HUMAN RESOURCES REQUIREMENTS FOR REINDUSTRIALISATION IN BORSOD-ABAÚJ-ZEMPLÉN COUNTY

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Abstract

After World War II, Borsod-Abaúj-Zemplén county evolved into a major industrial centre due to coal mining, which was given priority in order to meet the industry's growing demand for energy. Following the change of regime, the processes of deindustrialisation, which affected the various parts of the country very differently due to their diverse characteristics, had serious consequences in this county. Decline in mining had a major role in this. The county's economic and social indicators still reflect this shock. The 2008 financial crisis shed doubts on the process of deindustrialisation. In its Communication for a European Industrial Renaissance (2014), the European Commission expressed its commitment to industrialisation, the modernisation of Europe's industrial base and the promotion of a competitive framework for EU industry. The success of reindustrialisation depends on a number of closely related factors. This article focuses on a single branch of the national economy: mining, and seeks to find the answer to whether a quality workforce and the necessary know-how are available in the region. We have prepared a SWOT analysis for the revitalisation of deep mines in Borsod-Abaúj-Zemplén county and we collected the most important statistical data about the deep mining. The history of mining is reviewed and the training needs are presented to assess the viability of revitalizing mining, with a focus on the specific features of human capital. Restarting mining in Borsod-Abaúj-Zemplén county is ideal because there are many unskilled or low-skilled unemployed people for whom traditional manual work is the only realistic alternative and the county still has the professional background in the science of mining.

Key words: *Deindustrialization, Mining, Human Resource*
JEL codes: *J2, L7*
LCC: *HD28-9999*

Introduction

The current mining situation in Borsod-Abaúj-Zemplén county was basically caused by two processes. The change of regime following the collapse of socialism induced qualitative and quantitative changes in the political, economic and social system, a unique process in history, which the different regions of the country experienced in different ways due to their different circumstances. In the county, the mining company's mines closed one after the other. The process of deindustrialisation is linked to structural change. In the same period in Hungary, the transformation of the economic structure as a result of the transformation recession, the decline of industry, including mining, was of particular importance, especially in areas such as B-A-Z county, where concentrated and large-scale industrial structures were established and operated. In these areas, serious scars were inflicted on the labour market and, through it, on society.

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The global economic crisis that has unfolded since the end of 2008 has fundamentally challenged the process of deindustrialisation. De-industrialisation is a process that is not in a state of equilibrium and can be prolonged, causing severe damage to a given unit of territory. In the view of many, the European economy, including the Hungarian economy, has become unbalanced, with a bottlenecked economic structure that relies too heavily on the creative industries. In order to boost economic growth, there is a renewed need to revitalise the industrial sector, including the mining sector. In other words, a kind of re-industrialisation must take place in Hungary. This will depend to a large extent on the ability of a region to preserve and, if necessary, partly redefine its mining traditions. It is essential to strengthen the local links between the existing industry and the mining sector and thus reduce the risk of delocalisation in the future. This industrial development is a long-term process, which depends on a number of inherited factors. The diversity of factors (in particular the labour force), the institutional background and the adaptability of the regions are the key to success or failure. The revitalisation of the mining segment requires well thought-out and innovative strategies. But these must in no way reflect pre-1980s thinking.

Following the financial crisis of 2008, the European Union saw the strengthening of the industry as an opportunity for recovery (EC 2010, 2014). In the post-crisis decade, the Hungarian industry's geographical transformation was marked primarily by the continuity and intensification of industrialisation processes (Lux, 2020). Although research focuses mainly on the manufacturing industry, a similar potential may exist in mining. In Borsod-Abaúj-Zemplén county, there is a high number of unemployed unskilled or low-skilled workers, and traditional manual labour is perhaps the only realistic alternative for them (Hajdú, 2021). The required educational background is still in place and perhaps, the mining traditions have not completely become vanished either.

Literature review

By the end of the 20th century, the services sector had gained increasing significance in developed countries at the expense of the industry. This process is called deindustrialisation, which, with the decline in industrial activity, has also led to a decline in the number of industrial employees and in the ratio of industry in GDP. In OECD countries, the process has also been strengthened by the outsourcing of industrial activities and by the North-South trade (Alderson, 1999). A study by IMF considers deindustrialisation as a feature of successful economic development, primarily resulting from higher productivity in manufacturing (Rowthorn and Ramaswamy, 1997). While in the USA and in the countries of Western Europe deindustrialisation took place even after the 2000's, reindustrialisation was more characteristic in the countries of Central and Eastern Europe (Nagy et al. 2019 Although traditional industries were in decline, the industry continued to drive economic development, in other words, structural change was also observed. Foreign direct investment and the relocation of international activity also had a key impact on the relevant processes (Barta et al. 2008). Following the financial crisis, the European Union announced the Europe 2020 strategy (EC 2010), which aims to achieve smart, sustainable and inclusive economic growth. The European Commission's relevant communication (EC 2014), published two years later, proposed a reform in Europe's industrial policy and aimed to increase the share of industry in GDP and its the role in employment.

Analyses by Nagy et al. show that, despite the set economic policy objectives, manufacturing employment in the EU-15 has stagnated since 2013 (the gross value added has risen slightly), while in post-socialist countries the contribution of manufacturing to employment had increased

up to 2008, and then, after a significant decline, it has demonstrated an upward trend since 2013. The ratio of gross value added also has an increasing trend. The authors note that in Western Europe deindustrialisation is still taking place, while in some Central and Eastern European countries the experience is lopsided, with reindustrialisation observed in addition to declining employment (Nagy et al. 2019).

As regards the preconditions for reindustrialisation, in addition to the previously predominant quantitative criteria (taxation level, wage level and road access), various quality factors (quality of the local government, qualifications and skills of the workforce, available supplier networks, clusters and business services) are gaining significance in Central European economies (Lux 2013a). Lux (2013a) also emphasises that these parameters are localised and must characterise a region simultaneously, i.e. their concurrent, favourable appearance is required. Another key feature includes path dependence (Lux, 2013b, and Molnár and Lengyel, 2015), i.e. the effect of past events and traditions can also be detected. According to a study of the period between 2009 and 2014 in Hungary (Lengyel, 2017), reindustrialisation was barely perceptible at the level of the national economy between 2009 and 2014. While the manufacturing industry's share in gross value added has increased in some counties, including Borsod-Abaúj-Zemplén county, deindustrialisation took place in the capital city and its agglomeration. The analyses by Nagy et al. (2019) also confirm that the transformation of Hungary's manufacturing industry is more similar to the one seen in the EU15 than to other post-socialist countries.

Based on its geographical and natural features, Borsod-Abaúj-Zemplén county is one of the most diverse regions in Hungary, as it is the place where the Northern Massif meets the Great Plains. Consequently, the economic and geographical position of the county is favourable. In addition to lignite and ore deposits, it abounds in mixed minerals (e.g. bentonite, limestone, andesite and tuff), in forests covering most of the mountains and in mineral springs, hot spas and healing waters. The county is also rich in tourist attractions: two of Hungary's 10 national parks, the Aggtelek National Park and the Bükk National Park, are located in this region, along with caves, medieval castles serving as theatres of history, romantic country houses, mansions, listed buildings and ethnographic traditions that have been added to the list of mankind's "intangible cultural heritage" (Siskáné et al. 2013).

The county has areas of different economic development. The north-eastern border with Slovakia is an agriculturally underdeveloped land, while the north-western region is industrialised. The economic significance of heavy industry, which used to underpin the previous development of the county, has significantly decreased in recent decades, as numerous coal mines and metallurgical plants have been closed. As a result, Ózd and the Sajó River Valley mining region were hit by economic crises. At the same time, in the region around Bükkábrány, significant lignite assets are still produced by opencast mining, and these serves as a raw material for the nationally significant electrical power plant installed on the foothills of the Mátra Mountains. South Borsod, the Tokaj Foothills and Zemplén have a diverse economic structure. In addition to the presence of industry in these areas, the wine regions of long traditions in the Bükk Foothills and the Tokaj Foothills are also of great significance.

Gross domestic product was HUF 2,073,434 million in 2018 in Borsod-Abaúj-Zemplén county, accounting for 4.86 per cent of the country's economic performance. Despite the nearly unbroken rise in per capita GDP in recent years, the figure characterising the county only amounts to 60 to 70 percent of the national average. However, the data shows significant fluctuations. After a period of growth up to 2005, performance declined as a result of the 2008 crisis, and this decline was well above the national average. After the low point seen in 2010

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(when the per capita output barely exceeded 60% of the national average), the county started to catch up, and in 2018, it performed 73.6 per cent (KSH).

In late June 2020 85,112 business organisations were registered in Borsod-Abaúj-Zemplén county, representing an increase of 0.2 per cent on a year earlier. Businesses amounted to 90 per cent of all organizations, 23 per cent were partnerships and 76 per cent were sole traders. The number of not-for-profit organisations was 6851. The number of *businesses operating with foreign direct investment* has been steadily declining since 2012 (there were 395 such businesses in the county in 2010; 335 in 2015, and 302 in 2018 in the county), but their foreign capital has increased significantly, reaching HUF 1122.2 billion in 2018, and thus their share in the country's total foreign capital has also increased (to 14.17% by 2018). According to the number of *registered businesses per 1000 inhabitants*, at the end of June 2020, Borsod-Abaúj-Zemplén county had the lowest value of all the counties. At that time, no more than 121 businesses were registered per 1000 inhabitants. In 2014 and 2015, there were 111 businesses, and in 2017, 114 businesses per 1000 inhabitants, representing a very modest increase (in the same period, the national average also increased slightly) (CSO, 2020).

In a *sectoral approach*, nearly 30 per cent of all organisations operate in agriculture; however, as sole traders predominate this sector (96.4%), in terms of employment it is much less important (merely 2.41% of the employees work in agriculture). Second to agriculture, most organizations are engaged in real estate transactions (9660), next comes trade and automotive repair (7407), followed by professional scientific and technical activities (7139). A total of 3754 organisations are active in industry (mining, quarrying, manufacturing, electricity, gas and steam supply, air conditioning, water supply, sewerage, waste management and remediation activities), representing 4.4 per cent of all organisations (with 29.3% of all the people employed in this sector). A significant part of the *value of investments* is realised in industry (72.7% in H1 2020). In terms of investments, the manufacturing industry is worth mentioning within industry, as a higher ratio of the development resources are used in this sector. In 2019, the value of investments amounted to HUF 669,747 million. In a national comparison, per capita figures may be used. This is HUF 1042,000 in Borsod-Abaúj-Zemplén county, against the national average, being HUF 875,000.

Industrial production (excluding water and waste management) amounted to HUF 2,824,486 million in the county in 2019. This translates to HUF 4,396,000 per capita (in 2019), higher than the national average (being HUF 3,538,000). Within industry, manufacturing accounts for 97.93 per cent of production (CSO, 2020). More specifically, the manufacture of chemicals, products, vehicles, computers, electronic apparatuses and optical products are the most significant, and these sectors also exhibit the highest productivity (production per employee).

Material and methods

We collected and analysed the statistical data about the mining in Borsod-Abaúj-Zemplén county. The time horizon of the data presented varies, as the collection of historical mining data at county level is often difficult because some of the data is difficult to obtain.

The qualification requirements and standards for mining jobs have been reviewed on the basis of Section 50/A (2) of Act XLVIII of 1993 on Mining and on the basis of Decree 60/2009 (XI. 3.) of the Ministry of Labour and Social Affairs (which provides for the professional qualifications and experience required for the occupation of jobs of technical safety significance in mining). We have prepared a SWOT analysis for the revitalisation of deep mines in B-A-Z

county. Our analysis is valid within the currently known legal, economic, technical and social framework.

Results – The history of mining in Borsod-Abaúj-Zemplén county

Since the late 1700's, *coal mining and ore mining* have played a key role in employment in Borsod-Abaúj-Zemplén county. Mine closures began as early as the 1960's as a result of economic restructuring (previous mine closures were due to mine depletion). Closures continued and the last step in Borsod-Abaúj-Zemplén county was taken in 2004, when an era ended on conclusion of the Borsod Coal Mines liquidation process and the termination of the company.

Table 1: Former mining centres

Locality	The beginning of mining	Mine closure	Locality	The beginning of mining	Mine closure
Abod	1921	1927	Ormosbánya	1870	1988
Alacska	1897	1973	Ózd	1840	1985
Alberttelep	1917	1989	Parasznya	1767	1939
Arló	1852	1947	Pereces	1830	1973
Bánfalva	1920	1965	Putnok	1923	2001
Bánhorvát	1890	1945	Radostyán	1858	1987
Bánszállás	1841	1957	Rudabánya	1892	2004
Barcika	1881	1946	Sajóbábony	1929	1946
Bekölce	1997	2003	Sajógalgóc	1822	1990
Berente	1919	1984	Sajóivánka	1880	1946
Borsodnádasd	1940	2002	Sajókaza	1769	2003
Diósgyőr	1850	1967	Sajókazinc	1820	1948
Izsófalva	1868	1977	Sajókápolna	1822	1934
Edelény	1850	1995	Sajólászlófalva	1864	1959
Farkaslyuk	1840	1990	Sajószentpéter	1888	1973
Felsőnyárád	1880	1978	Sajóvárkony	1834	1947
Hódoscsépány	1850	1923	Sajóvelezd	1867	1930
Járdánháza	1845	1957	Sáta	1890	1960
Kazincbarcika	1947	1993	Somsály	1854	1972
Királd	1822	1984	Szendrő	1893	1944
Kondó	1890	1962	Szuhakálló	1869	1996
Kurityán	1873	1985	Szuhogy	1910	1945
Lyukóbánya	1859	2004	Tardona	1769	1924
Mónosbél	1868	1926	Vadna	1921	1994
Múcsony	1890	1945	Varbó	1810	1936
Nagybarca	1920	1966			

Source: The authors' own elaboration based on a publication by Rónaföldi, Zoltán (2012), entitled "A borsodi és Ózd vidéki szénbányászat fontosabb évszámai, eseményei" (Important dates and events in coal mining in Borsod and in the neighbourhood of Ózd)

An analysis of the coal mining data (Figure 1) reveals that the extracted amount rapidly increased between 1950 and 1969, reaching its highest level at 6,029,000 tons in 1969. Production decreased slightly up to the early 1980's, and then dropped drastically in the period following the change of regime (3,826,000 tons of coal was mined in the county in 1989 and

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then only 2,908,000 tons a year later). Between 1993 and 2011, the extracted amount fluctuated between 1,700,000 and 1,100,000 tons per year, and after the mine closures, barely 600,000 tons of coal were mined per year.

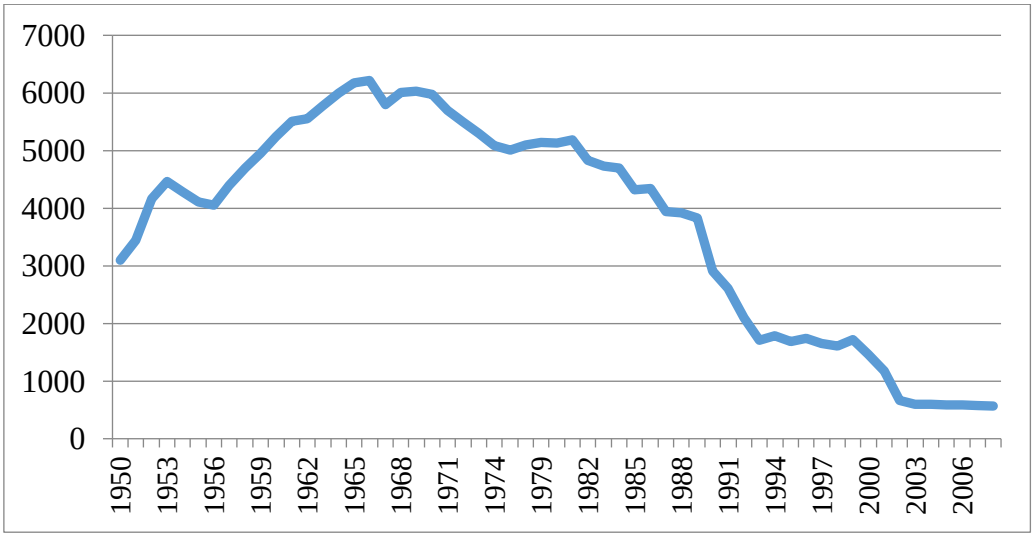

Figure 1: Coal mining in BAZ county between 1950-2008 (tousand tons)
Source: CSO, B-A-Z megyei statisztikai évkönyvek (Annals of statistics for BAZ county)

The county's employment data shows that the number of people working in industry (Figure 2) increased steadily between 1950 and 1975, peaking at 150,910 industrial employees. Between 1975 and the change of regime (1989), a slight decrease was observed, which was then followed by a drastic decrease.

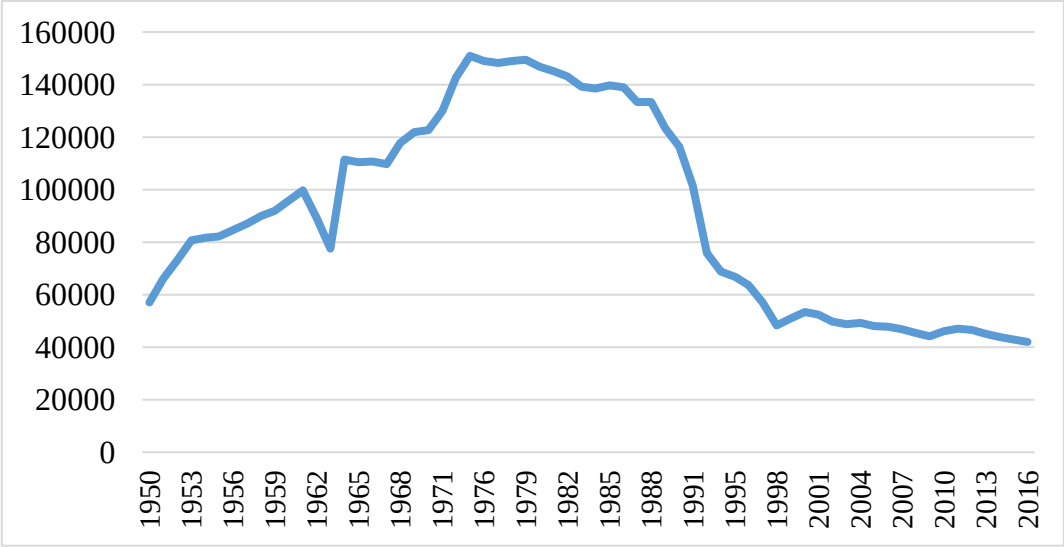

Figure 2: People employed in industry, 1950-2016, BAZ county
Source: CSO, B-A-Z megyei statisztikai évkönyvek (Annals of statistics for BAZ county)

Developments in the number of people working in coal mining in the county were also surveyed (Figure 3). Due to the absence of earlier data, the trend is only depicted from 1978, but based on existing data, the highest number of people worked in coal mining in 1961 (28,712 people), and the headcount was 19,609 in 1978. After the change of regime, the number of people employed in coal mining drastically decreased (to 7266 people), which has further dropped to this day, as in 2011 only 378 people worked in mines in the county.

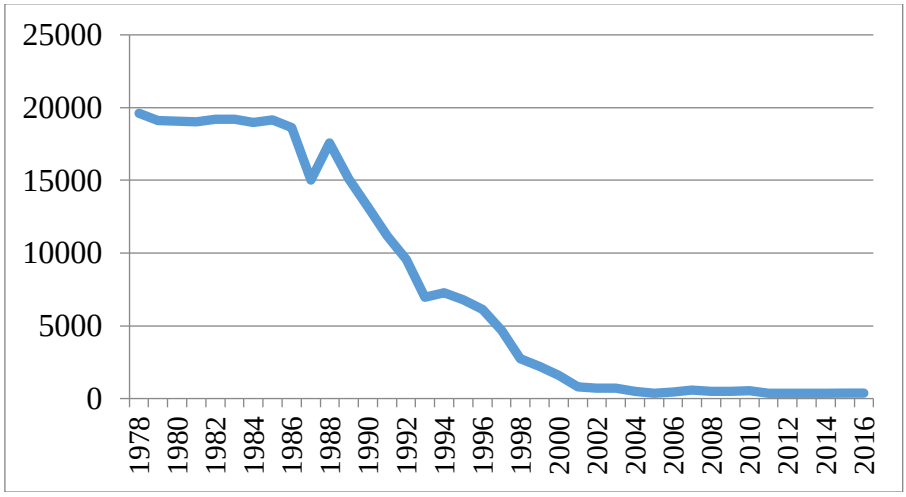

Figure 3: Coal mining employees in BAZ county, 1978-2016

Source: CSO, B-A-Z megyei statisztikai évkönyvek (Annals of statistics for BAZ county)

Based on the data of the last three censuses, the ratio of employed men to the population aged 15-59 was examined at the level of communities (Figure 4).

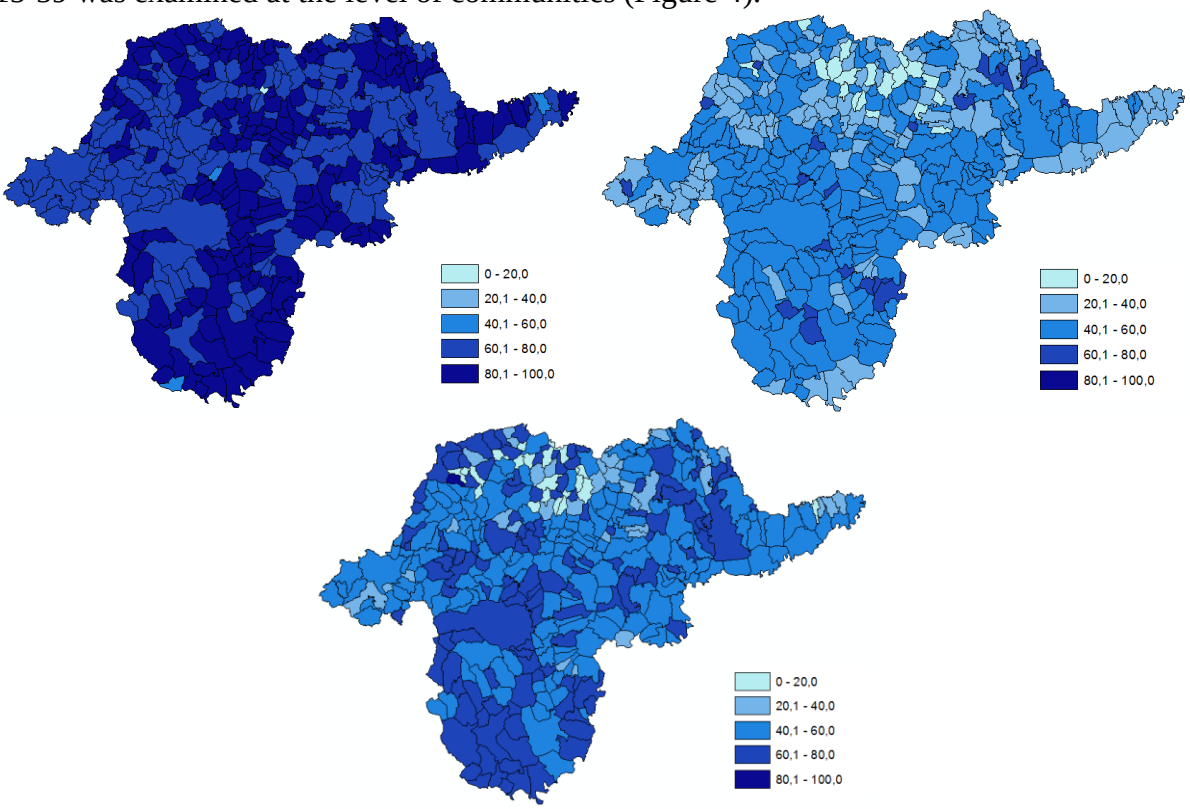

Figure 4: Employment rate among men aged 15-59 (1990, 2001 and 2011)

Source: The authors' own elaboration based on census data

In 1991, the impact of full employment, which had prevailed before the change of regime, was still felt among men. In more than half of the localities of Borsod-Abaúj-Zemplén county, employment was between 80-100 per cent, and the county average was 80.1 per cent. By 2011, it had fallen by nearly half, to a county average of 42.2 per cent. As a result of recovery from the economic crisis, in 2011 the employment pattern became considerably more stable, with the county average being 53.1 per cent. Among the economically active male population, in 2011,

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the highest employment rate was recorded at Égerszög (90.9%), Sima (80%) and Keresztéte (75%), where there are no registered Roma residents. At the other extreme is the group of localities where the ratio of employed men in the active age group is zero per cent: at Tornakápolna, Gagyapáti, Teresztenye, Tornabarakony, Pamlény, Varbóc and Nyésta (these localities already have higher ratios of Roma inhabitants).

The most common vocational qualifications required by the primary labour market in Borsod-Abaúj-Zemplén county in November 2020 included those of shop assistants, locksmiths and electricians (representing a total demand for 2657 people). According to the employer's core business activity, the number of vacancies registered in Borsod-Abaúj-Zemplén county for November 2020 was as follows: 41 persons were sought in agriculture, 371 in industry, 458 in market services and a total of 1787 in public and other services.

The idea of reopening mines emerged in 2010 as one way to restore a society based on work. For those who want to work, the most suitable job opportunities must be offered for the natural and geographical conditions of the given region. In this country, one of the breakthrough points could be the extraction and processing of the available mineral resources. As a first sign, the Borsod-Abaúj-Zemplén county Coal Mining Cluster was established on 4 December, 2013. Its members include: Ministry of National Development, Borsod-Abaúj-Zemplén county Local Government, Hungarian National Asset Management Ltd., Hungarian Mining and Geological Office, Hungarian Institute of Geology and Geophysics, University of Miskolc, National Association of Hungarian Mining Communities, National Hungarian Mining and Metallurgical Association (Törő, 2015). As no information was found about the cluster in 2020, if it was created, it is unable to fulfil its original function.

Results – Social and demographic background in Borsod-Abaúj-Zemplén county

On 1 January 2021, the population of Hungary was 9,730 thousand, of which 635 thousand lived in Borsod-Abaúj-Zemplén county. The resident population of Borsod-Abaúj-Zemplén county was 635 thousand on 1 January 2021, 0.8 per cent less than a year earlier. Accordingly, Borsod-Abaúj-Zemplén is the second most populous county in Hungary. As much as 6.5 per cent of Hungary’s population lives here. In Borsod-Abaúj-Zemplén county, population decline has been faster than the national level for a long time. The population of the county was characterised by rapid growth up to the early 1980’s. In the 1980’s, the number of births still exceeded the number of deaths, but already at that time natural reproduction was insufficient to offset the negative migration difference. Natural population decline has only characterised Borsod-Abaúj-Zemplén county since 1992. In the 21st century, the population is reduced by low birth rates, high mortality and migration losses.

Among the 16 districts of Borsod-Abaúj-Zemplén county, Miskolc is the most populous: at the beginning of 2020, 36.4 per cent of the county's population lived in the city, followed by the Kazincbarcika and Ózd districts. Over the past 4 years, the number of residents has decreased in all districts. The fastest decline was registered in Sárospatak (5%), followed by Sátoraljaújhely (4.7%), while the slowest decline was recorded in the Szikszó (0.5%) and the Tiszaújváros (1.4%) districts. At the time of the 2016 micro-census, 24 per cent of the county's population lived in Miskolc, 35 per cent in other cities and 41 per cent in villages. In 4 years the resident population has decreased by 4.2 per cent in the county seat, by a total of 4.8 per cent in the other cities and towns of the county, and by 3.5 per cent in its villages. Among the towns of Borsod-Abaúj-Zemplén, the population has increased in Szendrő, and decreased in the rest.

Table 2: Population in Borsod-Abaúj-Zemplén county

Year	Resident population (persons)	Population density, (persons per square km)	Population as a percentage of the previous census (%)	Period (year)	Actual reproduction rate or decline (persons)	Average annual reproduction rate or decline (%)
1980	809,468	112	104.2	1970–1979	32,718	0.4
1990	761,963	105	94.1	1980–1989	-47,505	-0.6
2001	744,404	103	97.7	1990–2001	-17,559	-0.2
2011	686,266	95	92.2	2001–2011	-58,138	-0.8
2020	637,064	88	93.0	2011-2020	-47,729	-0.9

Source: Data source: CSO website, Fókuszban a megyék (Counties in focus) and https://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_wdsd003c.html
The table is the authors' own elaboration.

Similarly to national trends, but at a slower pace, the change seen for a long time in the age composition of the population has continued. For years, both the average age and the median age have been steadily increasing in Hungary. The average age of men was 40.6 years, while the average age of women was 44.8 years at the beginning of 2020. Half of the population is younger than 42 years and the other half is older than 42. At a national level, the ratio of people over the age of 65 is close to 20 per cent, while the ratio of those under the age of 14 was 14.5 per cent on 1 January 2020. In Borsod-Abaúj-Zemplén county, the average age is lower for both sexes than nationally. On 1 January, 2019, the average age of men was 39.3 years and that of women was 44.1 years in the county (CSO, 2019).

Based on the data of the 2016 micro-census, Borsod-Abaúj-Zemplén county does not have much to boast in terms of educational attainment, as it ranks second after Szabolcs-Szatmár-Bereg county (13.8%) in the ratio of people without primary qualifications. In terms of the highest level of education, Borsod-Abaúj-Zemplén county has a slightly better result, as it is in the second quartile in the ranking of counties according to the ratio of people with a tertiary degree. The county is also characterised by a high degree of heterogeneity in terms of education. The education of people living in the Miskolc District exceeds the national average, as the ratio of people with higher education in Hungary is 18.7 per cent, while in the Miskolc District it is close to 20 per cent. Among the districts of the county, the least educated are those living in the Edelény, Cigánd, Encs, Szikszó and Gönc districts.

In Hungary, including Borsod-Abaúj-Zemplén county, labour supply has been influenced by new factors in recent years in addition to the traditional ones. Below the focus is placed on the factors that encourage men's willingness to work, given that the stronger sex is over-represented among those employed in mining operations. The first important factor is demographic, as the number of people aged 15-64, who represent a potential labour supply, has been steadily declining in recent years. However, this effect is mitigated by the fact that the final exit of large numbers of people born in the first half of the 1950's from the labour market has been slowed down by raising the retirement age. Labour supply has also been boosted by the *elimination of the possibility of leaving before the statutory retirement age*, and the criteria for access to health benefits have not only been tightened recently, but previous benefits have also been reviewed and some of them withdrawn. Thus, even those who have not worked for many years are compelled to work to make up for their lost income.

The compulsory school-leaving age has been lowered from 18 to 16 years. However, those leaving education without qualifications and with a lack of general knowledge are expected to continue to find it difficult to enter the labour market.

The term of the job-seeking allowance, which is more or less linked to some previous income, has been reduced to three months, shortening the time available between losing a job and re-employment, which could in principle speed up job search. Low educational attainment, lack of skills, Roma ethnicity and residence in a disadvantaged region increase the likelihood of a more difficult than average integration into the labour market for an individual. The composition of the Roma by educational attainment and by residence also differs from those of the non-Roma population. The ratio of young people is higher among those who identify themselves as Roma, and the ratio of the elderly is significantly lower than among the non-Roma. Nearly 16 per cent of the Roma aged 15-64 has not even completed primary school, according to 2015 data, and a further 63 per cent only has primary qualifications. For the non-Roma population, these ratios were 1.0 and 19 per cent, respectively. The lowest difference between the Roma (15%) and the non-Roma (25%) was recorded in the ratio of trade and vocational school graduates to the total population (CSO, 2016). Among the total number of jobseekers in the county, in H1 2020, the highest ratio (46%) included people with qualification of 8 completed primary school grades, 26 per cent of them had vocational or trade school certificates, 24 per cent had completed secondary school, and 3.6 per cent graduated from university (CSO, 2020).

Results – Training needs in mining

When planning mine reopening, the organisation of training should simultaneously be reconsidered. Since 2013, the former collier training can no longer be launched in Hungary. In 2020, three training courses for registered trades (mining technician, mineworker and opencast miner) were available for those wishing to work in mining. Due to the low number of employees in coal mining and the low demand for training, Perfekt Zrt. only launches such vocational training courses at the Centre for Industrial Training in Pécs and at the Eurokt-Academy in Esztergom (in the latter vocational training is only available for opencast miners).

A *mining technician* may be employed as an open-pit mining technician, a deep mining technician (miner), a blaster, a mining machine maintenance manager, a geologists, or a geophysicist. Vocational qualifications only require the completion of primary education and adequate physical fitness and health for the prospective job. A technician with general professional know-how, familiarity with tasks of an opencast and a deep miner and those related to the operation and maintenance of the machines and equipment used there. He has satisfactory knowledge as required for jobs in coal, ore, mineral, bauxite, stone, sand, etc. mining and quarrying, and is familiar, at an intermediate level, with the managerial duties. He is engaged in the extraction of solid minerals, directly at the site or at the approach point on the surface, underwater or under the ground. In the course of performing the job, he carries out excavation, cleaning, narrow work, production or abandonment, including the partial tasks of ground-breaking, lining, loading and transportation, according to the instructions and regulations received from his supervisors and to specific work orders. In the course of these workflows, he acts according to and adheres to the above-listed, reasonably expected professional knowledge also specified in the official instructions, and to any additional information learned at basic and additional training courses. He is familiar with the expected requirements for the use of tools and machines. He follows the instructions and requirements of handling, operating, starting,

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and maintaining machines. He is aware of the risks inherent at his workplace, and makes decisions, gives and executes instructions accordingly in the course of his activities.

With the professional qualification of a *mineworker*, the following positions can be filled: collier (assistant collier), mineral narrow worker, deep mining classifier, operator, winning machine operator, power loader operator, machine operator, belt operator, tractor operator, pump operator, filler. His tasks include the cultivation of deep mining coal, ore and mineral mines, mining or quarrying extraction, the operation of winning, transporting, loading and servicing machines, machine inspection, manning and maintenance, and the performance of technological and unexpected work organisation tasks in relation to operation. A worker with a degree in *opencast mining* may hold the positions of an open-pit miner, a quarry miner, a mineral narrow worker, an ore narrower, an ore concentrator, a sizer operator, a winning machine operator, a machine operator, a belt operator, a master dredger, a master loader or a heap keeper. His principal duties include the operation of the winning, transport, loading and servicing machines of opencast coal, ore, mineral, stone, gravel, sand and clay mines and quarries, and the inspection, machine management, maintenance, technological and work organisation tasks related to the operation. Pursuant to Article 50/A (2) of Act XLVIII of 1993 on Mining, Decree no. 60/2009. (XI. 3.) KHEM provides for the professional qualifications and experience required to fill technically significant jobs in mining, and the jobs specified in its annex may only be filled by persons with the professional qualifications and experience specified therein.

Results – Chances of reindustrialisation in Borsod-Abaúj-Zemplén county (SWOT analysis)

Following the logical structure of the SWOT analysis, below is a summary of the most important factors of chances for mining in the county.

Strengths

In the 1800's, coal had already been mined in Borsod county. In addition to open-pit mining, miners also extracted fossil coal from under the ground through adits (Lehoczky, 1975). After World War II, the amount of coal extraction in Hungary rose to over 12 million tons due to forced military production, and a significant part was provided by the Borsod areas. This suggests a deep-rooted mining culture in the county. Between 1949 and 1959 university departments teaching mining and metallurgy were gradually relocated to Miskolc, thus giving the city's technical university the image of three technical faculties, namely mining, metallurgy and mechanical engineering. The legal successor of the institution is the University of Miskolc, currently having approximately 10,000 students in its campus. In addition to education, numerous professors at the university, which has a strong research base, are members of the Hungarian Academy of Sciences.

The county is characterised by a developed and competitive chemical industry. In a national comparison, industrial production is outstanding in the county; in 2019 it was HUF 4,396,000 per capita as against the national average HUF 3,538,000. Manufacturing has a share of nearly 98 per cent in industry, with chemical industry having a pivotal role in terms of both production value and labour productivity. Chemical technology in Borsod (No. 1 nitric acid plant and Nitrogénművek Zrt.) represents a high standard, the workforce is skilled, and market demand for these products is constantly growing (they are also suitable for sale in export markets). In terms of human resources, the number of economically active people in the county has increased (in 2006, 2016 and 2019 this cohort comprised 269,400; 284,600 and 280,800 people,

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respectively); the number and ratio of the unemployed as well as the number of inactive people has decreased in this group, which is even more pronounced in light of the change caused by decrease in the resident population. In Q2 2020, this region had an employment rate (55.3%), or the quotient of the number of employed and of the working age population, which is below the national level (59.5%) but has improved by 8.5 percentage points on 2006. Low wage level in the county: Local salaries are 42 per cent lower than the wages paid in Budapest, and the difference is between 15-20 per cent nationally. Approximately 30-40 per cent of the blue-collar workers receive a minimum wage for their work, in many cases their earnings are only a few thousand forints higher than the benefit they could receive for raising children, for joblessness or for their social condition. For this reason, a considerable percentage chooses to stay at home rather than work.

Weaknesses

The closure of underground mines caused social, physical and moral erosion. In former mining areas, the population that used to have a secure livelihood, high wages and social esteem, could no longer find any suitable alternative livelihood after the disruption of production. The population engaged in mining-related professions is aging, and the former miners with specialised experience and knowledge are already retired or about to retire. For this reason, the replacement of professionals (filling jobs that require experience) is a major challenge. Another problem is that the qualifications required for this activity (locksmith, electrician, machine operator, etc.) are in short supply in the county.

The propensity to work is low among the people who live in the region. The individual's employment decision is made by comparing the expected wage (and any non-monetary benefits earned on work) to the expenses and inconveniences associated with the job. If an individual receives income without work, he can “buy” more products and more free time from such extra income, and so his job supply will be lower than without a separate income (Killingsworth, 1983). The high inactivity rate is considered as the most important factor limiting competitiveness. Low-skilled people are overrepresented in the region: Low-skilled workers are over-represented in the region: Borsod-Abaúj-Zemplén county ranks second among counties in terms of the ratio of people without completed primary school education (13.8%). Among the districts of the county, the least educated are those living in the Edelény, Cigánd, Encs, Szikszó and Gönc districts. In Edelény, 25 per cent of the population over the age of 7 have not completed primary school education. There is no potential investor in the area; the county currently has no investor capacity.

Opportunities

The technology required for the creation of an innovative product structure in relation to mining is available, and the chemical companies located in the county and the university have the latest technological conditions. Wage opportunities in mining may be attractive, and high bonuses and shift breaks due to hazardous operations may increase the ratio of people wishing to work in the sector. Reindustrialisation is given government and EU support. As in accordance with the EU2020 strategy, the priority areas of the EIDHR include the development of the productive sector and the promotion of reindustrialisation (Varga, 2016); reindustrialisation is expected to receive significant external resources. As the continuation of mining activities requires special expertise, for which training is currently only available in Pécs and Esztergom, EU funding is warranted for the organisation of training.

The regulatory framework for supporting hazardous occupations is strengthening; further tightening of the existing legislation is expected to make benefits for mining employees more

transparent. Instead of early retirement pensions, which were abolished in 2015, in the case of work with an increased risk of health damage, the employee is compensated by reduced working hours, more leave, additional benefits or recreational measures (Világgazdaság, 2017, November 8). Government Decree no. 23/1991 (II. 9) on the Social Security Benefits Due to Certain Mineworkers was in force before 1 January 2012, and granted a significant early retirement benefit to miners if all the other conditions were met. The restoration of this early retirement benefit might perhaps be considered in order to increase the attraction of the profession, as miners are exposed to increased danger and adverse health effects during their work underground, which should be compensated. If the existing mines were reopened, a significant number of new jobs would be created, and thus the county's population, currently afflicted by high unemployment, would have a good opportunity, which could also be the key to the region's population retention.

Threats

Mining affects the local and regional environment in numerous ways. These include changes in the natural environment, an impact on water quality, and the generation of hazardous substances, which are the causes of the population's resistance to mine opening. In addition to environmental concerns, there has also been an increase in aversion to plants where accidents are waiting to happen and that are unhealthy. Deep mines have, on the one hand, an increased impact on health and a high risk of accidents, and, on the other hand, a considerably higher requirement for workers to be physically fit and healthy. Mineworkers should certainly be provided benefits to take up work despite the dangers.

This activity should only be carried out under strict regulatory conditions. Decree no. 60/2009. (XI. 3.) KHEM on the Professional Qualifications and Experience Required to Fill Technical Safety-Relevant Jobs in Mining specifies rules on the length of experience in the number of years required of a worker engaged in mining activities. The generosity of the welfare system is tantamount to competition, and for those living in the area, public service and high social benefits offer a "comfortable" position, which may have a disincentive to work. Economic recovery and emerging labour shortages are depriving the region of labour capacity. In the case of certain professions, there is a significant outflow of labour from the county, only people with a very low level of education stay here, and moreover, they do not necessarily have the appropriate state of health.

Conclusions

Following the 2008 financial crisis, the European Union saw reindustrialisation as an opportunity to recover from the crisis (EC 2010, 2014). These processes are characterised by path dependence (Lux, 2013b and Molnár and Lengyel, 2015). Due to the industrial traditions of Borsod-Abaúj-Zemplén county and the still significant industrial production, mainly of the chemical industry, which exceeds the national average, the quantitative and qualitative conditions necessary for reindustrialisation are largely in place. The aim of this article was to examine the current state of human resources in the county, as one of the qualitative factors playing a significant role in the success of these processes, and then to draw conclusions about the potential for reindustrialisation in mining.

The revival of mining in Borsod-Abaúj-Zemplén county is ideal because there are many unskilled or low-skilled unemployed people for whom traditional manual work is the only realistic alternative. In other words, tens of thousands of jobs could be created as industry expands. However, the new mining industry is sensitive to the quality of the education system,

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the level of material and intellectual infrastructure, and the quality of life in a given locality. The foundations for all this are in place in the county, with both higher education and vocational schools. The new mining technology has a low environmental impact and improves our country's energy dependence.

It was found that the county has a high number of low-skilled workers available and wages are also below the national average. The knowledge base is partly available thanks to the University of Miskolc. At the same time, the population engaged in mining professions is aging, and replacing professionals is a major challenge, especially for jobs requiring experience and the necessary qualifications (locksmith, electrician, machine operator, etc.) are also in short supply in the county. The low willingness to work on behalf of the currently available workforce is also a cause for concern. Our findings suggest that without a well-considered strategy that also takes into account education, training and labour market integration, human resources will be a critical bottleneck in the reindustrialisation of mining.

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Appendix: Minimum professional qualifications and experience required to fill technical safety-relevant jobs in mining

Job	***Education, vocational qualifications, other qualifications***	***Required specialised experience***
Specialist supervising blast and explosion-proof equipment	specialised tertiary or	1 year
	secondary or	3 years
	basic vocational qualification	5 years
Operator of mining electrical installation	At least a basic electrical qualification and completed course in mine power plant management	2 years in mining*
Operation of a machine powered by an engine of a capacity less than 50 kW unit power	Completed primary school education and the mining machine operator course 1	3 months in mining
Operation of a machine powered by an engine of 50 kW or higher unit power	completed primary school education and the mining machine operator course 2	6 months in mining
In deep mining		
Mine rescue team commander and deputy	tertiary qualifications in mining and rescue	3 years
	secondary qualifications in mining and rescue	6 years

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Head of mine rescue centre and deputy	tertiary qualifications in mining and rescue	3 years
	secondary qualifications in mining and rescue	6 years
Engine supervision	specialised tertiary qualifications	1 year
	specialised secondary qualifications	2 years
	tertiary or secondary electrical qualification	2 years
Electrical supervision	tertiary electrical qualification	1 year
	secondary electrical qualification	2 years
	tertiary qualification in engineering	2 years
Special technical supervision (ventilation, coal-dust explosion, fire prevention, water protection commissioner)	tertiary qualification in mining	1 year
	secondary qualification in mining	2 years
Mining supervision	secondary qualification in mining	1 year
Dispatch centre operator	Secondary qualification in mining, mechanical engineering or electrical equipment, and a completed course in mining dispatch centre management	2 years in mining
Mine hoist operator	completed primary school education and the mining machine operator course 2 and training course in mine hoist operation	1 year in mining
Mine rescuer	Specialised qualification in mining, or mechanical, or electrical, or construction engineering, and a completed mining rescue course	2 years in underground mining
Independent electrician in an underground mine	At least a basic electrical qualification and a completed course in independent mining electrical installation	2 years in underground mining
Firedamp- and explosion-proof electrical equipment installer, operator, inspector, maintainer and repairer	At least basic electrical qualification, and a competed course in firedamp- and explosion-proof electrical equipment handling and installation	2 years in underground mining
In opencast mining		
Mining supervision	tertiary or secondary qualification in mining	1 year
	secondary qualification in mechanical, electrical, road-, traffic and transport engineering, road construction, or civil engineering	3 years
Engine supervision	at least a secondary degree in mechanical engineering	1 year
Electrical supervision	tertiary or secondary electrical qualification	1 year

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In mineral oil and natural gas mining and in underground gas storage		
Direct manager of white- and blue-collar workers performing significant technical and safety activities	specialised tertiary or	3 years
	specialised secondary vocational qualification	5 years
Direct manager of blue-collar workers performing significant technical and safety activities	specialised secondary or	3 years
	specialised basic vocational qualification	5 years
Unaided management of a mining facility (equipment)	specialised basic vocational qualification	6 months
Blow-Prevention Team Commander (BPC)	specialised tertiary qualification	5 years
Blow-Prevention Team Deputy Commander (BPDC)	specialised tertiary qualification	5 years
	specialised basic vocational qualification	10 years

Source: Decree no. 60/2009. (XI. 3.) KHEM on the Professional Qualifications and Experience Required to Fill Technical Safety-Relevant Jobs in Mining

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