RECENT DYNAMICS OF THE SECONDARY SECTOR IN ROMANIA. REGIONAL DISPARITIES

BIANCA MITRICĂ[*], RADU SĂGEATĂ[*], IRENA MOCANU[*],
NICOLETA DAMIAN[*], ADRIANA NEAGOE[**]

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Abstract. The secondary sector of the Romanian economy has in time suffered several modifications, the most important ones being linked to the political and legislative systems. The present paper, which analyses the secondary sector in the Romanian economy, relies on the following variables: the turnover, the employed population, net investments, as well as various indicators that illustrate the enterprises' demographic picture. This paper is a spatial/geographical approach of the secondary sector in the national economy context; its sub-branches, processes, social and economic actions, which influence its evolution in space, are entirely different. The space dimension of the variables analysed herein emphasizes the structural-quantitative changes which have occurred during the past few decades in the whole secondary sector and in each of the eight development regions. This approach proved useful in completing the more general economic analysis. The time-interval this analysis refers to is not the same for all the indicators chosen. However, the last two decades are fully covered by all the four variables taken into consideration.

1. INTRODUCTION

Once in power, the Romanian communist system focused on industrialization as a way of economic development. The major goal of the then state policy was to achieve a balanced development of the country's territory. Central-based planning, investments in different economic sectors, mostly in the secondary one, were made in all of the country's regions, irrespective of whether they were economically justified, or not. Concentrating industrial investments, especially in towns, made many villagers choose the town area, hence a higher rate of urbanization. Redistributing the population had a negative effect on the rural environment, reducing its demographic vitality, and thus declining economically. The towns themselves were negatively affected (through swift urbanization), having to cope with demographic and social pressures too high for the available housing stock, as well as for their technical and social infrastructure (Popescu *et al*., 2016).

After 1990, industry turned from a main way to progress into a main cause of economic decline. That year represents a major breach in the evolution of Romania's industry, and the traits of the secondary sector, characteristic of that moment, are quite relevant for understanding the deeply-rooted structural changes recorded over the last few decades, *i.e.* a gigantic industry (numerous big enterprises) exclusively state property, dominantly heavy industry (metallurgy and machine-building) units, the industry-governed functional specialization of large cities, and the presence of factory-towns (small urban centres under 20,000 inhabitants – whose economy was dependent on one big industrial plant alone); the rural sector featured industrial diffusion, with only a few minor concentrations here and there (Popescu, 2016). After 1990, restructuring was characteristic of the Romanian industrial sector: in-depth changes in the type of property, mode of production, forms of organization, development policies, relationships between activities in the secondary sector and the environmental components.

[*] Senior Researcher, Institute of Geography, Romanian Academy, 12 Dimitrie Racoviţă Street, 023993, Bucharest, Romania, biancadumitrescu78@yahoo.com; rsageata@gmail.com; mocanitai@yahoo.com; nicoleta_damian2002@yahoo.com.
[**] PhD student, Aerospace Service, 44/A Ficusului Blvd., Bucharest, Romania, adriana.mateescu93@gmail.com.

A decisive element for industrial evolution after 1990 was the legal framework. Although the mining industry was considered to be a strategic industry, the post-1990 restructuring processes did not spare this sector either, conferring it an unwanted specificity, namely the degradation of the economic structures in mining areas, destroying the miners' social identity and creating severe social imbalances. Based primarily on an economic reason, as well as on environmental protection, restructuring the mining industry showed major temporal discontinuities, among which collective layoffs, reorganization of the extractive activity and the legislative framework regarding the action of restructuring the mining areas. In 1997, the wave of restructuring, began with collective layoffs, which affected the over 200,000 people engaged in mining, adding up to the several hundreds of thousands directly, or indirectly, dependent on that industry. This action did not rely on any single normative act to stipulate the stages, actions, and concrete measures of the restructuring process. The Law of the Mines, passed in March 1998 – *Law No. 61/1998* (Parlamentul României, 1998), although restructuring the mining industry, had begun with massive layoffs in August–September 1997 (Mocanu, 2008). *Law No. 15/1991* (Parlamentul României, 1991), which stipulated that industrial enterprises be turned into commercial societies, was the moment when the processing industry started on a downward trend (Popescu, 2016). Industrial processing branches had to adjust to the new conditions and put up with new challenges. Some of them would choose decentralising in order to fit into the smaller economy of lower-size companies, and develop more flexible collaboration relations. On the other hand, industrial units would merge in order to better cope with competition and, thus, trusts and holdings emerged.

A spatial approach to the secondary sector implies analysing the differences between one type of space and the other (*e.g.* urban versus rural areas, development counties and regions, or historical regions, between various categories of towns etc.). An area's dynamics is generated by the multitude of economic, social, cultural etc. changes. In the post-communist period, modifications, transformations and restructuring were omnipresent in spatial evolution, and when territorial actors – as a major component of territorial development – started to also diversify and multiply, the premises were laid for a very complex process of changing the geographical space. The space-based approach to the industrial sector is beneficial for the economic sciences. Quite often, the macro-space analysis hides and distorts secondary sector dynamics (and not only of this sector) at lower territorial levels, therefore, the all-country level study offers a far too superficial generalization of regional and local trends, which have a greater impact (in terms of economic activities) on the economic communities and economic actors.

Consequently, this paper is aimed at studying the secondary sector in terms of aspects revealed by its relation with space (*i.e.* the level of the 8 Development Regions), but also with homogeneous groups of "economic entities" (*i.e.* through the analyses the secondary sector in terms of the Classification of Activities in the National Economy (CAEN Rev 1, 2) which offer distinct picture of categories of factories or enterprises). Thus, this paper approached the structural-quantitative changes which have occurred during the past few decades in the whole secondary sector, through the following variables: the turnover, the employed population, net investments, as well as various indicators that illustrate the enterprises' demographic context. The economic activities the secondary sector is subdivided into (according to CANE Rev 1 and 2) are: extractive industry; processing industry; construction; electrical and thermal energy, gas and water; gas, hot water and air conditioning; water distribution, scavenging, management of wastes, decontamination activities. The enterprises' demographic component is illustrated by analysing secondary sector units at national level, as well as the economic activities included in this sector.

2. STUDY-AREA

The Romania's administrative-territorial structure has the following levels: NUTS2 (8 development regions without administrative and legal person status, an average population number/region of 2.8 million inhabitants); NUTS3 (41 counties and Bucharest Municipality) and NUTS5/LAU (319 towns, and 2,862 communes). The regional development policy in Romania has been closely correlated with the use of pre-accession instruments offered by the European Union to restart the

national economy after the severe deindustrialization and excessive fragmentation of agriculture, processes with a strong social impetus that marked the 1990s (Mitrică *et al.*, 2020).

The starting point for the delimitation of Romania's Development Regions was the elaboration of a study on regional disparities, on the basis of the socio-economic evolution taking place in the 1990–1994 period. The development-gap analysis took account of indicators grouped into five categories: the economy, infrastructure, household resources, socio-demography and urbanisation. (Hansen, *et al.*, 1996).

The study is focusing on the Development Regions of Romania – the NUTS 2 level (Fig. 1). Designed as regional spaces with specific development problems, the Development Regions were delineated as functional spaces of comparable size composed of units with different levels of economic and social development. In terms of area and demographic size, with the exception of the Bucharest–Ilfov Region, the regions are slightly different, corresponding to NUTS 2 of the EU Territorial Units Nomenclature (Table 1) (Popescu and Săgeată, 2016).

Fig. 1. The Development Regions of Romania.

Table 1

Main characteristics of the Development Regions, 2018

Development region – NUTS2	Counties/NUTS3	Region centre	Population	Area	Share of employees in secondary sector
North-West	Bihor, Cluj, Bistriţa-Năsăud, Maramureş, Satu Mare, Sălaj	Cluj-Napoca	2,836,219	3,416,046	39.4
Centre	Alba, Braşov, Covasna, Harghita, Mureş, Sibiu	Alba-Iulia	2,634,748	3,409,972	42.6
North-East	Bacău, Botoşani, Iaşi, Neamţ, Suceava, Vaslui	Piatra-Neamţ	3,939,938	3,684,983	32.4
South-East	Brăila, Buzău, Constanţa, Galaţi, Tulcea, Vrancea	Brăila	2,859,897	3,576,170	34.2
South-Muntenia	Argeş, Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa, Prahova, Telorman	Călăraşi	3,242,876	3,445,299	40.0
Bucharest–Ilfov	Ilfov, Bucharest Municipality	Bucharest	2,510,877	182,115	21.4
South-West Oltenia	Dolj, Gorj, Olt, Mehedinţi, Vâlcea	Craiova	2,194,235	2,921,169	37.7
West	Arad, Caraş-Severin, Hunedoara, Timiş	Timişoara	2,012,053	3,203,317	42.5

Source: data processed from http://statistici.insse.ro/shop/?lang=ro

In socio-economic terms, differentiations between development regions are moderate, with the exception of the North-East Development Region which has lower performances (Guvernul României, Comisia Europeană, 1997, Popescu, Săgeată, 2016, Mitrică *et al,* 2019).

3. DATA AND METHODOLOGICAL ASPECTS

The methodological approach involves several steps, such as: (1) selecting the statistical indicators, (2) building the database and (3) processing the data into graphics and maps.

(1) ***The selection*** of statistical indicators was generated by the availability of statistical variables contained in the main official source of data, namely the National Institute of Statistics, TEMPO-Online Time Series (National Institute of Statistics, 1992, 2002, 2011, 2015).

(2) These data were organized in a ***database***, structured by variables and indicators (2.1.), by Classification of Activities in the National Economy (CAEN Rev 1, 2) (2.2) and by years (2.3.). (*2.1.*) Analysing the economic sector was based on the following variables and indicators: the turnover, the employed population, and net investments in the whole secondary sector (over two intervals: 2003–2008 and 2008–2015). (*2.2.*) A longer time-interval (1992–2016) is devoted to looking at the employed population, having in view that the demographic component of a territorial system has greater inertia, the current situation of this component is the result/effect of the socio-demographic and economic evolutions developed decades back, while the trends are expected to be seen in coming decades. (*2.3.*) The present study analyses the secondary sector in terms of the Classification of Activities in the National Economy (CAEN Rev 1, 2), so that the observations made and conclusions reached in this paper are distinguished not only in relation to space (at the level of the Eight Development Regions), but also of homogeneous groups of 'statistical units' (*i.e.* a factory, or a group of factories which form an economic entity – an enterprise). The economic activities the secondary sector is subdivided into (according to CANE Rev 1 and 2) are: extractive industry; processing industry; construction; electrical and thermal energy, gas and water; gas, hot water and air conditioning; water distribution, scavenging, management of wastes, decontamination activities. The enterprises' demographic component is illustrated by analysing secondary sector units at national level, as well as the economic activities included in this sector.

(3) An important step of the methodological approach consists in ***processing the data into graphics and maps*** that show the trends and dynamic differences of the secondary sector both, in time and space.

4. RESULTS

4.1. The turnover dynamics

The 1998–2008 turnover is progressively growing throughout the secondary sector, from 255,083 mil. Lei in 1998 to 1,793,653 mil. Lei in 2004, 1,946,530 mil. Lei (*i.e.* 194,653 RON) in 2005 and 316,132 RON (3,161,320 mil. Lei old currency) in 2008.

The highest turnover at sub-sectorial level was registered by the processing industry, followed by the construction, electrical and thermal energy, gas and water industries. At the same time, the extractive industry proved to be less investment-attractive, with the lowest turnover score (Fig. 1).

At regional level, the highest turnover value was registered by the Bucharest–Ilfov and South-Muntenia Regions, the lowest values going to the West, North-East and South-East Regions (the poorest regions, investment-unattractive, having an economy largely based on agriculture and the extractive industry) (Fig. 2).

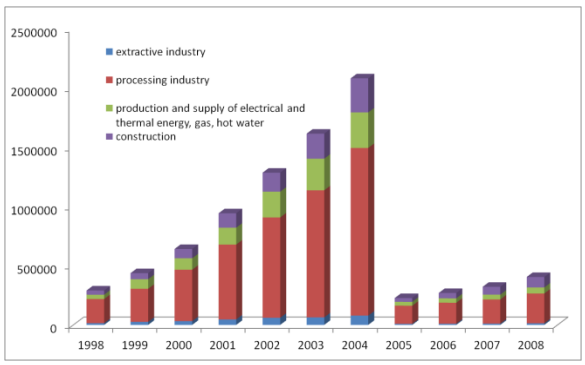


Fig.1 – Secondary sector turnover dynamics at national level, 1998–2008 (mil. Lei).

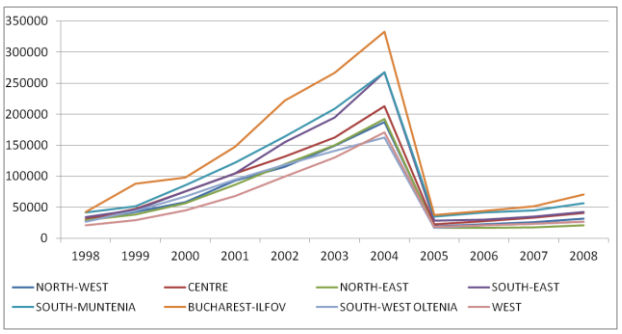


Fig. 2 – Secondary sector turnover dynamics at regional level, 1998–2008 (mil. Lei).

In the first part of 2008–2018, as a result of the economic-financial crisis, the turnover was negative, followed by an increase until 2011 (when it registered higher values than at the beginning of that period), its evolution fluctuating until 2015, when the secondary sector turnover exceeded 450,000 mil. Lei (Fig. 3). Looking at the national activities in this sector, one finds investment to prevail in the processing industry, in construction, energy and the thermal industry, hot water and air conditioning. At the other end of the spectrum lie investments in the extractive industry and in the commercial management sector.

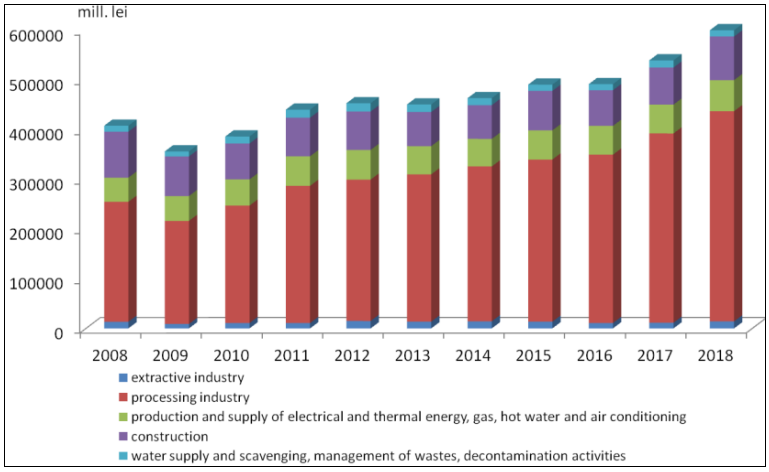
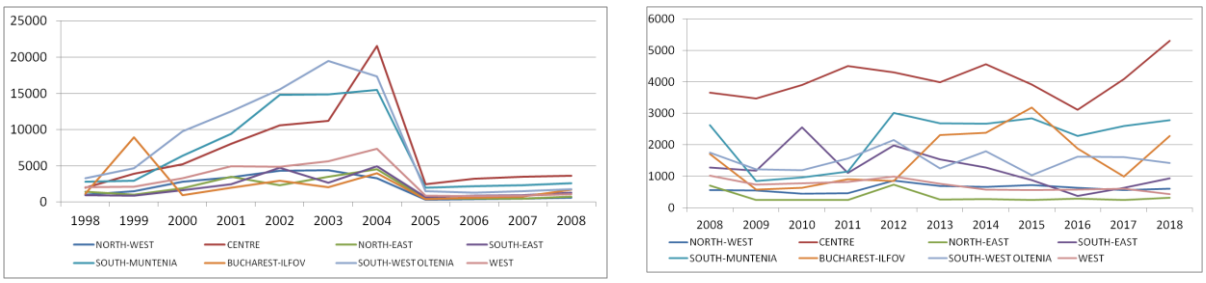


Fig. 3 – Secondary sector turnover dynamics at national level, 2008–2015.

Distinguishing the secondary sector by activities in the national economy shows the following industries having benefitted from major investments: the processing industry, construction, the energy and thermal industry, gas, hot water and air conditioning. At the other end of the spectrum we have investments in the extractive industry; the communal management sector (distribution of water, scavenging, management of waste and decontamination), which proved little investment-attractive.

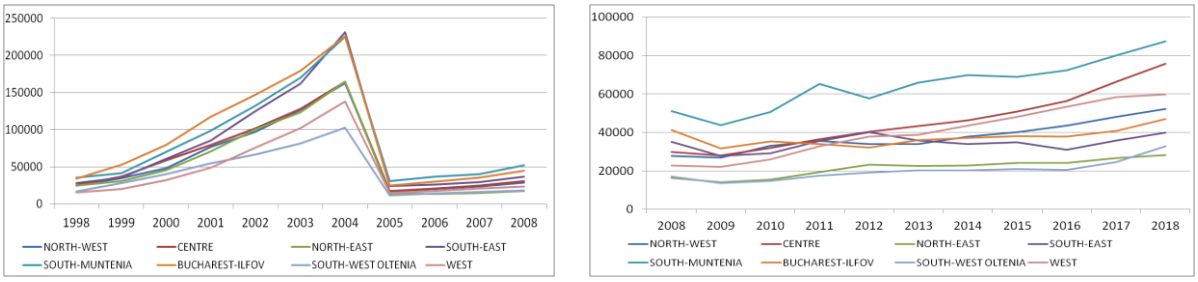
The fluctuating evolution of the 1998–2008 turnover in the *extractive industry* is the result of legislative inconsistency and of attempts, largely unsuccessful, to restructure and make this industry more efficient. Thus, in 1998, 2000, 2001, 2002 and 2003 the highest turnover values in this industry were registered by the South-West Oltenia Region. At the other end were the South-East and North-East Regions (Fig. 4a). Between 2008–2018, the turnover was constantly positive in the extractive industry due to investments made in the Centre, South-Muntenia, South-East and South-West Regions (Fig. 4b).



a. **b.**

Fig. 4 – Turnover evolution in the extractive industry (mil. Lei): a. 1998–2008; b. 2008–2018.

The processing industry. The turnover registered constant growth, from 203,634 mil. Lei in 1998 to 1,415,109 mil. Lei in 2004, 241,259 mil. Lei in 2008 and 422,916 mil. Lei in 2018. The highest turnover values were registered by Bucharest–Ilfov and South-Muntenia, the lowest ones by the South-West Oltenia, West and North-East Regions (Fig. 5a, b). The capital-city Bucharest and its peripheral zone (Bucharest–Ilfov Region) became increasingly less attractive for investments in the processing industry, successively falling behind South-West Oltenia, Centre, West and even North-East Regions (in 2018) (Fig. 5 b).



a. **b.**

Fig. 5 – Turnover dynamics in the processing industry (mil. Lei): a. 1998–2008; b. 2008–2018.

In the area of production and distribution of electrical and thermal energy, gas, water and scavenging, management of waste and decontamination, a positive turnover evolution was constantly registered, the Bucharest–Ilfov Region being the clear standout.

In the interval between 2008 and 2018, the Bucharest–Ilfov Region headed the charts with a turnover of 2,300,000 and 3,500,000 Lei (top figure in 2011), with the Centre and South-West Oltenia Regions next in line. Regarding water supply, scavenging, management of wastes and decontamination, Bucharest–Ilfov had the lowest turnover score.

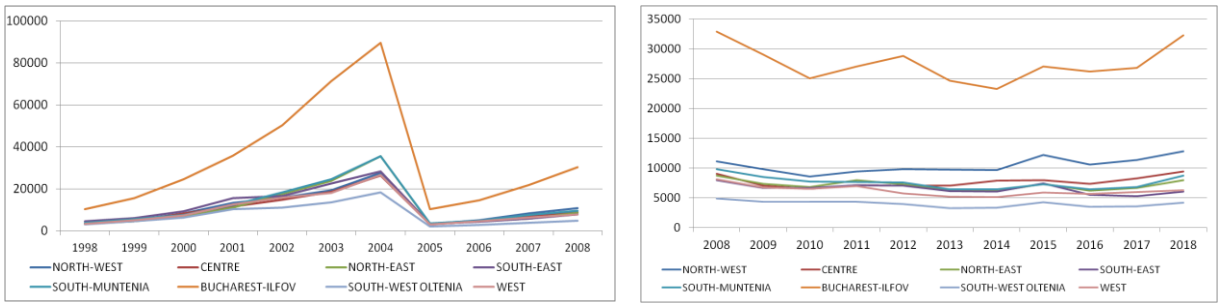
For the interval between 1998 and 2008, the turnover in the field of electric power and heating, gas and water the Bucharest–Ilfov region, South-West Oltenia and South-East regions recorded maximum values, while the other development regions registered low values.

For the interval between 2008 and 2018, the situation is quite similar in terms of regional distribution: the Bucharest–Ilfov region recorded a turnover ranging between 2,300,000 and 3,500,000 thousand Lei (with the highest value in 2011), followed by Centre and South-West Oltenia regions with a different dynamic (positive for the first one and negative for the second).

In water distribution, sanitation, waste management and decontamination activities, the highest turnover figures pertained to the Bucharest–Ilfov region, which registered an oscillating dynamic: decreasing between 2008 and 2009, ascending during the interval 2009–2012, followed by a new

downward spiral between 2012 and 2015. This development region was consistently followed by the South-East, South-Muntenia, Centre and West regions, all of them recording oscillating trajectories similar to that of the Bucharest–Ilfov region.

Turnover evolution in *construction* (Fig 6 a, b) was constantly on the increase. However, the economic-financial crisis was being felt in the regression between 2008–2010 and in the oscillating course from 2010 to 2014. Outstanding again was the Bucharest–Ilfov Region in both intervals, followed at a great distance by the North-West Region, with the lowest score in the South-West Oltenia Region.

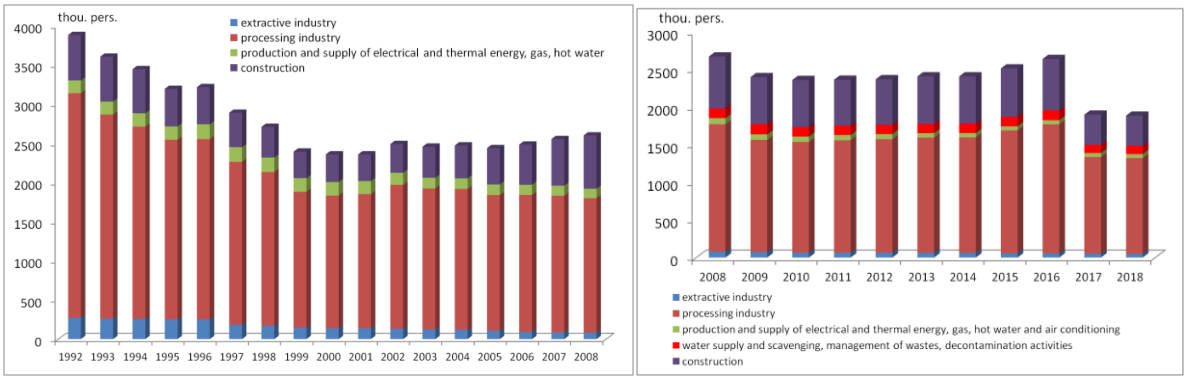


a. **b.**

Fig. 6 – Turnover evolution in construction (mil. Lei): a. 1998–2008; b. 2008–2018.

4.2. Employed population dynamics

At national level (1992–2018) the study of the employed population in the secondary sector covered the years 1992–2008 and 2008–2018 (Fig. 7a). Thus, in the first interval, the population employed in this sector was steadily decreasing (from 3,900 to 2,400 people between 1992 and 1999) followed by a period of stagnation at 2,500 employed people. In terms of the types of economic activity in the secondary sector, the majority of the employed population (two–thirds of it worked in the processing industry, then in construction, the extractive industry, electrical and thermal energy, gas and water.



a. **b.**

Fig. 7 – Dynamics of the population employed in the secondary sector, a. 1992–2008, b. 2008–2018

The interval between 2008 and 2018 features oscillating evolutions in the secondary sector population (around 2,300–2,600 individuals employed), with the highest values in 2008 before the economic crisis-induced layoffs, and from 2015–2018, when people started being employed given the

post-crisis recovery. Depending on the economic activities discharged in this sector over the same time-interval, most people were employed in the processing industry and in construction (best recovering after the economic-financial crisis). Together, these two types of activity registered over three-fourths of the secondary sector's employed population. At the same time, the population working in the extractive industry, electrical and thermal energy, gas, hot water and air conditioning, water supply, scavenging, management of wastes and decontamination proceeded to personnel cuts (Fig. 7b).

Restructuring the mining sector, which began after 1990, as well as failed privatizations, turned the extractive industry into one of the most vulnerable economic activities, large-scale layoffs join on as numerous production units closed down. Declaring less-favoured mining zones proved an unsuccessful attempt at making up for layoffs by granting investors facilities.

Thus, between 1992 and 2008, *the population employed in the extractive industry* was considerably reduced in all development regions, except for the Bucharest–Ilfov Region where, after 2005, they began employing people in the central administration. Most mining areas experienced steep decreases, especially from 1996 to 1997 (West, South-West Oltenia, North-West, South-Muntenia and North-East Regions), the decline being less obvious in the mining areas of the South-East and Centre Regions because the extractive sector was less developed there. After 2008, differences in the evolution trend became apparent: the regions with a well-developed mining sector (South-West Oltenia, South-Muntenia and the West Regions) continued to lose people employed in extractive activities, while the regions where this industry held a lower share (South-East, Bucharest–Ilfov and North-East) had an oscillating record, employment alternating with layoffs (Figs. 8, 9, 10).

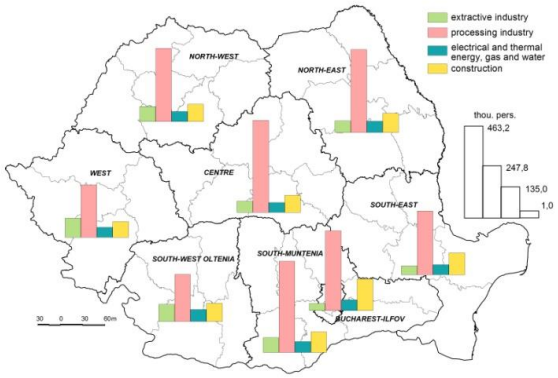


Fig. 8 – The structure of the employed population by secondary sector branches, 1992.

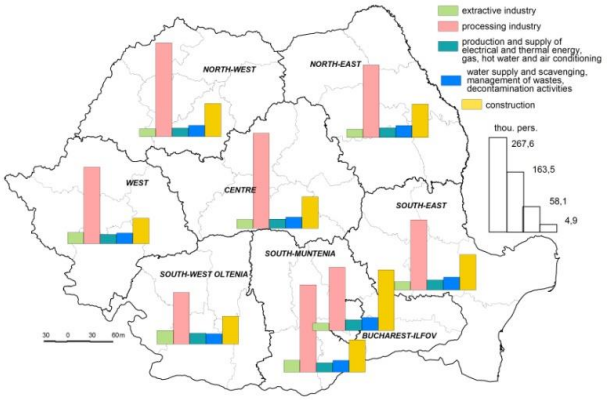


Fig. 9 – The structure of the employed population by secondary sector branches, 2008.

Analysing the two reference intervals (1992–2008 and 2008–2018) we found that the evolution trend in the *processing industry workforce* was similar in all the development regions. However, a steeper decline was registered in the first interval in the Centre and South-Muntenia Regions, followed by an oscillating period, mainly of stagnation, and one of increase after 2014. Most people employed in the processing industry were in the Centre and North-West Regions, which had a greater demographic availability and a sustained economic growth (in 2013, the North-West Region was ahead of the Centre Region in regard to the population working in the processing sector), next in line being South-Muntenia and the West Regions (the last one having the most constant growth of population employed in this industry), the North-East, South-East, and Bucharest–Ilfov Regions, with the South-West Oltenia Region coming constantly last (Figs. 8, 9, 10).

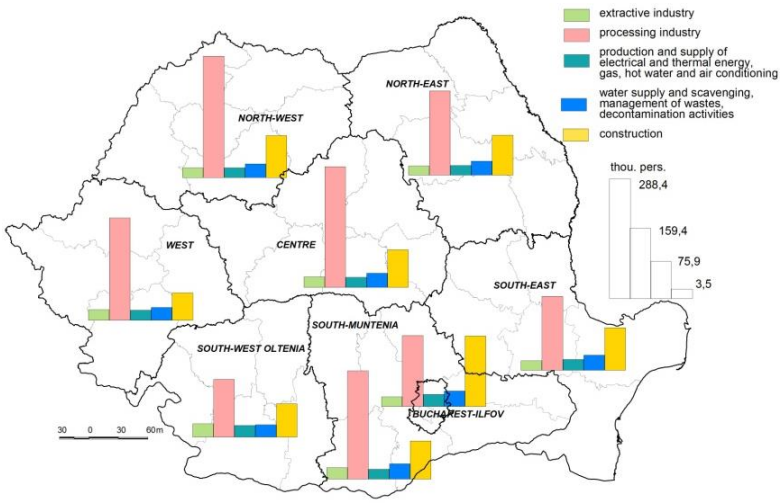


Fig. 10 – The structure of the employed population by secondary sector branches, 2018.

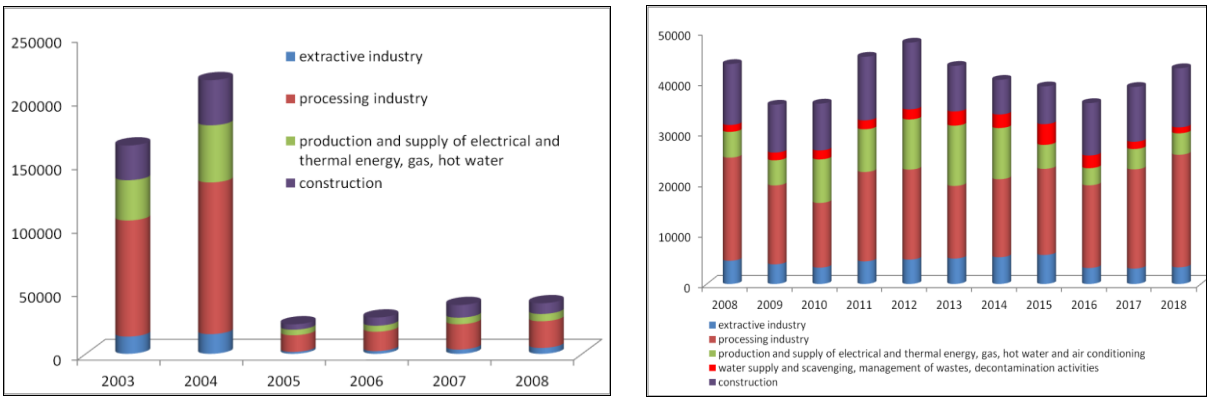
Within the first part of the 1992–2008 interval, the *population employed in the energy and thermal, gas and hot water, and air conditioning industries* experienced an increasing evolution (especially the North-East, South-Muntenia and North-East Regions); however, during 1997–2008 all the eight development regions registered involutions. Thus, in 2008, the hierarchy of development regions had changed, the first positions being occupied by South-Muntenia and South-East Regions followed by Bucharest–Ilfov, North-East, Centre and South-West Oltenia, the last places going to the West and North-West Regions. The evolution of the population employed in the production and supply of electrical and thermal energy, gas, hot water and air conditioning over 2008–2018 indicated a general declining trend, especially in the South-West Oltenia, South-East, South-Muntenia, Centre and North-East Regions (the last one having the worst record) (Figs. 8, 9, 10).

An oscillating evolution between 2008–2018 was recorded by the population working in the water supply, scavenging, management of wastes and decontamination sectors (Fig. 7b), which sharply decreased during certain years in the Bucharest–Ilfov, South-East and Centre Regions, as well as in South-Muntenia. The most important employment of personnel, with positive effects on the evolution of the population working in these fields, took place over various periods of time in Bucharest–Ilfov, South-East, North-East, South-Muntenia, South-West Oltenia and other regions (Figs. 8, 9, 10).

Throughout the 1992–2008 interval, *the population employed in construction* experienced two distinct evolution trends in all the development regions, particularly in 1990. The most obvious evolution record was had by the Bucharest–Ilfov Region, with an explosive growth especially in the City's peri-urban area (from 50,000 pers. to over 160,000 pers.). A stagnation occurred from 2008 to 2018 in the employment of population in this sector, which affected all developed regions, with slight employment decreases from 2009 to 2016 and mild increases over 2015–2016 (Figs. 8, 9, 10).

4.3. Net investments dynamics

Within the 2003–2008 interval (Fig. 11a), net investments in the secondary sector registered consistent growth throughout the country. Most investments were made in the processing industry, which reached impressive growth to the detriment of the extractive industry which was faced with difficulties in being restructured and becoming efficient. After investing in the processing industry, there followed construction, electrical energy, gas and water, and eventually in the extractive industry, which proved to be the least net investment-attractive sector.



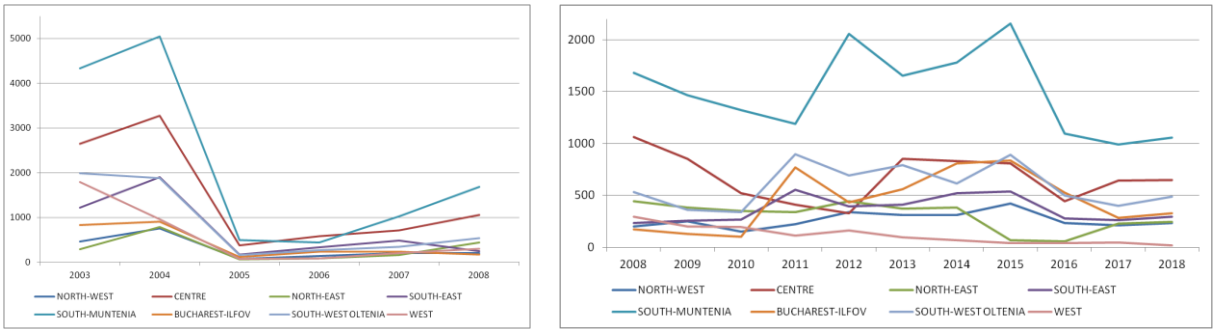
a. **b.**

Fig. 11 – Net investment evolution in the secondary sector (mil. Lei), a. 2003–2008, b. 2008–2018.

Beginning with 2008, net investments in the secondary sector started oscillating primarily due to the financial crisis-induced decline in 2008–2009, with a second negative trend occurring in 2012–2015 (Fig. 11b).

In the net investment structure, the processing industry held pride of place, next in line standing production and supply of electrical and thermal energy, gas, hot water and air conditioning (a sector that decreased significantly between 2013 and 2015), construction, extractive industry and water supply, scavenging, management of waste and decontamination, the share of the last sector increasing significantly in 2015 versus 2008.

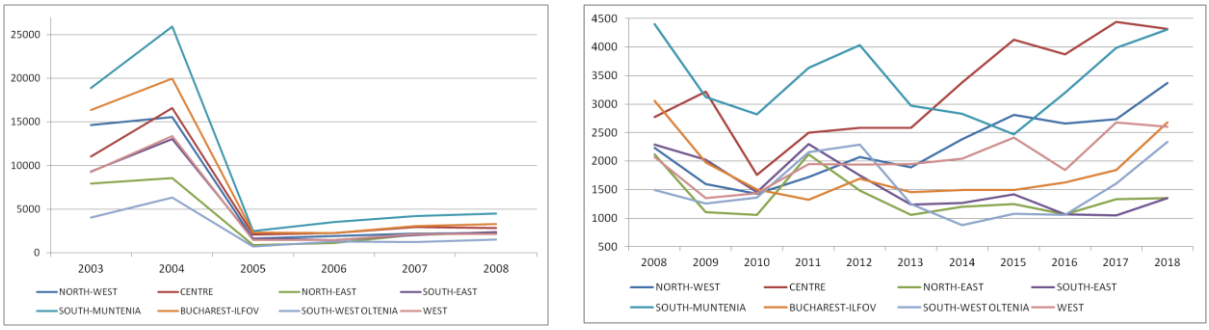
Net investments in the extractive industry at the end of the 1990s suffered sharp cuts in all the development regions because restructuring and effectiveness policies in this economic sector failed. After 2006, it was South-Muntenia Region that headed the list, with the Centre and South-West Oltenia Regions coming next in line (Figs. 12 a, b).



a. **b.**

Fig. 12 – Net investments in the extractive industry (mil. Lei), a. 2002–2008, b. 2008–2018.

Net investments in the processing industry were concentrated in the South-Muntenia, Bucharest–Ilfov, North-West, Centre and West Regions. Until 2008, all development regions had a pretty similar dynamic in attracting net investments (see the hierarchy in Fig. 13a). However, the economic-financial crisis would disturb the course of capital intake, all development regions having a fluctuating record in this respect (Fig. 13b). At the top of the net investments' hierarchy (basically the net investment value) we may find the South-Muntenia and Centre Regions, with the poorest regions (North-East and South-West Oltenia) falling to the bottom; the Bucharest–Ilfov Region (the last position in 2010–2012) was involved mainly in the third sector.



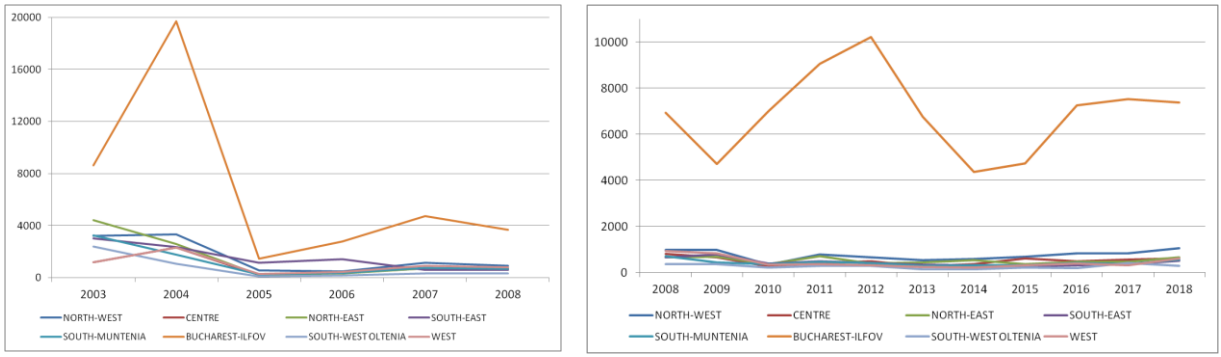
a. **b.**

Fig. 13 – Net investments dynamics in the processing industry (mil. Lei), a. 2003–2008, b. 2008–2018.

Net investments in electrical and thermal energy, gas, water, scavenging, air conditioning, management of wastes, and decontamination recorded an evolution relatively similar to that in the processing sector, *i.e.* quite relative from 2003 to 2008, followed by a mild decrease especially in the Bucharest–Ilfov Region during 2007.

After 2008, investments registered great fluctuations. The biggest capital vested in the supply of electrical and thermal energy, gas, hot water and air conditioning went to the South-West Oltenia, South-East and Bucharest–Ilfov Regions. As to net investments in water supply, scavenging, management of waste and decontamination, it was the South-East Region that has stood at the forefront ever since 2010. In 2015, preferential investments were earmarked for the North-West and South-Muntenia Regions.

Net investments in construction were concentrated in the Bucharest–Ilfov Region, being ten times higher than the average value registered by the other regions. During the economic-financial crisis, the land-price increasing fewer net investment went to construction (Fig. 14 a, b).



a. **b.**

Fig. 14 – Net investment dynamics in construction (mil. Lei), a. 2003–2008, b. 2008–2018.

4.4. Enterprises and their demographic component

Between 2002 and 2008, secondary sector units had been constantly growing all over the country by twice as many units (from 60,000 to 120,000), being set up especially in the processing and construction branches. The share of extractive industry, energy and thermal, gas and water sectors was simply insignificant.

After 2009, the economic-financial crisis marked the evolution of secondary sector units, which decreased from 120,000 to some 90,000 over the 2009–2011 period. What followed was a slow increase and then a stagnation (2014–2015), no more than 100,000 units being left mainly in the processing and construction sectors, themselves numerically reduced in the 2008–2018 interval. An insignificant proportion of units in the extractive industry production and supply of electrical and thermal energy, gas, hot water and air conditioning, water supply, scavenging management in waste and decontamination.

Extractive industry units went on an upward trend but at distinct rates: faster in 2002–2004 and 2006–2008, and slower in 2004–2006. Most extractive industry units were located in the regions North-West, Centre, South-Muntenia, South-West Oltenia and West, with North-East and Bucharest–Ilfov Regions coming next in line, where the latter sector was less represented in the regional economic structure. From 2008 to 2015, the number of extractive industry units would increase beyond the 1,400-threshold fluctuating afterwards around 1,200–1,300 units. Most of them continued to be concentrated in the North-West, Centre, West and South-West Oltenia Regions, their share decreasing in the South-West Oltenia Region because many mining exploitations were being closed (Fig. 15, 16, 17).

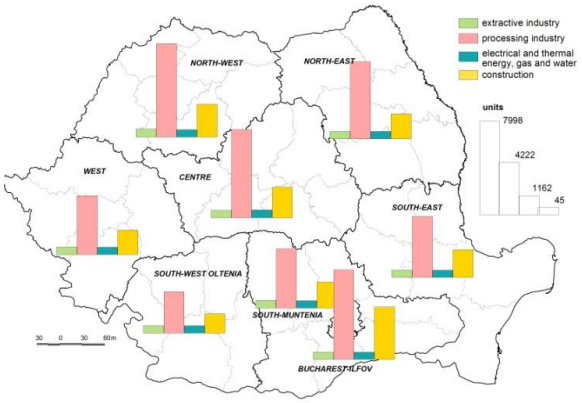


Fig. 16 – The structure of secondary sector units, 1992.

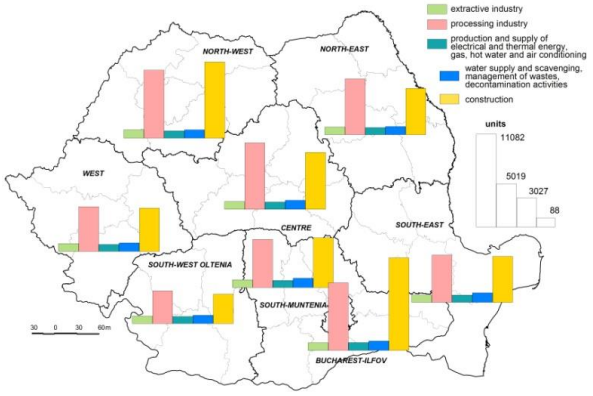


Fig. 17 – The structure of secondary sector units, 2008.

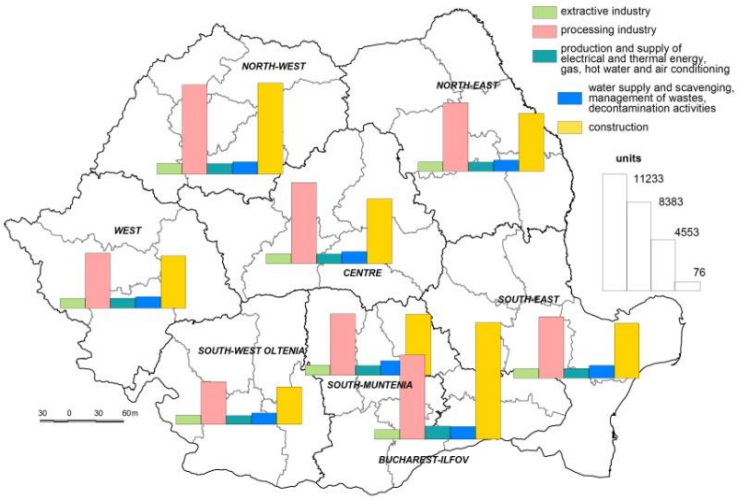


Fig. 18 – The structure of secondary sector units, 2018.

Processing industry units registered an upward trend in some 45,000 to over 65,000 units throughout 2003–2008. Outstanding in the territory was the Bucharest–Ilfov Region with more than 10,000 units, followed by the Centre and North-West Regions with above national average evolutions (Figs. 16, 17, 18). After 2008, the economic-financial crisis would be deeply felt, the number of processing industry units dropping from some 58,000 in 2008 to about 45,000 in 2014–2015. As the regional analysis revealed, the Bucharest–Ilfov Region stood at the top of the hierarchy, followed by the Centre and North-West Regions, with the South-West Oltenia, West and South-East Regions standing at the bottom of the table (Figs. 15, 16, 17).

Between 2008 and 2014, the units belonging to the *production and supply of electrical energy, gas, hot water and air conditioning sectors* went on the increase, but at distinct rates and directions of evolutions. The hierarchy was headed by the Bucharest–Ilfov Region with up to one-third of all the units in this field. The South-West Oltenia and North-East Regions fell at the bottom of the list (Figs. 16, 17, 18).

A slow numerical growth between 2008 and 2018 was registered by *the scavenging, management of wastes and decontamination units*, in other years their activity kept stagnating, or decreased. Their distribution at regional level registered a relatively balanced evolution, yet the South-Muntenia Region was slightly ahead of the others (Figs. 15, 16, 17).

From 2002–2018, *the number of construction units* went steadily up between 2003–2008 and at a constant rate until 2007, subsequently declining because of the economic-financial crisis, however, they would slightly recover from 2012 to 2018. In terms of territorial structure, the Bucharest–Ilfov Region stood out with nearly one-third of all construction units, the North-West Region coming second. At the other end of the spectrum there were the South-West Oltenia, the South-East, North-East and West Regions (Figs. 15, 16, 17).

4.5. Secondary sector economic activities and their effects on environment quality

In Romania, the general state of the environment has improved due to the technological progress in some industrial units, as well as because industrial activity was significantly reduced. Air and soil pollution is visible in the areas surrounding pollution sources, *i.e.* industrial mining and oil processing sites, as well as animal breeding zones (Sima, Popovici, 2016). All these secondary sector activities have a significant impact on environmental factors – air, water and soil –, but more especially it is such industries as thermal energy, cement, oil and natural gas, refinery, chemical and petrochemical, as well as metallurgy that may affect these polluting factors. The potential impact is the result of emissions released by the preparation of raw material, the final processing of products, the transport and storage of raw material and auxiliary items (Annual Report on the State of the Environment in Romania 2016–2017).

The quality of air is being changed by atmospheric pollutants up to noxious concentrations produced mostly by burning procedures used in the energy industry. Looking at the evolution and origin of various types of air pollutants, one finds a general tendency towards reducing the mean annual concentrations which, as a rule, fall below limit values. However, it appears that mercury emissions are released during the energy producing process to obtain iron and steel. Also, the highest contributor to the emissions of persistent organic pollutants is just the iron, steel and aluminium manufacturing process; the energy sector does contribute to polluting the air with significant quantities of sulphur dioxide, carbon monoxide, carbon dioxide, nitrogen oxides and powders. Analysing the evolution of the main air-released pollutants one finds a general decreasing trend since big burning installations have been rehabilitated and updated, while sulphur-rich fuels are no longer used. The analyses made by the Ministry of the Environment show that closing down some industrial installations is an important way of reducing air-released pollutants (Annual Report on the State of the Environment in Romania in 2016, 2017). Since the activities of industrial installations can be controlled so that energy consumption-yielded emissions and waste is as decreased as possible, has led to the EU legislation

reform, with the publication in 2010 of *Directive 2010/75/UE on industrial emissions (IED Directive)* included in the national legislation – Law No. 278/2013 on industrial emissions (Parlamentul României, 2013).

The industrial units producing polluting emissions, releasing dangerous substances and used waters put significant pressure on water quality in Romania, water being charged with organic matter, nutrients and dangerous substances. Among secondary sector activities significantly contributing to the degradation of water bodies, we would recall the catchment and processing of water for the population, the production of electrical and thermal energy, as well as the chemical, metallurgical and extractive industries (Guvernul României, Ministerul Mediului, Agenţia Naţională pentru Protecţia Mediului, 2017, Ministerul Economiei, Energiei şi Mediului de Afaceri, 2020). Water management and the monitoring of water body quality in this country are as per the *Water Framework Directive (60/2000/CEE*) aimed primarily at having all water bodies in good condition by acting at drainage basin level (Sima, Popovici, 2016).

The degradation of *soil quality* through various digging works is the severest form of its impairment, a situation occurring especially in the case of open mining. The quality of land affected by this type of pollution is by 1–3 classes lower, some such surfaces having actually become unproductive. Soil degradation is induced by extractive industry works, the presence of waste deposits, mud-setting ponds, dump heaps of debris, wastes produced by the extractive, siderurgical and metallurgical industries, pollutions with various types of chemical components carried by air and water in the proximity of industrial pollution sources, radioactive materials, crude oil, and salt water from oil extraction (Sima, Popovici, 2016, Guvernul României, Ministerul Mediului, Agenţia Naţională pentru Protecţia Mediului, 2017, Ministerul Economiei, Energiei şi Mediului de Afaceri, 2020).

5. CONCLUSIONS

This analysis of the Romanian secondary sector has in view turnover variability, the employed population, net investments and various indicators relevant for the demographic aspects of the enterprises. Thus, some regional profiles may be singled out. Secondary sector territorial characteristics, the specificity of development regions, which is based on in-depth studies of a larger number of variables and statistical indicators (Popescu 2000, Popescu *et al*. 2003, Dumitrescu 2008, Bălteanu *et al*., 2016, Popescu *et al*., 2016) are briefly outlined below:

South-Muntenia Development Region. Secondary sector activities that were restructured and made investment-attractive: oil and natural gas extraction and processing, machine-building, pieces of equipment and means of transport, chemical industry, electrical and household items.

South-East Development Region. The secondary sector featured a steep decline of employed population but also benefitted from natural resources, from the openness to international markets, accessibility to and diversity of a transport infrastructure. The advantages offered by the localisation of secondary sector units and by the Region's industrial specialization proved investment attractive.

North-East Development Region. An underdevelopment secondary sector was among the causes of great poverty here, this Region being one of the poorest in Romania (Mocanu *et al*., 2016), with the least amount of investments in the secondary sector, especially in the processing industry, as opposed to other development regions; a lower turnover than in other regions (again in the processing sector), but a better one in the mining industry.

North-West Development Region. The secondary sector is relatively diversified, tending, however to specialize in machine-building and equipment, furniture, textile and footwear industries. Due to their cross-border co-operation potential and a better development infrastructure than in other regions, important investments could be drawn in.

Centre Development Region. The secondary sector is well represented, especially the energy industry. The Region is specialised in wood processing, food, aeronautics and chemical fertilisers.

West Development Region. Its secondary sector was severely affected by industrial restructuring (of the extractive and metallurgical branches); however, a positive evolution was were recorded in telecommunications, machine-building, chemical and electrochemical industries.

South-West Oltenia Development Region. Failures to privatise some industrial units and dysfunctions in the energy and extractive industry led to it being more poorly developed than other regions.

Bucharest-Ilfov Development Region. The deindustrialization and tertiarization of Bucharest's economy, together with the relocation of some firms in Ilfov County, has forced its secondary sector to heavily restrict its activity. Industrial units are largely connected with the industries working for the urban market; in addition, numerous multinational companies are also involved.

The disparities revealed by this study are consistent with Romania's complex socio-economic discrepancy rooted in the historical background of the country: Romania's economic development follows a West–East direction, thus having a powerful geographical component, the less developed regions being more focused in the Eastern and Southern parts of the country (Ianoş, 1998). Since the early 20th century, Romania has had two space organisation patterns: the Wallachia historical region (corresponding to the South-Muntenia Development Region and parts of the South-East Development Region) follows a North-South development direction with a few scattered nuclei; and Transylvania, Banat and Crişana historical regions (corresponding to the Development Regions located in the Central, Western and North-Western parts of Romania), which have a profile shaped by mining activities and by the main cities encompassing secondary and tertiary sectors). Having been perpetuated over time, these two main opposite space organisation patterns have led to the emergence of regional disparities. However, the South-East–North-West industrial profile has been maintained, leaving discontinuities at the periphery (Popescu 2000; Ministerul Dezvoltării Regionale şi Administraţiei Publice, 2014, Popescu *et al*., 2016, Mitrică *et al*., 2017).

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