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A REGIONAL MODEL FOR LABOUR SUPPLY IN ROMANIA

Abstract

This study aims at estimating an econometric model, in order to describe the evolution of important issues related to the regional labour supply in Romania. The model introduces a set of economic and social indicators which characterize the labour market regarding the labour resources. The results obtained underline significant regional differences on the labour supply market that are able to cause serious problems on the labour market in the context of population ageing and the migration of qualified work force.

Key words: labour supply, econometric model.

J.E.L. Classification: C3, J2

1. Introduction

The global economic crisis has generated severe effects on the labour market in most European countries. These effects manifested especially through job losses and implicitly through the growth of the unemployment rate. The impact of the crisis was felt differently within the EU countries, especially at the regional level.

In order to counteract these effects and to speed up economic growth, each country should apply economic policies, taking into consideration the resources available at the regional level.

According to the objectives of the Europe 2020 strategy concerning the employment, 75% of people of working age should be active in the labor market. Achieving this goal requires both the implementing of the European policies in each country and the measures developed by national and regional policies and programs. In this context, in order to create more jobs, the decision makers must take into account the evolution of the labour market, especially of the existing labour resources. These issues are highlighted by extensive statistical studies and developing models which characterize as well as possible the labour supply at both regional and national levels. Thus, it is absolutely necessary to create such models designed to provide a representation of the economic reality in terms of the relationships between the processes and phenomena occurring within the labour market.

The process of transition towards market economy that was started in the 1990's by the Central and Eastern European countries has resulted in major structural changes as far as the labour market is concerned. Among these countries, Romania has a special place due to the importance of the changes that needed to be implemented as well as due to its labour resources potential. This paper provides an analysis of the labour supply market in the eight regions of Romania. In the first section we present the main works and their outcomes in the special literature on this subject. Section two includes aspects regarding the data and methods used in the empirical study. In Section 3 we identify the economic and social characteristics of Romanian regions, taking into account the main economic indicators for the year 2011. Section 4 displays the outcomes of the empirical study, while the last section presents our main conclusions.

2. Literature review

The studies regarding the evolution of the labour market and of labour resources especially, regarded as the main production factor have always drawn the attention of both economists and researches, especially during the transition or crisis periods. Labour force supply is generally determined by the labour force available in the respective area and the number of unemployed people (Bhandari, 2008) and it is analyzed taking into account the labour resources characteristics, such as: age group, gender, rezidence environment, education level or qualification. As well as this, there are studies in which labour supply is regarded from the perspective of its dependance on wages and taxes levels, GDP per capita, households incomes or the migration phenomenon, both at a regional and national level.

Elmeskov and Pichelmann (1993) conducted an empirical study regarding the trend and cyclical behaviour of the participation and unemployment rates. The results thus obtained are based on the estimation of certain regression equations in which the correlation between the participation rate and its first lag, the real available income per capita and the general occupation rate are studied. On the long term it has been noticed that the increasing trend of the participation rate was recorded in the context of low unemployment values.

The econometric model designed by Van Soest el all. (2000) studies the connection between the work supply of married women and the number of working hours provided by their spouses as well as their incomes.

The research conducted by Dostie, B., and Sahn, D. E., (2006) approaches the labour supply from different points of view: population structure depending on age groups, wage level, income dimension. The outcomes of their study proved that generally an employee increases his/her labour supply until he/she reaches a wage level that would ensure a decent living standard, while above this threshold work is replaced by spare time. As well as this, the authors take into account traditions, habits and the psychological factors that influence the use of labour force.

Elhorst and Zeistra (2007), starting from the hypothesis that an individual is part of the labour supply at a certain moment *t* provided that the level of usefulness associated with participation is higher than the level of usefulness associated to the lack of participation in the labour suply, designed a model that explains the connection between the participation rate in the labour supply and other variables such as: unemployment rate, salary level, income tax, social contributions, job finding related expenses, unemployment benefits, social benefits.

The study performed by Elhorst (2008) demonstrates that the labour supply participation rate, at the regional level, is strongly correlated in time, yet poorly correlated in space. The author analyzes at the same time the connection between the participation rate related to gender/age groups on the one hand and the wages level, unemployment rate, birth rate and education level on the other hand. Another conclusion of the same study points out the fact that the younger the population, the higher the male participation rate. the participation rate, that plays an extremely important part, is defined in other studies in connection to the previous wages and the occupation rate (Bolton, 1985).

In the case of Romania, a representative study was performed by Dobrescu (2006), who analyzes the important processes occuring on the labour market as far as request and supply are concerned: labour force participation rate, unemployment rate and nominal income per employed individual.

3. Data and methodology

This study provides an analysis of the labour supply in Romania for the eight macroeconomic regions (NUTS II level).

The identification of regional disparities is performed by means of multivariate statistical analysis methods, main components analysis and correspondence factor analysis. These descriptive methods of data multidimensional analysis aim at pointing out the correlations or associations between variables as well as the resemblances and differences between statistical units (Volle, 1997). The advantage of these methods consists in the synthetic graphical representation in a factorial axis system of statistical units and statistical variables. Factorial axes are linear combinations of statistical variables. Each factorial axis is associated with a part of the information contained in the initial data table, named explained variance (Bénzecri, 1992). Factorial axes are classified in descending order based on their discriminating power: the first factorial axis explains the most part of the total variance and consequently points out to the most differencs between statistical units. The interpretation of results is to be thus performed for a reduced number of factorial axes (Everitt, Dunn, 2001).

The variables used in statistical analysis are represented by the most important economic indicators, namely:
- Activity rate (*prap)* (%);
- *GDP per capita* (million lei);
- Occupation rate (*e*) (%);
- Monthly gross average wages (*wages*) (lei/month);
- unemployment rate (*ru*) (%).

The econometric equations to be estimated for each region are as follows:
- Bucarest: $prap = \beta_1 + \beta_2 e + \beta_3 ru$;
- Center: $prap = \beta_4 + \beta_5 e + \beta_6 ru$;
- North-East: $prap = \beta_7 + \beta_8 prap(-1) + \beta_9 e + \beta_{10} ru + \beta_{11} D_1$;
- North-West: $prap = \beta_{12} + \beta_{13} prap(-1) + \beta_{14} e + \beta_{15} ru + \beta_{16} D_2$;
- South: $prap = \beta_{17} + \beta_{18} prap(-1) + \beta_{18} e + \beta_{19} ru$;
- South-East: $prap = \beta_{20} + \beta_{21} prap(-1) + \beta_{22} e + \beta_{23} ru + \beta_{24} D_3$;
- South-West: $prap = \beta_{25} + \beta_{26} prap(-1) + \beta_{27} e + \beta_{28} ru$;
- West: $prap = \beta_{29} + \beta_{30} prap(-1) + \beta_{31} e + \beta_{32} ru + \beta_{33} D_4$,

where: β_i, $i = \overline{1,33}$, represent the regression equations coefficients, while D_j, $j = \overline{1,4}$, are the dummy variables.

Econometric modelling was achieved by means of series stationarity testing using Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) statistical tests. The estimation method used was the ordinary least squares method (OLS). Structural ruptures registered in the evolution of certain indicators were correlated by including the dummy variables.

The data is represented by the annual values of the indicators, being taken from the Romanian National Institute for Statistics for the period between 1995 and 2011.
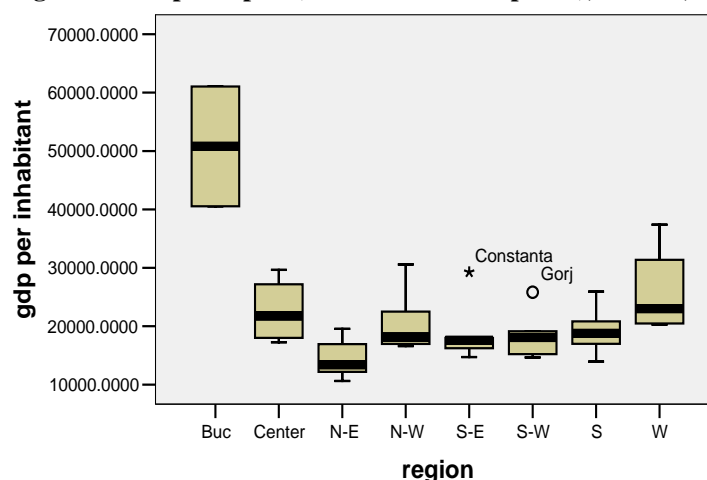
4. Economic profile of Romanian regions

In order to identify the main economic characteristics specific to the Romanian regions, we shall register the following regional indicators, in 2011: *GDP per capita.*, *Unemployment rate* (%), *Activity Rate* (%), *Gross nominal earnings* (lei), *Employment rate* (%). These indicators are registered for the eight regions of Romania: Bucharest-Ilfov (*Buc*), North-West (*N-W*), Center (*Center*), North-East (*N-E*), South-East (*S-E*), South (*S*), South-West (*S-W*), West (*W*).

The graphical representation of the GDP/loc. by regions is shown in the figure below:

Figure 1. Regional GDP per capita (in million current prices), in 2010, in Romania

Source: Authors' computing and presentation based on the database of the National Institute for Statistics

The above represented box-plot diagrams highlight significant disparities between the Bucharest region, including the country's capital, on one hand, and all the other regions, on the other hand. The Bucharest region is characterized by the highest level of the GDP per capita in comparison with the other regions as a whole.
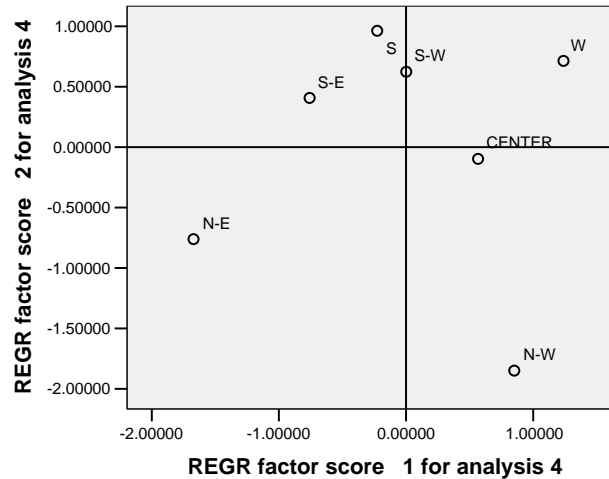
Due to the different features of the Bucharest region from the ensemble of the other regions, the analysis of regional disparities will be conducted taking into account the other seven regions of Romania: North-West (*N-W*), Center (*Center*), North-East (*N-E*), South-East (*S-E*), South (*S*), South-West (*S-W*), West (*W*).

After processing the data registered at the level of the seven regions of Romania, by applying the analysis of the main components, the following data were obtained:
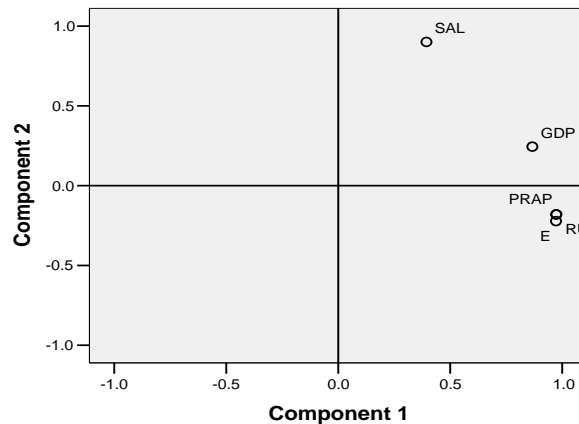
**Figure 2. The graphical representation of the main regional economic indicators
registered in Romania in 2011**

Component Plot

Source: Authors' computing and presentation based on the database of the National Institute for Statistics

The graphical representation of the regions in the system of the two factorial axes
allows the assessment of the inter-regional disparities from the point of view of the
indicators under analysis. The most important regional disparities in Romania in 2011
were registered between the North-East region, on the one hand, and the West and
North-West regions, on the other hand. The North-East region is characterized by a
reduced level for the indicators considered unlike the regions in the second group. The
first factorial axis, horizontally represented, appears as an axis of economic
development including a significant geographical component: the Western regions, also
benefiting from their geographical position, close to the Western markets, are
characterized by a higher economic development level, in comparison to the Eastern
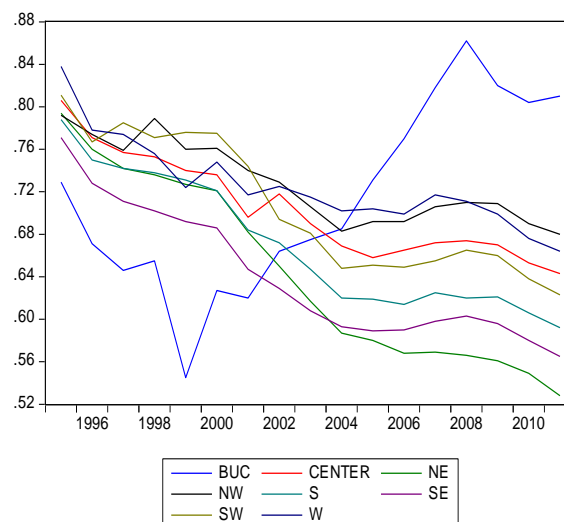regions, which have a lower level of economic development.

5. Empirical Study

In the empirical study we conducted, the first sub-section presents a short description of the main indicators of the labour force supply market at the regional level recorded in the period 1995-2011. In the second sub-section we present the econometric equations estimated for each of the eight regions.
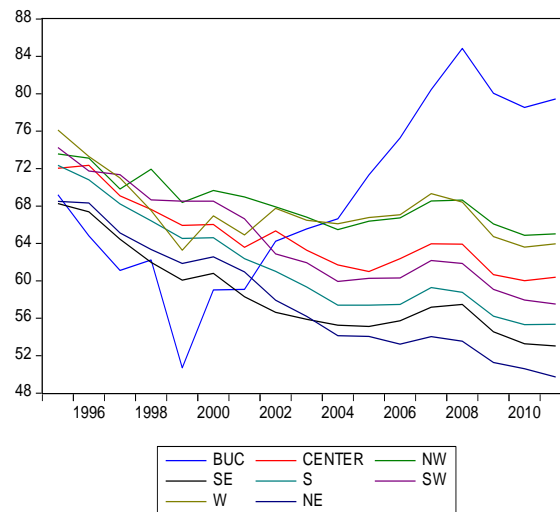
5.1 Data description

The graphical representation of the activity rate and the occupation rate at a regional level in Romania, in the period 1995-2011 is illustrated by the figure below:

Figure 3. The graphical representation of the activity rate and employment rate at regional level in Romania during 1995-2011

Source: Authors' computing and presentation based on the database of the National Institute for Statistics

The diagrams in the figure above show that there are significant differences at the regional level between the activity rate evolution (represented in the left side of the graphic) and the occupation rate evolution. The Bucharest-Ilfov region is characterized by a continuous growth of the activity and occupation rates, especially in the period between 1997 and 2009, while in all other regions there is a descending trend in the evolution of these indicators.

The active population recorded a fairly high level in the first years of the period under analysis, yet after the year 2000 the percent of active population has continuously and constantly decreased in all Romanian regions, except for the Bucharest-Ilfov region. These evolutions were determined by the important decrease of the birth rate recorded after the 1990's. These economic phenomena generated significant changes in the active population structure on age groups, leading to a population ageing phenomenon, characteristic for all European Union countries.

The occupied population decreased significantly, especially after the year 2009, when the effects of the global economic and financial crisis started to affect the Romanian market.

5.2 Econometric modelling

After variables stationarity testing, using the ADF and PP statistical tests, the following estimated equations were obtained for each of the eight regions:

Table 1. Estimated equations for each region

Regions	Equations
Bucharest	$prap = -0.0151 + 1.0234 e + 0.649\ ru$ $\quad\quad\quad(2.182)^* \quad\quad (129.46)^* \quad\quad (13.967)^{**}$
Center	$prap = -0.0867 + 1.128 e + 0.7682 ru$ $\quad\quad\quad(6.096)^* \quad\quad (50.24)^* \quad\quad (16.451)^*$
North-East	$prap = -0.0804 - 0.1124\ prap(-1) + 1.245\ e + 0.7942\ ru + 0.0049\ D_1$ $\quad\quad\quad(17.685)^* \quad (4.495)^* \quad\quad\quad\quad (39.476)^* \quad (37.807)^* \quad\quad (4.047)^*$
North-West	$prap = -0.0361 - 0.0361\ prap(-1) + 1.0844 e + 0.8203\ ru - 0.0015 D_2$ $\quad\quad\quad(9.785)^* \quad (4.587)^* \quad\quad\quad\quad (137.21)^* \quad (80.888)^* \quad\quad (3.312)^*$
South	$prap = -0.0601 - 0.0486\ prap(-1) + 1.1394 e + 0.7678\ ru$ $\quad\quad\quad(16.205)^* \quad (2.393)^{**} \quad\quad\quad\quad (46.928)^* \quad (39.935)^*$
South-East	$prap = -0.0642 - 0.055\ prap(-1) + 1.1561 e + 0.7543\ ru + 0.002\ D_3$ $\quad\quad\quad(18.215)^* \quad (3.42)^* \quad\quad\quad\quad (57.084)^* \quad (48.809)^* \quad\quad (2.563)^{**}$
South-West	$prap = -0.0693 - 0.0301\ prap(-1) + 1.1283 e + 0.8092\ ru$ $\quad\quad\quad(18.19)^* \quad (2.061)^{***} \quad\quad\quad\quad (66.492)^* \quad (41.95)^*$
West	$prap = -0.046 - 0.0216\ prap(-1) + 1.0854 e + 0.7917\ ru + 0.0021 D_4$ $\quad\quad\quad(11.033)^* \quad (2.712)^{**} \quad\quad\quad\quad (100.69)^* \quad (81.964)^* \quad\quad (3.133)^{**}$

Source: Authors' computing and presentation based on the database of the National Institute for Statistics .
*Note: *, ** and *** denote significance at the 1%, 5%, and 10%. Absolute t-statistics are given in parentheses.*

The results obtained show that the estimated coefficients are statistically significant for a significance level of 10%.

The econometric estimations underline the fact that the unemployment rate and the occupation rate have a significant influence upon the activity rate. However, the intensity of this influence differs from one region to the other. The coefficients associated with the occupation rate (*e*) differ from one region to the other, the highest differences at a regional level being noticed between the Bucharest-Ilfov and West and North West regions, on the one hand, and the North-East region, on the other hand. The values of the estimated coefficients indicate that the North-East region has a very high occupation potential. In the year 2011 the North-East region recorded the highest percentage (approximately 17%) of the total labour resources of the country. Despite this fact, the region is quite underdeveloped due to the high unemployment rate correlated with the prevalence of population occupation in agriculture and also to the reduced ability to attract foreign investments.

Moreover, the estimations obtained point to a higher inertia of the labour force market in all regions except the Bucharest-Ilfov and Center regions. The first lag of variable prap is significant for the other six regions. The Bucharest-Ilfov and Center regions are characterized by a high level of GDP per capita, in which the population occupied in the service sector and the industry sector respectively, is prevalent. The labour market dynamics was more significant in these regions when compared to the other regions.

6. Conclusions

One of the most important objectives of the Europe 2020 strategy, concerning the employment, is to obtain an occupation rate of 75% for the working age population.
The Eastern and Central European countries have undergone major changes following the economic reform measures implemented in the 1990's. Among these countries, Romania occupies a special place due to the significant changes that had to be implemented in order to access a new economic system.

The transition towards market economy that began in Romania in the 1990's generated significant structural changes on the labour market. The state enterprizes privatization measures as well as the insufficient internal capital that would ensure the development of the private sector led to lower rates of the active and the occupied population. The occupation rate in Romania decreased thus from 82% in 1990 to 59.6% in 2011. The activity rate was subject to the same decreasing tendency. The global economic and financial crisis that started in 2008 subsequently accentuated these defficiencies on the labour market. At the regional level there are though significant differences in the evolution of these indicators.

The empirical study conducted in this paper underlines the significant regional differences in the evolution of the main indicators on the Romanian labour supply market. The constant decrease in the birth rate recorded in Romania after 1990 caused a significant decrease of the percentage of active population in all regions except for the Bucharest-Ilfov region. Later, the economic and financial crises that started in 2008 caused a decrease in the percentage of occupied population in all regions.

The active population decrease caused important problems on the labour market, especially in the fields of medical insurances and pensions. These problems are augmented by the population ageing phenomenon as well as by the labour force migration phenomenon. An important part of the Romanian qualified labour force currently works abroad, while in the context of the economic recession following the global crisis, the level established by Strategy Europe 2020 is difficult to attain.

The policy makers need to take decisions meant to prevent and ideally reduce the negative effects that would affect the labour market, mainly by adopting measures that would allow more flexibility on the labour market.

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