Economic aspects of the mining industry in the Slovak Republic

Pavol Budaj[1], Jana Klencová[1], Alena Daňková[1] and Jana Piteková[1]

This paper analyses the economic aspects of the mining industry in the Slovak Republic. This study aims to point out the changes in the sectoral structure with a focus on the mining industry and its role in the economy of Slovak Republic. The analysed period is based on the time series provided by the current statistics for the years 2004-2016 using the revised ESA 2010, which represents the most recent internationally comparable accounting framework of the EU. The paper presents two selected analytical approaches to the evaluation of the mining industry in the V4 countries. The shares of individual sectors on the Slovak economy are surveyed on GDP and employment within the analysed period. At the same time, structural changes in the Slovak economy are analysed using selected indicators – the Krugman index of specialisation and Balassa concentration index. These indices are examined on the gross value added basis at constant prices for specific sectors in V4 countries. The result of this study is the quantification of the interrelations between selected indicators characterising the mining industry and the identification of the economic position of the mining industry in the Slovak Republic. The benefit of the study also consists in the quantification of inter-sectoral relations in the Slovak economy.

Key words: mining industry, structural changes, gross value added, Krugman index of specialisation, Balassa concentration index

Introduction

Every economy, including the Slovak Republic, is constantly changing its internal structure, i.e. in its internal configuration. After 1989, the Slovak Republic has undergone political, economic and social changes that have had a significant impact on its economy, as outlined in the National Strategic Reference Framework (NSRF) 2007-2013. The peak of these changes was the integration of the Slovak Republic into the EU on May 1st, 2004.

The process of economic transformation is defined in the economic encyclopedia as the process of transforming central planned economy into market economy. Economic transformation is a complex long-term process that brings a temporary decline of the economic activity along with the various adverse social consequences (Michnik, 1995). Under the transformation of the centrally planned economy to market economy, we understand a complex change of an initial socio-economic system. Therefore, transformation cannot be considered as a one-time or short-term act (Vincúr, 2007; Gavurova, 2016). According to Okáli (1999), the transformation is based on a change in organizational form of national economy in order to improve its production and allocation efficiency. The transformation process is considered to be completed if there is a functioning market in the country that coordinates economic activities, all reforms are completed, and the country achieves sustainable economic growth (Morvay, 2005). The conclusion of transformation can also be seen as a condition where the problems and challenges with which emerging economies are confronted are similar to those that emerge in other countries at a comparable level of development (Gelb, 1999).

The goal of ongoing changes should have a more efficient economy. An example of such change is a transformation process from centrally planned economy to market economy. By the transformation in this study, we understand the process of change from a centrally planned economy into the economy with an active market mechanism.

A transformation process can be done in two ways. The first way is so-called shock therapy, in which all the reform steps are carried out at one particular time. This method was chosen at the initial stage of the transformation of the conditions of the Slovak Republic. The second method is gradualism, which is based on gradual steps and changes in the transforming economy. As Roland (2002) states in his article, partial reform, usually in the framework of a gradualist strategy, has some clear disadvantages. It yields lower efficiency gains than a complete reform. There may be losses of complementarities between reforms. It does not resolve all uncertainty about future outcomes and thus yields less learning about the future. If partial reform is less expensive to reverse than full reform, political acceptability can be easier than for full reform because it provides an option for early reversal (Dewatripont and Roland, 1995).

An integral part of the transformation process is structural transformation, which is at the same time one of its key assumptions. It is the process that is demanding both in terms of the range of resources used and the time of its implementation.

The process of transformation of economies and defining the understanding of its underlying context is dealt with by several authors, which results in a large number of definitions of this category (Tošović, 2016).

---

[1] *Pavol Budaj, Jana Klencová, Alena Daňková, Jana Piteková,* Catholic University in Ruzomberok, Faculty of Education, Department of Management, Nábrežie Jána Pavla II č. 15, 058 01 Poprad, Slovakia, pavol.budaj@ku.sk, jana.klencova@ku.sk, alena.dankova@ku.sk, jana.pitekova@ku.sk

Dirgová (2014) focuses on the phenomenon of social transformation that is reflected in all areas of society. The transformation process of the social sphere has a permanent character which is unlimited in time, and it is, therefore, necessary to address current and prospective social processes and phenomena.

It should be noted that there is no generalisation of the view on the transformation process from the centrally planned economy to the market economy. Differences in understanding arise from different starting conditions and an existing potential of transforming countries. In our paper, we are focusing on the structural transformation in the conditions of the Slovak Republic, with the special focus on the changes in its sectoral structure in 2004-2016.

A large number of domestic and foreign debates are constantly being held on the subject of the transformation of economies (Dirner, 2016). One of these discussion forums was held on 25-26 June 2013 at the School of Slavonic and East European Studies, University College London on the topic *„Transition economics meets new structural economics“*. In the Journal of Economic Policy Reform, three major themes of this discussion forum are described. First, what is the relationship between transition economics (TE) a and New Structural Economics (NSE)? Second, if NSE is about the promotion of structural change, what then are the specific features of structural changes in the „transition region“, especially in the view of the strong influences of the EU on the growth of this region? Third, EU´s smart specialisation activities represent extremely important examples of new industrial policy: how does this relate to NSE? (Berglof et al., 2015).

J. A. Schumpeter belongs to the most well-known authors in the field of the structural change in the economy. He had developed the first structural theory with an emphasis on the innovations in technology that have an impact on changes in economic growth and structure of an economy. One of the leading forces influencing the structural change was an entrepreneurial innovation activity. The process of ever-changing structural changes was defined as a process of the creative destruction (Schumpeter, 2011).

Various indicators were developed for the measurements and assessments of structural changes in different sectors of an economy. In our paper, we are focusing on two selected indicators: Krugman index of specialisation (K-index), according to which we measure a structure of the country's economy in relation to the structure of EU countries. A researched country must be part of the group above (Krugman, 1991). The second indicator is a Balassa concentration index which indicates the concentration of the industry in relation to the average of the EU countries (Balassa, 1965). In addition to the indices mentioned, there is as well Lilien indicator which examines changes in sectors in terms of employment (Lilien, 1982) and the economic structural changes intensity index (Landesmann, 1999, 2003). Indexes recording changes in the structure of the economy were also applied in the studies of these authors: Wolf used these indices in Polish economy (Wolf, 2004), Midelfart-Knarvik were working with the Krugman index (Midelfart-Knarvik, 2000) and Brainard and Cutler applied the Lilien Index (Brainard, Cutler, 1993).

The presented paper aims to identify the economic aspects of the mining industry in the Slovak Republic. The paper follows on previous published papers on similar topic (Kršák et al., 2015) (Blišťan et al., 2015). We have chosen relevant macroeconomic indicators on the basis of the annual national accounts, through which we can better understand the importance of the examined sector. At the same time, the paper aims to quantify the interrelations between selected indicators characterising mining industry and identification of the economic position of the mining industry in the Slovak Republic.

The position of the mining industry in the Slovak economy

With respect to the aim of the presented paper, it is necessary to define the position of the mining industry in the sector classification in the conditions of the Slovak Republic. According to the classification of SK NACE Rev. 2, the official term for the mining industry is „Mining and quarrying“ (which is classified in section B). Mining and quarrying involve mining minerals naturally occurring as solid (coal and ores), liquid (petroleum) or gaseous (natural gas). Mining can be realised by various methods such as underground or surface mining, oil drilling, seabed drilling, etc. This section includes the additional services in order to prepare raw materials for the market. Within the above section, we work with so-called divisions 05, 06 where the mining and extraction of fossil fuels (coal, lignite, oil and gas) are included, and the divisions 07 and 08, which include mining and extraction of ores, various minerals and stones.

Despite the historical tradition of the mining industry, the Slovak Republic is no longer one of the countries with the developed mining industry. Countries in which the share of mining and processing of raw materials in the gross domestic product (GDP) is more than 25 % are classified as countries with the developed mining industry (by UNCTAD methodology).

The mining and quarrying in the Slovak Republic provide the important inputs, especially for the manufacturing industry and energetics. However, in the country the reserves of mineral and energy raw materials are limited. The possibilities of their utilisation are set in the document *Surovinová politika Slovenskej republiky pre oblasť nerastných surovín*. This document defines the objectives of the usage of the domestic mineral resources in connection with the long-term needs of economic and social development of the society with regard to the environmental aspects of the sustainable development (MH SR, 2004). As stated in this

policy, while in the fuel-energy and ore raw materials, the Slovak Republic is permanently dependent on their imports. However, the mining of certain types of raw materials for industry and construction has positive economic importance. The mining of brown coal and lignite covers about 80 % of the domestic consumption.

As part of the Slovak Republic's energy policy, the domestic resources of brown coal and lignite are considered as a strategic raw material base, reducing the dependence on the imports of the primary fuel-energy raw materials. Domestic resources are also considered as the reserves for unforeseen situations and as the source of job opportunities. Due to the verified geological reserves of the oil and gas, it is not possible to expect the significant increase in domestic mining volumes in the future, and it will be necessary to continue to import these commodities. Slovakia is the second largest natural gas transit country in Europe after Ukraine. In the future, the main focus will be on the improving the gas storage services in the context of the liberalisation of the gas market.

A primary task remains to reduce the energy intensity to the level of the European Union countries. Taking into account the high level of the mining costs and processing costs of the domestic ore raw materials, their extraction is uneconomic (Malindžáková, 2014). The necessary ore commodities are imported. On the other hand, reserved mineral deposits are the most important group of minerals in the Slovak Republic. In 2015, geological reserves on reserved deposits reached 16 605 million tons, which mainly consist of non-ore commodities (12 586 million tons). During the year 2015, there was the slight increase in the mining of construction and non-ore raw materials. In long-term view (2000 - 2015), there was the significant decline in the ore raw materials mining (by 95.3 %) and the decrease in the extraction of energy raw materials by 50.5 %. The growth was recorded in non-ore mining (by 9 %) and construction raw materials (by 49 %). In 2015, the share of the mining of the energy raw materials in inventories amounted to 0.16 %, in the crude raw materials 0.01 %, in non-ore raw materials 0.09 % and 0.62 % in the construction materials (MŽP SR, 2016).

In the paper Malindžák et al. (2015), there is described the model for "In-process inventories calculation" in the metallurgy production conditions. The model was designed considering the factors affecting the in-process inventories levels. The in-process inventories levels have to respect different efficiency of the aggregates in sequence, idle times, technological safety and the production continuity. For the calculation of the in-production inventories levels, a dynamic model was designed.

The most important non-ore raw materials in terms of export are magnesite, dolomite, rock salt, bentonite, limestone and barite. The magnesite industry with proven geological reserves of magnesite and built mining and processing capacities is one of the most important producers of basic refractory materials in the world (MH SR, 2004). Authors Ambriško et al. (2015) are dealing with the proposal to rationalise the transportation of the magnesite in the mining company.

According to the National Strategy for Sustainable Development of the Slovak Republic, the state of the environment and the use of raw materials resources in the Slovak Republic is unsustainable in a long-term view. The current state of the Slovak Republic's raw material base is characterised by the almost complete depletion of the ore raw materials, large supplies, but the different level of utilisation of non-ore and construction raw materials, as well as the overall state control reductions in the mining industry. The landscape and the environment impacts are extensive with respect to the mining of mineral raw materials. The mining represents one of the most serious environmental problems of the Slovak Republic (Uznesenie vlády SR, 2001). Straka, Bindzár and Kaduková (2014) use the multi-criteria decision-making methods for the needs of the mining industry, with emphasis on the decision-making process in the area of selecting the suitable waste dump location.

Material and methods

The classification of the sectors was based on the SK NACE Rev. 2, which represents the classification used in the conditions of the Slovak Republic, formerly referred to as OKEČ (Sectoral Classification of Economic Activities). According to this classification, we have aggregated the sectors into five groups, namely: sector A - Agriculture, forestry and fishing; the second group is industry: B - Mining and quarrying, C - Manufacturing, D - Electricity, gas, steam and cold air condition supply and E - Water supply sewerage, waste management and remediation activities; the third group is included separately in group C - Manufacturing; the fourth group includes the sector F - Construction and the fifth group includes the service sector: G - Wholesale and retail trade; repair of motor vehicles and motorcycles, H - Transport and storage, I - Accommodation and food services activities, J - Information and communication, K - Financial and insurance activities, L - Real estate activities, M - Professional, scientific and technical activities, N - Administrative and support services activities, O - Public administration and defense, compulsory social security, P - Education, Q - Human health and social work activities, R - Arts, entertainment and recreation, S - Other service activities, T - Activities of households as employers; undifferentiated goods - and services - producing activities of households for own use and U - Activities of extraterritorial organisations and bodies.

The database consists of the data from the Statistical Office of the Slovak Republic (SLOVSTAT database), which is based on the National Accounts System ESA 2010, which represents the coherent system of information and therefore allows mutual interconnection and comparability of the surveyed indicators. The European System of National and Regional Accounts ESA 2010 implemented from 1st September 2014 is the latest internationally comparable EU Accounting Framework for a systematic and detailed description of the economy. The differences in National Accounts methodology ESA 2010 compared to the ESA 95 are aimed towards capturing changes in economic reality in the conditions of increasing globalisation (ŠÚ SR, 2015). The most significant changes in this methodology were described by Eurostat in *Manual on the Changes between ESA 95 and ESA 2010* (EUROPEAN COMMISSION, 2013). Through ESA 2010 Slovak statistics work with more detailed data.

When analysing the selected structural change indicators (Krugman index of specialisation and Balassa concentration index) in the V4 and EU28 countries on an annual basis, we also worked with the data from the EUROSTAT for the examined groups. Specifically, the data on the gross value added at constant prices in the sectors breakdown.

We have obtained information from document *Bilancie zásob výhradných ložísk Slovenskej republiky (BZVL SR)*, which is produced annually by the Ministry of the Environment of the Slovak Republic and on the basis of information provided by the Main Mining Office.

By the analysis of the structural changes in the industry, we used selected structural indicators. The first was the Krugman index of specialisation, which illustrates the structure of the economy in the surveyed country in the relation to the structure in the EU28.

The Krugman index of specialisation is defined as the sum of all sectors in the absolute value of the difference between:

(B)

    a)   the share of sector *j* in country *i* on total gross value added at period $t (Q_{ij,t})$

    b)   and share of the same sector *j* on total gross value added (at constant prices) of all other EU countries at period $t (\overline{Q}_{ij,t})$ (Midelfart and Knarvik, 2000).

$$K_{i,t} = \sum_j \left| Q_{ij,t} - \overline{Q}_{ij,t} \right| \tag{1}$$

The K-index value ranges between 0 and 2. The index value increases with the increasing degree of specialisation in the country. If the value equals zero, the country has the sectoral structure identical to the rest of the EU, so it is not specialised. When the maximum value is reached, i.e. 2 in the sectoral structure, the major specialisation prevails. If we divide the K-index by two and multiply by 100, we get the difference (deviation) between a) and b) in percentage. The analysis of sectoral differences between a) and b) shows how the particular components of the Krugman index of specialisation allow the better understanding of the role of the individual sectors in the countries.

The concentration index (Balassa index) expresses the sectoral specialisation of the economy from the other side. Specialization is the driving force of the sectoral concentration. This index reflects the share of a sector in the country concerned in EU28 production, in relation to the share of its whole economy in EU28 output.

Concentration index is defined as follows:

$$I_i^k(t) = \frac{Q_i^j(t)}{Q_{EU}^j(t)} \bigg/ \frac{Q_i(t)}{Q_{EU}(t)} \tag{2}$$

where:

$Q_i^j(t)$ is gross value added at constant prices in country *i* in sector *j*,

$Q_{EU}^j(t)$ is gross value added at constant prices in all EU countries in sector *j*,

$Q_i(t)$ is gross value added at constant prices in country *i*,

$Q_{EU}(t)$ is gross value added at constant prices in all EU countries.

Index values above 1 indicate a high level of concentration of the industry, around value 1 the concentration of the industry is the same as the EU28 average, and values below 1 reflect the lower concentration in the sector than the average of the countries compared (Čutková, Donoval, 2004).

Results

The following part of the paper focuses on the analysis of the share of the individual groups of sectors in the generated GDP at current prices and total employment in the period 2004 - 2016. For the analysis purposes, we used the classification of the sectors into five main groups: Agriculture, forestry, fishing – sector A, Industry in total – sectors B, C, D, E, Manufacturing – sector C, Construction – sector F, and Services (sectors : G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U). Sector B - Mining and quarrying due to reporting by the Statistical Office of the Slovak Republic is the part of the aggregate Industry in total.

Tab. 1. Development of the structure of created GDP and employment between 2004 and 2016 [%]

Sectors (SK NACE Rev. 2)	2004	2006	2008	2010	2012	2014	2016	Average
The share of sectors to GDP at current prices (%)								
Agriculture, forestry, fishing	3.6	3.2	3.7	2.6	3.2	4.0	3.4	**3.3**
Industry in total	26.9	28.0	25.8	23.9	24.1	24.3	24.6	**25.0**
Manufacturing	21.1	21.2	20.2	18.9	19.0	19.8	20.5	**19.7**
Construction	5.5	6.9	8.6	8.1	8.2	7.0	6.8	**7.3**
Services	53.5	52.1	52.6	56.3	55.8	55.3	55.3	**54.7**
Net taxes on products	10.5	9.8	9.3	9.1	8.7	9.4	9.9	**9.7**
The share of sectors in total employment [%]								
Agriculture, forestry, fishing	4.7	4.0	3.6	3.4	3.2	3.3	3.1	**3.6**
Industry in total	27.0	26.5	26.3	23.6	23.8	23.7	24.0	**24.9**
Manufacturing	24.1	23.7	23.9	21.3	21.6	21.6	22.0	**22.5**
Construction	6.8	7.5	8.1	8.5	7.8	7.4	7.3	**7.6**
Services	61.5	62.0	62.0	64.6	65.3	65.6	65.6	**63.9**

Source: own processing

Table 1 and the Figure 1 show that GDP growth in the Agriculture, Forestry, Fishing, Industry in Total and Manufacturing remained fairly stable over the period. The most significant changes are visible in the Construction and Services sectors.

In GDP structure, the highest share in the long-term consists of Services, as shown in figure 1. Services reached an average of almost 55 % of GDP of all sectors between 2004 and 2016. The second best-progressing sector was Industry in total, with a share ranging from 22 % in 2009 to 28 % in 2006. Agriculture, Forestry, Fishing and Construction achieved lowest shares of GDP. The share of the Construction sector in GDP has increased by 3.3 pp to 8.8 % (2009) from baseline (2004).
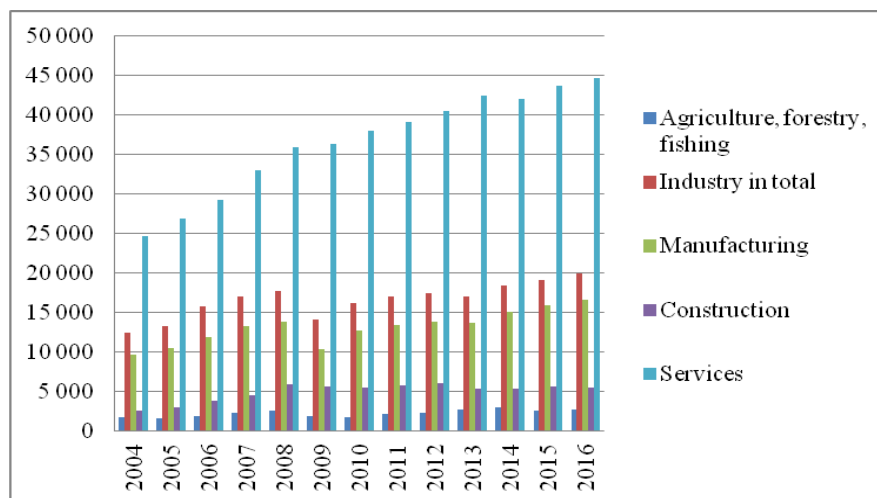

Fig. 1. GDP by sectors (SK NACE Rev. 2) (in mill. EUR, at current prices).

The industrial production in February 2017 increased by 2.6 % compared with February 2016. The development by SK NACE Rev. 2 influenced growth in mining and quarrying by 7.4%, electricity, gas, steam and air conditioning supply by 5 % and industrial production by 2.2 % (ŠÚ SR, 2017).

Recently there has been the gradual decline in the mining activity due to the increased prices of inputs to the mining activities and the recent consequences of the economic crisis in the Slovak Republic and the world.

The labour market situation in the Slovak Republic has undergone various structural and institutional changes. The data in Table 1 show similar employment developments, as in the case of GDP. Since 2000 (125 877) in the Agriculture, Forestry and Fishing sector, the value of the indicator has decreased significantly to 2016 (72 362). Total employment in this sector reached 96 476 (4.7 %) in 2004. There has been a decline in the number of the workforce moving to the Services sector, which has increased from 61.5 % in 2004 to 65.6 % in 2016. The different trend was typical for the Industry in total, except a few years when there was a slight increase. The decline in Industry in total was 3 percentage points higher in 2016 than the base year – 2004. Average values per Industry in total were 24.9 %, for the Services, with an average of 63.9 %. On the other hand, the Services recorded the steady increase in the employment over the monitored period.

Krugman index of specialization, Balassa concentration index

On the basis of the data on gross value added at constant prices for individual sectors of the economy obtained from the EUROSTAT database, we firstly compared (through the Krugman index) the degree of the sectoral specialisation of the Slovak Republic with other V4 countries in relation to EU28 countries. The data for 2016 were not available at the time of paper processing, and data for 2015 were incomplete, so we mostly worked with the data from 2004 to 2014.

Then, we pointed out the difference, or the similarity or even the consistency in the concentrations of the sectors in the monitored countries through the Balassa index.

Through the Krugman index, the European Central Bank carried out in 2004 calculations for the EU15 countries. The results of this analysis have shown that smaller countries are more specialised than larger countries, except Germany and Spain, which have emerged relatively more specialised as other countries of comparable size (ECB, 2004).

Production specialisation involves the process of differentiation of production activities, whereby individual sectors, production departments, enterprises and workplaces producing similar production, respectively, are separated and with similar technological processes. In the production process, there is an important role of integration of customer's requirements into product quality attributes, which is the basic precondition for systematic quality management (Madzík, 2016; Hrnčiar, 2017). The cognition, application and management of knowledge in manufacturing as well as non - manufacturing sphere of the national economy of every country create a basic competitive advantage of both, an organisation and a country. It is only possible to talk about the knowledge-based economy if knowledge, abilities and experiences become the main factor of production (Čepelová and Bernatík, 2013).

The sectoral specialisation can, therefore, be seen as the certain degree of concentration of employment and the value added within the sectors of the economy compared to other economies. In the long-term run, it has a significant impact on the productivity growth. However, the sectoral specialisation may influence economic growth even in the short term, as sectoral developments may be different due to the conjunctural cycle of the economy, and also depend on the link between the sectors and the world trade. The different production and product characteristics of the sector (product life, stock size and importance, capital intensity of production) can provide different responses to the structural shocks in the economy. As a result, the different lengths and amplitudes of economic cycles in individual countries, as well as their synchronisation, which is finally different between countries (Čutková and Donoval, 2004).

Tab. 2. Krugman's index of specialization.

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Slovak Republic	0.247	0.263	0.270	0.267	0.313	0.273	0.280	0.292	0.292	0.255	0.326
Czech Republic	0.150	0.187	0.222	0.221	0.243	0.248	0.245	0.258	0.254	0.236	0.250
Poland	0.245	0.261	0.274	0.276	0.283	0.324	0.335	0.346	0.357	0.353	0.345
Hungary	0.169	0.161	0.158	0.184	0.192	0.187	0.184	0.181	0.168	0.152	0.169

Source: own processing

In the terms of gross value added data at constant prices in the mining industry in the V4 countries and their share in the total gross value added of the EU28 countries result, that the highest share was in Poland, in 2004 it was up to 4.14 %. By contrast, the lowest share of gross value added in the mining industry had Hungary

in 2004 at 0.14 %. The Slovak Republic recorded an average of 0.55 % for the whole monitored period, including 2015.

As shown in Table 2, the sectoral specialisation has increased over the period 2004 - 2014 in all countries surveyed. The highest rate of specialisation on the basis of gross value added at constant prices was reached in Poland (0.345) in 2014, followed by the Slovak Republic (0.326) and the Czech Republic (0.250). In 2012, the Krugman index for Poland reached the level of 0.357, which was the highest value in the period under the review. Based on this development, we can conclude that the lowest degree of specialisation was reached in Hungary.

Table 3 shows the achieved results in the Balassa concentration index for 2004 - 2015 for the Slovak Republic. Based on the results, it is possible to determine whether the concentration in the sector is higher, lower or possibly the same as the EU28 average.

Tab. 3. Balassa concentration index for the Slovak Republic.

Sectors	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
A	1.96	1.95	1.98	2.08	2.08	2.04	1.74	1.99	2.11	2.40	2.72	2.34
B	0.49	0.55	0.41	0.61	0.67	0.75	0.62	0.72	0.72	0.73	0.72	0.77
C	1.11	1.17	1.17	1.18	1.21	1.20	1.35	1.33	1.33	1.32	1.50	n.a.
D	3.13	2.37	3.48	3.49	3.01	2.17	2.07	2.32	2.04	1.86	2.07	1.77
E	1.35	1.36	1.30	1.22	1.06	1.04	1.01	0.94	1.02	1.12	0.95	0.95
F	1.17	1.22	1.35	1.36	1.58	1.63	1.53	1.63	1.77	1.58	1.55	1.54
G - I	1.22	1.26	1.14	1.11	1.17	1.16	1.13	1.10	1.09	1.04	1.06	n.a.
J	1.01	1.01	0.99	0.96	0.87	0.97	0.92	0.91	0.97	0.88	0.79	n.a.
K	0.84	0.90	0.81	0.71	0.64	0.70	0.72	0.75	0.74	0.76	0.84	0.93
L	0.82	0.69	0.64	0.71	0.69	0.65	0.63	0.65	0.65	0.81	0.58	0.57
M - N	0.53	0.54	0.63	0.65	0.67	0.74	0.73	0.70	0.71	0.73	0.73	n.a.
O - Q	0.81	0.80	0.78	0.75	0.72	0.76	0.76	0.72	0.69	0.71	0.66	n.a.
R - U	0.70	0.83	0.80	0.88	0.65	0.87	0.86	0.91	0.96	0.95	0.96	n.a.

Source: own processing

As can be seen from Table 3, the Slovak Republic achieved, during the analysed period of twelve years, higher values than 1 for Balassa concentration index in the following sectors: A (Agriculture, forestry and fishing), D (Electricity, gas, steam and air conditioning supply), E (Water supply; sewerage, waste management and remediation activities), F (Construction). The analysis shows that these sectors have a higher share of the gross value added than the average of EU28 countries.
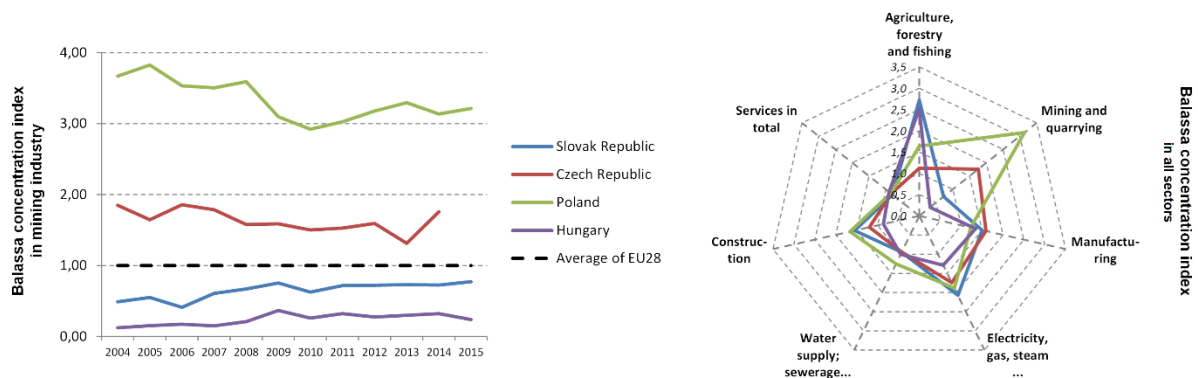

Fig. 2. Ballassa concentration index in V4 countries (left from 2004 to 2015; right in 2014).

In the base year of 2004 in the mining industry, the Balassa concentration index was from 1.85 (in the Czech Republic) to 3.67 (in Poland) times higher than the EU28 average. The highest concentration according to the above index was in Poland and the Czech Republic during the reporting period. At the end of the monitored period, this index in the Slovak Republic shows a concentration rate almost the same as the average of EU28 countries. The Balassa concentration index for Hungary shows that the concentration in the mining industry was the smallest in this country.

Conclusion

The submitted paper aimed to point out to the changes in the sectoral structure with a focus on the mining industry and its role in the economy of the Slovak Republic. Economic aspects of the mining industry were examined on the basis of selected indicators. As first we defined an economic position of the mining industry in the conditions of the Slovak Republic. Through the data on created GDP and employment between 2004 and 2016, we examined changes in the sectoral structure of the Slovak economy where the mining industry was analyzed within aggregate sector Industry in total. Subsequently, using the Krugman index of specialisation, we quantified the degree of sectoral specialisation within the V4 countries, which allowed us to make the comparison. The further result of this study is the quantification of the sectoral concentration with an emphasis on the mining industry using Balassa concentration index. These indicators are structural indicators, which are used by many foreign authors in their works. The benefits may also be considered by the study of cross-sectoral relationships across sectors.

This paper processed the data from the database of the Slovak Statistical Office (SLOVSTAT), as well as the Krugman index of specialisation and the Balassa concentration index from the European Statistical Office (EUROSTAT). It should be noted that the results achieved were largely influenced by the availability of data, in particular by the European Statistical Office, which did not provide data for 2016, and data for some sectors were not relevant for 2015 because they were incomplete. In the present study, two analytical approaches to the economic assessment of the mining industry within the V4 countries were presented. However, there are other appropriate tools and approaches that would allow broader coverage of this interesting scientific area. These approaches include the Lilien index (which tracks sectoral changes from the employment point of view), structural change intensity index, and generic approaches to structural deviation analysis.

References

Ambriško Ľ., Marasová, D., Grendel, P., Lukáč, S. (2015) Application of logistics principles when designing the process of transportation of raw materials. *Acta Montanistica Slovaca, vol. 20, no. 2. pp. 141-147.*.

Balassa, B. (1965) Trade Liberalization and Revealed Comparative Advantage. *Manchester School of Economic and Social Studies, 1965, pp. 99-123.*.

Berglof, E., Foray, D., Landesmann M., Yifu Lin, J., Nauro Campos , M., Sanfey P., Radosevic, S., and Volchkova, N. (2015) Transition economics meets new structural economics. *Journal Of Economic Policy Reform Vol. 18 , No. 3, pp. 191-220.*.

Blišťan, P., Kršák, B., Blišťanvá, M., Ferencz, V. (2015) The seabed-an important mineral resource of Slovakia in the future. *Acta Montanistica Slovaca, vol. 20, no. 4 pp. 334-341.*

Brainard, S. L., Cutler, S. L. (1993) Sectorial Shifts and Cyclical Unemployment Reconsidered. *The Quarterly Journal of Economics Vol. 108, No. 1 (Feb., 1993), pp. 219-243.*

Čepelová, A., Bernatík, W. (2013) The process management position in a transformation of a traditional organization into a knowledge-based organization. *Vision 2020: Innovation, Development Sustainability, and Economic Growth - Proceedings of the 21st International Business Information Management Association Conference, IBIMA, pp. 1105-1116.*

Dewatripont, M., Roland, G. (1995) The Design of Reform Packages under Uncertainty. *American Economic Review.December, 85:5, pp. 1207–223.*

Dirgová, E. (2014) Nezamestnanosť ako sprievodný jav transformujúcich sa ekonomík. *Studia scientifica facultatis paedagogicae. Roč. 13, č.4. Katolícka univerzita Ružomberok, ISSN 1336- 2232.S. 55-75.*

Dirner, V., Pavelek, Z. (2016) Aspects of classification of energy sources in terms of their position in the sector of the economy. *Acta Montanistica Slovaca, vol. 21, no. 4. pp. 287-297.*

European Central Bank (2004) *Sectoral Specialization in the EU. A Macroecnomic Perspectvives. Occasional Paper series 19/2004. Frankfurt am Main.*

European Commission EUROSTAT (2013) *Manual on the Changes between ESA 95 and ESA 2010. November.*

Gabrielová, H. (1996) Developmenttrendsin the structureof the Slovak economy.*Journal of Economics, vol. 44, no.10, pp. s. 780-800. ISSN 0013-3035.*

Gavurova, B., Perzelova, I., Bencoova, B. (2016) Economic aspects of renewable energy use - Application of support schemes based on a particular biogas plant in Slovakia.*Acta Montanistica Slovaca, vol. 21, no. 3. pp. 217-228.*.

Gelb, A. (1999) The End of Transition. In: Brown, A.- Kalamazoo, M.: When is Transition Over? *W. E. Upjohn Institute for Employment Research.*

Havlík, P. (2005) Structural Change, Productivity and Empolyment in the New EU Member States. *WIIW Research Report 313. The Vienna Institute for the international Economic Studies. Vienna.*.

Hrnčiar, M., Madzík, P. (2017) A 3D view of issues of quality in higher education. *Total Quality Management and Business Excellence, vol. 28, no. 5-6, 633-662,.*

Kršák, B., Sidor, C., Štrba, Ľ., Molokáč, M., Hvizdák, L., Blišťan, P., Koľveková, G., Liptáková, E., Delina, R., Mesároš, P. (2015) Maximizing the potential of mining tourism through knowledge infrastructures. *Acta Montanistica Slovaca, vol. 20, no. 4, 319-325.*

Krugman, P. (1991) Increasing Returns and Economic Geography. *The Journal of Political Economy, Vol. 99, (Jun.,1991), No. 3, pp. 483-499.*

Landesmann, M. (1999) Structural Developments in Central and Eastern Europe. *Vienna: WIIW.*

Landesmann, M. (2003) Structural Features of Economic Integration in an Enlarged Europe: Patterns of Catching-up and Industrial Specialization. *European Economy. Economic Papers, No. 181 – January.*

Lilien, D. M. (1982) Sectoral Shifts and Cyclical Unemployment. *The Journal of Political Economy, Vol. 90, (Aug., 1982), No. 4, pp. 777 – 793..*

Madzík, P., Chocholáková, A. (2016) Structured transfer of customer's requirements into product quality attributes - A university case study. *Quality - Access to Success. SRAC - Societatea Romana Pentru Asigurarea Calitatii, Vol. 17, Issue 154, pp. 38-45. ISSN:1582-2559..*

Malindžák, D., Šaderová, J., Vitko, D., Malindžáková, M., Gazda, A. (2015) The methodology and model for in-process inventories calculation in the conditions of metallurgy production. *Metalurgija. Vol. 54, Issue 1, pp. 227-230..*

Malindžáková, M., Rosová, A. (2014) Risk assessment method applied for waste ashes processing and further use as a renewable source. *Advanced Materials Research, vol. 1001, pp. 484-491,.*

MH SR (2004) *Aktualizácia surovinovej politiky Slovenskej republiky pre oblasť nerastných surovín.*

Michník, Ľ. (1995) Ekonomická encyklopédia - Slovník od A – Ž. *Bratislava : Sprint, 1995. 630 s. ISBN 80-967122-2-5.*

Midelfart-Knarvik, K.H. (2000) The Location of European Industry. European Commission, Directorate-General for Economic andFinancial Affairs, *Economic Paper.*

Morvay, K. (2005) Strategy and history of economic transformation in Slovakia. *Journal of Economics, vol. 53, no.1, pp. 5-32. ISSN 0013-3035.*

MŽP SR (2016) *Bilancie zásob výhradných ložísk Slovenskej republiky (BZVL SR).*

Okáli, I.. (1999) Zhodnotenie doterajších výsledkov transformačného procesu v slovenskej ekonomike, náčrt jeho otvorených problémov a ďalšieho postupu z hľadiska úloh hospodárskej politiky. *[Expertízne štúdie, č. 31.] Bratislava : Ústav slovenskej a svetovej ekonomiky SAV.*

Pawliczek A., Kozel, R., Vilamová, Š., Janovská, K. (2015) On the strategic planning, innovation activities and economic performance of industrial companies. *Acta Montanistica Slovaca. vol. 20, no. 1. pp. 16-25.*

Roland, G. (2002) The Political Economy of Transition. *Journal of Economic Perspectives, 16(1): pp. 29-50.*

Schumpeter, J. A. (2011) The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle.*Transaction Publishers New Brunswick (U.S.A) and London (U.K.), 244 p. ISBN 9781412815925.*

Straka, M. , Bindzár, P. , Kaduková, A. (2014) Utilization of the multicriteria decision-making methods for the needs of mining industry. *Acta Montanistica Slovaca, vol. 19, no. 4, pp. 199-206.*

ŠÚ SR (2015) *Nová metodika pre národné účty - ESA 2010.*

ŠÚ SR (2017) *Štatistická správa o základných vývojových tendenciách v hospodárstve SR. 4/2016.*

ŠÚ SR (2011*) Vysvetlivky SK NACE Rev. 2.*

Tošović, R., Jelenković, R. ((2016) Uranium mineral resources of serbia and their potential economic importance. *Acta Montanistica Slovaca, vol. 21, no. 1. pp. 9-18.*

Uznesenie vlády SR č. 978/2001 : *Národnástratégia trvalo udržateľného rozvoja Slovenskej republiky. 2001.*

Vincúr, P. (2007) Teória a prax hospodárskej politiky.*Bratislava : Sprint, 432 s. ISBN 978-80-89085-80-4.*

Wolf, N. (2004) Endowments, Market Potencial, and Industrial Location. Evidence from Interwar Poland (1918-1939). *London: Centre for Economic Performance, ISBN 0-7530-1710-5, 36 p.*