment (Fernandez, 2021).

Employment itself represents a very comprehensive indicator that can be viewed from several aspects. Also, there are many ways how to quantify it, to analyse the inner relations and thus, to measure its attributes. Employment in the mining industry can change depending on many factors, such as economic conditions, technological innovation and environmental regulations. In some periods, there may be an increase in employment due to investment in new mining projects or increased demand for raw materials. On the other hand, the fluctuations in commodity prices or changes in the political environment can lead to a decline in employment in this industry. Currently, employment in the mining industry can change depending on many factors, such as technological improvements that can increase efficiency and automation in the mining process, which can lead to the need for less labour. At the same time, however, the demand for some raw materials may increase, which could lead to an increase in employment in the industry. Overall, the mining industry is very dynamic and depends on many external factors, so it is difficult to offer a future prediction on how employment in this industry sector will be developed.

Employment has a significant impact on the mining industry for a number of reasons. Firstly, efficient operation of the mining process demonstrates that employees are essential for the proper functioning of mining operations. From technicians and engineers to workers on mining sites and in administrative roles, everyone plays a key role in ensuring that mining runs smoothly. The development of coal mining in the United States of America brought a huge creation of the labour positions. There was a variety of the jobs that were related to the rise of the mining and quarrying industry in the nineteenth and twentieth century (Dunne and Merrell, 2001). Chen et al. (2023) discuss the diversification aspects of labour competitiveness from a perspective of gender. It touches not only the fundamental job, but also positions that are often not related to the primary industrial sectors. The similar situation is found by Mandras and Salotti (2021), stating indirect jobs are visible in the primary economy sectors too. Employees show the various levels of the perception of their appropriateness in the labour process and therefore, it is questionable how workers can feel in the mentioned jobs as they create the primary economy sector values (Ciobanu et al., 2019). Here, also the International Monetary Fund can be helpful in the field of the support with the employment programmes not only in the European Union member countries (Ohayan et al., 2017). As it is presupposed, one of the key factors of employees' satisfaction is received wage. Satisfaction also represents positive emotions of workers regarding their work, work-related task and their experiences (Cizrelioğulları & Babayiğit, 2022). Satisfaction is related to job involvement that improves performance of workers (Chang et al., 2022). Pauhofova et al. (2018) state it should be at the level appropriate to the labour activities done. Otherwise, it causes the distortions in the economy systems. In the multiple cases, the energy sector actors has initiated various activities in order to understand better the needs of employees and how to perceive their satisfaction (Bacon and Kojima, 2011).

Secondly, innovation and technological progress are significant nowadays. For this reason, firms take various initiatives including making collaborations with their partners for R&D (Ključnikov et al., 2022b) and innovation activities that increase their innovativeness (Espino-Rodriguez et al., 2022). Innovation ability of enterprises also enables them to transfer their knowledge to businesses processes such as production of new products and services (Civelek et al., 2023a). Many businesses also make investments for their human capital to increase quality and capability of their workers (Plaikner et al., 2023) to adopt them the usage of latest technologies (Šakytė-Statnickė et al., 2023) since human resources determine the success of companies (Rózsa et al., 2022). Thus, they implement training activities to increase digital awareness and digital literacy of their workers (Civelek et al., 2023b).

The usage of innovative technologies also provides more opportunities for firms to achieve greater performance levels compared to their rivals (Lincényi & Bulanda, 2023), increases their competitiveness (Dušek

& Sagapova, 2022), brand image and prestige from the perspective of their customers (Chang & Ku, 2023) and increase their competencies in digitalization (Wu, 2022). Brand management is also linked with sustainability and competitiveness of businesses (Shpak et al., 2022) because it increases customers' satisfaction (Ergün et al., 2022; Ismail et al., 2022). Firms showing their interests for digital literacy of their workers can also be more successful in digital transformation process (Krajčík et al., 2023).

On the other hand, employment can support research and development investment in the industry. For example, firms can hire well-experienced workers for their R&D activities (Civelek & Krajčík, 2022). In this regard, employing engineers and researchers can lead to the discovery of new mining methods, safety technologies and better environmental practices. The suitable construction of the innovation policies and technological development should be supported by each field of economic life of the country (Lipták et al., 2015). The resistance and recovery indicators are able to be aimed to investigate the economic resilience, mainly in the field of employment as the crucial area of the economy structure (da Silva et al., 2021). Workers involved in informal employment are usually exposed to the harmful metals, for instance like mercury miners in Mexico (Saldaña-Villanueva et al., 2022).

Thirdly, impact on the local economy is of high importance. The mining and quarrying industry sector can be an important driver of the local economy. Employees in this industry contribute to local consumption, pay taxes and support various services and businesses in the community. Here, financing of the involved companies is a crucial point in their operation (Juhásová, 2020; Gavurova et al. 2016, 2017). The society structure and the patterns within the country population can be demonstrated as a key to hiring new or former employees in the discussed industrial sector (Kočanová et al., 2023). Local economy is supported also by the income level of the population in the terms of households and individuals (Juhásová et al., 2023). Lopes et al. (2023) demonstrate the significant job linkages in retail and wholesale, services, construction, manufacturing, and public administration. It is seen mainly in the municipalities, where the metal mining industry is localised. Zhang et al. (2023) show that competitiveness in the sectors significant for economic development is considerable and of high importance for microeconomic sphere too. The dynamics of the local system is analysed by García-García et al. (2023). Job spillovers represent the key aspects of regional development and one of the main benefits of the mining and quarrying industry sector in the field of regional growth (Fleming, and Measham, 2014).

Fourthly, the environmental and social impacts are visible as employment can affect the environmental and social aspects of mining. Employees may be responsible for compliance with environmental regulations and ethical standards in the mining process. The sustainability issues should be examined very well in order to prepare the circularity of the materials for the economy (Skare et al., 2023). Since there is a strong emphasis on sustainability and environmental protection, there have been many initiatives of businesses in sustainability practices as well (Fahlevi, 2023). Sustainability practices have also drawn attention of businesses from different industries (Cheng et al., 2022) and improve the competitiveness of enterprises (Folgado-Fernández et al., 2023) including tourism businesses (Devkota et al., 2023). Creation of new job opportunities is also related to social responsibility of businesses to achieve their sustainability targets (Streimikiene, 2023).

On the other hand, there are several indicators that should be under supervision of the authorities in order not to cause additional diminishing of the standard of living for workers (Gavurova et al., 2020). Moreover, the macroeconomic indicators are able to be influential also in a way directly to the other sector of the country economies, so information value of such impact is brought to the real economy (Gavurova et al., 2021). New mining and mineral-processing projects in Western Australia create 22,000 new job positions, forming a very high benefit for the local economy. Such an impact is very important and related also to the other fields of economy (Clements et al., 1996). Kotsadam and Tolonen (2016) investigate also the gender issues regarding local development of employment in the African countries. Gold mining brings a very harsh period in the history of each country. It has happened in Ghana during the third gold rush period. The local economy is very closely connected to the mining and quarrying industry sector and hence, it influences many socio-economic aspects of living (Benshaul-Tolonen et al., 2019). Such a state can emerge in creation of communities (Della Bosca and Gillespie, 2018).

Overall, employment has a major impact on the mining industry, not only in terms of the proper functioning of operations, but also in terms of innovation, economic development and environmental consequences.

The paper is structured as follows. After the general introduction into the discussed topic, the section devoted to the theoretical background is subsequent. The third section explains the data applied in the analytical processing and the methodologies employed in order to offer the study outcomes. Successively, the discussion section compares the obtained results with the other studies, while the concluding section summarises all the gained findings and offers the possible insights for the further analysis in this field as employment represents a very complex system of the macroeconomic relations.

Data and Methodology

The analytical processing introduced in the Results section is carried out via the standard statistical methodology. The techniques applied are mentioned and the data examined is described below.

The data comes from the official database of Eurostat – the official statistical office of the European Union (https://ec.europa.eu/eurostat/data/database) as well as from the World Bank Open Data, which is the official database of the World Bank Group. The explained variables are represented by the value added in the mining and the quarrying industry sector, while there are the five explanatory variables included in the analytical processing. These are the following ones: employment, labour productivity, wage, labour input in industry, and turnover. The covered period included in the data processing begins in 2011 and ends in 2021. All the data is normalised in a standard way. Therefore, the results are comparable within the framework of this analysis to each other.

The methodology is applied accordingly to the examined data set. Hence, the standard regression analysis is engaged to offer the results. The linear form is employed for the analytical processing. This means the explanatory variables demonstrate their impact on the explained variable. The constant value in the form of intercept is included in the regression models too. After the construction of these models, the statistics to the whole regression models are demonstrated. Firstly, the coefficient of determination that shows how much of the explored data set is explained in the statistically significant way. This share explains how much of the data variability is represented correctly by the examined regression model. The higher this share is, the better resulting power the regression model keeps. The coefficient of determination is abbreviated as R^2 in the tables below. Secondly, the comparing criterion is selected in order to show the comparison of the regression models interpretation power. Particularly, the Akaike information criterion is picked up and its abbreviation AIC is listed in the tables in the Results section. The lower the value of AIC is the better result is shown by the regression model. Of course, this is valid only in the comparison of one pair of the regression models and the numbers cannot be interpreted themselves.

Here, it should be stated that it is the methodological intention to include employment in each regression model. It is not a mistake or only accidentally, but the main focus is laid just right on this indicator. Another note is associated with the division of the regression models. They are composed of the partial adding of further indicators in order to compare their influence on the explained variable gradually and individually, so it can offer a comprehensive view

The essential five research hypotheses are stated as follows:

1. H_0: The value added in the mining and quarrying sector is not influenced in a statistically significant way by employment.
   H_1: The value added in the mining and quarrying sector is influenced in a statistically significant way by employment.
2. H_0: The value added in the mining and quarrying sector is not influenced in a statistically significant way by labour productivity.
   H_1: The value added in the mining and quarrying sector is influenced in a statistically significant way by labour productivity.
3. H_0: The value added in the mining and quarrying sector is not influenced in a statistically significant way by wage.
   H_1: The value added in the mining and quarrying sector is influenced in a statistically significant way by wage.
4. H_0: The value added in the mining and quarrying sector is not influenced in a statistically significant way by labour input in industry.
   H_1: The value added in the mining and quarrying sector is influenced in a statistically significant way by labour input in industry.
5. H_0: The value added in the mining and quarrying sector is not influenced in a statistically significant way by turnover.
   H_1: The value added in the mining and quarrying sector is influenced in a statistically significant way by turnover.

There are the two further research questions declared:

1. Is the production value spatially distributed in a particular way in the European Union member countries?
2. Is the value added at factor cost spatially distributed in a particular way in the European Union member countries?

Results

The entire analytical section is divided in the two subsections that are devoted to the particular chapters of the analytical processing. At first, the fundamental regression models are demonstrated. Successively, the second subsection is devoted to the analysis of the particular indicators related to the mining and quarrying industry sector.

The following table illustrates the group of the regression models.

Table 1: The regression models

Indicator	Model 1	Model 2	Model 3	Model 4
	Regression coefficient [p-value]	Regression coefficient [p-value]	Regression coefficient [p-value]	Regression coefficient [p-value]
Constant value	$7.641 \cdot 10^{-1}$ ***	$9.294 \cdot 10^{-1}$ ***	$5.003 \cdot 10^{-1}$ ***	$2.719 \cdot 10^{-2}$ ***
Employment	$2.567 \cdot 10^{-2}$ **	$2.032 \cdot 10^{-2}$ ***	$1.741 \cdot 10^{-2}$ **	$1.369 \cdot 10^{-2}$ **
Labour productivity	$1.973 \cdot 10^{-2}$ *			
Wage		$4.011 \cdot 10^{-1}$ *		
Labour input in industry			$1.912 \cdot 10^{-3}$ **	
Turnover				$1.005 \cdot 10^{-5}$ **
R^2	0.4752	0.4142	0.5961	0.6349
AIC	754.61	852.23	538.21	311.71

Legend: *** – p-value < 0.001, ** – 0.001 ≤ p-value < 0.01 , * – 0.01 ≤ p-value < 0.05.
Source: own processing.

Table 1 shows the results of the first step of the analytical processing related to the regression analysis. Here, the four variables are included: firstly employment, secondly labour productivity, thirdly wage, and fourthly labour input in industry. The form of the table is selected in order to offer the particular regression models with the empty cells meaning these indicators are not involved in the individual regression models. Below the explanatory variables, the statistics to the whole models are demonstrated. The explained variable is value added in the discussed industrial sector. Firstly, the coefficient of determination R^2 shows what these regression models possess a quite good interpretation power. All the regression models keep this indicator above the level of 40 %. The lowest value is assigned to the second regression model that keeps it at the level of 41.42 %. The second lowest value is kept by the first regression model at the level of 47.52 %. Successively, the second highest value is demonstrated by the third regression model at the level of 59.61 %. Finally, the best position belongs to the fourth regression model with the coefficient of determination at the level of 63.49 %. The Akaike information criterion demonstrates the very similar situation regarding the construction of the regression models. From the comparative viewpoint, the best position is held by the same regression model as in the previous case with the AIC value at the level of 311.71. This regression model is followed by the third regression model with the AIC value of 538.21. The third position is occupied by the first regression model with the AIC value of 754.61 and finally, the last position and the worst result at the same time is reached by the second regression model with the AIC value of 852.23. l

The regression models themselves offer the interesting results. The explanatory variables possess the following values. The constant value reaches the statistically significant outcomes for all the regression models. Its level achieves the highest significance. The further indicators are involved successively, while employment is included in each model.

The first regression model is based on the intercept of 7.641 . 10-1. Employment reaches the value of 2.567 . 10-2 that shows the highest performance, although the statistical significance level is between 0.001 and 0.01. Labour productivity achieves the statistical significance of 1 % to 5 %, while its regression coefficient stands at 1.973 . 10-2.

The second regression model includes wage instead of labour productivity. The selection of this indicator is done according to its very close ties to employment manifestation itself. Wage shows good performance with its regression coefficient of 4.011 . 10-1 at the statistical significance level of 0.01 to 0.05. On the other hand, the remaining indicator, that is, employment possesses the impact of 2.032 . 10-2 on the explained variable. It is kept at the highest statistical significance level as well as the constant value that reaches the level of 9.294 . 10-1, the highest one among all the regression models.

The third regression model is aimed at the labour input in industry. It performs very well at the level of 1.912 . 10-3, while it reaches the statistical significance level of 0.001 and 0.01. Employment reaches the level of 1.741

. 10-2 itself at the same statistical significance level as the previous indicator. The constant value is considerably lowered in the comparison with the second regression model and it felt to the level of 5.003 . 10-1 while keeping the highest statistical significance.

Finally, the fourth regression model includes as the added variable turnover. It show good performance at the level of 1.005 . 10-5, while its statistical significance reaches the second highest level between 0.001 and 0.01. Here, employment was decreased to its lowest value of 1.369 . 10-2, but the important fact is that it keeps its statistical significance at the level between 0.001 and 0.01. Moreover, the constant value reaches its lowest value too. It is kept at the level of 2.719 . 10-2, while keeping the highest statistical significance level. This regression model is mostly interesting from the point of view that all the included variables stand at their lowest values. It can presuppose that turnover itself possesses the considerably lower impact from the normalisation aspect. This would further examined.

There is to declare that all the five research hypotheses are rejected. This is due to the statistical significance levels that are achieved by the particular examined indicators in the individual regression models. The first research question is partially answered as there are the considerable fluctuations in the development of the production value reported in the mining and quarrying industry sector during the observed period. On the other hand, so serious alteration is not visible for the value added at factor cost as the potential tendencies would be appropriate to further examination.

The second subsection of the analytical section consist of the demonstration of particular variables that are important to understanding the processes between the variables included in the regression models. There are the two essential indicators shown – firstly, productivity value in the mining and quarrying industry sector expressed in million euro and secondly, value added at factor cost expressed in million euro too.

There is to note related to Table 2 that value for Romania is not available in 2017, so the sum for the whole 27 European Union member countries does not include this missing value. The very similar situation occurs for Table 2, again with Romania, but the altogether sum for the European Union member countries is calculated by Eurostat and offered provisionally.

Table 2 demonstrates the numbers of the European Union member countries and the selected other selected European countries for the production value of the mining and quarrying industry sector. They are expressed in million EUR. Malta and Iceland does not offer all the values of the time series because of no availability of the data and Romania is missing one value. The United Kingdom does not offer the values after its withdrawal from the European Union. It is evident that the production values have fluctuated very considerably. It would be interesting to carry out the analytical processes in order to find out the reasons for this, while do not possess a continual tendency, but trend has jumped variously. On the other hand, as it can be seen in Table 3, the value added numbers at factor cost of the mining and quarrying industry sector does not show such oscillations. Nevertheless, there are tendencies that would be appropriate to undergo further examination.

Discussion

Although the first view does not presume to demonstrate such a powerful aspect of the mining and quarrying sector, it is undisputable that this sector shows up a strong performance. Employment aspect reveals a very interesting view at the main indicators manifesting behaviour of the crucial performance indicators related to this industrial sector. A total of 378,000 employees are assigned to this sector in the entire European Union in the year 2021. This looks like a considerably low number, however it is partially disputable.

In the European Union, the mining and quarrying sector generated 101.9 billion EUR from a perspective of the net turnover in the year 2021. It is increased by almost 40 % on a year-to-year basis when compared to the previous year. The structure of the explored sector is quite heterogeneous. It is caused by a high number of the enterprises run in this field. According to the main operational activity of each enterprise, a total of 17,100 entities creates their production in the mining and quarrying sector. Although, there are further employees that could be counted to this sector, employed population here represents a share of 0.2 %, these sectors generated added value of 37.4 billion EUR. This represents a 0.4-per-cent share of the entire business economy sectors altogether. All these numbers belong to the year 2021. There is to note that a year-on-year increase is at a level of 38.2 % in a case of value added. Whilst the turnover indicator shows a little higher increase, it is not such significant in a merely level. It brings up an increase of 39.4 %, signifying a total of 101.9 billion EUR. Among all the sections of the Statistical Classification of Economic Activities in the European Community, the mining and quarrying sector represents the second lowest values from the perspectives of the number of enterprises, employment in an absolute way and finally, value added too. This sector embodies one of the sectors with the highest labour productivity ratio.

Table 2: Production value of the mining and quarrying industry sector in million EUR

area	period									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
European Union 27	170,000	176,000	147,000	140,000	123,616	106,440	186,194	92,917	72,855.5	62,267.9
Belgium	976.6	857.3	846.8	902.7	810.8	793.0	788.5	668.3	732.1	690.5
Bulgaria	1,432.8	1,518.4	1,307.4	1,243.9	1,318.4	1,276.5	1,458.2	1,411.3	1,322.5	1,583.7
Czechia	3,711.4	3,449.1	2,944.4	2,614.9	2,513.0	2,232.9	2,463.1	2,573.5	2,469.1	2,197.7
Denmark	9,004.5	8,399.2	7,612.2	6,538.0	6,944.7	4,493.3	5,158.5	11,736.2	4,165.2	2,440.0
Germany	12,775.0	12,455.8	11,686.2	11,767.8	11,348.2	10,441.7	10,731.6	18,912.7	9,008.0	9,114.0
Estonia	367.7	395.1	457.7	459.2	423.8	372.2	458.1	458.6	408.8	358.3
Ireland	1,393.4	1,303.9	1,070.0	1,007.3	878.0	1,309.3	1,790.1	1,120.9	1,430.4	723.4
Greece	762.1	622.1	672.9	972.4	915.3	813.1	875.8	889.4	839.1	770.1
Spain	4,576.4	4,341.3	3,613.7	3,455.1	3,474.5	3,543.6	4,374.6	4,107.9	3,756.0	3,425.3
France	7,665.2	7,434.4	7,575.9	6,610.9	5,925.8	6,139.5	4,475.2	4,438.8	4,975.4	4,586.4
Croatia	3,968.5	3,953.4	3,727.3	3,357.7	2,555.1	377.6	382.3	456.9	213.9	169.3
Italy	65,196.6	71,869.8	47,950.2	46,765.3	40,175.5	36,051.1	6,753.7	8,500.1	7,804.9	6,607.3
Cyprus	80.9	53.3	79.4	84.5	98.4	49.8	77.3	78.8	68.4	66.0
Latvia	168.6	193.2	211.6	219.0	224.7	222.2	257.3	282.8	294.3	307.6
Lithuania	200.2	195.6	217.0	215.7	181.1	180.8	208.8	239.9	236.4	250.5
Luxembourg	74.3	74.8	74.9	71.0	74.3	75.3	77.2	84.3	81.8	81.3
Hungary	380.6	369.6	418.1	387.4	370.3	307.8	394.2	561.6	737.1	504.5
Malta	NA	NA	NA	NA	22.5	30.3	20.7	19.6	18.6	23.1
Netherlands	21,076.7	24,932.9	26,162.2	21,585.3	17,869.8	12,382.5	11,261.8	10,487.6	8,917.1	4,634.4
Austria	2,533.5	2,606.6	2,500.5	2,325.7	2,022.7	2,017.3	2,158.5	2,474.8	2,300.4	1,953.3
Poland	15,260.0	15,186.0	13,628.6	12,982.6	12,670.9	11,106.3	13,575.3	13,036.9	12,041.8	11,121.3
Portugal	1,220.4	1,104.1	1,027.5	1,000.0	994.4	977.5	1,084.2	1,167.2	1,184.4	1,147.7
Romania	5,897.2	6,379.5	6,083.0	6,396.6	5,647.8	4,545.5	NA	2,527.4	2,983.5	2,328.3
Slovenia	260.8	250.5	252.5	262.4	267.9	266.9	290.7	305.1	312.6	286.9
Slovakia	524.2	497.6	528.0	519.7	562.7	511.5	526.1	599.7	594.0	576.3
Finland	2,482.7	1,886.9	1,722.8	1,506.9	1,535.5	1,702.1	2,113.3	2,270.6	2,159.7	2,259.8
Sweden	5,503.5	5,241.2	4,742.2	4,221.5	3,790.5	4,325.9	5,225.2	3,495.8	3,799.6	4,057.0
Iceland	NA	NA	NA	NA	28.0	36.4	51.5	55.3	47.6	42.9
Norway	164,755.5	184,479.6	166,312.8	149,760.2	78,910.9	61,806.3	71,855.0	88,207.2	69,905.3	54,689.5
Switzerland	1,695.9	1,830.2	1,800.2	1,797.8	2,079.1	2,212.7	1,974.2	1,943.8	1,984.2	2,050.4
United Kingdom	60,667.6	58,949.9	60,123.2	53,499.6	50,115.8	32,022.7	35,332.8	38,585.5	NA	NA

Source: own processing according to the Eurostat database.

Table 2: Value added at factor cost of the mining and quarrying industry sector in million EUR

area	period									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
European Union 27	58,200.0	56,100.0	50,700.0	45,000.0	42,259.6	33,866.8	40,000.0	44,160.8	33,055.3	27,087.1
Belgium	310.8	271.4	259.2	292.1	235.8	257.5	271.2	188.3	269.8	230.3
Bulgaria	810.3	848.7	664.2	588.9	590.7	581.0	726.1	687.9	652.9	915.2
Czechia	1,867.7	1,602.4	1,294.5	1,148.6	1,127.5	965.7	1,120.2	1,117.4	938.7	815.8
Denmark	7,034.4	6,319.5	5,557.5	4,271.0	4,271.2	1,906.3	2,561.5	9,921.4	2,434.4	1,087.5
Germany	5,843.8	6,157.2	5,487.0	5,240.1	5,128.7	4,470.5	4,784.7	5,522.0	3,717.4	3,677.9
Estonia	154.8	154.0	211.0	213.4	187.8	178.9	215.5	204.6	182.2	153.6
Ireland	582.8	535.3	521.1	494.6	269.2	567.7	772.4	563.5	470.1	303.2
Greece	328.9	254.9	298.7	350.1	357.1	474.9	780.0	456.5	301.6	374.7
Spain	1,976.2	1,847.8	1,495.9	1,365.6	1,267.4	1,290.4	2,021.3	1,634.2	1,400.8	1,297.6
France	2,582.1	2,316.3	2,175.0	1,834.0	1,813.0	1,464.4	1,151.2	1,150.4	1,335.7	1,397.3
Croatia	1,547.4	1,328.7	1,223.7	1,147.6	819.9	137.6	141.9	165.5	74.0	67.4
Italy	5,045.5	4,706.8	3,941.3	3,715.8	3,591.3	3,407.9	2,357.5	2,715.2	2,430.4	1,800.5
Cyprus	34.6	16.4	18.8	21.9	26.1	16.2	14.9	21.4	22.9	21.8
Latvia	68.8	78.8	80.5	77.2	85.3	86.6	102.0	111.8	112.6	126.2
Lithuania	100.9	91.1	94.2	89.6	75.5	79.9	91.1	101.2	100.9	105.1
Luxembourg	36.2	32.0	31.5	29.9	27.0	30.6	33.0	33.7	37.4	38.8
Hungary	189.7	183.1	201.0	171.0	147.5	136.9	193.1	259.2	327.4	229.3
Malta	NA	NA	NA	NA	-0.1	6.1	8.7	13.1	8.8	10.6
Netherlands	10,090.2	11,324.8	11,048.2	9,269.6	8,137.8	5,272.5	5,301.5	5,676.5	4,857.3	1,735.7
Austria	1,295.2	1,294.0	1,245.4	1,162.4	991.5	838.2	952.2	1,022.6	918.1	785.0
Poland	9,549.6	9,007.5	7,813.3	7,329.5	7,499.4	6,520.4	9,106.3	8,113.1	7,550.6	7,120.1
Portugal	522.5	462.0	418.8	414.1	388.5	395.0	453.4	469.5	461.3	430.9
Romania	3,478.2	3,603.4	3,604.1	3,376.1	2,589.0	1,832.9	NA	1,023.4	1,254.5	1,019.5
Slovenia	120.8	109.4	104.2	108.8	110.6	117.6	127.5	127.6	131.0	124.7
Slovakia	324.8	314.3	318.1	318.3	345.7	290.1	298.2	316.4	296.7	321.9
Finland	1,200.1	580.3	466.7	151.1	481.5	671.7	806.2	826.6	735.8	804.3
Sweden	3,056.5	2,686.1	2,093.9	1,779.9	1,694.8	1,927.7	2,798.5	1,716.8	2,031.6	2,091.5
Iceland	NA	NA	NA	NA	13.1	15.8	23.3	22.9	-10.3	10.2
Norway	77,417.7	87,198.0	76,167.7	65,075.4	57,448.0	44,626.3	55,096.1	68,576.6	50,475.3	37,806.6
Switzerland	689.8	711.0	699.2	667.4	797.2	903.8	790.3	802.3	705.7	741.3
United Kingdom	33,891.5	29,910.3	27,853.6	20,003.1	20,317.5	14,123.3	18,963.9	22,445.8	NA	NA

Source: own processing according to the Eurostat databas

In the terms of a wage-adjusted version of this indicator, it represents blurred alternative of apparent labour productivity and benefits expense of employees.This number is signified by average personnel costs. A labour productivity ratio demonstrates a level of coverage of value added per employee from a view of average personnel costs of one employee. As for characteristics of the mentioned indicators, a considerably high level of productivity prevailed in the mining and quarrying industry sector, while average personnel costs related to employees possess only a very little increase, meaning this industrial sector demonstrates a very high ratio of wage-adjusted labour productivity reaching value of 253.3 %. To understand the relations within the discussed industrial sector, it is appropriate to have a look at the subordinate sectors of the mining and quarrying sector. Firstly, from an angle of view of employment, the other mining and quarrying (representing the eighth subdivision) shows the highest performance at a level of 42.9 %. It is followed by another considerably high value of 29.1 % that belongs to the coal and lignite mining subsector (representing the fifth subdivision). Secondly, regarding the output volume, the extraction of crude petroleum and natural gas subsector (representing the sixth subdivision) embodies a 38.2-percent share of the total value.

There are several potential limitations arisen during the analytical processing phase. The characteristics of the data set points to the methodologies applied. Nevertheless, there are also the methods that would reveal more interconnectedness between the examined indicators, focusing on the timely data (Šubová, 2023). The future of the mining and quarrying industry is influenced by several factors. At first, technological advances increase use of automation, robotics, and artificial intelligence. These will change the way the mining industry is conducted and such a state can lead to a more efficient extraction of raw materials and at the same time to a reduction in the number of human workers (Novakova, 2020). Demand for raw materials has been gradually rising for the recent period. As the global population grows and new technologies develop, the demand for some raw materials may increase. This can lead to the development of new mining sites and investment in new mining projects. The sustainability and environmental constraints are represented by the growing emphasis on environmental protection and how it can affect the way mining is done. The companies will have to invest in technologies and procedures that minimise the environmental consequences of their activities. Regulatory changes regarding the mining industry, including environmental regulations and tax policies, can impact the competitiveness and profitability of companies in the industry (Brauers and Oei, 2020). Regarding these factors, the future of the mining industry can be expected to be characterised by considerable dynamic attributes and the need to adapt to changing conditions along with the alteration of the labour market challenges (Christiaensen et al., 2022). The involved companies in this industry will need to be able to respond quickly to new technological, environmental, and regulatory challenges in order to compete successfully in the market and ensure their sustainability in the long term.

Conclusion

Employment represents a very comprehensive topic in the field of the mining and quarrying industry. Its essential attribute in a form of dynamics is a subject to the influence of the economic, technological, and environmental factors. This sector can change depending on demand for raw materials, innovations in technology and regulatory changes. Firstly, impact of the technological innovation is important. Technological advances can have a significant impact on employment in the mining industry. Improvements in automation and efficiency may lead to the need for fewer workers, but they may also create new opportunities for skilled information and communication technologies and engineering professionals. Secondly, importance to the local economy plays a crucial role in regional development of the countries. The mining industry can have a significant positive impact on the local economy, providing employment, contributing to local tax revenue and supporting the development of local communities and services. Thirdly, the need for sustainability is a very current topic nowadays in this industry sector. Employment in the mining industry must also take into account environmental and social aspects. The pursuit of sustainable mining practices and compliance with environmental and ethical standards is important. Generally, it is important to track and analyse employment in the extractive industry, taking into account its diverse impacts and dynamics, in order to better understand the challenges and opportunities that the sector presents.

References

Bacon, R., and Kojima, M. (2011). Issues in estimating the employment generated by energy sector activities. World Bank Sustainable Energy Department. Available online: https://documents1.worldbank.org /curated/es/627831468159915345/pdf/827320WP0emplo00Box379875B00PUBLIC0.pdf.

Benshaul-Tolonen, A., Chuhan-Pole, P., Dabalen, A., Kotsadam, A., Sanoh, A. (2019). The local socioeconomic effects of gold mining: Evidence from Ghana. The Extractive Industries and Society, 6, 4, 1234–1255. https://doi.org/10.1016/j.exis.2019.07.008.

Brauers, H., and Oei, P.-Y. (2020). The political economy of coal in Poland: Drivers and barriers for a shift away from fossil fuels. Energy Policy, 144, 111621. https://doi.org/10.1016/j.enpol.2020.111621.

Chen, M., Ma, Y., Liu T. and Xing, H. (2023). How employment diversification affects labour competitiveness: A gender perspective. Journal of Competitiveness, 15, 2, 54–71. https://doi.org/10.7441/joc.2023.02.04.

Christiaensen, L., Ferré, C., Gajderowicz, T., Ruppert Bulmer, E., and Wrona, S. (2022). Towards a Just Coal Transition: Labor Market Challenges and People's Perspectives from Silesia. World Bank Jobs Working Papers, 70. Available online: https://documents1.worldbank.org/curated/en /099721210062220918/pdf/IDU0766a573c0e7bd040930a81b095ae2377689f.pdf.

Ciobanu A, Androniceanu A and Lazaroiu G (2019) An Integrated Psycho-Sociological Perspective on Public Employees' Motivation and Performance. Frontiers in Psychology, 10, 36. https://doi.org/10.3389/fpsyg.2019.00036.

Chang, K.-Y., Chang, W.-H., and Yeh, Y.-C. (2022). How to Improve Tour Leaders and Guides Service Performance through Emotional Display Rules – The Moderating Effect of Job Stress. Journal of Tourism and Services, 13(25), 156–175. https://doi.org/10.29036/jots.v13i25.403

Chang, K.-Y., and Ku, E. C. S. (2023). Discount or Prestige: E-reputation, Compatibility, and Continued Mobile Apps Usage Intention of Low-Cost Carriers. Journal of Tourism and Services, 14(26), 73–91. https://doi.org/10.29036/jots.v14i26.463

Cheng, Y.-H., Chang, K.-C., Cheng, Y.-S., and Hsiao, C.-J. (2022). How Green Marketing Influences Customers' Green Behavioral Intentions in the Context of Hot-Spring Hotels. Journal of Tourism and Services, 13(24), 190–208. https://doi.org/10.29036/jots.v13i24.352

Civelek, M., and Krajčík, V. (2022). How do SMEs from different countries perceive export impediments depending on their firm-level characteristics? System approach. Oeconomia Copernicana, 13(1), 55–78. https://doi.org/10.24136/oc.2022.002

Civelek, M., Kasarda, M., Hajduk, Ľ. and Szomolányi, A. (2022). Social Media Usage as a solution for financial problems of European SMEs: International Comparison of Firms in Iron and Mining Industries. Acta Montanistica Slovaca, 27 (4), 982-993. https://doi.org/10.46544/AMS.v27i4.12

Civelek, M., Krajčík, V., and Fialova, V. (2023a). The impacts of innovative and competitive abilities of SMEs on their different financial risk concerns: System approach. Oeconomia Copernicana, 14(1), 327–354. https://doi.org/10.24136/oc.2023.009

Civelek, M., Krajčík, V., and Ključnikov, A. (2023b). The impacts of dynamic capabilities on SMEs' digital transformation process: The resource-based view perspective. Oeconomia Copernicana. https://doi.org/10.24136/oc.2023.019

Cizrelioğulları, M. N., and Babayiğit, M. V. (2022). Effects of High-Performance Work System on Job Satisfaction: The Mediating Role of Psychological Capital in the Hotel Employees of North Cyprus. Journal of Tourism and Services, 13(24), 43–70. https://doi.org/10.29036/jots.v13i24.284

Clements, K. W., Ahammad, H., and Qiang, Y. (1996). New mining and mineral-processing projects in Western Australia: Effects of employment and the macro-economy. Resources Policy, 22, 4, 293–346. https://doi.org/10.1016/S0301-4207(97)00016-0.

da Silva, J. F., Faria Silva, F., Miranda Leal, A. M., and de Oliveira, H. C. (2021). Regional economic resilience and mining in the State of Minas Gerais/Brazil: The barriers of productive specialisation to formal employment and tax management. Resources Policy, 70, 101937. https://doi.org/10.1016/j.resourpol.2020.101937.

Della Bosca, H., and Gillespie, J. (2018). The coal story: Generational coal mining communities and strategies of energy transition in Australia. Energy Policy, 120, 734–740. https://doi.org/10.1016/j.enpol.2018.04.032.

Devkota, N., Gajdka, K., Siwakoti, R., Klimova, M., and Dhakal, K. (2023). Promoting Sustainable Tourist Behavior through Promotional Marketing. Journal of Tourism and Services, 14(26), 219–241. https://doi.org/10.29036/jots.v14i26.512

Dunne, T., and Merrell, D. R. (2001). Gross employment flows in U.S. coal mining. Economics Letters, 71, 2, 217–224. https://doi.org/10.1016/S0165-1765(01)00369-X.

Dušek, R., and Sagapova, N. (2022). Instagram Use among Czech Young Generation during COVID-19 Lockdown Period with Restricted Travel and Services. Journal of Tourism and Services, 13(24), 150–163. https://doi.org/10.29036/jots.v13i24.350

Ergün, G. S., Keleş, H. ., Taşpınar, B., Gözen, E., and Derman, E. (2022). The Moderator Role of Culture in the Relationship between Destination Brand Equity and Travel Intention. Journal of Tourism and Services, 13(24), 256–271. https://doi.org/10.29036/jots.v13i24.371

Espino-Rodriguez, T. F., Gebril Taha Admed, M., and Gil-Padilla, A. M. (2022). Outsourcing from the Perspectives of Competitive Capabilities and Supplier Innovation in the Hotel Sector. Journal of Tourism and Services, 13(25), 22–44. https://doi.org/10.29036/jots.v13i25.429

Fahlevi, M. (2023). A Systematic Literature Review on Marine Tourism in Business Management: State of the Art and Future Research Agenda. Journal of Tourism and Services, 14(27), 299–321. https://doi.org/10.29036/jots.v14i27.549

Fernandez, V. (2021). Copper mining in Chile and its regional employment linkages. Resources Policy, 70, 101173. https://doi.org/10.1016/j.resourpol.2018.03.017.

Fleming, D. A., and Measham, T. G. (2014). Local job multipliers of mining. Resources Policy, 41, 9–15, https://doi.org/10.1016/j.resourpol.2014.02.005.

Folgado-Fernández, J. A., Rojas-Sánchez, M., Palos-Sánchez, P. R., and Casablanca-Peña, A. G. (2023). Can Virtual Reality Become an Instrument in Favor of Territory Economy and Sustainability?. Journal of Tourism and Services, 14(26), 92–117. https://doi.org/10.29036/jots.v14i26.470

García-García, P., Carpintero, Ó., and Buendía, L. (2023). Just transitions to F., renewables in mining areas: Local system dynamics. Renewable and Sustainable Energy Reviews, 189, A, 113934. https://doi.org/10.1016/j.rser.2023.113934.

Gavurova, B., Khouri, S., Kovac, V., and Ferkova, M. Exploration of Influence of Socioeconomic Determinants on Mortality in the European Union. International Journal of Environmental Research and Public Health, 2020, 17, 4699. https://doi.org/10.3390/ijerph17134699.

Gavurova, B., Privara, A., Janikova, J., and Kovac, V. (2021). Quantification of Tourism Sector Parameters Related to Competitiveness of Countries According to Macroeconomic Indicators. Journal of Competitiveness, 13, 3, 56–72. https://doi.org/10.7441/joc.2021.03.04

Gavurová, B., Vagasova, T., & Kovac, V. (2016). Competitiveness assessment of Slovak Republic regions. European Financial System 2016: Proceedings of the 13th international scientific conference, Ed: Krajicek, J., Nesleha, J., Urbanovsky, K., 2016, pp. 175-186.

Gavurova, B., Soltes, M., & Kovac, V. (2017). Application of cluster analysis in process of competitiveness modelling of Slovak Republic regions. Transformations in Business & Economics, 16(3), 129-147.

Ismail, T. A. T.., Zahari, M. S. M.., Hanafiah, M. H., and Balasubramanian, K.. (2022). Customer Brand Personality, Dining Experience, and Satisfaction at Luxury Hotel Restaurants. Journal of Tourism and Services, 13(24), 26–42. https://doi.org/10.29036/jots.v13i24.278

Juhásová, S. (2020). Analysis and prediction of the development of private banking in the Slovak. IAI Academic Conference Proceedings: International Virtual Academic Conference: Education and Social Sciences, Business and Economics, International Academic Institute, 53–63. Available online: https://ia-institute.com/iai-academic-conference-proceedings-virtual-conference-15-october-2020/.

Juhásová, S., Buleca, J., Vancová, J., Melasova, K., and Kováč, V. (2023). Gender and regional disparities in income level perspectives in United States agriculture sector, Entrepreneurship and Sustainability Issues, 11, 2, 54–66. https://doi.org/10.9770/jesi.2023.11.2(4)

Ključnikov, A., Civelek, M., Klimeš, C., and Farana, R. (2022a). Export risk perceptions of SMEs in selected Visegrad countries. Equilibrium. Quarterly Journal of Economics and Economic Policy, 17(1), 173–190. https://doi.org/10.24136/eq.2022.007

Ključnikov, A., Civelek, M., Krajčík, V., Novák, P., and Červinka, M. (2022b). Financial performance and bankruptcy concerns of SMEs in their export decision. Oeconomia Copernicana, 13(3), 867–890. https://doi.org/10.24136/oc.2022.025

Kočanová, D., Kováč, V., Serzhanov, V., and Buleca, J. (2023). Differences and Similarities in Patterns of Ageing Society in the European Union. E+M Economics and Management, 26(1), 45–64. https://doi.org/10.15240/tul/001/2023-1-003.

Kotsadam, A., and Tolonen, A. (2016). African Mining, Gender, and Local Employment. World Development, 83, 325–339. https://doi.org/10.1016/j.worlddev.2016.01.007

Krajčík, V., Novotný, O., Civelek, M., and Semrádová Zvolánková, S. (2023). Digital Literacy and Digital Transformation Activities of Service and Manufacturing SMEs. Journal of Tourism and Services, 14(26), 242–262. https://doi.org/10.29036/jots.v14i26.551

Lincényi, M., and Bulanda, I. (2023). Use of Marketing Communication Tools in Tourism in Accommodation Facilities during the COVID-19 Pandemic. Journal of Tourism and Services, 14(26), 25–44. https://doi.org/10.29036/jots.v14i26.440

Lipták, F., Klasová, S., and Kováč, V. (2015). Special Economic Zone Constitution According to Cluster Analysis. Procedia Economics and Finance, 27, 186–193. https://doi.org/10.1016/S2212-5671(15)00988-0

Lopes, A., Ruiz, R., Ribeiro, R., and Cantelmo, W. (2023). Linkages in the metal mining industry: Local job multipliers in Brazil. Resources Policy, 82, 103545. https://doi.org/10.1016/j.resourpol.2023.103545.

Mandras, G., and Salotti, S. (2021). Indirect jobs in activities related to coal, peat and oil shale: A RHOMOLO-IO analysis on the EU regions. JRC Working Papers on Territorial Modelling and Analysis, 11. Available online: https://www.econstor.eu/bitstream/10419/265237/1/178625333X.pdf.

Matijová, M., Šenková, A., Dzurov Vargová, T. and Matušíková, D. (2023). Tourism Indicators and Their Differentiated Impact on Sustainable Tourism Development.Journal of Tourism and Services, 14(27), 89-117. https://doi.org/10.29036/jots.v14i27.530

Novakova, L. (2020). The impact of technology development on the future of the labour market in the Slovak Republic. Technology in Society, 62, 101256. https://doi.org/10.1016/j.techsoc.2020.101256.

Ohanyan, G., and Androniceanu, A. (2017). Evaluation of IMF programmes on employment in the EU. Acta Oeconomica, 67, 3, 311–332. https://doi.org/10.1556/032.2017.67.3.2.

Pauhofova, I., Stehlikova, B., Kljucnikov, A., and Androniceanu, A. (2018). Spatial and sectoral conditionality of the average monthly nominal wage in the Slovak Republic. Transformations in Business and Economics, 17, 3, 155–169.

Plaikner, A., Haid, M., Kallmuenzer, A., and, Kraus, S. (2023). Employer Branding in Tourism: How to Recruit, Retain and Motivate Staff. Journal of Tourism and Services, 14(27), 1-21. https://doi.org/10.29036/jots.v14i27.666

Rózsa, Z., Minčič, V., Krajčík, V., and Vránová, H. (2022). Social Capital and Job Search Behavior in the Services Industry: Online Social Networks Perspective. Journal of Tourism and Services, 13(25), 267–278. https://doi.org/10.29036/jots.v13i25.481

Saldaña-Villanueva, K., Pérez-Vázquez, F., Ávila-García, I., Méndez-Rodríguez, K., Carrizales-Yáñez, L., Gavilán, A., Vargas-Morales, J., Van-Brussel, E., and Diaz-Barriga, F. (2022). A preliminary study on health impacts of Mexican mercury mining workers in a context of precarious employment. Journal of Trace Elements in Medicine and Biology, 71, 126925. https://doi.org/10.1016/j.jtemb.2022.126925.

Shpak, N., Oksana Muzychenko-Kozlovska, Gvozd, . M. ., Sroka, W., and Havryliuk, M. . (2022). Comprehensive Assessment of the Influence of Factors on the Attractiveness of a Country's Tourism Brand - A Model Approach. Journal of Tourism and Services, 13(24), 209–235. https://doi.org/10.29036/jots.v13i24.354

Skare, M., Gavurova, B., and Kovac, V. (2023). Investigation of selected key indicators of circular economy for implementation processes in sectorial dimensions. Journal of Innovation & Knowledge, 8 (4), 100421. https://doi.org/10.1016/j.jik.2023.100421

Soltes, V., & Gavurova, B. (2015). Modification of performance measurement system in the intentions of globalization trends. Polish Journal of Management Studies, 11(2), 160-170.

Stefko, R., Gavurova, B., & Korony, S. (2016). Efficiency measurement in healthcare work management using Malmquist indices. Polish journal of management studies, 13(1), 168-180. https://doi.org/10.17512/pjms.2016.13.1.16

Streimikiene, D. (2023). Sustainability Assessment of Tourism Destinations from the Lens of Green Digital Transformations. Journal of Tourism and Services, 14(27), 283–298. https://doi.org/10.29036/jots.v14i27.651

Šakytė-Statnickė, G., Budrytė-Ausiejienė, L., Luka, I., and Drozdova, V. (2023). Internal and External Communication between Employees of Different Generations: Emerging Problems in Lithuanian, Latvian, and Swedish Tourism Organizations. Journal of Tourism and Services, 14(26), 1–24. https://doi.org/10.29036/jots.v14i26.427

Šubová, N. (2023). Comparison of EU Countries Based on Social Policy Instruments to Mitigate Financial Vulnerability of Households. Politická ekonomie, 71(1), 23–45. https://doi.org/10.18267/j.polek.1377.

Wu, S.-H. (2022). Minds Think Alike: How Do Food Delivery Mobile Applications Innovate Consumer Service. Journal of Tourism and Services, 13(25), 137–155. https://doi.org/10.29036/jots.v13i25.384

Zhang, Ch., Xu, Z., Gou, X., and Škare, M. (2023). The Dynamic Impact of Inflation on Supply Chain and Competitiveness: Bibliometric and Econometric Analysis. Journal of Competitiveness, 15, 1, 146–167. https://doi.org/10.7441/joc.2023.01.09.