# STATISTICAL ANALYSIS OF LABOUR RESOURCES IN ROMANIA, BEFORE COVID-19 PANDEMIC CRISIS

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**Abstract**

In the three decades since the collapse of communism in Romania (1989), human resources have gone through several distinct moments in the process of social and economic transition, from the state economy to the market economy: (1) the period 1990-2007 characterized by declining employment, rising unemployment, low wages, employee poverty, labour migration to developed countries; (2) the period 2007-2019 in which Romanian employees experienced the benefits of the European integration process, which meant economic macrostability, increased foreign investment, projects financed by European operational programs that led to increased living standards, increased employment, labour crisis; (3) the period beginning with the 2020 pandemic year and the economic and social crisis, the effects of which are already quantified by official statistics.

This paper proposes a retrospective analysis of the evolution of labour resources in Romania, after joining the European Union. The methodology used combines descriptive statistical analysis (labour resources, activity rate, employment rate, unemployment rate, average net earnings), hierarchical cluster analysis to compare the employment situation in Romania in the year of accession to the European Union (2007) *versus* the year before the onset of the pandemic crisis (2019) and the simple linear regression analysis, having as an independent variable the „unemployment rate" and as a dependent variable „the number of employees". Simple linear regression is used not only for teaching purposes, but in addition to testing the link between variables, we wanted to find out how much the number of employees decreases if the unemployment rate increases by one percentage point nationwide. The data used come from the *TEMPO Online* database of the National Institute of Statistics and were processed with the SPSS.

**Keywords**: *labour resources, employment, unemployment, earnings, cluster analysis*

**Résumé**

Au cours des trois décennies qui ont suivi l'effondrement du communisme en Roumanie (1989), les ressources de travail ont traversé plusieurs moments distincts dans le processus de transition sociale et économique, de l'économie d'État à l'économie de

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marché: (1) la période entre les années 1990 -2007 caractérisé par une baisse de l'emploi, une hausse du chômage, des bas salaires, la pauvreté des employés, la migration de ressources de travail vers les pays développés; (2) la période 2007-2019 au cours de laquelle les employés roumains ont connu les avantages du processus d'intégration européenne, qui signifiait une macrostabilité économique, une augmentation des investissements étrangers, des projets financés par des programmes opérationnels européens qui ont conduit à une augmentation du niveau de vie, à une augmentation de l'emploi, crise du travail; (3) la période commençant par l'année pandémique 2020 et la crise économique et sociale, dont les effets sont déjà quantifiés par les statistiques officielles.
Cet article propose une analyse rétrospective de l'évolution des ressources de travail en Roumanie, après son adhésion à l'Union européenne. La méthodologie utilisée combine une analyse statistique descriptive (ressources en main-d'œuvre, taux d'activité, taux d'emploi, taux de chômage, salaire net moyen) et une analyse hiérarchique par grappes pour comparer la situation de l'emploi en Roumanie l'année de l'adhésion à l'Union européenne (2007) *versus* l'année précédant le début de la crise pandémique (2019) et l'analyse de régression linéaire simple, ayant comme variable indépendante le «taux de chômage» et comme variable dépendante «le nombre d'employés». La régression linéaire simple est utilisée de tester du lien entre les variables, nous voulions savoir dans quelle mesure le nombre d'employés diminue si le taux de chômage augmente d'un point de pourcentage à l'échelle nationale. Les données utilisées proviennent de la base de données *TEMPO Online* de l'Institut national de statistique et ont été traitées avec le programme SPSS.

**Mots-clés**: *ressources de travail, emploi, chômage, les salaires, l'analyse par grappes*

**Rezumat**
În cele trei decenii care au trecut de la prăbuşirea comunismului în România (1989), resursele umane au parcurs câteva momente distincte ale procesului de tranziţie socială şi economică, de la economia de stat la economia de piaţă: (1) perioada cuprinsă între anii 1990-2007 caracterizată prin scăderea ocupării, creşterea şomajului, salarii reduse, sărăcia angajaţilor, migraţia forţei de muncă spre ţările dezvoltate; (2) perioada cuprinsă între anii 2007-2019 în care angajaţii din România au cunoscut beneficiile procesului de integrare europeană, care a însemnat macrostabilitate economică, creşterea investiţiilor străine, proiecte finanţate prin programele operaţionale europene care au condus la creşterea nivelului de trai, creşterea ocupării, criza forţei de muncă; (3) perioada care are ca *starting point* anul pandemic 2020 şi criza economică şi socială ale cărei efecte sunt deja cuantificate de statistica oficială.
Această lucrare propune o analiză retrospectivă a evoluţiei resurselor de muncă în România, după aderarea la Uniunea Europeană. Metodologia utilizată combină analiza statistică descriptivă (efectivul resurselor de muncă, rata de activitate, rata ocupării forţei de muncă, rata şomajului, câştigurile salariale medii nete), analiza cluster ierarhică pentru a compara situaţia forţei de muncă din judeţele României în anul aderării la Uniunea Europeană (2007) *versus* anul anterior declanşării crizei pandemice (2019) şi analiza de regresie liniară simplă, având ca variabilă independentă „rata şomajului” şi ca variabilă dependentă „efectivul de salariaţi”. La prima vedere, regresia liniară simplă este utilizată în scop didactic, însă în afară de testarea analiza legăturii dintre variabile, am dorit să aflăm cu cât scade efectivul salariaţilor dacă rata şomajului creşte cu un punct procentual la nivel naţional. Datele utilizate provin din baza *TEMPO*

*Online* a Institutului Naţional de Statistică şi au fost prelucrate cu programul SPSS. Pentru analiza statistică descriptivă am utilizat şi datele din două cercetării statistice derulate de Institutul Naţional de Statistică: „balanţa forţei de muncă" şi „ancheta forţei de muncă în gospodării".

**Cuvinte cheie**: *resurse de muncă, ocupare, şomaj, câştiguri salariale, analiza cluster*

## 1. Introduction

Until joining the European Union (2007), Romania faced a surplus of labour generated by the process of economic restructuring in the transition from the centralized state economy to the capitalist market economy (Asiminei et al., 2017). At the end of this process, many state-owned enterprises were closed or went bankrupt, others were privatized with more or less success. In the early years of the economic transition, a lot of industries collapsed, considered by some rulers to be „piles of scrap metal" because they had outdated technology, were energy-intensive, uncompetitive, or had no markets. The place of the old industries developed during the communist regime was occupied by new and competitive industries, developed through the infusion of foreign capital or through investments of the local capitalists raised following the „privatization of communism".

During the communist regime, Romania had a full employment rate, unemployment did not exist from an official point of view. The beginning of the transition from communism to capitalism also meant the beginning of the problems related to employment. In 1990, the employment rate was 82%, then gradually decreased, reaching 63.4% in the year of the country's accession to the EU (2007). Until the COVID-19 pandemic crisis, Romania reached an employment rate of 70% from total labour resources, assumed under the Europe 2020 Strategy.

Unemployment broke out immediately after 1990, reaching 8.2% of the active population in 1992. Only after Romania's accession to the EU, when Romanians were able to move around the EU without Schengen visas, unemployment began to decrease in intensity. After a government in which privatization and massive economic restructuring by applying the „shock therapy" model was the watchword, the unemployment rate reached a maximum of 11.8% in 1999. As a result of the liberalization of the EU labour market for Romanians, the unemployment rate decreased to 3.3% in 2018, well below the level of more developed countries in the EU. Even if this low unemployment rate seems unlikely, the explanation must be sought, on the one hand in the increase of external migration (seasonal, temporary or permanent), and on the other hand, due to the increased demand for jobs in the conditions of economic recovery. For example, the gross domestic product increased in 2018 by 4% compared to 2017. This economic increase is based largely on the final consumption of the population, on the expansion of the automotive and construction industry, as well as on the increase of agricultural production in a favourable period from a meteorological and hydrological point of view.

In the context of overcoming the economic crisis from 2009-2012 and the economic recovery of the EU member states, in Romania, employment increased simultaneously with external migration, resulting in an increased demand for domestic labour. Throughout this period, more and more investors were reporting a labour crisis for certain economic activities: tourism and services sectors, industry and construction, information technology and communications (IT&C). In the context of high labour demand, employers have focused on „importing" labour from other countries. The health crisis triggered by the COVID-19 pandemic would reduce this demand for labour resources. At the moment, there is on talking about the need for labour resources, but about unemployment or the use of technical unemployment supported from the public budget.

During the pandemic crisis, many Romanian citizens returned to the country from Western Europe. The authorities do not have information on their social and professional status. It is not known what the intentions of the migrants are in relation to the labour market supply. Getting a job became difficult during the COVID-19 pandemic, when activities in the hospitality and tourism industry are restricted, an economic sector that could absorb the labour force.

The social and economic impact of the COVID-19 pandemic will be assessed as data collected from the field by the National Institute of Statistics (engl. NSI/ rom. INS) will be processed, analyzed and disseminated through the *INS-TEMPO Online* database and through specialized statistical publications.

The National Institute of Statistics conducts a quarterly survey on the perceptions of company managers regarding the prospects of economic activity (INS, 2020a). In the October 2020 business survey, managers in the manufacturing industry expect relative stability in production volume for the next three months. Regarding the number of employees in the manufacturing industry, a moderate decrease is estimated, the short term balance being -7% on the total manufacturing industry. In the retail sector, the managers estimated for the next three months a trend of relative stability of economic activity (short term balance -1%). Employers in the trade forecast for the next three months an increase in the number of employees (short term balance + 21%). The demand for services will decline moderately in the next three months (short term balance -9%). There will be a decrease for artistic creation and interpretation activities (short term balance -99%), air transport (short term balance -95%) and the activities of hotels and other accommodation facilities (short term balance -49%). In the services sector, employers estimate a reduction in the number of employees (short term balance -16%).

## 2. Concepts, indicators, data sources, research questions

For the evaluation of labour resources and the proportion in which they are used in the different sectors of economic and social activity, the National Institute of Statistics uses two series of statistical data: (1) data from the Labour Force Balance and (2) data from Household Labour Force Survey (AMIGO). Labour

Force Balance (LFB) allows the construction of comparable indicators over time, at national and territorial level (development regions, counties), and AMIGO ensures comparability over time, at national, territorial (development regions) and international level (with other countries) (INS, 2020b).

The statistical indicators resulting from the processing of the two statistical series (LFB and AMIGO) are not comparable because the data collection methods, the reference periods and the scope are different. However, the statistical analysis of the data of both series provides a comprehensive picture of labour resources and labour market dynamics.

The concepts and definitions within the Romanian system of labour resources have been adapted to the international conventions and standards, taking into account the specifics of national legislation. In this paper, we operate with the following concepts: „labour resources", „employed population", „ unemployment", „active population", „vocational training population and other categories of working population".

Labour resources represent a category of population that has all the physical and intellectual capacities that allow it to carry out useful work in one of the activities of the national economy. Work resources include:

- the working population, which is determined by the decrease in the working population of persons with permanent incapacity for work and of working pensioners who do not work;
- population under and over the working age in activity.

The employed population includes all persons who have an income-generating occupation, which they usually exercise in one of the activities of the national economy, being employed in an economic or social activity, on the basis of an employment contract or independently in order to obtain income in the form of salaries, payment in kind, etc. The employed population does not include military personnel and persons assimilated to them. The categories of people included are:

- employees working in one of the activities of the national economy in public sector units (fully state and public of national interest), mixed, private, cooperative, public;
- employers, managers of private units, who use for the activity of salaried labour force;
- self-employed;
- unpaid family workers.

The employment rate of labour resources represents the ratio, expressed as a percentage, between the civil employment population and the total labour resources.

The employee is considered the person employed based on individual employment contract for a fixed or indefinite period, in full or in part time (including those with suspended employment), existing in company records at the end of the year. According to the survey „Labour force in households" (AMIGO), the employee is considered the person who works on an

„employment contract" in an economic or social unit, regardless of its form of ownership, in exchange for remuneration in the form of salary, in cash or in kind, etc. (INS, 2020c).

The number of employees refers to the number of employees (exclusively with suspended employment contract) which includes persons with individual fixed-term or indefinite employment contracts (including seasonal workers, managers or administrators) whose employment relationship has not been suspended, being valid on the last day of the month when the data is reported. „Employees" do not include employees posted to work abroad and / or those who combine several positions and do not have the basic position at the unit that reports labour force data. The average number of employees is calculated as a simple arithmetic average resulting from the sum of the daily workforce of employees (excluding employees with suspended employment contracts) divided by the total number of calendar days.

According to the definition used by the National Agency for Employment, the unemployment represents the persons who are registered within the labour force state agency and cumulatively meet the following conditions:

- people who are looking for a job from the age of at least 16 years and until the retirement conditions are met;
- people whose their state of health and physical and mental capacities make them fit to perform a job;
- people who do not have a job, and who do not earn income or earn from activities authorized by law income lower than the minimum gross salary in the country, guaranteed in payment, in force until 2008 (inclusive) and than the reference social indicator starting with year 2009;
- people who are available to start work in the next period if a job is found;

Assimilated to the unemployed are also those people who are looking for a job and who did not find a job after graduating from an educational institution and who meet the following conditions: they are graduates of educational institutions, aged at least 16 years, who – a period of 60 days from graduation failed to get a job according to professional training; are graduates of special schools for people with disabilities at least 16 years old who have failed to find work according to professional training.

According to the standards of the International Labour Office (ILO), used in the survey „Labour force in households", the unemployed are people aged 15-74 who simultaneously meet three conditions:

- people who do not have a job and do not carry out an activity in order to obtain income;
- people who are looking for a job, using in the last 4 weeks (including the reference week) different active methods to find it;
- people who are available to start work in the next 2 weeks (including the week in which the interview took place), if a job is found immediately.

The unemployment rate represents the ratio, expressed as a percentage, between the number of registered unemployed and the civil economically active population.

The civil economically active population includes the civilian employed population and the unemployed. The activity rate of labour resources represents the ratio, expressed as a percentage, between the civil economically active population and the total labour resources.

The vocational training population and other categories of the working population include working students, housewives, people exempted from the civilian employed population and other categories of the unemployed population.

In the statistical analysis of labour resources, we also use the concept of „average net earnings". This indicator results from the deduction from the gross amounts paid related to the average gross monthly earnings of the social insurance contribution due by employees, the social health insurance contribution due by employees and the corresponding tax, the result being divided by the average number of employees and the number of months of the year.

Statistical analysis of labour resources in Romania after accession to the European Union aims to validate the following research questions (hypotheses): (1) what is the number and dynamics of labour resources in 2007-2019, the hypothesis that will be tested by descriptive statistical analysis (number of employees, earnings, unemployment); (2) what is the evolution of the labour resources of the Romanian counties from the year of accession to the EU (2007) compared to the situation from the year before the COVID-19 pandemic crisis (2019), a hypothesis that will be tested by hierarchical cluster analysis; (3) what is the impact of unemployment on the workforce, a hypothesis that can be tested by a simple linear regression analysis.

## 3. Research methodology, data analysis, results

In this study, we will use hierarchical cluster analysis to compare the evolution of the situation of Romanian counties in terms of average nominal net earnings, unemployment rate and number of employees in the year of accession to the European Union (2007) with the situation in 2019. The variables used are the following:

- average nominal net earnings (RON);
- unemployment rate (%);
- the number of employees (persons)

The data are taken from the *TEMPO ONLINE* base of the National Institute of Statistics, for the years 2007 and 2019, and the statistical software used for data processing is SPSS (Jaba & Grama, 2004; Netedu, 2005; Vasile, 2014).

Cluster analysis is a descriptive classification method that aims to group the units of the studied population into relatively homogeneous categories. It is a method of reducing data because it aims to organize a large set of objects into a small number of groups. The distances between cases are calculated, and on the

basis of these distance the matrix of the similarity of cases results. Distances represent the similarity as proximity of objects in a coordinate system defined by variables. The most used distance is the Euclidean distance. Finally, similar cases will be included in the same cluster.

Among the advantages of using cluster analysis are the achievements of classifications or typologies. Information about the entire population is reduced to information on smaller, relatively homogeneous groups. Cluster analysis is used both to generate hypotheses and to test them.

Although the number of clusters is determined by the algorithm of the SPSS, it is recommended that the researcher suggest a minimum and maximum number of clusters. For each number in the selected range, the program will generate a solution.

In the case of our analysis, Tables 1 and 2 of Annex 1 show the results of processing for a number of solutions between 2 and 5. We will choose the four-cluster version for both 2007 and 2019.

**Table 1.** *Number of cases in each cluster for the option chosen for 2007*

**Average Linkage (Between Groups)**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1 | 34 | 81.0 | 81.0 | 81.0 |
| | 2 | 5 | 11.9 | 11.9 | 92.9 |
| | 3 | 2 | 4.8 | 4.8 | 97.6 |
| | 4 | 1 | 2.4 | 2.4 | 100.0 |
| | Total | 42 | 100.0 | 100.0 | |

**Source:** *SPSS data processing*

For 2007, a first cluster is that of Bucharest. Then, a cluster consists of the counties of Cluj, Constanta, Prahova, Ilfov and Timisoara. In this cluster of developed counties, the average nominal net earnings are high (the average of the cluster is 1101 lei), the unemployment rate is low (an average of 2.67%), and the number of employees is high (an average of 183,125 employees), according to Table 2.

Vaslui and Mehedinti counties form another cluster that is characterized by the highest unemployment rate in the country and the lowest number of employees. Also, the average nominal net gain is below the average of the other counties.

The last cluster consists of the rest of the counties with values of the analyzed variables close to the national average (an average of net earnings equal to 923 lei, the average unemployment rate is 4.88% and an average number of employees of 94446 persons).

**Table 2.** *Average and median of analyzed variables for the chosen cluster for 2007*

**Average_nominal_net_earnings_2007 Unemployment_rate_2007 Number_of_ employees_2007 * Average Linkage (Between Groups)**

| Average Linkage (Between Groups) | | Average_ nominal_net_ earnings_ 2007 | Unemployment_rate_2007 | Number_of_ employees_ 2007 |
|---|---|---|---|---|
| 1 | Mean | 922.79 | 4.8832 | 94445.65 |
| | Median | 923.50 | 5.1550 | 88017.00 |
| 2 | Mean | 1101.00 | 2.6720 | 183125.20 |
| | Median | 1065.00 | 2.9900 | 192852.00 |
| 3 | Mean | 931.00 | 8.9050 | 56277.00 |
| | Median | 931.00 | 8.9050 | 56277.00 |
| 4 | Mean | 1398.00 | 2.0600 | 923635.00 |
| | Median | 1398.00 | 2.0600 | 923635.00 |
| Total | Mean | 955.71 | 4.7443 | 122927.79 |
| | Median | 933.50 | 4.7900 | 89207.00 |

**Source:** *SPSS data processing*

For 2019, the output below shows the number of counties included in each of the 4 clusters.

**Table 3.** *Number of cases in each cluster for the option chosen for 2019*

**Average Linkage (Between Groups)**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | 1 | 23 | 54.8 | 54.8 | 54.8 |
| | 2 | 8 | 19.0 | 19.0 | 73.8 |
| | 3 | 10 | 23.8 | 23.8 | 97.6 |
| | 4 | 1 | 2.4 | 2.4 | 100.0 |
| | Total | 42 | 100.0 | 100.0 | |

**Source:** *SPSS data processing*

According to Table 4, in 2019, Bucharest remains with the highest average nominal net earnings, the lowest unemployment rate and the highest number of employees.

The cluster of Cluj, Brasov, Iasi, Arges, and Sibiu, Prahova, Ilfov and Timisoara counties is marked by net average nominal net earnings of 3082 lei, an unemployment rate of 1.83% and an average number of employees of 193,277 persons.

The counties of Bacău, Vaslui, Suceava, Buzau, Galati, Ialomita, Teleorman, Dolj, Olt and Mehedinti form another cluster which is characterized by the highest unemployment rate in the country and the lowest number of employees. Average nominal net earnings are below the average of other counties.

The other counties are in the cluster which is characterized by values close to the national average of the variable analyzed.

**Table 4.** *Average and median of analyzed variables for the chosen cluster for 2019*

**Average_nominal_net_earnings_2019 Unemployment_rate_2019 Number_of_employees_2019 * Average Linkage (Between Groups)**

| Average Linkage (Between Groups) | | Average_nominal_net_earnings_2019 | Unemployment_rate_2019 | Number_of_employees_2019 |
|---|---|---|---|---|
| 1 | Mean | 2507.22 | 3.0887 | 87544.00 |
| | Median | 2501.00 | 3.1400 | 77765.00 |
| 2 | Mean | 3082.50 | 1.8325 | 193277.13 |
| | Median | 3050.50 | 1.9450 | 182987.00 |
| 3 | Mean | 2530.30 | 6.1810 | 86377.20 |
| | Median | 2479.00 | 6.3000 | 81802.50 |
| 4 | Mean | 4068.00 | 1.3000 | 1057642.00 |
| | Median | 4068.00 | 1.3000 | 1057642.00 |
| Total | Mean | 2659.45 | 3.5431 | 130503.40 |
| | Median | 2543.00 | 3.2200 | 88852.00 |

**Source:** *SPSS data processing*

The pay gap between the capital of the country and the other counties is very large. In 2007, the average nominal net earnings in Bucharest were 1398 lei, 46% higher than the national average equal to 956 lei. In 2019, the gap increased considerably, with average nominal net earnings being 53% higher than the national average.

If we analyze the other counties, we notice that in the year of Romania's accession to the European Union, only 5 counties could be considered more developed in terms of the variables analyzed. For comparison, in 2019, in the cluster with these characteristics, are added counties such as Iasi, Sibiu, Brasov, Arges which have considerably improved their economic situation lately. The original cluster came out of Constanta County in 2019.

Iasi County has become a development pole in recent years, due to investments made in sectors such as IT, pharmaceuticals, consulting, research and development, but also industrial production, due to the skilled labour (Iasi is a prestigious university center, ensuring the flow of graduates very well prepared for the insertion on the labour market), the development of the real estate sector. Also, counties such as Brasov, Sibiu, and Arges have developed a lot in recent years due to the growth of the automotive industry, but also due to other industrial sectors and the retail segment, the growth rate being an alert one. On the opposite pole is the cluster of Vaslui and Mehedinti counties in 2007, while in 2019 the counties of Bacău, Suceava, Buzau, Galati, Ialomiţa, Teleorman, Dolj and Olt are added.

If we consider only the variable average nominal net earnings, in 2007 the lowest salaries were found in the counties of Covasna (792 lei), Bihor (811 lei), Harghita (814 lei), Vaslui (833lei), while in the counties of Ilfov (1235 lei), Gorj

(1152 lei), Cluj (1113 lei), Constanta (1065 lei) and Timisoara (1049 lei), the average nominal net earnings were the highest, excluding Bucharest.

After 12 years, Cluj (3449 lei), Timisoara (3310 lei), Ilfov (3163 lei), Iasi (3125 lei), Sibiu (2976 lei) counties lead, excluding Bucharest, in the top of the average nominal net earnings. By contrast, in Harghita (2349 lei), Teleorman (2360 lei), Covasna (2379 lei), Bihor (2385 lei) and Vrancea (2389 lei), the average nominal net earnings is much lower than the national average.

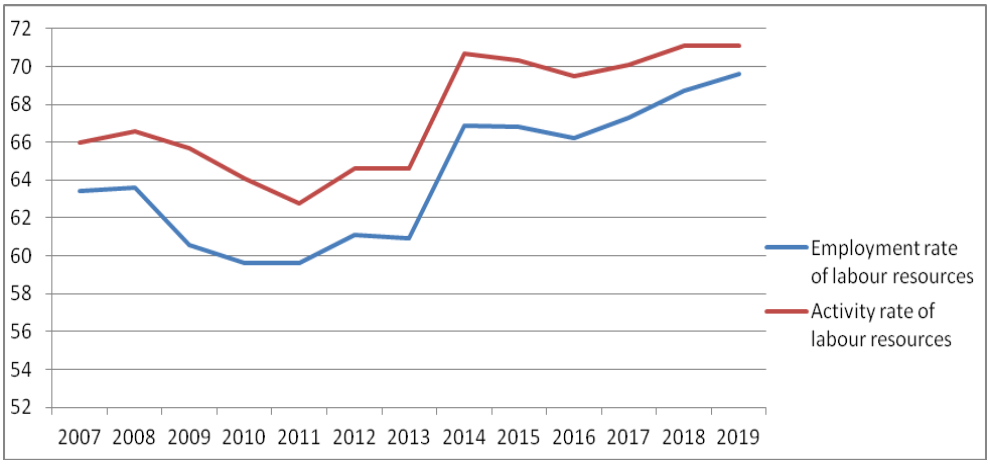
In terms of the number of employees, the geographical gaps are very large. With the exception of Bucharest, which in 2007 had an employee population of 923,635, the counties with the most employees were Timis (221,671 persons), Cluj (206,348 persons), Prahova (192,852 persons) and Constanta (192,608 persons). In 2019, there was a substantial increase in the number of employees in Timis (257,983 persons) and Cluj (260,451 persons), while Constanta (187,514 persons) and Prahova (185,077 persons) recorded a slight decrease. In contrast, counties such as Iasi (180,897 persons), Ilfov (164,209 persons) had a significant increase in the number of employees.

The unemployment rate has the lowest (below 1%) in Ilfov and Timis, with Vaslui and Dolj at the other end by more than 7% in 2019. By comparison, in the year of Romania's accession to the European Union, Ilfov County had 1.65% unemployment rate and Timis County 1.67%, while Mehedinti and Vaslui counties were at a value of 9% of the unemployment rate.

The employment rate of labor resources increased in the period 2007-2019 by 5.3 percentage points (reaching a value of 69.6% in 2019 – employment target assumed in the run-up to the Europe 2020 Strategy), while the activity rate has increased by 5.7 percentage points (reaching the value of 71.7% in 2019). Employees still hold the largest share (75.8%) in the total employed population, while self-employed and unpaid family workers represent 23.1 of the employed population.

In 2019, Romania's active population was 9,033,000, of whom 8,680,000 were employed and 353,000 were unemployed. The employment rate was higher for men (74.6% versus 56.8% for women). By areas of residence, the employment rate was higher in urban areas (67.1% compared to 64.2% in rural areas). Young people between 15-24 years old registered an employment rate of 24.7%, while the rate for people between 55-64 years old was 47.8%.

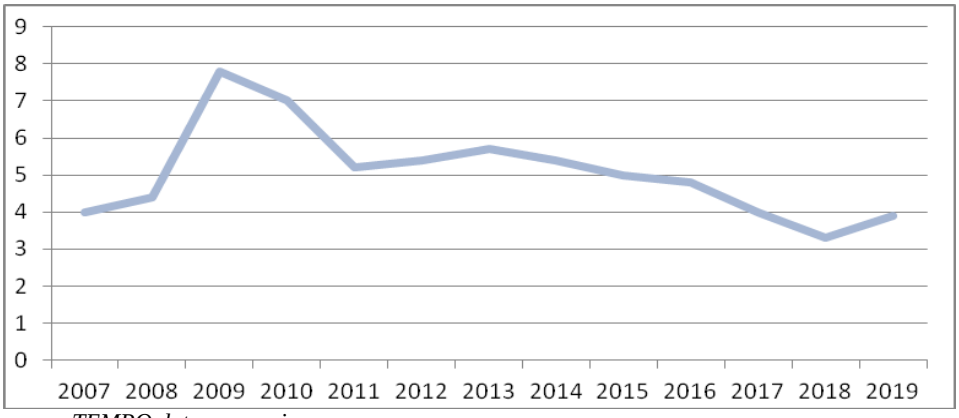
However, a job does not always guarantee a decent living (United Nations, 2015; Iftimoaei, 2020). Approximately 15.7% of employees in Romania are at risk of poverty, according to Eurostat data from 2019, the European Union average of employees at risk of poverty is 8.9%.




**Source:** *TEMPO data processing*

**Fig. 1.** *Employment rate (%) and activity rate (%) of labour resources in Romania, between 2007-2019*

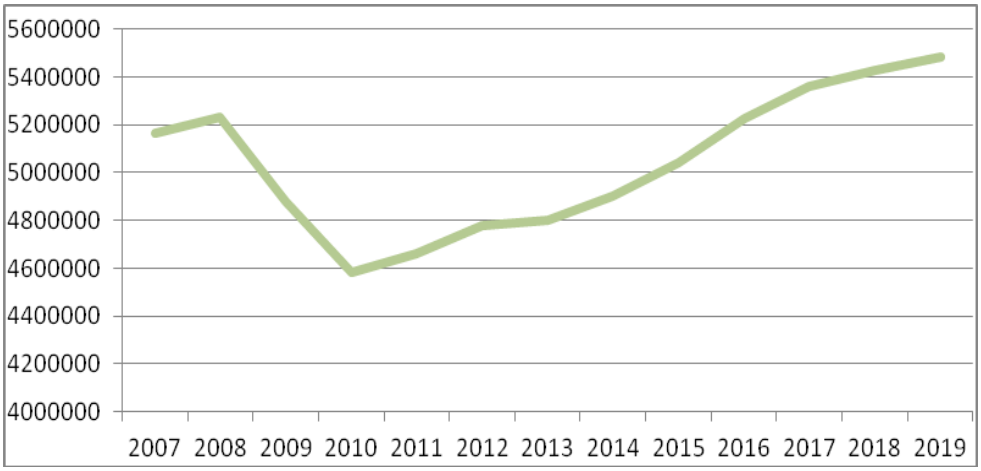
Across the country, the unemployment rate has been on the rise in the first years after joining the European Union, amid a worsening global financial crisis. After 2011, the unemployment rate stabilized at around 5%. Starting with 2016, there is a decrease in the number of unemployed, amid economic growth.




**Source:** *TEMPO data processing*

**Fig. 2.** *Evolution of unemployment rate (%) in Romania, period of 2007-2019*

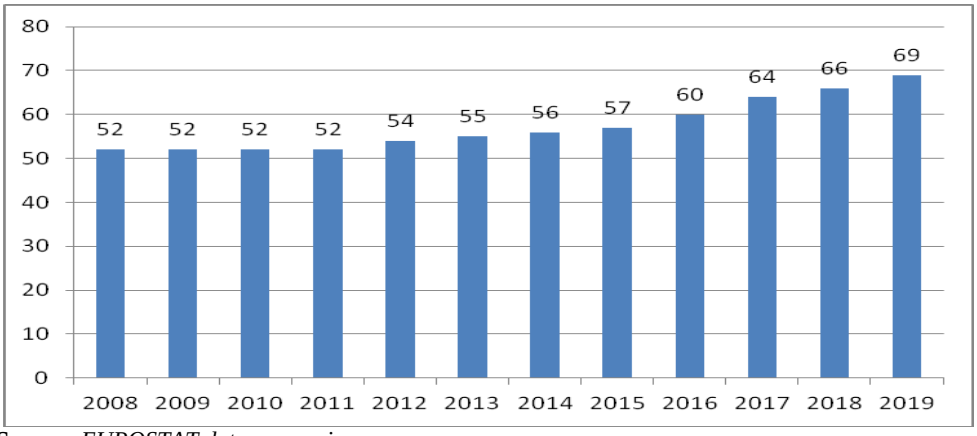
In 2007, the workforce was 5,162,967 people, then a decrease to a minimum of 4,580,989 employees in 2010 due to the effects of the global crisis. Starting with 2015, the number of employees again exceeded the threshold of 5,000,000 people, reaching the highest value in 2019 (5,481,143 employees).




**Source:** *TEMPO data processing*

**Fig. 3.** *Evolution of number of employees (people) in Romania, period of 2007-2019*

The Gross Domestic Product per capita expressed in standard purchasing power parity (PPS) for Romania had an upward evolution, especially after 2012, registering the value of 69% of the European Union average in 2019. Only countries like Greece (68 % of the EU average), Croatia (65% of the EU average) and Bulgaria (53% of the EU average) have lower values than our country.




**Source:** *EUROSTAT data processing*

**Fig. 4.** *Evolution of GDP per capita in PPS in Romania between 2008-2019*

The economic growth in recent years has not meant an increase in the welfare of the population, the inequalities in Romania being extremely high compared to other European countries. Romania continues to be an economically and socially polarized country, characterized by phenomena such as social

inequity, income inequality, marginalization and social exclusion for many people. These social imbalances will deepen during the SARS-CoV-2 health crisis, which will be followed by an economic and social crisis.

Next we will analyze how it influences the unemployment rate (independent variable), the number of employees (dependent variable), in Romania. The chosen period is 2007-2019; the data are annual and are taken from the *TEMPO ONLINE* database of the National Institute of Statistics.

Using the simple linear regression model, we estimate the regression equation. In the simple regression model, the evolution of the dependent variable is defined according to an independent variable. Simple regression quantifies the magnitude of the effect of the independent variable on the dependent one. In general, the statistical model of simple linear regression is determined by the relation:

$$\mathbf{Y = \alpha + \beta_1 X_1 + \varepsilon,}$$

*Where:*

*Y is the dependent variable*

*$X_1$ is the independent variable*

*$\alpha$, $\beta_1$ are the regression coefficients*

The estimation of the model parameters is done using the least squares method. Following the data processing, the following results were obtained:

**Table 5.** *Values of the regression model coefficients*

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 5971485 | 231504.4 | | 25.794 | .000 |
| | Unemployment_rate | -183597 | 44414.691 | -.780 | -4.134 | .002 |

a. Dependent Variable: Number_employees

**Source:** *SPSS data processing*

According to Table 5, the estimated equation of the simple linear regression model is as follows:

**Number_employees= 5971485 – 183597*Unemployment_rate**

An increase in the unemployment rate by 1% will lead to a decrease, on average, in the number of employees by 183,597 people.

**Table 6.** *The values of the correlation ratio and the determination ratio*

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .780[a] | .608 | .573 | 194248.618 | .608 | 17.088 | 1 | 11 | .002 |

a. Predictors: (Constant), Unemployment_rate

**Source:** *SPSS data processing*

The value of the determination ratio (R-squared) indicates that 60.8% of the change in the number of employees is explained by the change in the unemployment rate.

**Table 7.** *ANOVA*

**ANOVA[b]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 6E+011 | 1 | 6.448E+011 | 17.088 | .002[a] |
| | Residual | 4E+011 | 11 | 3.773E+010 | | |
| | Total | 1E+012 | 12 | | | |

a. Predictors: (Constant), Unemployment_rate

b. Dependent Variable: Number_employees

**Source:** *SPSS data processing*

From Table 7, it is observed that the probability of Sig. associated with the value of the Fisher test is less than 0.05, resulting in the proposed model being statistically significant to explain the dependence between variables. With a probability of 95% it can be guaranteed that the independent variable unemployment rate explains the variation of the variable dependent on the number of employees.

## 4. Conclusions

The statistical analysis of labour resources shows that economic and social inequalities between Romania's counties continued to reproduce throughout the period 2007-2019. The country's capital makes a discordant note compared to the rest of Romania: it has the most employees, the highest employment rate, the lowest unemployment rate and the highest average net earnings, comparable to the metropolises of Europe.

Bucharest has a GDP per capita at purchasing power parity of 43,200 Euros, reaching 144% of the EU-28 average, according to data provided by the European Commission for 2017. The Berlin region has a GDP per capita PPS of only 35,500 Euros. In the immediate vicinity, below Bucharest, is Budapest, with a GDP per capita of 41,900 or 139% of EU GDP. Not far from the Romanian capital is Vienna, with 45,200 Euros per capita (151% of the EU average).

After Bucharest, which from an economic point of view has been in Europe for a long time, follows a cluster formed by the counties of Ilfov, Timisoara, Cluj, Iasi, Constanta, Prahova. In this cluster of developed counties, the average net earnings are high, the employment rate is high, and unemployment is low. At the opposite pole, there is a cluster formed by Vaslui and Mehedinţi counties, which is characterized by the highest unemployment rate in the country and the lowest number of employees. Also, the average net gain is below the average of the other counties.

The salary differences between the country's capital and the other counties are very large. In 2007, the average net gain in Bucharest was 46% higher than the national average. In 2019, in Bucharest, the average net gain was 53% higher than the national average. At the opposite pole is the cluster formed by Vaslui and Mehedinţi counties. To this cluster, in 2019, are added the counties of Bacău, Suceava, Buzău, Galaţi, Ialomiţa, Teleorman, Dolj and Olt.

The unemployment rate registers the lowest values in Bucharest, Ilfov and Timiş, at the other extreme being Vaslui and Dolj. Employees still have the largest share (75.8%) in the total employed population, while self-employed and unpaid family workers represent 23.1% of the employed population.

The health crisis generated by the COVID-19 pandemic will perpetuate and, in some regions, will accentuate the discrepancies in the counties of Romania regarding the quality and quantity of labour resources (number of employees, level of training, employment rate, level of earnings, unemployment rate) among the counties of the country. Economic and social development takes place around the large county seat municipalities and their metropolitan areas (Bucharest, Timisoara, Cluj, Iasi, Ploiesti, Constanta, Brasov, Sibiu), which represent the poles of economic growth of Romania.

The chance of the other counties to reduce the socio-economic gaps compared to Romania's growth poles consists in massive investments in transport infrastructure (road, railway, airport), in increasing the capacity to attract European funds for regional development and in allocating special government resources for the poor regions and counties of the country, and continuous improvement of employment skills (Anton et al., 2020). In the absence of feasible investments, after the COVID-19 pandemic crisis, the labour force will continue to emigrate from Romania to the more developed regions of the EU.

The lack of decently paid jobs places a large number of Romanian employees below the poverty line. Over 15% of Romanian employees are affected by poverty, which led them to move to the EU labour market, taking advantage of its liberalization after the country's accession to the EU in 2007. Under external

migration, the economic active population has shrunk. In order to make up for the lack of labour force, Romanian employers have resorted to the import of cheap labour from abroad, with all the social costs involved in their integration into the domestic socio-economic environment.

According to the 2030 Agenda for Sustainable Development and SDG no. 8 – „decent work and economic growth", central and local authorities must promote sustainable economic growth and decent paid work, regardless of gender, geographical location. In this context, the application of the principle „no one is left behind" becomes imperative, through measures to increase employment and income, so that Romanians can enjoy a decent life, close to the standards of EU member states to which we often compare ourselves.

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## Annex 1

**Table 1.** Output *Cluster Membership 2007*

Cluster Membership

| Case | 5 Clusters | 4 Clusters | 3 Clusters | 2 Clusters |
|---|---|---|---|---|
| 1:BH | 1 | 1 | 1 | 1 |
| 2:BN | 1 | 1 | 1 | 1 |
| 3:CJ | 2 | 2 | 1 | 1 |
| 4:MM | 1 | 1 | 1 | 1 |
| 5:SM | 1 | 1 | 1 | 1 |
| 6:SJ | 1 | 1 | 1 | 1 |
| 7:AB | 1 | 1 | 1 | 1 |
| 8:BV | 1 | 1 | 1 | 1 |
| 9:CV | 1 | 1 | 1 | 1 |
| 10:HR | 1 | 1 | 1 | 1 |
| 11:MS | 1 | 1 | 1 | 1 |
| 12:SB | 1 | 1 | 1 | 1 |
| 13:BC | 1 | 1 | 1 | 1 |
| 14:BT | 1 | 1 | 1 | 1 |
| 15:IS | 1 | 1 | 1 | 1 |
| 16:NT | 1 | 1 | 1 | 1 |
| 17:SV | 1 | 1 | 1 | 1 |
| 18:VS | 3 | 3 | 2 | 1 |
| 19:BR | 1 | 1 | 1 | 1 |
| 20:BZ | 1 | 1 | 1 | 1 |
| 21:CT | 2 | 2 | 1 | 1 |
| 22:GL | 1 | 1 | 1 | 1 |
| 23:TL | 1 | 1 | 1 | 1 |
| 24:VN | 1 | 1 | 1 | 1 |
| 25:AG | 1 | 1 | 1 | 1 |
| 26:CL | 1 | 1 | 1 | 1 |
| 27:DB | 1 | 1 | 1 | 1 |
| 28:GR | 1 | 1 | 1 | 1 |
| 29:IL | 1 | 1 | 1 | 1 |
| 30:PH | 2 | 2 | 1 | 1 |
| 31:TR | 1 | 1 | 1 | 1 |
| 32:IF | 2 | 2 | 1 | 1 |
| 33:B | 4 | 4 | 3 | 2 |
| 34:DJ | 1 | 1 | 1 | 1 |
| 35:GJ | 5 | 1 | 1 | 1 |
| 36:MH | 3 | 3 | 2 | 1 |
| 37:OT | 1 | 1 | 1 | 1 |
| 38:VL | 1 | 1 | 1 | 1 |
| 39:AR | 1 | 1 | 1 | 1 |
| 40:CS | 1 | 1 | 1 | 1 |
| 41:HD | 1 | 1 | 1 | 1 |
| 42:TM | 2 | 2 | 1 | 1 |

**Table 2.** Output *Cluster Membership 2007*

Cluster Membership

| Case | 5 Clusters | 4 Clusters | 3 Clusters | 2 Clusters |
|---|---|---|---|---|
| 1:BH | 1 | 1 | 1 | 1 |
| 2:BN | 1 | 1 | 1 | 1 |
| 3:CJ | 2 | 2 | 2 | 1 |
| 4:MM | 1 | 1 | 1 | 1 |
| 5:SM | 1 | 1 | 1 | 1 |
| 6:SJ | 1 | 1 | 1 | 1 |
| 7:AB | 1 | 1 | 1 | 1 |
| 8:BV | 3 | 2 | 2 | 1 |
| 9:CV | 1 | 1 | 1 | 1 |
| 10:HR | 1 | 1 | 1 | 1 |
| 11:MS | 1 | 1 | 1 | 1 |
| 12:SB | 3 | 2 | 2 | 1 |
| 13:BC | 4 | 3 | 1 | 1 |
| 14:BT | 1 | 1 | 1 | 1 |
| 15:IS | 3 | 2 | 2 | 1 |
| 16:NT | 1 | 1 | 1 | 1 |
| 17:SV | 4 | 3 | 1 | 1 |
| 18:VS | 4 | 3 | 1 | 1 |
| 19:BR | 1 | 1 | 1 | 1 |
| 20:BZ | 4 | 3 | 1 | 1 |
| 21:CT | 1 | 1 | 1 | 1 |
| 22:GL | 4 | 3 | 1 | 1 |
| 23:TL | 1 | 1 | 1 | 1 |
| 24:VN | 1 | 1 | 1 | 1 |
| 25:AG | 3 | 2 | 2 | 1 |
| 26:CL | 1 | 1 | 1 | 1 |
| 27:DB | 1 | 1 | 1 | 1 |
| 28:GR | 1 | 1 | 1 | 1 |
| 29:IL | 4 | 3 | 1 | 1 |
| 30:PH | 3 | 2 | 2 | 1 |
| 31:TR | 4 | 3 | 1 | 1 |
| 32:IF | 2 | 2 | 2 | 1 |
| 33:B | 5 | 4 | 3 | 2 |
| 34:DJ | 4 | 3 | 1 | 1 |
| 35:GJ | 1 | 1 | 1 | 1 |
| 36:MH | 4 | 3 | 1 | 1 |
| 37:OT | 4 | 3 | 1 | 1 |
| 38:VL | 1 | 1 | 1 | 1 |
| 39:AR | 1 | 1 | 1 | 1 |
| 40:CS | 1 | 1 | 1 | 1 |
| 41:HD | 1 | 1 | 1 | 1 |
| 42:TM | 2 | 2 | 2 | 1 |