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The Demographic Consequences of the Restructuring Process of Mining Industry in Romania. Case Study: The Petroşani Depression

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Abstract
The process of economic restructuring affected many mining regions in Central and Eastern Europe along with the political, social and economic changes in the 1990s. For the mining industry in Romania, this process meant the closure of mines, which resulted in massive layoffs. In the Jiu Valley coal region, which overlaps Petroşani Depression, which is the area chosen for this study, the largest number of layoffs took place in 1997, when the process of industrial restructuring started. Its effects have been felt not only at the social, economic and environmental level but also at a demographic level. The present study analyses two of the demographic consequences of mining restructuring in Romania (the changes in the structure of active population and migration), thus emphasising how relatively recent economic changes have influenced the demographic characteristics of the area under study. Thus, the number of economically active persons in the mining industry dropped by ¾ during 1992-2011. If during 1990-1997, the migration rate remains positive in Petroşani Depression, starting with 1997 and until the present, this becomes negative, following the massive layoffs in mining.

Keywords
economic restructuring, mining industry, economically active population, migrations, Petroşani Depression.

Introduction

Mining regions are widespread in Europe. Many of them experienced a well-needed process of economic restructuring in the second half of the 20th century. This process was common in 1960-1970 in Western Europe (in countries like France and Germany) and later in the UK, USA, Canada, Japan, and Australia (He et al., 2017). In Central and Eastern Europe, the process of industrial restructuring started after 1990, along with social, economic and political changes in these countries. Lately, the mining industry (especially coal mining) in many EU countries has experienced a progressive decline following a decrease in competitiveness on the international market and following the need to integrate the environmental objectives in the energetic strategy of the EU (Rabanal, 2009). A characteristic of the mining industry found not only in Central and East-European countries is the emergence of single industry areas that are much more difficult to restructure or develop in an alternative manner. Economically, it is difficult to find a job outside the main industrial branch (Vesalon and Creţan, 2013b). One example is Roşia Montană, a semi-urban village in the Apuseni Mountains (Romania), where, in the early 2000s, a Canadian corporation proposed a project for one of the largest open-cast cyanide gold mines in Europe (Velicu and Kaika, 2017). The area has been officially declared a mono-industrial area since the 1990s, prohibiting any investment and economic activity outside of mining (Velicu, 2019b), thus cancelling any other alternatives for economic development (Velicu, 2012).

Developed countries consider industrial restructuring as the change in the dimension of a company (an increase or a decrease in its dimension), the setting up of small and medium-sized enterprises which to ensure the functioning of large enterprises, the increase in market competition (Prelipcean, 2001). The process of industrial restructuring can be done at different levels: the technological level, the organisation level, the level of the management and the level of employment (Jonek-Kowalska, 2015, Fodor and Baican, 2001). But restructuring can be applied to the industrial sector as a whole. If this is the case, restructuring implies "the adoption of more conscious and 'active' strategies by organisations and governments, as decision-makers, to rearrange, reorganise and redirect industrial activities more fundamentally to create new structures and patterns", as Hamilton puts it (1984, p. 349).

Among the industrial branches that experienced a significant restructuring, mining stands out. There are many studies that analyse the process of industrial restructuring, especially mining, in countries from Central and Eastern Europe (Poland being a case analysed very often) (Korski et al., 2016, Manowska et al., 2017, Morawski, 1994, Rachwał, 2011). Our study provides a look at the effects of the restructuring process of Romania's mining industry, focusing on coal mining and tracing its demographic aftermath. There are very few studies on this topic, and most of them focus on the situation of Roşia Montană and less on coal mining.

The strategy for the development of the mining industry was based on the concept of self-support in Romania before 1989. This aimed for Romania to ensure for itself the necessary mineral resources from its own sources, thus obtaining independence concerning energy and reducing imports. Moreover, the forced industrialisation promoted by the Communist regime needed more and more energy. Consequently, the mining sector was oversized (Strategia industriei miniere pentru perioada 2008-2020, 2008). It is crucial to point out that, besides coal, hydroelectric power had a massive impact on the energy system. Hydropower systems were considered as crucial in the industrialisation and urbanisation processes and were, at the same time, the embodiment of the social and economic modernisation of communist states (viewed as a multilateral-developed society) as well as a symbol of political power and socialist victory (Creţan and Vesalon, 2017). Thusly, a major hydroelectric project was the construction of the Iron Gates hydroelectric power plant and dam on the River Danube, a collaboration between Romania and Yugoslavia.

After 1989, along with the change in the political regime, there came about significant changes in the economy, as market economy principles started to be applied. This led to a decrease in investments in the national economy compared to the Communist period when economic activities were funded by the state. The result was represented by a significant decrease in raw materials (including coal) needed. Therefore mining production decreased due to the lack of a market (Ministry of Economy, Trade and Business, 2016).

Under these conditions, Romania experienced a rapid and radical reorganising of the mining industry towards the end of the 1990s, similar to most East-European countries (Harfst and Wirth, 2011). This manifested mainly through the closure of numerous mines. In the coal mining industry, an additional factor was represented by the economic inefficiency of coal due to the difficult geological exploitation conditions and the advanced damage of machines and tools (Ministry of Economy, Trade and Business, 2016). The mining sector was characterised by a great number of employees, low work productivity and high production costs (Cândea et al., 2004).

Mining activities can generate a major impact, especially at economic, social and environmental levels (Taušová et al., 2017). The impact on human societies, the economy, and the environment can be both positive and negative. The social impact assessment uses different sets of indicators. For example, Mancini and Sala (2018) advance six categories of indicators: economy, income and security (for example, increase in GDP and population income or income inequality); employment and education (for example, creation of new jobs, both in

the mining sector and, indirectly, in other economic sectors); land use and territorial aspects (for example, changes in land use, displacement and resettlement of population); demography (for example, population growth, gender imbalance, migration flows); environment, health and safety; human rights.

On the other hand, the complex process of an industrial restructuring meant a decrease in internal production for the mining sector and commonly the closing of the majority of the mines. This generated a series of social and economic, demographic and environmental consequences that seriously affected the quality of life of the inhabitants in the mining areas (Ministry of Economy, Trade and Business, 2016; Costache and Pehoiu, 2010; Iancu, 2007). Among the economic consequences we can enumerate: industrial decline, poor development of the affected region, low incomes, which led to a low purchasing power, lack of technical assistance in order to start a new business or implement development projects (Iancu, 2007). Among the social consequences we emphasise: an increase in the unemployment rate, especially a significant decline in the standard of living, and aggravation of poverty, an increase in domestic violence cases, divorces, crime, family abandonment, and alcoholism. The demographic effects comprise those related to an intensification of migration, a decrease in birth rates, a decrease in the number of inhabitants, changes in the structure of the active population, population ageing, while the environmental ones refer to land degradation, changes in land use, a persistent water, land and air pollution and floods.

The consequences of the economic restructuring process (especially in the mining industry) have been captured by numerous authors (Andrioni, 2017; Costache and Pehoiu, 2010; Iancu, 2007; Martinát et al., 2014), but the majority of them focus on social effects (mainly on unemployment), while the demographic effects (emigration, changes in the structure of active population, demographic ageing, depopulation) are just briefly referred to, mainly related to unemployment.

Therefore, our study aims to analyse these changes connected to the population in a more detailed way to assess how relatively recent shifts in the economy of the under-study region influenced its demographic parameters.

We will mainly focus on two issues: the structure of population in economic sectors and economic activities and migrations. The distribution of active population on economic sectors represents one of the most important and exploited criteria for assessing a geographic entity's social and economic level of development (Nicoară, 1999). The structure of active population on sectors is closely linked to the specific economic activity of a region. Thus, changes affecting this structure from one period of time to another are reflected in the specificity of that region's economy (Vert, 2001). At the same time, the territorial mobility of population (migrations) is closely linked to the social and economic state of a region. The economic criterion is the most important factor which generates migrations (Muntele and Ungureanu, 2017). On the other hand, migrations affect the demographic potential of a region and its workforce, as the persons that emigrate are the youth and adults—the working-age population. This demographic potential is assessed through the quantitative and qualitative dimensions of abilities and productive capabilities of the people, and it represents the most significant element of the economic potential of a geographic area (Simion, 2000).

In order to pursue the two demographic indicators (the structure of the active population and migration), we chose Petroșani Depression as a case study. The area overlaps the Jiu Valley mining region. This was the most important coal mining area in Romania until the 1990s.

Literature review

There are countless international studies on mining activities. As many countries from Latin America, Subsaharan Africa and Southeast Asia adopted development policies and strategies aimed towards economic growth and export, mining has been viewed as an instrument for such aims (Engels and Dietz, 2017). Such "extractivism" "is generally defined as a national, growth-orientated development pathway based on rent-seeking activities, that is, the large-scale exploitation, production and exportation of raw materials" (Engels and Dietz, 2017, p. 2). Due to their social, spatial, political, demographic and environmental effects, this process is widely contested. For instance, there is a wide body of research contesting extractivism or analysing the debates born from it (Engels and Dietz, 2017), focusing on the conflict and negotiations between local communities and multinational corporations (Horowitz, 2012; Le Meur et al., 2013). Such debates imply different forms of horizontal and vertical diffusion or the alignment of translations of the "agents of capitalism [...] with those of the communities their activities impact upon" (Horowitz, 2012, p. 824). Other studies dwell on grassroots movements or the manner in which local communities oppose mining projects, such as the one in Roșia Montană (Velicu, 2012, 2015, 2019a, 2019b; Velicu and Kaika, 2017). As previously mentioned, Roșia Montană is the most analysed case from Romania, be it geographically, sociologically or otherwise (Vesalon and Creţan, 2013a; Vesalon and Creţan, 2013b; Alexandrescu, 2020).

There are also studies that analyse the effects of mining at a local and regional level, and even at a national and global level (Đukičin et al., 2014; Hajkowicz et al., 2011; Kotey and Rolfe, 2014; Lockie et al., 2009; Mancini and Sala, 2018).

Some effects are demographic in nature: the demographic changes in the mining regions of Central and Eastern Europe, as well as the factors influencing these changes, have been partially studied by Iancu (2007), Morar (2011), Mureșan and Lazar (2017), Rechlowitz and Tkocz (2013), Rîșteiu et al. (2021), Runge (2008), Spórna and Kurpanik (2013). Other studies only touch upon the subject (Marot and Harfst, 2012).

Material and methods

Study area and the history of coal mining in Petroșani Depression

Petroșani Depression is located in the central part of Romania, within the Southern Carpathians, in the upper basin of Jiu River, being a tectonic Carpathian depression. It is triangular in shape, South West-North East oriented and occupies approximately 1300 km^2 (Mariciuc, 2007). One can say that Petroşani Depression equally meets the characteristics of a well-defined geologic basin, a hydrological basin and a geo-morphologic and geographic Depression at the same time, generally through the overlapping of all the borders of these types of basins (Badea, 1971). The total area of the Depression includes both its hearth and the slopes of the mountains that surround it. Administratively speaking, the Depression is part of Hunedoara County, and it includes seven territorial-administrative units (TAU), namely six towns (Petroşani, Aninoasa, Lupeni, Petrila, Uricani and Vulcan) and a commune (Băniţa) (Figure 1).

The Depression, also known as Jiu Valley Basin, represented the main coal mining area of the country for more than a century. It was significant both due to its economic and its social size (Popa and Predeanu, 2018).

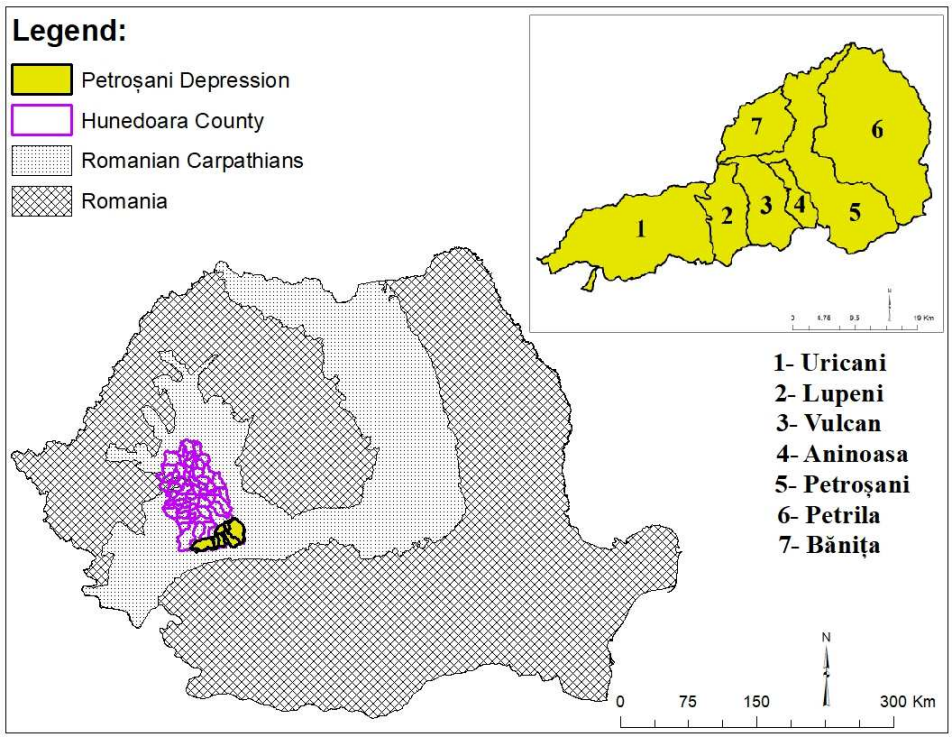

Fig. 1. Petroşani Depression – geographic location and settlements
Source: own processing

Coal ores had formed during the transition from Oligocene to Miocene, when the basin was characterised by favourable conditions for an alternation in the build-up of sediments of marine water origin and river water origin, respectively; as well as a mild and wet climate, beneficial for the development of rampant tree vegetation (Badea, 1971). The coal strata, 25 in total, occupy approximately 170 km^2 (Gruescu, 1972). The tectonic conditions of the coal formation in the Jiu Valley Basin were different in intensity and extension, which influenced the quality of the coal. In the Western part of the Depression, where tectonic movements had been more powerful, coals are of higher quality, and they are used, in the majority of cases, for coking, while the coal in the Eastern part of the Depression (Lonea, Petrila, Aninoasa etc.), lower in quality, were used for energy production. In the beginning, considered brown coal, they were later included in the bituminous coal group, yet of an inferior type. The average calorific value is 3650 kcal/kg (Ministry of Economy, Energy and Business, 2018). This characteristic, along with the difficult geological exploitation conditions, determined high exploitation costs, on the one hand, and low energetic efficiency, on the other (Neagu et al., 2015).

Even though the first observations on the coal deposits had been made in 1782, the first coal prospecting activities started only in 1835, and these showed that there were great coal reserves in the area. The first exploitations took place in 1840 in the area of Petroşani, Vulcan and Petrila towns (Popa and Predeanu, 2018).

Systemic and organised exploitation of coal in Jiu Valley started in 1868, in the Eastern part of the Depression. Later exploitation extended to the West, and coal mines in the following towns were opened: Aninoasa (1890) and Lupeni (1892). After 1895, coal started to be also mined in other settlements (Dâlja, Iscroni, Vulcan, Uricani, Câmpu lui Neag) (Popescu et al., 2003).

A major factor for the development of the coal mining industry in the Petroşani Depression was represented by the building of railways (Bulearcă et al., 2014). It was an imperious need to transport the coal in a rapid way and bring materials and equipment used in the mining industry. Consequently, during 1867-1870 Simeria-Petroşani railroad was built, thus ensuring the connection with the North, and in 1894, the connection by road with the Oltenia region in the South was ensured. The latter was doubled by a railroad finished in 1948.

Until the 18th century, Petroşani Depression was poorly populated. Yet, people gradually started to come from over the mountains and make a home here. Thus new settlements were set up. The 1850 Census registers 7,100 inhabitants in the Depression (Lung, 2019). Once mining started, in the second half of the 19th century, immigration intensified as a workforce was needed. The newcomers came either from various Romanian regions or from foreign countries (Transylvania, the historical region Petroşani Depression is part of, was under Austrian-Hungarian control at that time). Thus, between 1858 and 1868, groups of miners from Slovakia, Austria, the Czech Republic and Italy were colonised in Jiu Valley (Radu, 2015). The population increased by 297%, from 7,098 to 28,210 inhabitants between 1850 and 1900 (Lung, 2019). The mines in Jiu Valley had been exploited systemically until 1918, a situation that continued after the Great Union of 1918 when Transylvania was reunited with Romania.

During the Communist period (1948-1989), coal exploitation increasingly intensified in order to answer to the ever-growing needs generated by the forced industrialisation policy promoted by the Communist regime. In these conditions, a higher number of the working-age population moved into the Depression. The process of urbanisation also intensified, namely if in 1948 there was only one town in the region (Petroşani), in 1956 there were three new towns formally established (Lupeni, Petrila and Vulcan) (Alexandrescu, 1995), and another one (Uricani) in 1966. The accelerated urbanisation was a consequence of the intensification of the industrialisation process (Morar, 2011). Throughout the Communist period, due to the development of the mining industry, the number of inhabitants in the Depression continued to grow, in a rhythm more or less accelerated. As new mines and quarries had been opened, coal production increased (until it reached over 9 million tons in the 1980s), as well as the number of persons working in the mining industry (over 34,000 employees) (Costache and Pehoiu, 2010). At the same time, various economic activities and economic sectors associated with mining had been developed in order to absorb the feminine working-age population, namely textile manufacturing, leather and shoe industry, food manufacturing and chemical industry.

All this led to the rapid development of the region, but also to a type of economy dominated by a single industry (Schmidt and Andrioni, 2011), the most important economic characteristic of the region, that of mono industrial area.

Starting with Romania's political and economic changes (begun in 1990) and especially with the transition from a state-owned economy to a market economy, there appeared the need for industrial restructuring. This process mirrors post-communist Romania. Creţan (2018) distinguished six political and economic stages: the first two (the early 1990s, defined by instability, and 1996-2000, with a reformist government) are characterised by slow privatisation and restructuring processes, limited reform, and only a handful of foreign investors. The following two stages (2000-2004, with former communists back in power, and 2007, when Romania became an EU member) have constant economic growth, political and economic stability, and increasing foreign investment. The last two stages (the global financial crisis of 2008-2011 and the post-2011 period) are riddled with economic recession and frequent protests.

It is no wonder that, after 1991, bituminous coal production in Jiu Valley increased almost constantly until 1997 (Mariciuc, 2007). Due to the difficult exploitation conditions in mines and the high costs of production, the Romanian state supported the mining production from the state budget, money intended for investments and subsidies (Schmidt and Andrioni, 2011).

Nonetheless, the industry restructuring process, accompanied by a decrease in coal demand, led to a limitation of mining in Jiu Valley. Mining industry restructuring started in 1997 and was represented firstly by a reduction in state subsidies and a massive employee reduction (Andrioni, 2017). The most important employee reduction took place during 1997-1999 (Mariciuc, 2007).

In December 1998, Jiu Valley was declared a "disadvantaged area" (or "less-favoured area") for a period of 10 years, as part of a policy enforced by the Romanian government to help certain areas (mostly mining areas), which had suffered considerably trying to survive in the new market economy (Creţan et al., 2005). Ianoş (2000, p. 181) believes that even deeply disadvantaged mining areas are "the outcome of measures taken by society to

rush up national and regional development". The aim of the policy of disadvantaged areas was to bring in investors by granting them fiscal facilities and to implement special programs for development.

In the mining region from Petroșani Depression, there were 14 coal-mining areas from which coal had been extracted. The most important were the mines from Lonea, Petrila, Vulcan, Lupeni, Aninoasa, Uricani, Livezeni, Paroşeni and Bărbăteni. Only four underground hard coal mines were still operational in Jiu Valley (Lupeni, Vulcan, Livezeni and Lonea) in 2018, but are scheduled to close in the following years; these are part of Hunedoara Energy Complex Company (Complexul Energetic Hunedoara —CEH), a state-owned electricity and heat producer based in Petroşani (EURACOAL, 2019).

Data and Methodology

Our analysis was mainly based on processing statistical data from the National Institute of Statistics (NIS)—Institutul Naţional de Statistică (INS). Two sets of data had been collected: data on economically active population and data related to migration. The first set was obtained from the NIS and is part of three population censuses: 1992, 2002 and 2011. The data on migration was taken from the NIS online platform (Tempo-Online) and covered the 1990-2018 period (NIS Tempo-Online, 2019 a).

Generally, three big economic sectors are agreed upon, even though more and more specialists consider a fourth one, including scientific research and catering for the tertiary activities (Muntele and Ungureanu, 2017). Yet, the latter is not represented in the region we analyse. We must emphasise that the activities in each sector slightly differ from one census to another. Thus, the 2011 Census registers five types of economic activities in the secondary sector, while the 1992 Census and the 2002 Census register four each. The service sector is represented by 14 activities in 2011 and eleven in 1992. In all these three surveys mining industry is part of the secondary sector.

Besides this, the 1992 and 2002 censuses counted active population that, in conformity with NIS, "includes all persons that form the workforce available for the production of goods and services during the period of reference" (NIS Tempo-Online, 2019 b). For the two censuses, this includes, besides the employees in the three economic sectors, also the category of "persons looking for their first job" (interpreted as unemployed). Yet, the 2011 Census worked with the occupied population, who, along with the unemployed, form the active population. "The occupied population includes all persons of 15 years old and over that have been involved in an economic activity for the production of goods and services of at least an hour [...] in the reference period (one week) in order to obtain a salary, in-kind payment of other benefits" (NIS Tempo-Online, 2019 b). This definition could cause some distortions in the interpretation and comparison of data. Nevertheless, we consider that in 1992 the number of unemployed persons in Petroșani Depression was reduced, as the liberalisation measures were recent, and the industry restructuring process had not started. Consequently, we consider that the inherent distortions that can come up between the two operational categories are minor and do not influence the final result.

Some statistical data have been processed using Microsoft Excel. They show the evolution of the indicators in time. The same program was also used to draw up a table that includes the changes in the structure of active population on economic sectors (1992-2011). Other statistical data were processed using Geographic Information Systems (ArcGIS 10.3), and they represented the basis for several thematic maps on the structure of active population on economic sectors for the 1992 and 2011 censuses. ArcGIS 10.3 was again of help for the drawing up of the map on the geographic location of the Petroșani Depression.

Results and discussions

The share of the active/occupied population in the main economic sectors is an important indicator that clearly reveals the economic individuality of the Depression, oriented towards mining activities and its mono-industrial identity. Nevertheless, we should first mention that statistical data show a continuous decrease in the active population from one population census to another: in 1992, active population represented 42.6% out of the total population of the Depression, while in 2002 it decreased to 36.7%, and in 2011 it was 34.4% (Mureşan and Lung, 2019).

In 1992, 2002 and 2011, the most important economic sector was the secondary one. Nevertheless, the share of the active population activating in this sector decreased constantly from one census to another, along with the ongoing industry restructuring: 72.2 %, 58.2 % and 47%, respectively. Mining was the main economic activity in which the population activated. Statistical data clearly show this: in 1992, two-thirds of the total active population in the secondary sector was working in mining (66.8%), corresponding to half of the total active population of the Depression (48%). Mining continued to account for almost two-thirds of the active population working in the secondary sector (65.3 %) in 2002, but at the level of the economic activities taken as a whole, mining held only 38% of the active population in the Depression (Mureşan and Lung, 2019). The share of the population active in mining was only 19% out of the total occupied population in 2011 and 40.4% out of the total population active in the secondary sector (with approximately 25 percentage points less than in 2002).

Therefore, we can conclude that the number of persons working in the mining industry decreased by three fourths during 1992-2011. The largest number of layoffs (compensations being paid) had been done in 1997, followed by others in the following years, but at a lower level. In conformity with the data from CEH, 18,185 persons had been laid off in 1997. Almost 29,400 persons were laid off between 1997 and 2018 (Figure 2). In 2018, CEH only had 3,022 employees (EURACOAL, 2019).

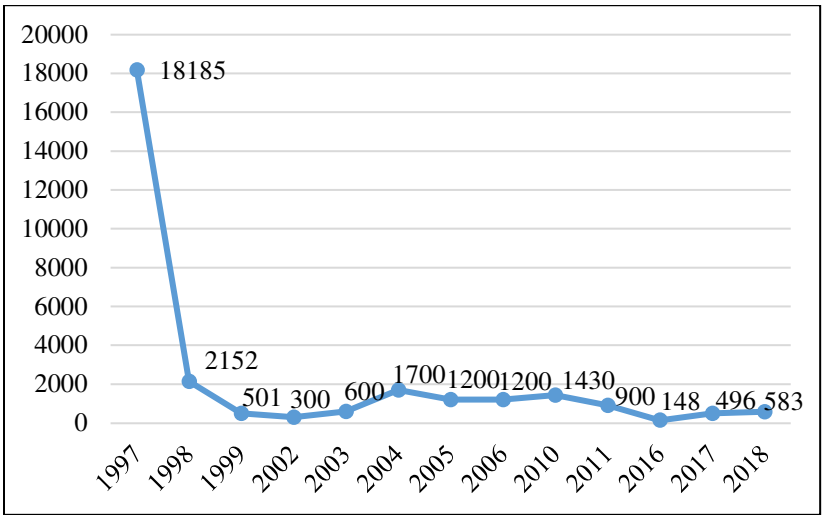

Fig. 2. The number of layoffs within the National Company of Bituminous Coal—Compania Națională a Huilei Petroşani, now Complexul Energetic Hunedoara (CEH).
Source: own processing of CEH data

At the level of territorial-administrative units (TAU), the analysis reveals that in 1992 and 2002, five of these units (typical mining towns) exceeded the average of the region concerning population who activated in industrial activities, and the most significant share was that of the extractive industry. Petroșani town, the most important urban centre in the Depression, was the only one that had a lower share of the population active in the secondary economic sector. This is also explained by the fact that the service sector was more developed in this town (Figure 3a). At the same time, Bănița commune, part of the Depression, was also characterised by a lower involvement of the population in mining and industry in general. Until 2011, all the territorial-administrative units had lost more than half of their employees from the secondary sector (Figure 3b). Even if some of these had been absorbed in the other economic sectors, especially in the service sector, the loss of workplaces in the industry was not completely compensated by the setting up of new workplaces in the service sector (Table 1).

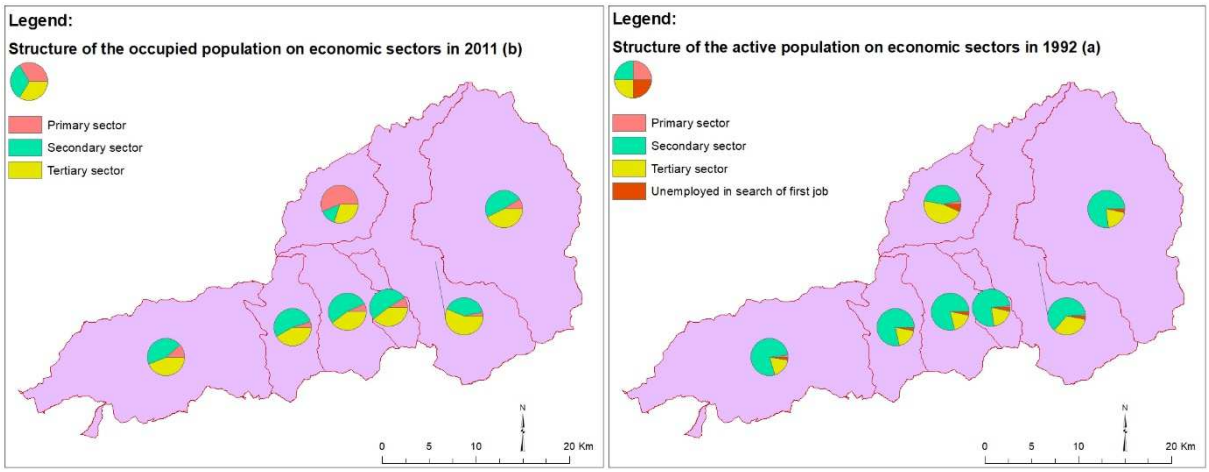

Fig. 3. The active/occupied population structure per economic sector in 1992 (a) and 2011 (b).
Source: own processing of NIS data

Tab. 1. Changes in the structure of active population on economic sectors (1992-2011).

TAU	Economic sector	Year		Change	
		1992	2011	Total	[%]
Petroşani	I	288	476	**188**	**65.3**
	II	14723	5465	**-9258**	**-62.9**
	III	8000	7683	**-317**	**-4.0**
Aninoasa	I	40	117	**77**	**192.5**
	II	1600	671	**-929**	**-58.1**
	III	410	523	**113**	**27.6**
Lupeni	I	57	348	**291**	**510.5**
	II	10632	4033	**-6599**	**-62.1**
	III	2546	3123	**577**	**22.7**
Petrila	I	109	676	**567**	**520.2**
	II	9009	3601	**-5408**	**-60.0**
	III	2340	3171	**831**	**35.5**
Uricani	I	99	346	**247**	**249.5**
	II	4063	1358	**-2705**	**-66.6**
	III	904	1317	**413**	**45.7**
Vulcan	I	134	544	**410**	**306.0**
	II	11719	4481	**-7238**	**-61.8**
	III	2668	3337	**669**	**25.1**
Băniţa	I	14	378	**364**	**2600.0**
	II	198	95	**-103**	**-52.0**
	III	210	198	**-12**	**-5.7**
Petroşani Depression	I	741	2885	**2144**	**289.3**
	II	51944	19704	**-32240**	**-62.1**
	III	17078	19352	**2274**	**13.3**

Source: own processing of NIS data, based on the model taken from Wirth and Harfst, 2012

The closure of exploitation meant deindustrialisation, high unemployment rates, and emigration (Harfst and Wirth, 2011). Even though we only have county-level data for the unemployment rate, one can assert with certainty that this rate was very high after the successive waves of layoffs during 1997-1999. Popescu et al. (2003, p.171) claim that the unemployment rate was 30% in Jiu Valley at the end of the 1990s, with high variations among its settlements. Thus, the highest unemployment rate was registered in Petroșani (38%) and the lowest in Lonea (18%). Gradually, during the following years, the unemployment rate decreased following the investments made, but especially due to the migration of a significant part of the population who either emigrated back to their native regions (return migration) or foreign countries for work (economic migration).

Referring to the migration phenomenon in Petroșani Depression, we can affirm that this had two opposite directions in time, depending on the intensity of the extractive activities. The first direction of migration was oriented towards the Depression. In the second half of the 19th century, it started once coal exploitation began as the workforce immigrated both from foreign countries (Cândea, 1996, Costache, 2010) and from other regions in Romania. During the 20th century, a massive immigration process took place, stimulated especially by the increase in coal exploitation after 1948. Thus, during 1950-1960, over 13,000 people established themselves in the Jiu Valley region, while during 1960-1970, their number grew to approximately 54,000, following the development and the diversification of the economy (Alexandrescu, 1995). After 1970 and until the change in the political regime in Romania—in 1989, intra-regional migration processes prevailed, as rural populations migrated towards towns—especially those towns that experienced a development of the mining activities.

After 1990, even though at the level of the country there were a series of demographical and economic changes, Petroșani Depression was still characterised by a positive migration rate until 1997—a year that marks the start of an intensified process of migration, along with the massive layoffs in coal mining. The second direction of migration was prominent, opposite to the first one: migration from the Depression towards outside, either to the regions from where the immigrants came or outside Romania, to look for a job (Figure 4). The migration rate became negative (-23.9 ‰ in 1997) and remained negative during 1997-2018, even though with decreasing values. During this period, approximately 70,000 people left Jiu Valley, and only 35,000 had established themselves here, thus resulting in a migration deficit of approximately 35,000 people (-10.3 ‰).

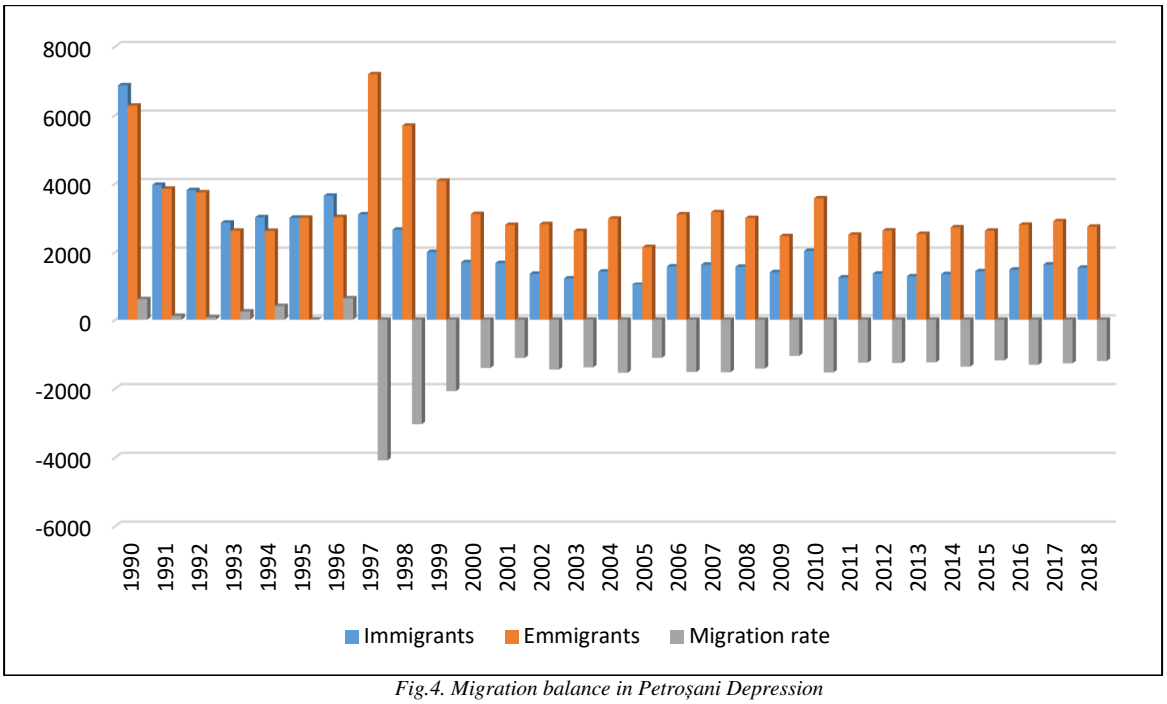

Fig.4. Migration balance in Petroşani Depression
Source: own processing of NIS Tempo-Online data

In general, all territorial-administrative units were characterised by a negative migration rate starting with 1997. The highest negative rate was registered in Petrila (-31.1‰ in 1997) and Uricani (-43.2 ‰ in 1997). Only Băniţa commune had a positive migration rate, especially starting with 2001. The massive layoffs and the emigration that followed were generally more intense in smaller towns, where monoindustries and lack of economic diversity were higher (European Commission, 2020). Consequently, the region recorded a decrease in population, coupled with the process of demographic ageing.

Depopulation is already a phenomenon embedded in the mining areas of post-communist Romania, as shown by Rîşteiu et al. (2021), who details the case of Roşia Montană. The mining project put forward by the Canadian company, despite being controversial and even contributing to depopulation by relocating a part of the community, was seen by many as a saving outlet, a solution to reverse rural population decline by creating new jobs and generating economic growth. However, discontinuing the project exacerbated the depopulation process.

Conclusions

In a similar way to other European mining regions, Jiu Valley faced the same challenges connected to overcoming the negative effects related to the termination or reduction of mining activities. The issues connected to this are represented by the high unemployment rate, low economic development, a decline in living standards and negative demographic phenomena (especially the emigration of the young and qualified population) (Wirth and Harfst, 2012). Even though efforts had been made to rehabilitate the economic situation of the towns in the region, these were not as successful as expected.

The impact of the policy of the disadvantaged areas was limited, and foreign investors stayed clear of the region: the majority of the companies that had been set up had low capital and a low number of employees (Costache and Pehoiu, 2010). Moreover, the activities aimed at investments were represented only by basic wood manufacturing and basic meat production, bread manufacturing and garment industry (lohn production) (Popescu et al., 2003). Among the causes that led to this situation, we list: the relatively poor qualification of the workforce, the reluctant attitude of the workforce to participate in training courses, the lack of an entrepreneurship culture—as the majority of miners have a low level of education, changes in laws and policies, a negative image of the region (social instability and social risks given the fact that miners are viewed as strike-prone, pollution)—which did not have a positive impact on the potential investors, the withdrawal of financial and fiscal facilities given to investors in disadvantaged areas (once Romania joined the EU and the policy of competition was enforced) (Cândea et al., 2004; Costache and Pehoiu, 2010; Creţan et al., 2005). An important factor halting the region's development was the corruption of political leaders, "a persistent feature of the post-communist period" (Creţan and O'Brien, 2020, p. 382). According to Ianoş et al. (2010), in order to attain the development of these disadvantaged areas, besides their economic reorganisation, one must also take into account the "ethics of space" – a set of moral norms and rules that human communities as well as decision-makers, investors, specialists must follow and respect in regards to their environment and resources.

Based on their tenure, laid-off miners received compensations between 12 and 20 salaries (Guvernul României, 1997). Miners had the highest salaries during the communist years, which remained high even during the transitional period, meaning that each miner received substantial compensation. However, few miners used this money to start a business, preferring to acquire houses, automobiles and other luxury items (Creţan et al., 2005).

The analysis of the active population's structure emphasises that the secondary sector decreased its share in 20 years, some of the persons who had been made redundant in the mining sector being taken over by other sectors (agriculture and tertiary sector). Even though there is a high rate of the population involved in the tertiary sector, one must not be led to think the region is remarkably developed. A significant share within the tertiary sector is occupied by trade (31%), with a small added value and which do not contribute to economic development (Popescu et al., 2003).

Until 1997, the Jiu Valley mining area was an outlet for the workforce from other country regions. Starting with 1997, it became a repelling area, the migration taking the opposite direction, as there was an intensification of the departures from the region.

According to a recent report by the European Commission (2020, p.8), "Romania does not yet have a clear and agreed phase-out plan or timeline for coal. Therefore, the future of the industry, both in terms of extraction and power generation, remains uncertain, as does the speed and nature of transition in the Jiu Valley". Another recent study (mentioned by the same report, p.8-9) proposes a series of alternative economic activities, which might help attain an efficient restructuring and mitigate social and demographic problems in the region. Among such activities: development of small agricultural farms, which can support traditional agricultural practices; usage of renewable energy (mostly wind and solar); development of food, textile, logging, and furniture industries; tourism promotion and development, taking into account the splendid natural environment; entrepreneur stimulation by establishing industrial parks and business incubators.

Our study analyses the demographic changes of the last 20-30 years (1990-2018) brought by the restructuring process of the Jiu Valley mining industry. As data regarding active population structure are only available for the national census and 10 years have passed since the last census, the current study exhibits several shortcomings. There might have been significant changes in the last decade when it comes to this indicator (structure of the active population). Consequently, new studies are required to confirm or refute our results. Furthermore, other studies are much needed, especially on depopulation in coal mining areas.

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