ANALYSIS OF EUROPEAN LABOUR MARKET IN THE CRISIS CONTEXT

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Abstract:

The purpose of this paper is to investigate the determinants of labour market dynamics in EU-27 in the recent period and to assess their impact on the process of economic development. The degree of originality is given by our choice to focus on the comparative analysis of two periods of time: 2000-2007, when the European Union as a whole, but especially Central and Eastern European countries as well as Mediterranean ones experienced significant improvements in labour market performances and overall competitiveness and 2008-2010, a recession period characterized by a massive loss of jobs and an equally large increase in unemployment, with anticipated consequences on economic growth. The main interest is to look for the key factors that determine the lasting performances of the leading European economies and possible solutions for ensuring the sustainable growth of the others.

Keywords: labour market dynamics, economic growth, unemployment, social models, global crisis

JEL Classification: P50, J21, O14, C23

1. Introduction

The recent financial crisis has negatively influenced countries' labour markets all over the world. Starting in 2008 its effects have been felt by a large majority of people, representing the main threat to the number, quality and stability of jobs. "Much of the steady gain in economic growth and reduction of unemployment rates witnessed over the last decade has been lost. EU GDP fell by 4.1% in 2009, industrial production dropped back to the levels of the late 1990s and 23 million people, close to 10% of the economically active population, are now unemployed" (EMCO-COM, 2010).

However, the consequences of the economic downturn on labour market conditions have varied from country to country, depending on how employers reacted when the demand for their products decreased and, of course, on the public policies adopted

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in this direction. According to OECD (2010), "in a number of countries, employers made extensive use of hours reduction as an alternative to layoffs" while in public sector "short-time work schemes played an important role in preserving jobs during recession". Yet, certain labour force groups have been more affected than others: "times are hard for workers on temporary contracts and people with lower levels of education" (Hijman, 2009).

Although in 2010 (most recent year for which statistics are available at this time) the first signs of economic recovery became visible, in terms of labour market results, it will take time before unemployment and employment will return to pre-crisis levels. According to ILO (2011), globally, the main features of the current period and of the near future are high unemployment, a recovery in growth without a comparable recovery in employment, industrial employment most affected, growing number of discouraged youth, stagnating progress in reducing vulnerable employment and slowed progress in reducing working poverty. On the whole, economic performances begin to improve, but risks remain.

In this context, the main aim of this paper is to investigate the determinants of labour market dynamics in EU-27 before and after the crisis and to analyse their impact on the process of economic development. The objectives refer to assessing the persistence in time of labour market phenomena and differences between European countries in terms of these trends, exploring the existence of groups of countries with similar performance and whether these groups remained unchanged before and after the crisis, analyzing the main determinants of labour market performance and how they influence countries' competitiveness.

The key drivers of labour market dynamics in the European Union countries and their impact on economic performances have been largely documented in both theoretical and empirical literature. The purpose of this paper is not to explore the results of these articles, but rather to focus on studies that address the effects of the recent financial and economic crisis.

But first, it is important to take a look at how labour market looked like in the years before the economic recession. Perugini and Signorelli (2007), examining differentials, dynamics and determinants of labour market performances in EU-15, found evidence of widely and somehow unexpected improvements in labour market performances at the European Union level. Without having as main goal identifying the reasons of these positive evolutions, the authors point to the European Employment Strategy, as an important factor that cannot be excluded.

Rovelli and Bruno (2008) reinforce the idea that evaluating the health of the European Union economies can be done in close relation with their labour markets performances. A key element of labour market outcomes is represented by the social policies adopted in different countries. Starting from the four types of social policy models (Nordics, Anglo-Saxon, Continental and Mediterranean) the authors prove that, as expected, countries with higher rates of employment are those that have "higher expenditures

on labour market policies and lower rigidity in labour market institutions and product market regulation".

In fact, the literature devoted to the impact of institutions and public policies on labour market outcomes is very wide. The papers of Kluve (2010) and Dolenc and Laporšek (2010) are just two of the most recent.

Moving now to the literature that deals with the causes and consequences of the crisis, Rose and Spiegel (2011) try to identify some of the main reasons of the recession using a cross-country analysis. Their research emphasises the fact that countries with higher income and not so tight credit regulations have been more affected by this economic downturn, while countries with current account surpluses have managed to easier overcome recent difficulties.

Existing connections between global crisis and labour market results have been documented by Downes (2009). The author highlights the fact that both the contagion and spillover effects of the financial crisis are present in its relation with labour markets. The fall in production being caused by the decrease in labour demand and the decline estimated to be recorded in peoples' income, due to the same reason, is supposed to generate a fall in the demand of goods and services. This creates a spiral in which economic outcomes are strongly linked to the labour market performances.

To achieve this paper's objectives, statistical and econometric methods (principal component method, cluster analysis and regression analysis) have been applied, using the most recent data provided by EUROSTAT.

Section 2 focuses on papers research questions, data and methodology. Descriptive analysis and compared evidence are subject to Section 3. The methodology and results of the principal component method, cluster analysis and regression analysis are presented and commented on in Sections 4 and 5. Main conclusions are presented in Section 6.

2. Data and Methodology

In order to achieve the objectives of this paper the following research questions will be addressed:

- Have EU-27 labour market trends of the last decade been persistent over time or, in other words, could the previous reforms meet the challenges of the economic crisis? Perugini and Signorelli (2007) found evidence that in the decade 1997-2006, European countries experienced "widespread and unexpected improvements" of their labour market performances, especially regarding job creation. Even though, during the same period, in terms of unemployment, not all countries managed to improve their performance, Spain, Ireland, Finland and Italy made significant progress in reducing it. In this context, our empirical investigation aims at providing some insights into the changes that economic crisis brought into the EU-27 labour markets and the causes for the deep transformations in some countries.

- Which have been the groups of countries or social models that best cope with the recent years' difficulties and have these groupings remained constant over time? As already mentioned in the literature review, Boeri (2002) and then other scientists like Sapir (2006) and Rovelli and Bruno (2008) included European countries in four social groups and examined their performances according to these models. Based on their outcomes, our study concentrates on analysing the 27 European countries as clusters (created according to the labour market outcomes and overall economic performance) and assessing the changes within and between these groups, due to recent economic downturn.

- Which are the determinants of labour market results and what is their impact on the process of economic development? A large body of research has been devoted to the factors that can explain differences in labour market performances across countries or regions (Petrongolo and Pissarides, 2001; Wall and Zoega, 2002; Nickell *et al.*, 2002; Wasmer, 2002, Ahtonen, 2004; Robson, 2006; Bachmann and Burda, 2007, Caroleo and Pastore, 2007; Bouvet, 2009, Perugini and Signoreli, 2007, 2010, to name but a few). From these studies four categories of drivers emerged as most significant: *composition of labour force and unemployment, institutional variables, structural shocks, business cycle.* One innovation of this paper is related to our intention to measure the labour market outcomes in relationship with economic performances in the 27 European Union countries by means of panel data models.

To answer the first research question, labour market trends in the EU-27 countries have been examined during the period 2000-2010 and separately by sub-periods (before and after the economic crisis) using descriptive statistics and simple econometric models. To this end, the following indices have been computed and the next equations have been estimated:

1. **Spearman's rank correlation coefficient:**

$$S = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}, \tag{1}$$

where d_i are differences between the ranks of each observation of the variables x and y.

2. **Kernel density:**

$$\hat{f}_h(x) = \frac{1}{nh} \sum_{i-1}^{n} K\left(\frac{x - x_i}{h}\right), \tag{2}$$

where $K(\cdot)$ is the kernel function, h is the bandwidth parameter and n the number of observations.

3. **Dispersion index (sigma):**

$$sigma_t = \sqrt{\frac{\sum_{i=1}^{n}(\ln y_{i,t} - \ln \overline{y}_t)^2}{n}} \tag{3}$$

4. **Absolute convergence:**

$$\frac{1}{T}\ln(\frac{y_{i,t_0+T}}{y_{i,t_0}}) = a + b\ln y_{i,t_0} + \varepsilon_{i,t_0+T} \tag{4}$$

where y_i represents the value of the variable in country i, $\hat{b} = -\frac{(1-e^{-\beta T})}{T}$ is the convergence coefficient, $\beta = -\frac{\ln(1+\hat{b}T)}{T}$ is the rate of convergence, t_0 is the initial year and T is the period of time during which the growth rate of the variable y is measured.

In order to classify the 27 EU Member States according to their labour market performances and to take into account additional variables characterising the level of economic development, different techniques have been used: Principal Component Analysis (PCA) and Cluster Analysis (CA). If PCA aims at reducing the number of variables without losing too much of the initial information, CA seeks to classify cases into homogeneous groups based on the characteristics analysed, so that objects in a group to be similar in terms of these variables, but different from the objects in other groups.

For grouping the objects (in our case the 27 EU countries) into clusters, a method often used in economic analysis – non-hierarchical algorithms k-means – has been preferred.

K-means algorithms are based on the following considerations: if the number of groups is known *a-priori*, in a first step, the objects are associated with a group according to certain criteria. The average for every group is then computed, following that each object to be associated with a group based on the similarity with the group average. Group averages are again computed and the process of association of the objects to groups continues until no object can change the group.

To measure the impact of determinants factors on labour market performances and economic outcomes several econometric models based on panel data with fixed and random effects and Generalized Least Squared method for parameters' estimation have been used (Green, 2005):

- fixed effects model (FE):

$$y_i = X_i\beta + i\alpha_i + \varepsilon_i, \tag{5}$$

where y_i and X_i represent the T observations of the i th unit, i represent a column of $T\times1$ by dimension. The last component represents the perturbation vector. The model could be written also as follows:

$$Y = X\beta + D\alpha + \varepsilon, \tag{6}$$

where D is a matrix of n columns, each column having 1 for each cross section unit.

Applying OLS we obtain:

$$\hat{\beta} = [X'MX]^{-1}[X'MY], \text{ where matrix } M = I - D(D'D)^{-1}D'. \tag{7}$$

- random effects model (RE):

$$y_{it} = x_{it}^t \beta + (\alpha + u_i) + \varepsilon_{it}, \tag{8}$$

where x is formed of K regressors, y is a vector for the dependent variable, ε and u are two random variables.

- Generalized Least Squared method:

$$\hat{\beta} = (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}Y, \tag{9}$$

where $\Omega = I_n \otimes \Sigma$ and $\Sigma = \sigma_s^2 I_T + \sigma_u^2 i_T i_T'$, i_T being a column vector of 1, dimension = T.

To apply such techniques, several conditions regarding the absence of autocorrelation and heteroscedasticity of disturbance components (u and ε) need to be satisfied and also the availability of Σ.

3. Descriptive Statistics and Compared Evidence

Throughout the period 2000-2007, labour market performances consistently improved in all the 27 European countries, but specific dynamics were affected by the baseline conditions in individual countries (*e.g.* until late 1990s, post-communist countries were still undergoing through major transformation process).

At the European Union level, as a whole, the number of employed increased on average by 2.3 millions (1.1%) every year, reaching over 215 millions people in 2007. The most jobs were created in Spain, France and Italy, while, in relative terms, Mediterranean countries (Spain, Cyprus, Italy, Greece) and Central and Eastern European (CEE) ones (Latvia, Bulgaria, Estonia, Slovakia) experienced the greatest improvements. In addition, it is worth noticing the average increase of employment by 3.2%, every year, in Ireland, the second best performance after Spain and Cyprus, but also the negative result of Romania (employment declined, on average, by 1.2%, every year) (see Table 1).

During the same period of time, at EU-27 level, female employment increased on average by 1.6%, every year, a net annual job creation of approximately 1.4 million. This was a widespread phenomenon, in some countries the growth rate of the number of jobs occupied by women being almost double compared to the growth rate of total employment (Germany, Portugal and Netherlands) (see Table 1).

Table 1

Total and Female Employment – Average Annual Changes (absolute value and %)

Countries	Total employment				Female employment			
	$\overline{\Delta}$ 2000-2007		$\overline{\Delta}$ 2008-2010		$\overline{\Delta}$ 2000-2007		$\overline{\Delta}$ 2008-2010	
	(1000)	(%)	(1000)	(%)	(1000)	(%)	(1000)	(%)
EU-27	2,342.5	1.1	-2,656.9	-1.2	1,426.3	1.6	-586.7	-0.6
Belgium	40.1	1.0	18.5	0.4	30.0	1.7	21.6	1.1
Bulgaria	62.9	2.1	-147.9	-4.6	29.9	2.2	-59.8	-3.9
Czech Republic	33.0	0.7	-61.9	-1.3	8.0	0.4	-28.3	-1.3
Denmark	9.0	0.3	-69.7	-2.5	6.2	0.5	-20.8	-1.6
Germany	215.2	0.6	-82.6	-0.2	193.4	1.2	9.8	0.1
Estonia	11.0	1.9	-40.9	-6.7	5.6	1.9	-14.2	-4.6
Ireland	59.0	3.2	-127.5	-6.4	30.7	4.0	-32.2	-3.6
Greece	61.1	1.5	-83.6	-1.9	33.8	2.1	-12.1	-0.7
Spain	687.4	4.0	-899.4	-4.6	381.9	5.7	-189.3	-2.3
France	315.8	1.3	-101.2	-0.4	220.3	2.0	-12.4	-0.1
Italy	299.1	1.4	-257.0	-1.1	201.0	2.4	-53.2	-0.6
Cyprus	11.4	3.6	0.6	0.2	6.4	4.6	1.3	0.8
Latvia	22.2	2.3	-78.7	-7.6	10.6	2.2	-27.8	-5.4
Lithuania	19.5	1.4	-85.3	-5.9	7.1	1.0	-23.6	-3.2
Luxembourg	3.1	1.7	8.4	4.1	2.5	3.2	4.3	4.8
Hungary	13.0	0.3	-49.6	-1.3	7.8	0.4	-5.8	-0.3
Malta	1.8	1.2	1.7	1.0	0.9	2.0	1.4	2.5
Netherlands	75.2	0.9	-120.4	-1.4	62.7	1.8	-39.2	-1.0
Austria	40.8	1.1	0.6	0.0	26.8	1.6	13.9	0.7
Poland	120.3	0.8	80.8	0.5	52.3	0.8	68.3	1.0
Portugal	16.1	0.3	-104.4	-2.2	14.5	0.7	-30.0	-1.3
Romania	-106.7	-1.2	-30.1	-0.3	-65.0	-1.5	-25.6	-0.7
Slovenia	11.4	1.2	-16.9	-1.7	4.3	1.0	-5.6	-1.3
Slovakia	36.4	1.7	-58.1	-2.4	9.9	1.0	-18.8	-1.8
Finland	19.9	0.8	-43.6	-1.8	12.6	1.1	-14.9	-1.2
Sweden	40.8	1.0	-28.2	-0.6	18.6	0.9	-13.6	-0.6
United Kingdom	223.8	0.8	-280.6	-1.0	113.4	0.9	-80.0	-0.6
Min	-106.7	-1.2	-899.4	-7.6	-65.0	-1.5	-189.3	-5.4
Max	687.4	4.0	80.8	4.1	381.9	5.7	68.3	4.8

Source: EUROSTAT, 2011; own calculations

Good labour market performances were also recorded in terms of part-time employment and employees with temporary contracts. On average, every year during 2000-2007, at EU-27 level, part-time employment increased by 1 million people (3%), while the

number or employees with temporary contracts by almost 0.8 millions (3.5%) (see Table 2).

If in terms of female employment, during 2000-2007, all the European countries (except for Romania) recorded improvements, there have been significant differences among them, regarding the number of atypical labour contracts. Thus, according to EUROSTAT, in 2007 the share of part-time workers in total employment ranged from 46.3% in Netherlands to 1.5% in Bulgaria, while the percentage of employees with temporary contracts from 31.7 in Spain to 1.6 in Romania.

The highest average annual increase in the number of part-time jobs, during 2000-2007, has been recorded in Germany (+383,100), while the greatest average annual growth rate (4%) in Spain. Over the same period, in many CEE countries, part-time employment fell, Romania recording the most significant average annual decrease (-8%). A relatively similar situation can be noticed in terms of temporary contracts. Significant growth was reported by Mediterranean countries, Luxembourg and Ireland, while in Poland case the increase was notable (+ 27.8%, annual average).

When assessed during the crisis period and after the end of it (2008-2010), EU-27 labour market performances occur quite different and sometimes mixed. Trends have changed and differences between countries have increased:

- At EU-27 level, approximately 2.7 millions of jobs have been lost on average every year during 2008-2010, most of them occupied by men, representing an annual decrease by 1.2%, while female employment has just slightly decreased by 0.6%. As expected, part-time employment has continued in upward trend of the recent years but at a much lower average annual rate, of just 1.3%. The number of temporary employees instead has dropped by more than 2% every year (see Table 1 and 2).
- Countries with the highest growth rates of total employment in 2000-2007 have recorded during 2008-2010 the strongest average annual decrease: Latvia (-7.6%), Estonia (-6.7%) and Ireland (-6.4%). Among CEE countries only Poland has succeeded in maintaining a favourable trend of total employment, while of the Mediterranean countries Cyprus and Malta proved to have relatively stable labour markets (see Table 1).
- In terms of part-time employment, two CEE countries have made notable prog-ress: Latvia who, from an annual average growth rate of -6.5%, during 2000-2007, has gone to a rate of +20.2% in 2008-2010 and Romania, that went from -8% to +6%, average part-time employment growth (see Table 2).
- During the crisis, most of the European countries have lost jobs based on tem-porary contracts; exceptions have been mainly the new entered ones – Latvia, Estonia, Hungary, Malta *etc.* (see Table 2).

Hitherto, labour market trends in the EU-27 countries have been analysed taking into consideration the differences between two periods, before and after the beginning of the economic crisis, and focusing mainly on job creation and job destruction.

Now it is recommended to look more closely at the distributions´ shape and evolution of three variables that reflects labour markets performances and overall economic outcomes: unemployment rate, non-employment rate and GDP *per capita*, to cast some light on the disparities within the European Union.

Our decision to use non-employment rate along with unemployment rate is related to measurement and comparability issues raised by the second indicator (for a more extensive debate, see Perugini and Signorelli, 2007). Non-employment rate was computed as: 100 – employment rate (%) and try to measure the part of the population of working age (15 to 64 years) that could perform work (*i.e.* unused labour potential, in a given period of time), unlike the unemployment rate which refers to a specific category of population (*e.g.* unemployed according to the guidelines of the International Labour Organization). The intention was to bring additional consistency to the comparative analysis that has been performed.

As is duly confirmed by the box-plots in Figure 1, differences between EU performers and those with poor performances remain high, no matter if assessed before or after the crisis. Moreover, in terms of unemployment rate and GDP *per capita*, 2010 results announce the beginning of an increasing tendency of these differences. In 2010, excepting Luxembourg, GDP *per capita* ranged from 32,800 PPS *per* inhabitant (in Netherlands) to 10,600 PPS *per* inhabitant (in Bulgaria), while the difference between the lowest unemployment rate (4.4% in Austria) and the highest (20.1% in Spain) was of 15.7 percentage points, an increase by 1.4 percentage points compared to previous year. Only when assessed in terms of non-employment rate, EU countries tend to have more and more similar performances, but this fact is mainly due to worsening conditions in the advanced countries.

The same reality is emphasized by the k-density graphs, namely, the tendency of polarization and formation of two groups of performers (see Figure 1).

In absolute terms, graphs and Spearman coefficients show that examined phenomena are persistent over time (see Figure 2). In this sense, the highest rank correlation coefficient, recorded for GDP *per capita* (0.990) means that, on the whole, countries kept their positions before the crisis. Among them, during 2008-2010 only Germany has improved its performances, going up two places, while UK, Portugal and Hungary fell two positions. If regarding non-employment rate the situation is similar to that reported for GDP *per capita*, with respect to unemployment, countries changed their positions, in some cases quite significantly: Ireland, Portugal, Hungary (worsened their performances), Bulgaria and Poland (improved their positions).

Table 2

Part-Time Employment and Temporary Employees – Average Annual Changes (absolute value and %)

| Countries	Part-time employment				Temporary employees			
	$\overline{\Delta}$ 2000-2007		$\overline{\Delta}$ 2008-2010		$\overline{\Delta}$ 2000-2007		$\overline{\Delta}$ 2008-2010	
	(1000)	(%)	(1000)	(%)	(1000)	(%)	(1000)	(%)
EU-27	1,008.5	3.0	516.1	1.3	812.5	3.5	-527.0	-2.1
Belgium	34.4	4.3	32.1	3.2	1.5	0.5	-2.3	-0.7
Bulgaria	-5.2	-7.9	-0.3	-0.4	-0.3	-0.2	-13.6	-10.0
Czech Republic	-1.0	-0.5	18.5	8.4	5.0	1.7	11.8	3.9
Denmark	10.1	1.7	9.3	1.4	-4.5	-1.9	-1.8	-0.9
Germany	383.1	4.8	33.3	0.3	113.3	2.6	-6.2	-0.1
Estonia	1.5	3.8	6.8	15.5	0.1	1.2	2.3	14.7
Ireland	12.4	4.0	11.7	3.1	9.5	9.8	-1.9	-1.3
Greece	8.7	4.3	12.7	5.2	-1.7	-0.5	5.8	1.7
Spain	162.0	9.8	13.1	0.5	189.1	4.2	-529.5	-11.5
France	70.7	1.7	79.5	1.8	42.7	1.3	-19.0	-0.5
Italy	182.1	8.0	47.0	1.4	106.2	5.9	-68.9	-3.0
Cyprus	0.2	1.1	2.5	9.3	2.3	7.7	-0.1	-0.4
Latvia	-5.2	-6.5	13.2	20.2	-1.7	-3.6	12.0	32.6
Lithuania	-0.2	-0.2	2.5	2.5	0.7	1.6	-1.4	-4.4
Luxembourg	2.3	8.7	0.9	2.6	1.0	12.8	1.2	9.7
Hungary	5.2	4.0	20.4	11.7	4.1	1.8	25.9	9.3
Malta	1.1	9.8	0.6	3.6	0.3	4.8	1.0	16.0
Netherlands	94.6	2.7	2.6	0.1	50.2	4.6	-18.1	-1.4
Austria	36.5	5.1	35.0	3.8	7.7	2.8	6.3	2.0
Poland	-7.0	-0.5	-2.4	-0.2	383.0	27.8	38.1	1.2
Portugal	6.3	1.6	-15.3	-3.7	21.7	2.8	-10.0	-1.1
Romania	-86.4	-8.0	47.2	6.0	-10.4	-7.6	-5.7	-7.4
Slovenia	4.4	7.5	8.8	10.5	8.0	6.8	-5.7	-3.9
Slovakia	3.2	7.4	12.8	19.0	3.6	4.2	7.5	7.6
Finland	7.2	2.4	8.8	2.7	-2.4	-0.7	-1.8	-0.5
Sweden	26.3	2.8	-16.4	-1.4	24.7	4.2	-14.9	-2.3
United Kingdom	49.2	0.7	131.8	1.9	-20.5	-1.4	62.2	4.6
Min	**-86.4**	**-8.0**	**-16.4**	**-3.7**	**-20.5**	**-7.6**	**-529.5**	**-11.5**
Max	**383.1**	**9.8**	**131.8**	**20.2**	**383.0**	**27.8**	**62.2**	**32.6**

Source: EUROSTAT, 2011; own calculations

Figure 1

Box Plots* and k-density** Estimates of Unemployment Rate, Non-Employment Rate and GDP per capita in EU-27 Countries
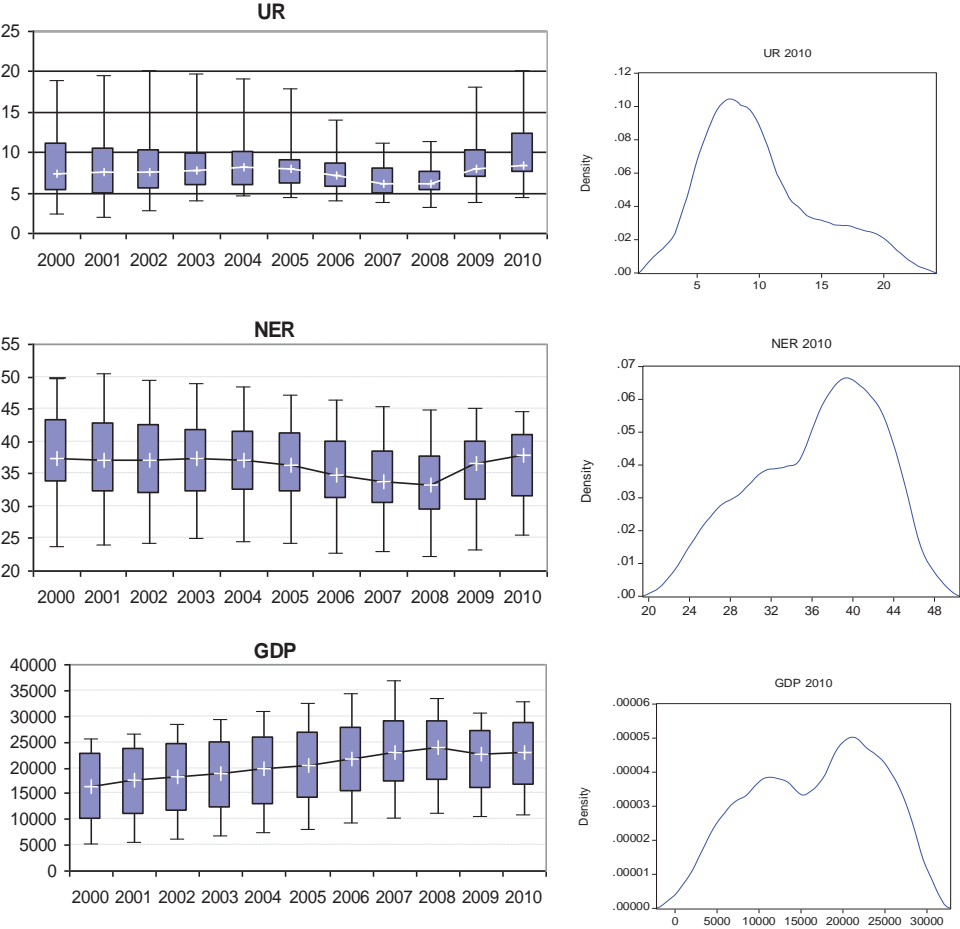
* Maximum, minimum, median and interquartile range of each variable are marked on the vertical axis. ** The estimated probability values (estimated density function values) are represented on the vertical axis and a range of values adequate for each economic indicator on the horizontal axis.

Source: EUROSTAT, 2011; own calculations (in the case of the indicator GDP *per capita*, Luxembourg was excluded from the analysis due to the large gap compared to European average)

Figure 2

**Ranking of Unemployment Rate, Non-Employment Rate and GDP per capita: EU-27 Countries**
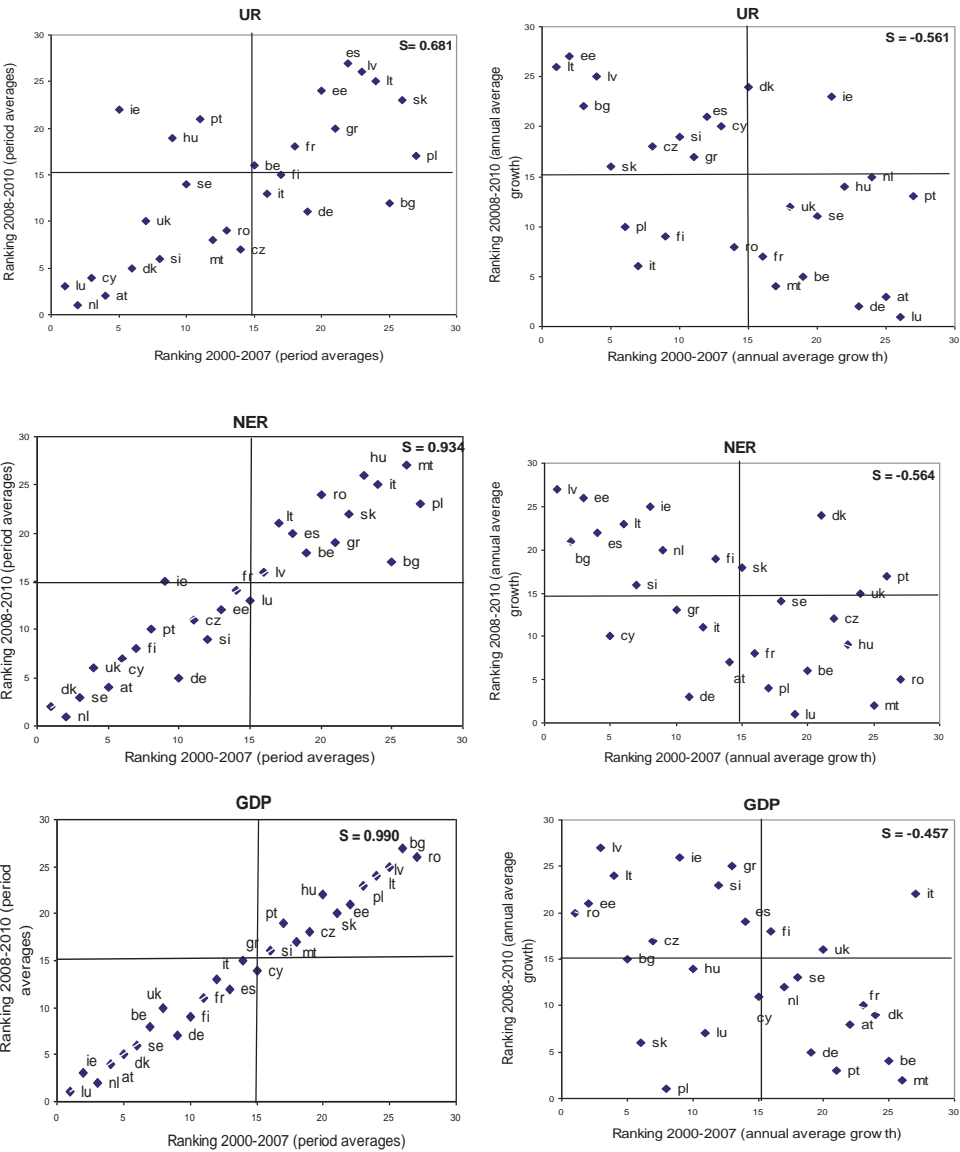
When assessed in terms of growth (the annual average growth of the period 2000-2007 against the period 2008-2010) countries rankings offer a completely different image. Those with the best performances in the period before the crisis have been most affected (CEE countries, but also Spain, Greece and Ireland), while Nordics and Germany, Austria and Luxembourg have proved to have very stable labour markets and constant overall performances. The surprises of these rankings are two countries, Poland and

Malta, which seem to have succeeded better than others in their group to overcome the difficulties of recent years (Figure 2).

Having in view all these developments of the recent period it is not surprising why dispersion within the European Union remains very high. In terms of unemployment rate and GDP *per capita*, dispersion index (sigma) was in 2010 approximately 40%, increasing in unemployment rate case and standing in that of GDP. Only regarding non-employment rate EU countries seem to have more similar performances, sigma convergence being in this case less than 20% (see Figure 3). The negative sign of the convergence coefficient *b* proves the existence of an inverse unconditional convergence, but the rate is still very small: 0.4% for GDP *per capita*, 0.5% for NER and 5% for UR (see Figure 3).

Figure 3
Sigma and Beta Convergence in EU-27 Countries
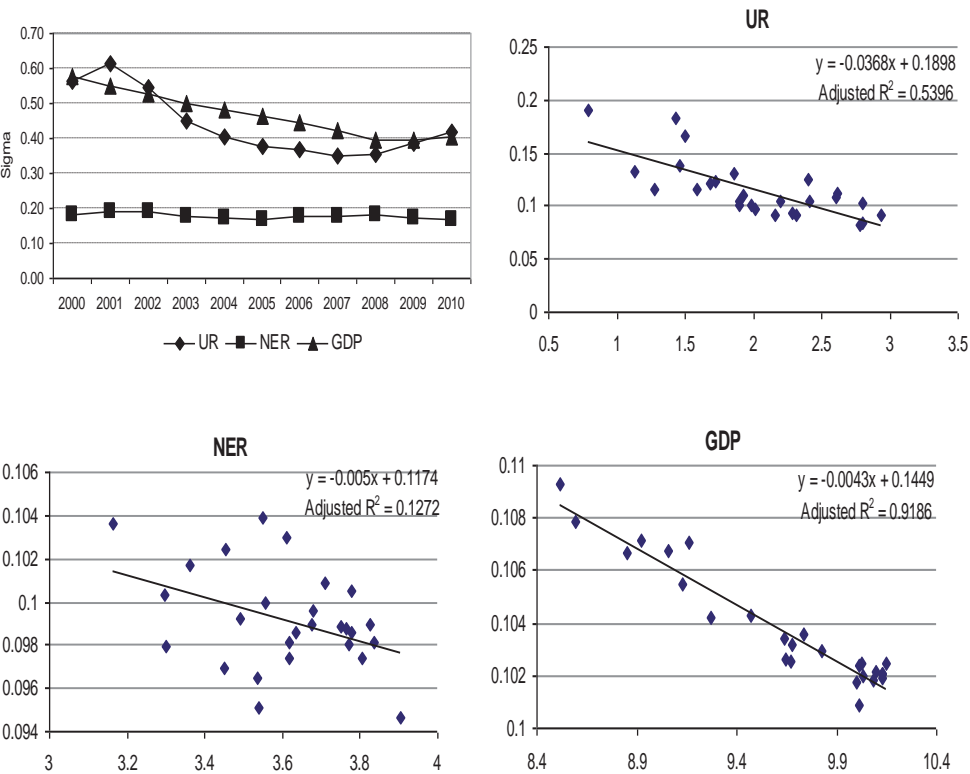
Source: EUROSTAT, 2011; own calculations (in the case of the indicator GDP *per capita*, Luxembourg was excluded from the analysis due to the large gap compared to European average).

Here, *y* is the notation for variable growth rate during 2000-2010 and *x* represents the variable level in 2000, both in natural logarithm.

4. Principal Component and Cluster Analyses

Economic literature and empirical studies have shown that the number of factors that may affect labour market performances is large, their impact being different from country to country or from one region to another. This reality imposes making use of a comprehensive set of data able to capture as many dimensions as possible of the phenomenon analysed. At the same time, preparing national or regional development policies involves identifying along with the main dimensions of economic and social phenomena, homogeneous groups of countries and regions which proposed policies to be addressed.

One objective of this paper was to classify the European Union Member States according to their labour market performances and to take into account additional variables characterising the level of economic development, using different statistical techniques: Principal Component Analysis (PCA) and Cluster Analysis (CA).

The ultimate goal was to identify both the common features of the European Member States and the differences between them, successful development models and how they can be transferred to other countries.

Several categories of factors have been largely considered in the economic literature to influence labour markets dynamics and performances. These include:

- Demographic characteristics, like sex and age structure of unemployed and employed population, level of education, migration.
- Structural factors, such us the share of population employed in different economic branches, regional specialization.
- Institutional and policy settings, like unemployment benefit and wage-setting systems, labour market policies.
- Business cycle, measured through indicators such us GDP, or the difference between real GDP and potential GDP (output gap).

In order to cluster the 24 member states (Luxembourg, Malta and Cyprus have been excluded from the analysis to ensure greater data homogeneity) into groups according to their labour markets performances but also their overall economic results, eleven social and economic variables have been selected: **GDP** (GDP *per capita* in PPS *per* inhabitant), **DIF** (Direct investment flows as % of GDP, in the reporting country), **NER** (Non-employment rate = 100 – employment rate, in %), **HT** (High-technology sectors: high-technology manufacturing and knowledge-intensive high-technology services in % of total employment), **EARN** (Net earning, single parent without children, 67% of average worker in PPS), **EDU** (Graduates - International Standard Classification of Education - ISCED 5-6 in Maths, Science and Technology fields - as % of all fields), **FEM** (Female employment as % of total employment), **MIGR** (Crude rate of net migration plus adjustment *per* 1,000 persons), **LMP** (LMP expenditure as % of GDP), **PART** (Part-time employment as % of the total employment) and **TEMP** (Percentage of employees with temporary contracts). Analysis was performed for two periods, 2000-2007 and 2008-2010, using variables' period averages.

Running PCA analysis by means of Statistical Package for the Social Sciences (SPSS-16), the eleven factors were reduced to three principal components for the period 2000-2007, explaining over 70% of the variance of the initial variables, and two principal components for 2008-2010, which explain over 60% of the initial variance (see Table 3).

Table 3
Rotated Component Matrixes

Period	2000-2007			2008-2010	
Factors	1	2	3	1	2
GDP	**0.803**	0.533	0.186	**0.880**	0.419
DIF	0.023	-0.129	**-0.618**	-0.199	**-0.600**
NER	**-0.836**	-0.079	0.086	**-0.820**	0.020
HT	**0.647**	0.436	-0.343	**0.702**	0.031
EARN	**0.796**	0.498	0.168	**0.877**	0.354
EDU	0.166	**0.765**	0.026	0.196	**0.398**
FEM	0.159	-0.537	-0.614	0.282	-0.799
MIGR	0.219	**0.700**	0.513	0.241	0.698
LMP	**0.838**	0.032	0.226	**0.690**	0.335
PART	**0.903**	-0.022	0.015	**0.880**	0.110
TEMP	0.218	-0.037	**0.867**	0.147	**0.669**

Source: EUROSTAT, 2011; own calculations

According to these new factors, in the initial period, 2000-2007, countries have clustered as follows (see Tables 4 and 5):

- **Cluster 1** - composed of the countries with second best results in terms of economic development, mainly characterised by high immigration and a very good representation of education in Maths, Science and Technology fields (**Ireland, France, Austria, Finland and the United Kingdom**).

- **Cluster 2** - negatively correlated with factor 1 and containing countries with low economic performances and investments in labour market policies, but relatively high migration and foreign direct investments (**Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovakia**).

- **Cluster 3** - positively correlated with factor 3 and composed of Mediterranean countries, having as main features low direct investments flows and female employment, but with high imigration and temporary work (**Greece, Spain, Italy, Portugal**).

- **Cluster 4** - strongly correlated with factor 1 and including countries with very good economic performances, low non-employment, high earnings, substantial part-time and high-tech employment and large investments in labour market policy (**Belgium, Denmark, Germany, the Netherlands, and Sweden**).

In the second period, 2008-2010, the eleven variables selected have reduced to only two factors (principal components) and according to the latter countries have been regrouped as follows (see Tables 4 and 5, Figure 4):

- The initial clusters 4 and 1 have regrouped in a single **cluster** with number **4**, containing countries with the best results in terms of labour market and overall economic competitiveness: **Belgium, Denmark, Germany, the Netherlands, Sweden, Ireland, France, Austria, Finland and the United Kingdom.**

- **Cluster 3** is composed now only of **Greece, Spain and Italy.**

- **Portugal** from cluster 3 passed to **cluster 1** and together with the **Czech Republic, Hungary, Poland, Romania, Slovenia and Slovakia** have formed the group of countries with lower economic and labour market performances.

- **Bulgaria, Latvia, Lithuania and Estonia** have grouped in **cluster 2**, having poor economic performances but relatively high direct investments flows, female employment and migration.

Table 4

Final Cluster Centers

Clusters	1	2	3	4
2000-2007				
Factor 1	0.630	**-0.784**	-0.595	**1.415**
Factor 2	**1.043**	-0.554	0.513	-0.345
Factor 3	-0.383	-0.438	**1.643**	-0.056
2008-2010				
Factor 1	**-0.847**	-0.647	-0.721	**1.068**
Factor 2	0.244	**-1.723**	**1.637**	0.027

Table 5

Number of Cases in Each Cluster

| Number of cases			
2000-2007		2008-2010	
Cluster 1	5	Cluster 1	7
Cluster 2	10	Cluster 2	4
Cluster 3	4	Cluster 3	3
Cluster 4	5	Cluster 4	10
Valid	24	Valid	24
Missing	0	Missing	0

Source: EUROSTAT, 2011; own calculations

To sum up, cluster analysis has allowed looking inside the European Union at groups of countries formed according to their economic results and labour market performances. Before the crisis, the 24 EU Member States clustered as expected: Nordics as the best performers, Continental and Anglo-Saxon having the second best performance, Mediterranean very attractive for immigrants, but with rather rigid labour markets, and finally New Member States, the less efficient.

The analysis performed for the period 2008-2010 has led to interesting results. According to the variables selected, advanced countries proved to be more homogeneous in terms of the measures taken to overcome the crisis and their results, while CEE countries recorded different results, separating into two clusters. Regarding Mediterranean countries, Portugal was the only one who joined the group with poorer performances.

Figure 4
Cluster Analysis Results for the Period 2008-2010
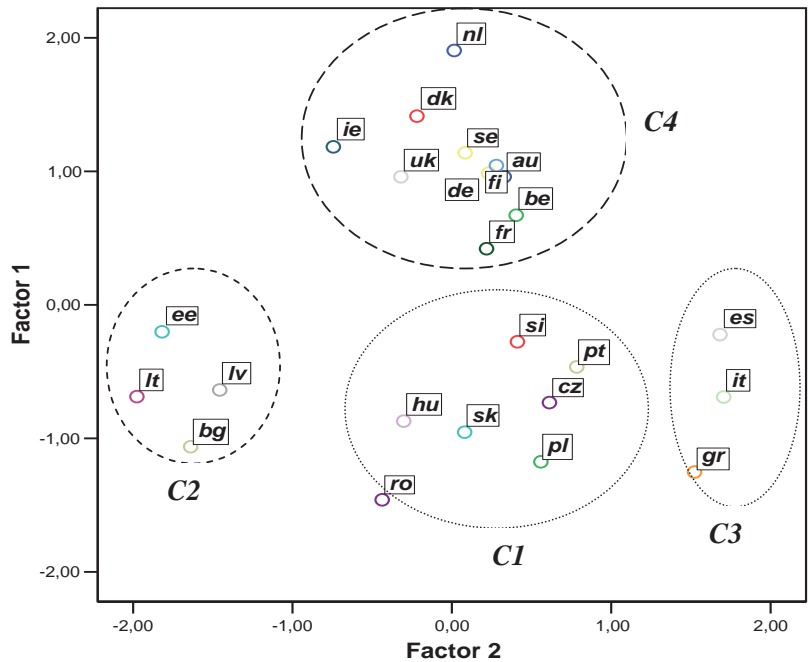
Source: EUROSTAT, 2011; own calculations

5. Determinants of Economic Performances and Labour Market Outcomes - Econometric Approach

To achieve the third objective of our paper *i.e.* to study the determinants of economic performances and labour market outcomes in the current context an econometric analysis based on panel data for the 25 EU Member States (Luxembourg and Malta have been again excluded, due to the fact that they have emerged as outliers in many variables' case) an analysis has been performed. The period under analysis was 2000-2009 for which data were available for all the variables and countries taken into account.

The dependent variables have been in turn, **GDP** (GDP *per capita* in PPS *per* inhabitant) and **UR** (unemployment rate), while the independent variables have been: **NER** (non-employment rate in %), **GFCF** (gross fixed capital formation as % of GDP), **HT** (High-technology sectors: high-technology manufacturing and knowledge-intensive high-technology services in % of total employment) in the first model, and **NAE** (non-agricultural employment in %), **FEM** (Female employment as % of total employment), **PART** (Part-time employment as % of the total employment) in the second.

LOG(GDP) has been used as natural logarithm of the gross domestic product indicator. Also each variable was first differenced, $D(X_{ti}) = X_{ti} - X_{t-1i}$, in order to avoid some non-stationary and time-autocorrelation problems.

The following table presents the results regarding parameters significance and overall performance of several models in which different types of effects have been combined: NO (no effects), FE (fixed effects), RE (random effects). The overall performance measured by adjusted R squared suggests the choice of one model of 2, 4, 5, 7, 8. In case of $N \gg T$, according to Gujarati (2009), it is recommended to choose a Random Effects Model. Since model 8 is affected by time autocorrelation and the number of periods is small, model 7 has been considered the best in explaining the variance in GDP *per capita* in the period and analysed countries (see Table 6).

It can also be observed that there are no relevant differences between the models selected. When variation between coefficients is larger a significance test (Hausman test, for example - Hausman, 1978) is required to choose between RE or FE models. The results obtained using E-Views program are in line with economic theory. An increase in non-employment by 1 percent, if all other factors remain constant, determines in average a decrease in GDP *per capita* by 0.01%. A positive impact on GDP *per capita* can be seen regarding the coefficients of the variables GFCF and HT. A country's economy based on investment and high-tech employment has a combined mean effect of 0.04% on GDP *per capita*.

Table 6
Panel Country Analysis Using GDP per capita as Dependent Variable

Model Number	Model type		Independent variables			Constant	Adjusted R^2
	Cross-sectional	Time	D(NER)	D(GFCF)	D(HT)		
1	NO	NO	-0.01**	0.01**	0.03**	0.03**	0.54
2	NO	FE	-0.005	0.008**	0.013*	0.035**	0.70
3	NO	RE	-0.006**	0.009**	0.016**	0.035**	0.28
4	FE	NO	-0.011**	0.013**	0.028**	0.036**	0.63
5	FE	FE	-0.006**	0.007**	0.009**	0.03**	0.82
6	FE	RE	-0.0066**	0.007**	0.008**	0.011**	0.53
7	**RE**	**NO**	**-0.01****	**0.013****	**0.028****	**0.036****	**0.59**
8	RE	FE	-0.005**	0.007**	0.01*	0.035**	0.79
9	RE	RE	-0.006**	0.007**	0.012**	0.035**	0.32
Structural Equation model			0.009**	0.014**	0.028**	0.03**	0.58

*parameter significant at 5% level, **parameter significant at 1% level

Source: EUROSTAT, 2011; own calculations

The model explains 59.8% of variable effect variation. This value is reasonable taking into account the practice implication and complexity. Some other variables could also contribute to the increase of explanatory power such as: foreign investment, average level of education in the country, structure of employment, *etc*. Foreign investments and graduate of education in science and technology were tested and found to be non-significant at reasonable levels.

An overall significant model has been also obtained regarding the analysis of the unemployment rate. But in this case, with the exception of the results for GDP *per capita* that proved to have a positive impact in reducing unemployment, the other models outcomes are rather unexpected. Non-agricultural employment, female and part-time employment seems to be positively correlated with unemployment rate, even though the inverse relationship would have been expected (see Table 7).

Table 7

Panel Country Analysis Using Unemployment Rate as Dependent Variable

Model Number	Model type		Independent variables				Constant	Adjusted R^2
	Cross-sectional	Time	D(NAE)	D(LOG (GDP))	D(FEM)	D(PART)		
1	NO	NO	0.36**	-16.75**	1.11**	0.17	0.24	0.58
2	NO	FE	0.32**	-13.55**	1.12**	0.122	0.15	0.61
3	NO	RE	0.34**	-15.51**	1.11**	0.14**	0.21	0.47
4	FE	NO	0.32**	-18.14**	1.142**	0.22*	0.29	0.61
5	FE	FE	0.29**	-18.26**	1.139**	0.163	0.32*	0.63
6	FE	RE	0.30**	-18.26**	1.139**	0.184	0.312*	0.50
7	**RE**	**NO**	**0.35****	**-16.98****	**1.116****	**0.186***	**0.256***	**0.60**
8	RE	FE	0.323**	-14.25**	1.13**	0.13	0.17	0.62
9	RE	RE	0.33**	-15.96**	1.12**	0.15	0.23	0.48
Structural Equation model			0.45**	-29.56**	0.48*	0.088	0.81**	0.45

*parameter significant at 5% level, **parameter significant at 1% level

Source: EUROSTAT, 2011; own calculations

These results are fully explainable taking account of the sample of countries, very different from each other, and the time period under analysis, before and after the economic crisis. In addition, some authors have pointed out that, in difficult times, agriculture is the sector that acts "as a buffer against unemployment by providing some employment, food and income to the most vulnerable groups in society" (Perugini and Signorelli, 2010), while Quintini and Martin (2006) emphasised the fact that part-time employment has a negative effect on reducing unemployment in countries where it is involuntary.

6. Conclusions

Nowadays, global macroeconomic environment is far from a friendly one. The financial and economic crisis is not yet overcome and worrying news comes about the situation of the public deficits in many developed countries. In this context, labour market has to anticipate and to adapt to these new evolutions and the shifts in this global economy in order to avoid transformation of a financial crisis into a social one.

In this paper labour market dynamics in the 27 European Union countries have been examined before and after the global financial and economic crisis in close relationship with economic performances. The goals were to find if 2000-2007 positive labour market developments have continued in 2008-2010, which were the groups of countries that best performed in these difficult times and the key to their success.

The analysis based on data drawn from EUROSTAT on–line statistics database and a mix of statistical methods and econometric models led us to some very interesting conclusions. First, as other authors have already emphasized, 2000-2007 was a period of very good labour market results at the European Union level at a whole, but for Mediterranean and CEE countries, in particular.

However, the results of the period 2008-2010 have proved that these positive trends have not been sustainable and that, rather the places that advanced countries occupy in a ranking of economic performances are more persistent than the growth rates of emerging countries. In other words, the social models based on major investments in labour market active policies (Nordics countries) are still those that give the best results. As for Mediterranean and CEE countries, they have to implement deeper reform in order to successfully deal with all the crisis problems.

Besides trying to keep people in jobs and stressing on the process of creating new ones (in short term), more attention has to be paid to make the employment more attractive for the unemployed, actually to improve the match between the labour supply and demand (in mid and long term).

In the coming years, despite the lack of resources, people will have to invest more in developing new competences and improving their productivity. In this respect, it can be expected that the education system will play a key role in the labour market recovery process.

During this financial crisis labour market is going to be restructured in the entire European Union, the workforce having to fight against the increasing rate of unemployment, the scarcity of labour offer and the pressure of inflation and earnings shortcomings.

If in this moment the main topic is represented by the financial crisis, in the next years the new topic might be one of its main negative secondary effects: the labour market crisis. This is due to the fact that the entire society is actually facing global restructuring phenomena, and nobody knows exactly what it is going to happen.

What can be done for the moment is to start an anticipative process of developing peoples' competences in order to improve the labour market flexibility and, as a consequence, to create a proper environment for a future faster economic recovery.

References:

Ahtonen, S. M. (2004), "Matching across Space: Evidence from Finland." Paper presented at 44th European Congress of the European Regional Science Association Porto, Portugal 25th -29th August.

Bachmann, R., Burda, M. C. (2007), "Sectoral Transformation, Turbulence and Labour Market Dynamics in Germany." SFB 649 Discussion Paper 2007-008 "Economic Risk", paper available at: http://sfb649.wiwi.hu-berlin.de.

Biagi, F., Lucifora, C. (2008), "Demographic and Education Effects on Unemployment in Europe." *Labour Economics*, No.15, pp. 1076–1101.

Boeri, T. (2002), "Let Social Policy Models Compete and Europe Will Win." Paper presented at a conference hosted by the Kennedy School of Government, Harvard University, 11–12 April.

Bouvet, F. (2009), "The Beveridge Curve in Europe: New Evidence Using National and Regional Data." Paper available at: http://euce.org/eusa2009/papers/bouvet_12H.pdf.

Caroleo, F. E., Pastore, F. (2007), "The Youth Experience Gap: Explaining Differences across EU Countries." *Quad Dip Econ Fin Stat*, No. 41, University of Perugia.

Cazes, S., Verick, S., Heuer, C. (2009), "Labour Market Policies in Times of Crisis." International Labour Office (ILO), Employment Working Paper No. 35.

Dolenc, P., Laporšek, S. (2010), "Tax Wedge on Labour and its Effects on Employment Growth in the European Union." *Prague Economic Papers*, No.4, pp. 344-358.

Downes, A. S. (2009), "Labour Market Aspects of the Global Economic Crisis." Paper presented at ILO Conference, April 1-2, Jamaica.

EMCO-COM (2010), *The Employment Crisis: Policy Responses, Their Effectiveness. And the Way Ahead.* Joint Employment Committee and Commission services (EMCO-COM) Paper, Council of The European Union, 31 May, Brussels.

Furia, D., Castagna, A., Mattoscio, N., Scamuffa, D. (2010), "Education and Labour Market in the Age of Globalisation: Some Evidence for EU-27." *Procedia Social and Behavioral Sciences* No. 9, pp. 1140–1444.

Greene W. (2005), *Économétrie*, 5 édition. Pearson Education France, in French language, pp. 283-285.

Gujarati, D. N., Porter, D. C. (2009), *Basic Econometrics*, Mc Graw-Hill International Edition, p. 606.

Hausman, J. A. (1978), "Specification Tests in Econometrics." *Econometrica,* Vol. 46, No 6, pp. 1251–1271.

Hijman, R. (2009), "The Impact of the Crisis on Employment." EUROSTAT, Statistics in focus, 79/2009.

ILO (2009), *Economic Crisis and Labour Market Impacts.* International Labour Organization Job Crisis Observatory, 26 October.

ILO (2011), *Global Employment Trends 2011. The Challenge of a Jobs Recovery.* International Labour Organization.

Kluve, J. (2010), "The Effectiveness of European Active Labour Market Programs." *Labour Economics*, No.17, pp. 904–918.

Marelli, E. (2004), "Evolution of Employment Structures and Regional Specialization in the EU." *Economic Systems*, Vol. 28, pp. 35-59.

Nickell, S., Nunziata, L., Ochel, W., Quintini, G. (2002), "The Beveridge Curve, Unemployment and Wages in the OECD from the 1960 to the 1990s." Paper available at: http://www.nuffield.ox.ac.uk/users/nickell/papers/TheBeveridgeCurve.pdf.

OECD (2010), *Employment Outlook 2010.* Paris: Organization for Economic Cooperation and Development.

Petrongolo, B., Pissarides, C. A. (2001), "Looking into the Black Box: A Survey of the Matching Function." *Journal of Economic Literature* No. 39, pp. 390-431.

Perugini, C., Signorelli, M. (2007), "Labour Market Performance Differentials and Dynamics in EU-15 Countries and Regions." *The European Journal of Comparative Economics*, Vol. 4, No. 2, pp. 209-262.

Perugini, C., Signorelli, M. (2010), "Youth Labour Market Performance in European Regions." *Economic Change and Restructuring,* Vol. 43, No. 2, pp.151-185.

Quintini, G., Martin, S. (2006), "Starting Well or Losing Their Way? The Position of Youth in the Labour Market in OECD Countries." OECD Social Employment and Migration Working Papers, No. 39.

Robson M. (2006), "Sectoral Shifts, Employment Specialization and the Efficiency of Matching: An Analysis Using UK Regional Data." *Regional Studies*, Vol. 40.7, pp. 743-754.

Rose, A. K., Spiegel, M. M. (2011), "Cross-Country Causes and Consequences of the Crisis: An Update." *European Economic Review*, No. 55, pp. 309–324.

Rovelli, R., Bruno, R. (2008), "Labor Market Policies, Institutions and Employment Rates in the EU-27." IZA Discussion Paper No. 3502.

Sapir, A. (2006), "Globalization and the Reform of the European Social Models." *Journal of Common Market Studies*, Vol. 44, No. 2, pp. 369-390.

Wall, H. J., Zoega, G. (2002) „The British Beveridge Curve: A Tale of Ten Regions." *Oxford Bulletin of Economics and Statistics*, Vol. 64, No. 3, pp. 257-276

Wasmer, E. (2002), "Labor Supply Dynamics, Unemployment and Human Capital Investments." IZA Discussion Papers No. 463, Institute for the Study of Labor (IZA)