A CROSS-REGION PANEL ANALYSIS OF THE UNEMPLOYMENT IN ROMANIA

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Abstract
Strategies for combating unemployment and stimulate employment must be build upon the main objective established in the market labor of Romania: development of human resources and increase it competitiveness on labor market. The main purpose of this paper is to make an analysis of unemployment in Romania and to present the complex evolution of unemployment phenomenon depending on a multiplicity of economic and social factors.

I. INTRODUCTION

According to Vogel (2003), labour market is the main arena where the individual living conditions are determined. The labour market is such an important market for the good operations of economy that it could be considered the barometer for reaching competition economy.

Broadly speaking, the labour market includes matters that refer to employment, unemployment, work quality, productivity, incomes and labour costs. This makes the labour market to be among the key topics in the EU social and political debates. It is no accident that the 2020 Europe Strategy has as first indicator precisely the population employment rate. In this respect, the European Employment Strategy (ESS), having as objective the creation of more and better workplaces in the EU, requires for the purpose of following the results an analytical and statistical support that can help with the assessment of development in the field of the labour market.

The 2020 Europe Strategy was launched in 2010. According to it, the fundamental goal constitutes the creation of more work places and the provision of better living conditions. This strategy aims at ensuring an intelligent, lasting growth that is beneficial to inclusion. Specifically, there are five strategic priorities among which the first one is the increase of the employment rate of the 20 to 64 year-olds from 69% to at least 75%.

In Romania, unlike in other EU member countries, there is another major consequence of the labour market dysfunctions namely, the existence in agriculture of a large number of people who have the status of independent workers and, respectively, unpaid family workers. In fact, these, being only partially or even informally employed (the proof lies in the very low income with which they are officially registered, near or under the poverty threshold) and not being adapted or mobile in respect to the current conditions on the Romanian labour market, should practically be excluded from the work force and possibly placed in a special category of 'unemployment'. However, because of the professional status given to them and taking into account they are not legally entitled to unemployment benefits they are still formally registered within the employed person category of the statistical system (Albu, Caraiani, Iordan, 2011).

In times of crisis, a discrepancy emerges between the wish for (potential for) seeking new employment opportunities and incomes and the possibilities (capability) of absorbing this rising demand. In such periods major tensions occur on the labour market, the mobility of the workforce being sometimes limited. The tensions may occur on multiple levels: between the unemployed and the employed, between the young workforce seeking employment and those nearing retirement, between the immigrants and the native workforce, between the well-qualified and well-paid and the poorly-qualified who are poorly-paid. In these conditions, competition becomes fierce on the labour market, and employers can take advantage of the occasionally exaggerated decrease of labour cost, including the diminishing of funds assigned to professional requalification (i.e., re-training). In Europe, over the last years, debates about the simultaneous concentration on both labour market flexibility and labour security perceived from all viewpoints (the so-called flexicurity) are permanently on the agenda of employees and unions, which is expected to have a major impact on social policies (Albu, Caraiani, Iordan, 2011).

The mobility of the workforce is influenced, apart from the differences among economic sectors in respect to salaries, productivity, work conditions, etc., by differences existing at territorial, regional, county and place levels. One of the factors is the distribution across regions of the gross income and the net income.

Eichhorst, Escudero, Marx and Tobin (2010) claim that the countries which were able to rely on a strong internal flexibility managed to control better the loss of jobs and the increase of unemployment.

Moreover, they claim that this was possible due to the protection of the labour market core through strict rules regarding employment and the adjustments of the work hours and salaries and not through massive dismissals.

In respect to employment, a set of measures in keeping with the 2020 Europe Strategy for Romania meant to increase the people's employment rate can be mentioned:

- the reform of the legal frame regarding the stimulation of the employment rate and continuous professional formation;
- investments in continuous professional formation with emphasis on people from vulnerable groups (rural areas and inactive);
- case studies about the correlation between demand and offer on the labour market and the estimation of the required qualifications;
- measures to sustain transition from unemployment or inactivity to employment;
- improvement of the legal frame and the stimulation of extending an active life;
- consolidation of social dialogue;
- increased efficiency to better correlate the social assistance system with the employment sector;
- modernization of the agricultural sector and the extension of economic activities in the rural area (services and small industries).

II. METHODOLOGY

Econometrics analysis relies on the estimation of a panel model using the R Studio software package. We have decided the estimation of this type of regression model based on panel-type data as data panels control the individual heterogeneity (Hsiao, 2003). Furthermore, the panels offer a larger amount of information, increased variability, low probability for collinearity between the used variables and more degrees of freedom. Similarly, the analysis results based on panel-type data are more efficient since they give the possibility to identify and measure effects that are not detectable through the analysis of cross-sectional data or of time sequences.

A regression of the panel type has the following formula:

$$y_{it} = \alpha_i + x_{it}' \times \beta + \varepsilon_{it} \qquad i=1...N,\ t=1...\ T$$

where i represents the cross-sectional dimension and t represents the temporal one.

When one makes an estimate of a data panel, the first step is to determine whether the regression is a panel-like model or an ordinary regression. (Baltagi, 2008). The simplest test for grouping the data has as null hypothesis the model of ordinary regression and as alternative hypothesis the model with fixed effects. In other words, the presence of individual effects is being tested. In the case of the ordinary regression model, the method of least squares (OLS) is applied to the model obtained through the elimination of the individual average values, thus eliminating the fixed effects. Given that through this method the variables established over time are eliminated, their use in this model is not recommended. In the case of the model with fixed effects the most used estimator is also known as the *within* estimator (Stănilă, Andreica, Cristescu, 2013).

The next step should be to determine what model is more suitable: one with fixed effects or one with random effects. This decision can be made on the basis of some tests, economic reasons and/or informational criteria. Baltagi proposes the use of these methods; therefore, both models can be estimated and the choice is to be made according to the informational criteria and or economic reasons.

A great advantage of the panels is the fact that solid estimations can be obtained even with endogenous regressors as long as these are correlated with that part of the error found over time.

For the model with random effects, the term αi from the above relationship is incorporated in the error and presumed uncorrelated with explanatory variables.

Taking into consideration this hypothesis, the next model represents a model with random effects:

$$y_{it} = x_{it}' \times \beta + u_{it} \quad i = 1,...,N, t = 1,...,T$$

An advantage of the model with random effects is the fact that it allows the use of the explanatory variable found over time; a great disadvantage is the fact that the model with fixed effects would be more suitable while the estimations obtained through the model with random effects would not be solid.

The random effect model is a generalized regression model and all disturbances have variance $Var(\varepsilon_{it} + \alpha_i) = \sigma^2 = \sigma^2_{\varepsilon} + \sigma^2_{\alpha}$ (Chuang, Lai, 2008).

If the explained variables correlate with α_i, then α_i will not satisfy the presumed condition. The estimated parameters of the random effect model will produce error. On the contrary, if α_i satisfies the condition, using the random effect model will be more efficient than using the fixed effect model.

To verify the appropriate model, the Hausman (1978) test for random effect model or fixed effect model is used. The null hypothesis is

H_0 : α_i does not correlate with explained variables

H_1: $(b_{fix} - b_{ran})'(M_{fix} - M_{ran})^{-1}(b_{fix} - b_{ran}) \sim \chi^2$

Where b_{fix} and b_{ran} are respectively the estimated parameters of the fixed effect model and random effect model, M_{fix} and M_{ran} are the corresponding covariance matrices.

In the literature, factors that cause the discrepancies in the unemployment rate across regions include compensating differentials for amenities and opportunities of employment (Hall, 1972, Marston, 1985, Greenwood and Hercowitz,1991); increasing costs of migration arising from community identity or social networks (Partridge and Rickman 1997); demographic composition such as age, gender, education, and family background (Feasel and Rodini 2002); and industry composition and labor mobility (Partridge and Rickman 1997). Marston (1985) asserts factors due to the cost of migration as being disequilibrium factors while that due to heterogeneous labor preference such as compensating differentials are as equilibrium factors. Overall, the macro environment is potentially an underlying common factor that affects the unemployment rate across regions.

Demographically speaking, in general, a higher percentage of young people who enter the labour market leads to an increase in the unemployment rate. This aspect is argued for by Topel and Ward (1992) and Lin (2000) in the sense that young people have the tendency to seek a job that suits them in a more intense manner and this leads to their changing their job more often.

Similarly, the balance of residence change at regional level may be used as a way of approximating the opportunities of finding a job and of discovering the prosperity potential of the regions.

According to Hall (1972) the employed are influenced by the appropriate aspects of life quality at regions' level, which means that better facilities are matched by a higher unemployment rate. The population living in a community that benefits from a better life quality is more tolerant towards a higher unemployment rate.

In order to explain the variation of the unemployment rate across Romania's developing regions we have used the series of data offered by the National Institute of Statistics from the Tempo-online databases out of which we extracted the series corresponding to the 1990-2015 period for the following variables:
- total number of graduates
- balance of residence change
- natural population growth
- monthly net nominal income
- annual spending with the social protection of the unemployed
- GDP

III. ECONOMETRIC RESULTS

As we have also mentioned in the methodological section, the individual effect specific to each region (αi) may be a fix parameter that can be estimated if the model is with fixed effects or may be a random perturbation that affects a specific region if the model is with random effects. In the case of the model with fixed effects, the variable expression may differ from region to region but is unchanging over time; the slope of regression is instead the same for all the regions. The models with random effects, on the other hand, allow the estimation of variables that remain unchanged over time.

In order to make a solid decision three models have been estimated, namely:
- the model obtained through regression
- the panel-type model with fixed effects
- the panel-type model with random effects.

Table. 1 – The summary of the identified models

	Dependent variable: Unemployment rate		
Factorial variables	Pooled OLS Regression Model	Fixed Effect Model	Random Effect Model
Total number of graduates	-3.442***	-1.374*	-3.442***
Balance of residence change	-0.0002***	-0.0002***	-0.0002***
Natural population growth	-0.0001**	-0.00002	-0.0001**
Monthly net nominal income	-5.037***	-3.577**	-5.037***
Annual spending with the social protection of the unemployed	0.926***	0.588**	0.926***
GDP	4.458***	3.281**	4.458***
Constant	14.265**		14.265**

Observations	160	160	160
R^2	0.330	0.211	0.330
Adjusted R^2	0.304	0.141	0.304
F Statistic	12.573*** (df = 6; 153)	6.509*** (df = 6; 146)	12.573*** (df = 6; 153)

Note:	*p<0.1; **p<0.05; ***p<0.01

To decide which model is more suitable to characterize the manner of influence for the factorial variables on the resulting variable (the unemployment rate) we have used the Hausman test.

The Hausman test puts to test the following hypothesis:

H_0 – the model with random effects is recommended
H_1 – the model with fixed effects is recommended

The results are presented below:

chisq = 93.6, df = 6, p-value < 2.2e-16

As the *p-value* is less than 5% the null hypothesis is rejected and the alternative hypothesis is accepted and in this way the model with fixed effects is recommended.

The next decision is to choose the appropriate model between the one with fixed effects and the one obtained by means of multiple regression. In this case we have used the F test for individual effects. The F test for individual effects puts to test the following hypothesis:

H_0 – the Pooled model is recommended
H_1 – the model with fixed effects is recommended.

The results of this test are presented below:

F = 10.284, df1 = 7, df2 = 146, p-value = 1.912e-10

As the *p-value* is less than 5% the null hypothesis is rejected and the alternative one is accepted and in this way the model with fixed effects is the recommended one and is actually reconfirmed by means of this test, too.

Table. 2 – The summary of the fixed effect model

	Dependent variable:
Factorial variables	Unemployment rate
Total number of graduates	-1.374*
Balance of residence change	-0.0002***
Natural population growth	-0.00002
Monthly net nominal income	-3.577**
Annual spending with the social protection of the unemployed	0.588**
GDP	3.281**
Center Region	1.241*
North-East Region	-1.347
North-West Region	-1.254**
South-East Region	1.269*
South Muntenia Region	0.575
South -West Oltenia Region	0.070
West Region	0.137
Constant	0.219
Observations	160
R^2	0.551
Adjusted R^2	0.511
Residual Std. Error	1.197 (df = 146)
F Statistic	13.806*** (df = 13; 146)

Note: *p<0.1; **p<0.05; ***p<0.01

Out of the analysis of the values yielded following the panel-type testing with the help of the model with fixed effects the following conclusions can be drawn:

- The link between the total number of graduates and the unemployment rate is a reverse type so that we may say that one per cent increase of the total number of graduates leads to a

diminishing of the unemployment rate by 1.37%. This thing can be explained through the fact that Romanian youths in general do not seek a job immediately after graduation and prefer to remain for a while under the family's 'protection'. Also, a worrying trend over the last years has been the migration of young people especially from the rural areas to the EU developed countries.

- Also, there is a reversed link between the balance of residence change across Romania's developing regions and unemployment rate. This thing indicates that one unit increase in the balance of residence change results in 0.0002 unit decrease in the unemployment rate. This aspect confirms the fact that the regions that succeed in having a dynamic growth of economy manage to draw labour force from other regions and to have a falling unemployment rate.
- It seems that the natural population growth variable does not offer a significant value from a statistical viewpoint in order to explain the evolution of the unemployment rate.
- The increase of the monthly net nominal income by one per cent has led to a decrease of unemployment by 3.6%. The salary policy constitutes a motivating factor in maintaining and attracting new employees.
- On the other hand, increases by one per cent in the annual spending with the unemployed people's social protection lead to a 0.58% increase in the unemployment rate. Ensuring a raising income during the period of unemployment seems to discourage the unemployed people from constantly seeking a job.
- Similarly, from the analyzed data results that one percentage increase in the GDP at the level of developing region leads to a 3.28% increase in the unemployment rate. This aspect confirms the conclusions of Hall (1972) according to which the population that lives in a community benefiting from a better life quality is more tolerant towards an increased unemployment rate.

As the panel-type model with fixed effects allows the identification of the individual effects of the regions included in the analysis, the values corresponding to this effects were also calculated. Their interpretation is done having as basis of comparison the Bucharest-Ilfov region.

In contrast to the Bucharest-Ilfov region, the regions of Center, South-East, South Muntenia, South-West Oltenia, and West show higher BIM unemployment rates with values ranging between 0.13% and 1.26%. These differences are recorded and explained by the model as having other causes apart from those included in the current analysis. A case may be made about differences starting from mentality, culture, to differences at the level of public investments in road infrastructure.

The only two regions which, in comparison to the Bucharest-Ilfov region have, on average, lower unemployment rates are the North-East and the North-West, with the latter region having a significant rate from a statistical point of view. Again, possible explanations for these differences can be the items previously presented, but it is most likely that this can be accounted for through the consistent migration of population from that area to the EU member states.
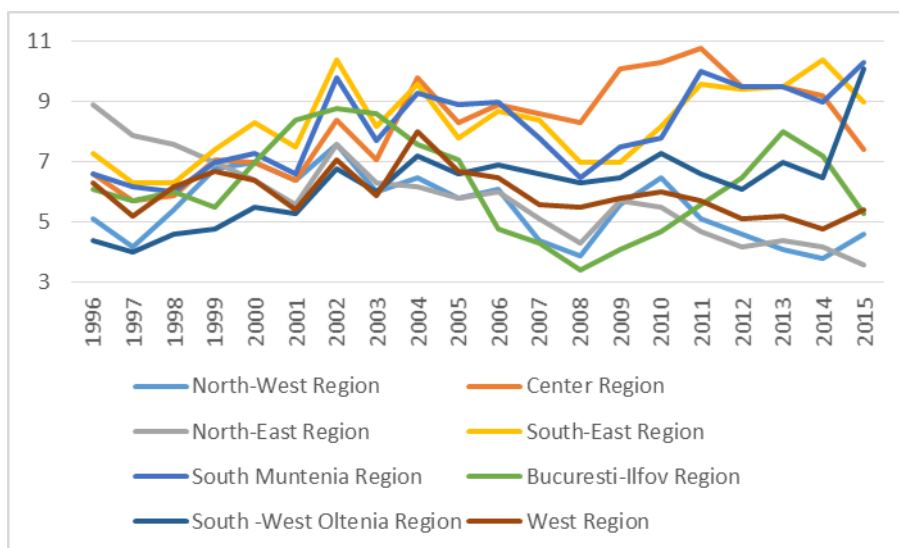

Fig. 1 – The evolution of the unemployment rate at the levels of development regions in the period 1996-2015

IV. CONCLUSIONS

The purpose of the performed analysis was to identify the relevant factors that influence the unemployment rate variable across Romania's developing regions and to establish if between these regions there exist differences caused by a series of unidentified influences.

The econometric analysis was based on the estimation of a panel model using the R Studio software package. The analysis results based on panel-type data are more efficient since they give the possibility to identify and measure effects that are not detectable through the analysis of cross-sectional data or of time sequences.

In order to explain the variation of the unemployment rate across Romania's developing regions we have used the series of data offered by the National Institute of Statistics from the Tempo-online databases out of which we extracted the series corresponding to the 1990-2015 period for the following variables:
- total number of graduates
- balance of residence change
- natural population growth
- monthly net nominal income
- annual spending with the social protection of the unemployed
- GDP

Three models have been estimated, namely:
- the model obtained through regression
- the panel-type model with fixed effects
- the panel-type model with random effects.

In order to decide which model is suitable to characterize the influencing mode of the factorial variables upon the resulting variable (unemployment rate) we have used the Hausman test to differentiate between the model with random effects and the model with fixed effects, and, afterwards, the F test to choose the right model between the model with fixed effects and the model obtained with the help of multiple regression. With the help of these tests it was possible to establish that the model with fixed effects is the recommended one.

Out of the analysis of the values yielded by the panel-type analysis with the help of the fixed effects model the following conclusions can be drawn:
- The link between the total number of graduates and the unemployment rate is a reversed type so that we may say that one per cent increase of the total number of graduates leads to a diminishing of the unemployment rate by 1.37%.
- Also, there is a reversed link between the balance of residence change across Romania's developing regions and unemployment rate. This thing indicates that one unit increase in the balance of residence change results in 0.0002 unit decrease in the unemployment rate.
- The natural population growth variable does not offer a significant value from a statistical viewpoint in order to explain the evolution of the unemployment rate.
- The increase of the monthly net nominal income by one per cent has led to a decrease of unemployment by 3.6%. The salary policy constitutes a motivating factor in maintaining and attracting new employees.
- From the analyzed data results that one percentage increase in the GDP at the level of developing region leads to a 3.28% increase in the unemployment rate.
- On the other hand, increases by one per cent in the annual spending with the unemployed people's social protection lead to a 0.58% increase in the unemployment rate. Ensuring a raising income during the period of unemployment seems to discourage the unemployed people from constantly seeking a job.
- The only two regions which, in comparison to the Bucharest-Ilfov region have, on average, lower unemployment rates are the North-East and the North-West and this is most likely to be argued by the consistent migration of the population in that area to the EU countries.

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