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# Labour Market Performance Differentials and Dynamics in EU-15 Countries and Regions\*

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## Abstract

The aim of this paper is to contribute to empirical analysis of the differentials, dynamics and determinants of labour market performance in EU-15. One innovation of the paper reflects our decision not to use a single indicator of labour market performance, but to adopt three variables: employment rate, unemployment rate, and long-term unemployment rate. In addition to national data (1997-2006), the use of data at regional NUTS-2 level (1999-2005) is a key characteristic of this study. Empirical analyses are carried out by means of various comparative statistics and econometric approaches. In the latter, a large set of explicative variables is applied to examine the potential determinants of regional (un)employment levels and dynamics.

JEL Classification: R23, P50, J21, J23

Keywords: Compared Labour Market Performance and Indicators, Regional Labour Markets

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## 1. Introduction

The aim of this paper is to contribute to empirical analysis of the differentials, dynamics and determinants of labour market performance across EU-15 in recent years. The topic is particularly attractive due to: (i) the existence (and, partly, persistence) of remarkable national and regional differentials<sup>1</sup>, but also (ii) the unexpected shift from a long period of prevailing “job-less growth” and diverging employment performance to a situation of prevailing “job-rich (low-) growth” and general convergence in EU-15 labour market performance<sup>2</sup>.

In the first part of the paper we briefly review the theoretical and empirical literature on the determinants of labour market performance and differentials (section 2), discuss labour market performance indicators (section 3.1) and place (un)employment evolutions in a more general framework of real dynamics (section 3.2).

The second part of the paper (section 4) first provides a descriptive analysis of differentials, changes and convergence trends in national/regional labour market performance indicators and in employment intensity of growth, by means of basic descriptive and non-parametric techniques. Then, with both cross-section and panel

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<sup>1</sup> Analyses of the regional dimensions of the European labour market have been recently presented in Caroleo and Destefanis (2006). In particular, Amendola et al. (2006) used a dynamic multivariate approach in order to investigate the existence and persistence of regional disparities in Europe.

<sup>2</sup> On the employment intensity of growth see, e.g., Dopke (2001); European Commission (2002); Kapsos (2005). On the dynamics of labour market participation in a global perspective, see Kapsos (2007).

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data econometric analyses, the existence of significant relationships is tested between the main regional labour market performance indicators and four groups of explicative factors: (i) development/growth indicators and sectoral structure, (ii) labour costs, (iii) institutional settings, and (iv) other variables.

## **2. A partial review of literature on (un)employment determinants: Okun's law, labour cost and institutional variables**

As is well-known, an extremely large range of theoretical and empirical literature has analysed the determinants of labour market differentials and performance (both levels and dynamics). As it is impossible to examine all the main studies, we recall here only part of the literature, considered more strictly functional to the aims of this paper. We start from the main results based on the so-called Okun's law, highlighting its limitations which are (mainly) due to neglecting the importance of prices (labour costs and wages) and institutional factors as determinants of labour market performance.

Although the link between labour market performance and per capita GDP level has also been considered<sup>3</sup>, the existing literature has devoted particular attention to relationships between employment/unemployment changes and GDP dynamics. Some preliminary questions are related to the definition of the (main) direction of causality: (i) is it per capita GDP growth (e.g., above a certain threshold) which increases employment (or reduces unemployment)? Or (ii) is it employment growth (or reduction in unemployment) which increases GDP? Or (iii) do both per capita GDP and (un)employment changes depend, mainly or exclusively, on many other variables, so that a simple and direct causal relationship cannot be said to exist? Theoretical discussion of the causal links between output and unemployment (or employment) has always been particularly important in the history of economic research<sup>4</sup>. Considering the aims of this paper, we present only a brief review regarding the last three decades. Okun (1970) defined a coefficient corresponding to the rate of change of real output associated with a given change of the unemployment rate, focusing on an estimation of "potential" GDP. So, in that seminal paper, unemployment was seen as the exogenous variable and real GDP as the dependent variable. In much empirical research estimating the Okun coefficient, causality is mostly assumed to be in the opposite direction, i.e., changes in output explain variations in employment or unemployment. Prachowny (1993) considered the theoretical foundation of Okun's law and derived empirical evidence for the US, supporting the view that the Okun equation is a useful proxy in macroeconomics. Erber (1994) estimated the Okun equation for a number of OECD countries, finding a significant negative correlation between unemployment and growth. Padalino and Vivarelli (1997) found that the Okun equation is still valid in G-7 countries and that the growth-employment link in manufacturing is stronger than for the total economy. Blinder (1997) counted the relation between unemployment and growth among the principles of macroeconomics in which "we should all believe", but he also argued that a simple equation between the percentage change of output and the

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<sup>3</sup> A higher per capita GDP is generally accompanied by higher female participation and employment rates, and by lower under-employment in the agricultural sector.

<sup>4</sup> Rodano (2004) carried out an analysis of the labour market in the history of economic thought, focusing on some of the above questions.

absolute change in unemployment rates is “atheoretical, if not indeed antitheoretical”. Baker and Schmitt (1999) estimated the Okun coefficient for a panel of OECD countries and found that (i) employment intensity of growth was higher in the 1990s than in previous periods, and (ii) foreign growth is a crucial variable for domestic employment dynamics. Lee (2000) estimated the Okun equation for all OECD countries, and stressed that the relationship is not stable over time and that it is different across countries, but concluded that the impact of growth on employment is still valid<sup>5</sup>. Solow (2000) argued that a good deal of European unemployment is due to lack of demand: he used the Okun equation and quantified the output gap for Germany. Gabrisch (2005) applied Okun’s law to test the unemployment-output relationship in the eight countries of Central and Eastern Europe which joined EU in 2004, but found a systematic relationship only in the later stages of transition.

Considering the regional perspective, Freeman (2000) found the high stability of Okun’s coefficient for all time periods and across US regions, whereas Villaverde and Maza (2007) found that an inverse relationship between unemployment and output holds for most of Spanish regions in the period 1980-2004, but the Okun’s coefficients are quite different across regions (partly as a consequence of regional disparities in productivity)<sup>6</sup>. Lastly, Aoki and Yoshikawa (2006) added a “regional” labour sector to a model of output fluctuations and found that Okun’s coefficient increases as the average GDP increases.

Notwithstanding the varying results, all the above studies suggest that the link between (un)employment and growth is still a useful macroeconomic “rule of thumb”.

Flaig and Rottman (2000) criticised the Okun coefficient literature because it neglects the influence of relative prices. Indeed, they argue that the employment intensity of growth is clearly related to real labour cost; consequently, estimating a simple Okun equation is not appropriate, due to incorrect specification. Obviously, the structure and evolution of labour costs and wages are important features of the labour market and, through their link with productivity, profits and consumption, they are also important determinants of economic growth and (un)employment performance. A broad literature has considered wage moderation (and its determinants) as a crucial condition for avoiding poor labour market performance. However, as is well-known, Keynes clearly warned about the macroeconomic risks (and difficulties) of wage reductions, partly due to the effect on consumption decisions. In the last few decades, many researchers have focused on nominal and real wage rigidities as determinants of unemployment. Studies on wage-setting institutions and labour market performances have greatly increased in recent years. For example, the OECD *Job Strategy* recommends policies aimed at increasing wage flexibility, including shifts towards decentralised wage bargaining (OECD, 1994, 1995, 2005a). In a long-run perspective of structural change, Vercelli and Signorelli (1994) considered the wage and occupational instability as part of a general heuristic model of the forms of instability and regulations.

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<sup>5</sup> Lee (2000) also used several methods to calculate the output elasticity of employment or unemployment.

<sup>6</sup> On the empirical analyses of regional GDP and employment dynamics and convergence, see also Perugini and Signorelli (2005b) and Perugini et al. (2005).

In a regional perspective, Montuenga et al. (2006) investigated the wage curve and measurement of wage flexibility in five EU countries, while Sudekum (2006) used some stylised facts of EU-15 regions to present a theoretical model combining a wage curve with increasing returns technology.

Revena and Bentolila (1995) explained that different employment intensity of growth may depend partly on differences in labour market institutions<sup>7</sup>. In many studies, institutions have been analysed not only for their effects on wage levels, differentials and dynamics, but also for their direct effects on labour market performance. Part of the literature considers each institutional factor (e.g., OECD, 1994, 1995; Scarpetta, 1996) as “independent variables”, part considers possible “sets of institutional characteristics” defining different “industrial relations systems” (e.g., Calmfors and Driffill, 1988; Soskice, 1990a; Buti et al., 1998; Signorelli, 2000)<sup>8</sup>. Genda et al. (2001) analysed the huge difference in labour market performance between Japan and Italy and attributed a key role to the degree of uncertainty faced by firms when making employment decisions, and, in particular, the uncertainty generated by the industrial relations systems. Some authors use the concept of “neocorporatism”, with some differences in definition (e.g., Calmfors and Driffill, 1988, p. 24). However, in short, the main indicators used to determine the degree of “neocorporatism” are the level of centralisation of wage negotiations and the degree of bargaining coordination. Some empirical research has found a positive relationship between a country’s economic performance and its degree of “neocorporatism” (e.g., Bruno and Sachs, 1985; Crouch, 1985; Tarantelli, 1986; Soskice, 1990b). These authors argue that a more “neocorporatist” industrial relations system can internalise the main macroeconomic effects of any agreement, allowing better economic performance. Calmfors and Driffill (1988) found a non-monotonic (U-shaped) relationship between the degree of centralised bargaining and economic performance. Decentralised bargaining is constrained by competition in the product market; in centralised negotiations, trade unions and employers internalise most of the negative externalities of wage increases. So, the authors argue that countries with an intermediate type of collective wage bargaining are in the worst situation: interest groups are strong enough to impose their conditions on wage negotiations, but are not sufficiently encompassing to consider the social costs of their actions. It is interesting to highlight that the crucial condition for good performance on the part of decentralised systems is the absence of monopolistic (or oligopolistic) firms which, facing a not infinitely elastic demand curve, may, at least partly, pass wage increases on to their customers by increasing product prices<sup>9</sup>. There are also many difficulties in the classification of the various countries according to the industrial

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<sup>7</sup> In a more general framework, Blanchard (2000a, p. 1403) argued that “*identifying the role of differences in institutions in generating differences in macroeconomic short and medium-run evolutions is likely to be an important topic of research in the future.*”

<sup>8</sup> Assessments of the impact of various industrial relations systems on measures of economic (and employment) performance are very difficult, because of measurement and methodological problems (e.g., Signorelli, 2000; Pieroni and Signorelli, 2002). The method usually adopted in empirical analysis is that of correlating rankings of the various countries according to economic performance indicators and indicators of the level of neocorporatism and/or centralisation of industrial relations. The main factors considered in the literature as indicators of economic performance are the following: 1) real GNP growth rate; 2) inflation rate; 3) unemployment rate; 4) misery index (inflation rate + unemployment rate); 5) productivity growth.

<sup>9</sup> For the crucial importance of a high degree of competition in the product market, see Nickell (1999).

relations systems. For example, Soskice (1990b) claims that Japan and Switzerland were wrongly classified as decentralised systems by Calmfors and Driffill (1988), who neglected to consider the role of powerfully co-ordinated industrial (employer) organisations and networks in those countries. If they were re-classified, Soskice showed that unemployment would be a monotonic decreasing function of the degree of “neocorporatism”. Other significant difficulties for analysis are the questions of determining the primary direction of causality, possible existence of feedbacks, possible strong dependence of outcomes on the period considered, and the (in)stability of relationships<sup>10</sup>. Many other institutional factors, in addition to centralisation and co-ordination of wage bargaining, have been considered in the literature. Some of them<sup>11</sup> are the fiscal wedge, employment protection legislation (EPL), active labour market policies (ALMP), passive labour market policies (PLMP), working time and part-time regulation, and product market regulation. In particular, a number of empirical studies have found that high labour taxes tend to increase unemployment rates (e.g., Belot and van Ours, 2000; Nickell, 1997; Daveri and Tabellini, 2000); other authors are less conclusive (e.g., Scarpetta, 1996; Nunziata, 2003). Strict EPL means higher costs of firing workers, which entails disincentives to hiring in the first place, with reductions in both inflows and outflows from unemployment and ambiguous effects on the unemployment rate. The OECD (2005a) claimed that the depressing effect of EPL on employment was stronger than the effect on aggregate unemployment; Scarpetta (1996) and Elmeskov et al. (1998) found a positive effect in some estimated equations, but Nickell (1997) and Nunziata (2003) found no significant effect. Signorelli (1990 and 1997) highlighted the joint role and interactions of “systemic uncertainty” and “systemic flexibility” (of which labour market flexibility is a part) and their effects on regular and irregular labour demand. According to Blanchard (2005), shocks and institutions (and their interactions) have played a key role in determining the generally bad labour market performance in Europe in the last thirty years. Boeri and Garibaldi (2007) emphasised that, contrary to the predictions of most economic theory, labour market reforms increasing flexibility “at the margin” (i.e., increasing the flexibility for temporary and training contracts), have recently been paying out in terms of employment growth; in particular, they argue that these two-tier labour market reforms have a transitional, “honeymoon”, job-creating effect, which has so far been largely ignored by the literature. Corsini and Guerrazzi (2007) provide a probabilistic evaluation of the transition from temporary to permanent employment in a regional context, and found a stabilisation probability of 61.6%, but with significant variations across worker characteristics. Perugini and Signorelli (2004) highlighted the fact that the 12 European countries which adopted a single currency (January 1999, 2001 for Greece), notwithstanding the restrictive macro-economic policies required to respect the financial convergence goals defined by the Maastricht Treaty criteria (1992) and confirmed in the “Stability and Growth Pact” (1997), have (like the EU-15 aggregation) been characterised by unexpected improvements in (national)

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<sup>10</sup> For example, Calmfors (1993) analysed some of these difficulties and produced more prudent and less general conclusions compared with Calmfors and Driffill (1988).

<sup>11</sup> See, for a brief survey, Employment in Europe 2003 and OECD (2005a). For the complex relationship between employment protection legislation and labour market performance, see OECD, 2004, chapter 2. For the various models of European labour market regulation, see Signorelli (2006).

employment performance (1997-2003) and by  $\sigma$ - and  $\beta$ -convergence trends on both national (1997-2003) and regional (1999-2003) levels. They argued that a positive link between the (surprising) employment performance and the role played by the European Employment Strategy cannot be excluded. As regards more specific labour policies, properly designed ALMP can reduce unemployment by improving efficiency in the job-matching process, but some empirical results are ambiguous or negative (Martin, 2000; Layard et al., 1991; Nickell, 1997; Scarpetta, 1996; Morgan and Mourougane, 2001). Relatively high unemployment benefits (passive labour market policies) which are available for relatively long durations can have negative effects on (un)employment performance, especially by reducing the job search intensity of the unemployed and their willingness to accept job offers. More flexible working time arrangements and the spread of part-time work can favour both labour demand and supply increases, with stronger effects on employment with respect to unemployment. There is also evidence of interactions between labour market institutions and product market regulation (Nickell, 1999; Nicoletti and Scarpetta, 2002; OECD, 2005a and 2005b). In addition, product market deregulation (reducing rents) may pave the way for subsequent labour market reforms (Duval and Elmeskov, 2005). Recently, some authors (e.g., Amable et al., 2006) noted that the coefficient of the interaction term (between product market regulation and EPL) is negative, implying that complementarities exist between the two forms of regulation.

As for researches dealing with sub-national aspects and data, Bollino and Signorelli (2003) considered the institutions as a particular and complex factor of production affecting regional production structures and employment performances, and Monastiriotis (2006) presented a set of labour market flexibility indicators at sub-national level. Lastly, Caroleo and Coppola (2005) confirmed the importance of institutional variables (especially, centralisation of wage bargaining, decentralisation of public expenditure, and the level of bureaucracy) to explain EU regional unemployment disparities.

### **3. Labour market performance indicators and real convergence**

In this section, we first discuss our decision to consider three labour market performance indicators and then briefly present an analysis of (un)employment changes in a more general framework of real dynamics and convergence.

#### **3.1 Labour market performance variables**

A key characteristic of this paper is the use of three indicators of labour market performance. In order to support our decision, we provide a brief review and a theoretical discussion about the use of unemployment and employment variables.

As emphasised by Roncaglia (2004) and Rodano (2004) using an “historical” perspective, for various reasons most of the economic literature considers unemployment indicators as the main proxies of labour market performance. Although for classical economists such as Smith, the focus was on employment (“productive labour”) - since the wealth of nations crucially depends on both labour productivity and the share of productive workers with respect to the total population - subsequent theoretical evolution led to a clearcut tendency towards the use of unemployment rates. Keynes introduced the notion of (involuntary) unemployment, mainly in order to highlight the fact that “effective demand” may be insufficient to

guarantee full employment. The principle of effective demand allows equilibrium income and, consequently, the equilibrium level of employment, to be determined. In this context, unemployment and unemployment rates play a (mainly) passive role and are the consequence of the equilibrium level of income and employment when the (exogenous) labour force is taken into account. Unemployment and unemployment rate became “crucial” in all economic theories focusing on the gap between labour supply and demand - from pre-Keynesian marginalism (e.g., Pigou) to Keynesian neoclassical synthesis and “new Keynesian” approaches, from the monetarist school to rational expectation (market clearing) theories. Obviously, the various economists and schools attributed different roles and definitions to the concept of unemployment: involuntary, short-term or long-term, structural, frictional, natural (natural unemployment rate in the most neoclassical approach and NAIRU - Non-Accelerating Inflation Rate of Unemployment – or NAWRU, Non-Accelerating Wage Rate of Unemployment - in the neo-Keynesian perspective), voluntary and wait unemployment, and so on. Naturally, very different (economic and labour) policy implications derive from the various concepts of unemployment. In addition, if we consider the existence of significant labour market segmentation and the relevance of local labour markets, the role attributed to the aggregate unemployment rate(s) in affecting wage bargaining and dynamics and the tendency towards labour market equilibrium are markedly reduced.

In the growth and development theories, i.e., in a long-term perspective, the focus is mainly on the quantity (and, more recently, the quality) of “labour as a factor of production, growth and development”, but with a generally over-simple definition of the role played by the levels and dynamics of the (working-age) population, labour force, employment and employment rates.

As highlighted by Roncaglia (2004), the unemployment rate is a useful indicator of particularly low labour market performance (and an index of changes in the contractual weight of employees and unions)<sup>12</sup> but, due to the difficulties in correctly defining “full employment”, its exclusive use is questionable and the employment rate should be introduced as a complementary indicator. The usefulness of also considering employment dynamics was already emphasised in past decades (e.g., Valli, 1970), but many authors have recently started to prefer employment indicators (e.g., Frey, 1994; Signorelli, 1997; Moro, 1998; Garibaldi and Mauro, 2002; Tronti, 2002; Marelli, 2004; Perugini and Signorelli, 2004). Other economists (e.g., Blanchard, 2000b p. 324) are aware of the limitations of the unemployment rate as an indicator of labour market performance and attribute some merit to employment (or non-employment) rate indicators; but they are not fully convinced of the opportunity of using both (or of preferring the latter).

In our opinion, employment indicators are preferable to (or should be at least placed beside) unemployment indicators, for the following reasons: (i) there are well-known difficulties and differences in the statistical definition and subjective perception of the unemployment condition, especially regarding “active search for a job”; (ii) the unemployment rate also depends on the participation rate (labour

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<sup>12</sup> In addition, the information supplied by long-term unemployment (and the long-term unemployment rate) remains crucial in assessing labour market performance, since it is an indicator of the degree of persistence of part of the labour supply in unemployment status.

supply), which in turn partly depends on employment rate (job opportunities)<sup>13</sup>, i.e., a discouragement effect may exist; (iii) considering the importance of the fiscal wedge on labour (social contributions and labour income tax), employment rates are also preferable indicators of the sustainability of national welfare systems<sup>14</sup>; (iv) the Lisbon European Council (March 2000) defined total and female employment rates (calculated on a working-age population aged 15-64) as the crucial objective variables that needed to be improved; (v) the (quantitative) employment rate indicators (different from the unemployment rate) may usefully be integrated with some qualitative and quantitative information, such as type of contract (permanent and temporary employment rate, part-time employment rate), work quality (related to general working conditions and characteristics) and the influence of the so-called “working poor” (share of total employed population earning a wage under a certain minimum level).

Obviously, the employment rate (calculated on the working-age population) also has some problems, related to: (i) various (annual, weekly, daily) working hours (e.g., due to different weight of part-time employment), which produce significant differences between “employment” (number of workers) and “labour volume” (e.g., standard labour units or total hours annually worked)<sup>15</sup>, (ii) the weight and changes in the “shadow economy” and “irregular employment” (in terms of both persons involved and total hours worked)<sup>16</sup>, and (iii) the exclusion of “non-market labour activities” (e.g., unpaid household work and unpaid voluntary activities) from the official employment records. Moreover, the ER also depends on the dynamics of the working-age population, which may create paradoxes, e.g., a reduction in working-age population with stable employment (or employment decreasing at a lower per cent rate) produces an increase in employment rate, whereas an increase in working-age population accompanied by a lower per cent increase in employment reduces it. The above limitations may be removed to some extent by considering, in addition, changes in employment rate with respect to total population and the employment dynamic.

We now briefly consider the formal relationship between employment and unemployment rates, in order to show how the use of the UR alone can lead to paradoxical pitfalls in evaluating labour market performance.

The employment rate may be defined as the complement to one of the unemployment rate (divided by 100) multiplied by the participation rate:

$$ER = \frac{E \times 100}{P_{15-64}} = \left( \frac{LF - U}{LF} \right) \times \frac{LF \times 100}{P_{15-64}} = \left( 1 - \frac{UR}{100} \right) \times PR \quad [1]$$

where LF is the Labour force (= employment (E) + unemployment (U)); UR is the Unemployment rate (= unemployment x 100 / labour force); ER is the Employment rate (= employment x 100 / population 15-64); and PR is the Participation rate (= labour force x 100 / population 15-64).

<sup>13</sup> In particular, international and regional comparisons (e.g., Perugini and Signorelli, 2004 and 2005a) show that similar unemployment rates are compatible with significant differences in employment rates.

<sup>14</sup> More broadly, employment rate level and change may also be considered as two minor indicators of the sustainability of public finance dynamics.

<sup>15</sup> An additional indicator is the ratio between total annual hours worked and the working-age population.

<sup>16</sup> The existence of the shadow economy also affects the reliability of the unemployment rate.

In a simple dynamic perspective, it is easy to show that the change in employment rate is compatible with different dynamics of unemployment rate, participation rate, employment, and working-age population.

Starting from equation 1, the unemployment rate may be defined as the complement to one of the ratio between employment rate and participation rate (the result multiplied by 100):

$$UR = \left(1 - \frac{ER}{PR}\right) \times 100 \quad [2]$$

In a simple dynamic perspective, it is easy to show that a reduction in unemployment rate is necessarily accompanied by a per cent increase in the employment rate higher than the per cent increase in the participation rate, i.e., the increase in employment is greater than the increase in the labour force. Obviously, a reduction in unemployment rate is also compatible with a reduction in employment (or per cent ER) if the latter is lower, in absolute terms, than the reduction in labour force (or per cent PR).

Following some of the above considerations, in this paper we use the employment rate in addition to the traditional labour market performance indicator (unemployment rate). We also consider the long-term unemployment rate (calculated on labour force), since a high unemployment rate may be the result of high flows in and out of unemployment, and/or a high average duration of unemployment. Obviously, for the same level of unemployment rate, a higher short-term unemployment rate (less than one year) (STUR) is preferable.

$$LTUR = UR - STUR \quad [3]$$

### 3. 2 A wider approach to real dynamics and convergence

In this section, we briefly discuss labour market performance changes in a more general framework of real dynamics and convergence.

Per capita GDP (level and dynamic) may be decomposed into the basic components of productivity (GDP/E), employment rate (ER=E x 100/ P<sub>15-64</sub>) and a demographic indicator (P<sub>15-64</sub>/P), in both static and dynamic frameworks.

$$\frac{GDP}{P} = \frac{GDP}{E} \times \frac{E}{P} = \frac{GDP}{E} \times ER \times \frac{P_{15-64}}{P} \times \frac{1}{100} \quad [4]$$

Thus, in dynamic terms, per capita GDP changes and convergence/divergence trends are the result of dynamics and convergence/divergence of labour productivity, employment rate, and the share of working age population on total population.

In turn, labour productivity may be decomposed into hourly productivity (GDP/H) and the average working time per employed person (H/E).

$$\frac{GDP}{P} = \frac{GDP}{H} \times \frac{H}{E} \times ER \times \frac{P_{15-64}}{P} \times \frac{1}{100} \quad [5]$$

As regards the real convergence, although the idea of per capita GDP and productivity beta convergence is well rooted in economic theory starting from Solow's contribution (1956), and a lively debate on the topic is still one of the core issues of development and regional economics, the transfer of this conceptual framework to labour market dynamics is not simple, and one should be aware that

GDP growth and employment/unemployment dynamics may differ remarkably. As clearly explained, among others, by Blanchard (2000b) this may be due to: (i) the various possible responses of labour demand to output growth (or decline) (e.g., the *labour hoarding* phenomenon); (ii) the possible combinations of demographic and labour force dynamics in response to (or independent of) output fluctuations. In addition, the dynamics of productivity may also alter the relationship between output and employment (or unemployment). This view is clearly supported by some empirical results for EU countries, in which a long period of prevailing job-less growth and divergent labour market performance dynamics (Bean, 1994; Padalino and Vivarelli, 1997; Solow, 2000; Baici and Samek Lodovici, 2001; Garibaldi and Mauro, 2002; Sapir, 2004; Blanchard, 2005; Perugini and Signorelli, 2004 and 2005b; Marelli, 2000 and 2007) have recently been followed by a job-rich (low-)growth and prevailing convergence dynamics in EU-15 labour market performance (see Section 4.2 in this paper, but also Perugini and Signorelli, 2004, 2005b; Marelli, 2007<sup>17</sup>). However, the derivation of an independent theory of employment/unemployment beta convergence has not been attempted, and is clearly beyond the scope of this paper<sup>18</sup>.

Partially different considerations may be made with reference to a theoretical background for sigma convergence of labour market performance. Although the crucial problem of the definition of a common long-term convergence point persists, in a purely marginalistic framework, the idea of a process of harmonisation of labour market performance and equilibrium states is clearly justified. If indeed the labour market is in every aspect identical to all the other ones<sup>19</sup>, factors of production are perfectly mobile (at both inter-regional and inter-industry levels), and the price (wage) adjustment mechanism is left fully free to do its job, every unbalance in a labour market (e.g., excess of labour supply – that is, unemployment) should result in an adequate, rapid wage dynamic; and the hypothesised perfect integration of all labour markets should guarantee a single wage rate, clearing all markets (and thus permitting the absence of any involuntary unemployment). Of course, this purely

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<sup>17</sup> In a long-term perspective, Marelli (2007) distinguishes three "models" of growth in European countries: (i) an *intensive* model, with large productivity gains, even at the expense of employment; (ii) an *extensive* model, with significant improvements in employment, despite moderate (or even negative) growth rates and thus to the detriment of productivity; (iii) a *virtuous* model, characterised by a significant increase in employment, but even larger value added (and productivity) gains.

<sup>18</sup> In this direction, a preliminary condition would be the definition and acceptance of a concept, corresponding to the "steady state" in growth theory, of a common long-term labour market equilibrium. This concept is of course abundantly available in the literature (see the so-called "natural rate of unemployment" in its many versions), but its validity may be challenged from many perspectives. Following Solow (1990), we reject the restrictive hypotheses of the existence of a single long-term unemployment rate in favour of the more realistic possibility of a range of values that unemployment (and employment) rates may assume, across countries/regions and also in the long term, according to the effects of multiple economic, social and institutional factors and policies. We argue that the above hypotheses on the existence of a range of "equilibrium" (un)employment rates (according to countries/regions and over time) allows us to analyse the dynamics of labour market performance, rejecting the strict hypotheses of convergence to a single "natural equilibrium", but without excluding the possibility of a more general convergence process. In addition, our investigation of the possible dependence of empirical results on the labour market performance indicators used (unemployment versus employment rates) is consistent with the above "heterodox" approach.

<sup>19</sup> As an example of the heroism of this assumption, note that, as reported by Rodano (2004), Walras too would disagree on this point.

theoretical reasoning cannot be simply shifted in terms of “employment” performance, due to the fact that, as shown earlier, the same unemployment rate would be compatible with several employment rates, due to labour force participation (labour supply) dynamics.

In any case, in our opinion, the use of (un)employment sigma and beta converge analysis should be considered a useful descriptive tool, functional in (i) considering the contribution of labour market performance to the traditional real convergence dynamics of development levels, and (ii) comparing the per capita GDP, productivity and ER dynamics and convergence between different areas (as in Section 4.3, Figure 1) and (iii) assessing the process of convergence towards EU policy objectives.

From the first point of view, as emphasised by Esteban (2000), the inconclusiveness of convergence/divergence theory and empirics in a growth environment may be attributed to the fact that per capita income levels and changes depend on the interaction of various economic, productive, demographic and structural factors which unfold over time. The importance of accounting for these aspects was clearly put forward by Boldrin and Canova (2001, p. 217), who stress how the gap between the various convergence/divergence theories (predicting labour productivity dynamics) and empirical tests (which broadly adopt per capita incomes) is simply bridged by assuming full employment, neglecting the roles played by labour market performance dynamics. In particular, for the EU regions, Boldrin and Canova (2001) consider convergence patterns for per capita GDP as a whole and for labour productivity and unemployment rates separately. Similar considerations about the role of labour market performance on per capita GDP dynamics are also provided, for example, by Azzoni and Silvera-Neito (2005), Cuadrado-Roura et al. (2000), Ezcurra et al. (2005), Camagni and Cappellin (1985), Perugini and Bracalente (2006) and Marelli (2007). More in general, all the literature concerned with the decomposition of per capita GDP into its various components (both statically and dynamically), often using a shift-share approach, may be directly linked to this point<sup>20</sup>. This provides, in our opinion, the first strong argument on the usefulness of explicitly applying convergence analysis to labour market performance, especially in those contexts - as in many European regions - where development delays may be more a matter of employment than of productivity lags and where, consequently, productivity growth rates may be accompanied by different (un)employment dynamics, producing complex patterns of per capita GDP convergence processes.

As already noted, the convergence approach to labour market performance is also related to a more policy-making framework, with specific bearing on the EU. The well-known EU cohesion objectives (*via* the reduction of development disparities) also depend on re-balancing the outstanding gaps of regional labour market performance, and this is clearly incorporated in the so-called European Employment Strategy (EES). As is well-known, the EES was launched during the 1997 Luxembourg Job Summit as an “open method of coordination”, and one of its most important novelties was the definition of three quantitative objectives at the 2000 Lisbon Council (which also integrated the EES into the so-called Lisbon Strategy) and the 2001 Stockholm Council. The targets are based on the following

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<sup>20</sup> For the most famous examples, see Dunn (1960), Duro and Esteban (1998), Esteban (2000), Kamarianakis and Le Gallo (2003), Dall’Erba et al. (2005), Ezcurra et al. (2005) and Benito and Ezcurra (2005).

indicators: (1) total employment rate, ER (=employment x 100/P<sub>15-64</sub>) of 70% by 2010; (2) female ER (=female employment x 100/female P<sub>15-64</sub>) higher than 60% by 2010; and (3) older worker employment rate (= employed persons from 55 to 64 years old x 100/P<sub>55-64</sub>) exceeding 50% by 2010. So the EU policy targets clearly envisage a convergence pattern, within a given point in time, of labour market performance towards specific targets.

In short, the above considerations provide motivations for the study (of sigma and beta convergence) and comparison of evidence (US vs. EU-15) presented in sections 4.2 and 4.3. In addition, they may serve as a starting point for future research efforts.

#### 4. Compared empirical evidence and econometric analyses

In this section, we first present compared empirical evidence at both national and regional levels, and then produce various econometric estimates of the determinants of regional labour market performance differentials and dynamics. In particular, the econometric analyses of section 4.4 are preceded by a data description (section 4.1), descriptive analyses (section 4.2) and a brief empirical discussion of the relationship between (un)employment and GDP growth (section 4.3).

##### 4.1 Data

The labour market and economic data used here are entirely drawn from the on-line Eurostat dataset and refer to the 15 countries (and their NUTS 2 level regions) of the European Union before the 2004 enlargement<sup>21</sup>. Only data on GDP (at 1995 constant prices, transformed into purchasing power parity) and population are from Cambridge Econometrics Ltd.

In our empirical analyses, coverage of the datasets changes according to the availability of the statistical information needed. The descriptive statistics of section 4.2 are limited to the three basic labour market indicators, i.e., employment rate (ER), unemployment rate (UR) and long-term unemployment rate (LTUR), observed over the decade 1997-2006 for the 15 EU countries<sup>22</sup> and over the period 1999-2005 for their NUTS 2 regions<sup>23</sup>. Some regions have many missing values and were therefore excluded<sup>24</sup>; some other missing data for other regions were estimated by linear interpolation using, where possible, information from the NUTS 1 level. This first regional dataset is composed of 203 regions. As regards the regional analysis presented in sections 4.3 and 4.4, the set of regions considered had to be further

<sup>21</sup> The availability of the data of interest (at regional level) partly constrains analysis, especially in terms of duration. The still ongoing process of transition to a market economy and its consequences on labour market dynamics led us to exclude the new EU members of Central and Eastern Europe from the analysis. Their inclusion would also have implied a further narrowing of the time-span of the dataset.

<sup>22</sup> As for the national level, although a longer period was available, we decided to consider the decade following the launch of the European Employment Strategy.

<sup>23</sup> GDP data for 2005 at regional level are forecasts from Cambridge Econometrics.

<sup>24</sup> These are: fi20 – Åland (Finland); fr91 – Guadeloupe, fr92 – Martinique, fr93 – Guyane, fr94 – Réunion (France); es63 - Ciudad Autónoma de Ceuta, es64 - Ciudad Autónoma de Melilla (Spain); pt20 - Região Autónoma dos Açores, pt30 Região Autónoma da Madeira (Portugal). The other insular Spanish region of Canarias (es70) was also excluded, in view of the problems arising with “remote” observations when spatial econometric tools are used (see sections 4.3 and 4.4).

reduced, due to lack of data referring to institutional features. This second dataset is thus composed of 187 regions of the EU-15 countries (excluding Ireland, Greece and Luxembourg) observed over a seven-year period (1999-2005)<sup>25</sup>. A list of the regions considered in the various analyses is reported in table A3 of the appendix, while a short description of all the indicators used can be found in table A4.

## 4. 2 Compared evidence and descriptive analyses

We limit descriptive analysis here to three labour market performance indicators (ER, UR, LTUR) at both national and regional levels, assumed as possible endogenous variables in the following econometric testing. We provide some basic compared evidence; descriptive diagrams (box plots and k-density estimations<sup>26</sup>) of the shape of the distributions and their evolution; diagrams plotting convergence/divergence patterns of sigma (trend of coefficient of variation) and beta (Lowess density estimation<sup>27</sup>) type; transition matrixes (only for regional level) showing the probability of a region of moving, over the period considered, to the next or previous quintiles of the distribution.

When assessed in terms of ER, the country-level labour market performance in EU-15, notwithstanding a reduced output growth rate, revealed a widespread and unexpected improvement in the decade 1997-2006. In particular, the very good performance of Spain, Ireland, Italy, Finland and Greece are to be emphasised (Table 1). The increase in ER especially regarded female and elderly employment (Table A1 and A2 in Appendix). The general labour market performance improvements reduced the significant gap of the EU-15 (average) countries with the performances of the US and Japan. It should be noted that some EU countries (Austria, Denmark, Netherlands, Sweden, UK) present similar or better performances compared with the US and Japan.

During the decade 1997-2006, the EU-15 countries experienced a surprising and generalised increase in employment (in the 15-64 age group) of 12.5%, more than 18 million new jobs - double with respect to the increase in the 15-64 population (table 2). In particular, the employment change was especially remarkable in Spain (+47.9%) and Ireland (+45.5%).

That considerable net job creation was completely due to increases in the number of employees, especially with permanent contracts (more than two-thirds of the total employment increase). Employees with temporary contracts increased by around 5.8 million. Half of the total net job creation (more than 9 million workers) was due to the increase in the spread of part-time employment.

<sup>25</sup> The 13 Greek regions were excluded due to lack of data on levels of Bargaining Centralisation and Coordination; Luxembourg was excluded due to lack of data on Bargaining Centralisation, Employment Protection Legislation, Product Market Regulation and Active Labour Market Policies expenditures. For the two Irish regions, the adopted labour cost indicator was not available.

<sup>26</sup> The plots obtained by a Kernel density (K-density) estimation (Silverman, 1986) are density distributions considered as the continuous equivalents of histograms, in which the number of intervals tends towards infinity. The point on the curve associated with any level of the variable may be interpreted as the likelihood a unit of the distribution has in assuming that level of the variable.

<sup>27</sup> Lowess (locally weighted scatterplot smoothing) estimation is a non-parametric technique for estimating the relationship between two variables (in our case, between growth and the initial values of the indicator). In the empirical literature, the technique has gained remarkable importance, since it is able (compared with parametric estimates) to reveal graphically the existence of complex beta convergence/divergence relationships (e.g., club convergence).

Table 1. Employment rate (ER) levels and dynamics

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Δ 1997-2006 <sup>1</sup>	
											p. p.	%
EU-15	60.7	61.4	62.5	63.4	64.0	64.2	64.3	64.7	65.2	66.0	+5.3	+8,7
EMU-12	58.4	59.2	60.4	61.5	62.2	62.4	62.6	63.0	63.5	64.5	+6.1	+10,4
Belgium	56.8	57.4	59.3	60.5	59.9	59.9	59.6	60.3	61.1	61.0	+4.2	+7,4
Denmark	74.9	75.1	76.0	76.3	76.2	75.9	75.1	75.7	75.9	77.4	+2.5	+3,3
Germany	63.7	63.9	65.2	65.6	65.8	65.4	65.0	65.0	65.4	67.2	+3.5	+5,5
Ireland	57.6	60.6	63.3	65.2	65.8	65.5	65.5	66.3	67.6	68.6	+11.0	+19,1
Greece	55.1	56.0	55.9	56.5	56.3	57.5	58.7	59.4	60.1	61.0	+5.9	+10,7
Spain	49.5	51.3	53.8	56.3	57.8	58.5	59.8	61.1	63.3	64.8	+15.3	+30,9
France	59.6	60.2	60.9	62.1	62.8	63.0	63.3	63.1	63.1	63.0	+3.4	+5,7
Italy	51.3	51.9	52.7	53.7	54.8	55.5	56.1	57.6	57.6	58.4	+7.1	+13,8
Luxembourg	59.9	60.5	61.7	62.7	63.1	63.4	62.2	62.5	63.6	63.6	+3.7	+6,2
Netherlands	68.5	70.2	71.7	72.9	74.1	74.4	73.6	73.1	73.2	74.3	+5.8	+8,5
Austria	67.8	67.9	68.6	68.5	68.5	68.7	68.9	67.8	68.6	70.2	+2.4	+3,5
Portugal	65.7	66.8	67.4	68.4	69.0	68.8	68.1	67.8	67.5	67.9	+2.2	+3,3
Finland	63.3	64.6	66.4	67.2	68.1	68.1	67.7	67.6	68.4	69.3	+6.0	+9,5
Sweden	69.5	70.3	71.7	73.0	74.0	73.6	72.9	72.1	72.5	73.1	+3.6	+5,2
U. K.	69.9	70.5	71.0	71.2	71.4	71.3	71.5	71.6	71.7	71.5	+1.6	+2,3
<i>Coeff. of var.</i>	<i>0.118</i>	<i>0.113</i>	<i>0.109</i>	<i>0.103</i>	<i>0.101</i>	<i>0.096</i>	<i>0.090</i>	<i>0.082</i>	<i>0.079</i>	<i>0.081</i>		
U. S.	73.5	73.8	73.9	74.1	73.1	71.9	71.2	71.2	71.5	n.a.	-2.0	-2.7%
Japan	70.0	69.5	68.9	68.9	68.8	68.2	68.4	68.7	69.3	n.a.	-0.7	-1.0%

Note: (1) Δ 1997-2005 for US and Japan. Source: Eurostat (online database).

Table 2. 15-64 Employment and population changes (1997-2006; absolute value and %)

	Δ 1997-2006	% Δ 1997-2006	Δ 1997-2006	Δ 1997-2006 Employees		Δ 1997-2006
	Employment	Employment	Population	Total <sup>1</sup>	Temporary <sup>1</sup>	Part time <sup>2</sup>
EU-15	+18,704,500	+12,5	+9,165,500	+18,527,200	+5,787,200	+9,133,000
EMU-12	+16,858,300	+14,4	+7,769,100	+16,732,100	+5,853,100	+8,528,500
Belgium	+425,700	+11,2	+238,500	+441,600	+115,100	+370,500
Denmark	+129,100	+4,9	+58,100	+118,300	-43,600	+48,800
Germany	+1629,900	+4,7	-411,000	+1295,400	+1,079,600	+3,308,900
Ireland <sup>3</sup>	+624,600	+45,5	+535,600	+608,500	-44,800	-85,900
Greece	+611,800	+16,3	+366,300	+718,600	+72,500	+79,700
Spain	+6,349,000	+47,9	+3,478,800	+6,069,400	+2,118,000	+1,255,000
France	+2,674,400	+12,2	+2,385,100	+2,848,900	+454,100	+571,300
Italy	+2,781,400	+14,0	+30,900	+2,560,900	+1,080,200	+1,587,100
Luxembourg	+26,900	+16,0	+26,600	+26,700	+7,600	+19,700
Netherlands	+904,000	+12,5	+411,900	+882,800	+458,700	+1,050,900
Austria	+270,100	+7,5	+212,000	+285,600	+64,700	+305,700
Portugal	+303,800	+6,7	+410,200	+663,600	+407,100	+51,400
Finland	+256,400	+11,9	+84,100	+330,000	+40,200	+93,100
Sweden	+421,600	+10,7	+303,400	+476,900	+260,200	+125,300
U. K.	+1,295,700	+4,9	+1,035,000	+1,199,900	-282,600	+430,300

Note: (1) Total and Temporary contracts for employees may be par- time or full-time; (2) part-time employment may be (i) permanent or temporary contracts for employees and (ii) self-employment; (3) Ireland 1997-2005 (2006 data not available).

Source: Eurostat (on line database).

As highlighted in table 3, the significant cross-countries differential in total ER are also reflected in huge differences in “employees ER”, “temporary ER” and

“part-time ER”. The three indicators, calculated on the 15-64 population, range (i) from 39.3 in Greece to 70.7 in Denmark, as for “employees ER”, (ii) from 1.9 in Ireland to 18.2 in Spain, as for “temporary ER”, (iii) from 2.7 in Ireland to 34.0 in Netherlands, as for “part-time ER”.

**Table 3. ER (1997 and 2006) distance to Lisbon objective levels and (2006) 15-64 ER composition**

	(1997) 2006 ER distance to EU goal <sup>1</sup>	2006 ER	2006 Employees ER	2006 Temporary ER <sup>2</sup>	2006 Part time ER <sup>3</sup>
EU-15	(-9.3) -4.0	66.0	56.0	8.2	13.2
EMU-12	(-11.6) -5.5	64.5	54.3	9.0	12.2
Belgium	(-11.6) -9.0	61.0	52.1	4.5	13.4
Denmark	(+4.9) +7.4	77.4	70.7	6.3	17.7
Germany	(-6.3) -2.8	67.2	59.8	8.7	17.0
Ireland <sup>4</sup>	(-12.4) -1.4	68.6	58.0	1.9	2.7
Greece	(-14.9) -9.0	61.0	39.3	4.2	3.3
Spain	(-20.5) -5.2	64.8	53.4	18.2	7.7
France	(-10.4) -7.0	63.0	56.0	7.5	10.8
Italy	(-18.7) -11.6	58.4	43.5	5.7	7.6
Luxembourg	(-10.1) -6.4	63.6	58.6	3.6	10.9
Netherlands	(-1.5) +4.3	74.3	65.3	10.7	34.0
Austria	(-2.2) +0.2	70.2	61.2	5.5	14.9
Portugal	(-4.3) -2.1	67.9	54.2	11.2	5.5
Finland	(-6.7) -0.7	69.3	60.8	9.9	9.3
Sweden	(-0.5) +3.1	73.1	65.8	11.2	17.3
U. K.	(-0.1) +1.5	71.5	62.3	3.5	17.5

Note: (1) 70% (as defined by Lisbon Council in 2000); (2) Temporary ER = 15-64 temporary employees x 100 / 15-64 population. Temporary contracts for employees may be part-time or full-time; (3) Part-time ER = 15-64 part-time employment x 100 / 15-64 population. Part-time may be (i) permanent or temporary contracts for employees and (ii) self-employment; (4) Ireland 1997-2005 (2006 data not available).

Source: Eurostat (on line database) and our elaboration on Eurostat data.

A positive correlation exists between total ER and part-time ER, whereas the opposite occurred with the weight of the “shadow economy” (Figures A2 and A1 in Appendix).

The parts of diagrams 1 and 2 referring to ER supply complementary information about the shape and evolution of its distribution. As highlighted by the box plots, the large variability of the distribution in 1997 (ranging from 49.5 in Spain to 74.9 in Denmark) partly declined in 2006 (ranging from 58.4 in Italy to 77.4 in Denmark). This sigma convergence trend of national ER is also highlighted by the descending trend of the coefficient of variation (table 1 and diagram 2a). Similarly, a clear beta-type convergence pattern also emerges (diagram 2.b), revealing a catching-up process by countries with the lowest performance in 1997, which underwent greater improvements towards the main quantitative objective of the European Employment Strategy.

The compared evidence on unemployment rates (table 4 and related diagrams) shows a partially different picture. In three out of 15 countries, the UR increased during the period, while the improvements of Spain, Ireland, Finland and Italy were considerable. In terms of overall distribution dynamics (diagram 1 – box plots; diagrams 2a and 2c), the trend is not very different from that observed for ER. However, while beta convergence patterns clearly emerged, sigma convergence only started in 2000. Compared with ER, the remarkable differences (a) in the level of variability of the distribution (the UR coefficient of variation is approximately 3 times that of ER) and (b) in the clearcut bimodality of the distribution of UR (diagram 1), should in any case be noted, since they highlight the persisting polarisation of two “clubs” of UR performers.

Table 4. Harmonized unemployment rate (UR) levels and dynamics

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Δ 1997-2006	
											p. p.	%
EU-15	9.8	9.2	8.5	7.6	7.2	7.5	7.9	8.0	7.9	7.4	-2.4	-24.5
EMU-12	10.5	10.0	9.1	8.2	7.8	8.2	8.7	8.8	8.6	7.9	-2.6	-24.8
Belgium	9.2	9.3	8.5	6.9	6.6	7.5	8.2	8.4	8.4	8.2	-1.0	-10.9
Denmark	5.2	4.9	5.2	4.3	4.5	4.6	5.4	5.5	4.8	3.9	-1.3	-25.0
Germany	9.1	8.8	7.9	7.2	7.4	8.2	9.0	9.5	9.5	8.4	-0.7	-7.7
Ireland	9.9	7.5	5.7	4.2	4.0	4.5	4.7	4.5	4.3	4.4	-5.5	-55.6
Greece	9.8	10.8	12.0	11.2	10.7	10.3	9.7	10.5	9.8	8.9	-0.9	-9.2
Spain	16.7	15.0	12.5	11.1	10.3	11.1	11.1	10.6	9.2	8.5	-8.2	-49.1
France	11.5	11.1	10.5	9.1	8.4	8.7	9.5	9.6	9.7	9.5	-2.0	-17.4
Italy	11.3	11.3	10.9	10.1	9.1	8.6	8.4	8.0	7.7	6.8	-4.5	-39.8
Luxembourg	2.7	2.7	2.4	2.3	2.0	2.7	3.7	5.1	4.5	4.7	+2.0	+74.1
Netherlands	4.9	3.8	3.2	2.8	2.2	2.8	3.7	4.6	4.7	3.9	-1.0	-20.4
Austria	4.4	4.5	3.9	3.6	3.6	4.2	4.3	4.8	5.2	4.8	+0.4	+9.1
Portugal	6.8	5.1	4.5	4.0	4.0	5.0	6.3	6.7	7.6	7.7	+0.9	+13.2
Finland	12.7	11.4	10.2	9.8	9.1	9.1	9.0	8.8	8.4	7.7	-5.0	-39.4
Sweden	9.9	8.2	6.7	5.6	4.9	4.9	5.6	6.3	7.4	7.1	-2.8	-28.3
U. K.	6.8	6.1	5.9	5.3	5.0	5.1	4.9	4.7	4.8	5.3	-1.5	-22.1
<i>Coeff. of var.</i>	<i>0.419</i>	<i>0.435</i>	<i>0.449</i>	<i>0.474</i>	<i>0.471</i>	<i>0.419</i>	<i>0.358</i>	<i>0.317</i>	<i>0.300</i>	<i>0.294</i>		
U. S.	4.9	4.5	4.2	4.0	4.8	5.8	6.0	5.5	5.1	4.6	-0.3	-6.1
Japan	3.4	4.1	4.7	4.7	5.0	5.4	5.3	4.7	4.4	4.1	+0.7	+20.6

Source: Eurostat (online database).

Table 5. Harmonized long-term unemployment rate (LTUR) levels and dynamics

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Δ 1997-2006 <sup>1</sup>	
											p. p.	%
EU-15	4.8	4.3	3.9	3.4	3.1	3.1	3.3	3.4	3.3	3.1	-1.7	-35.4
EMU-12	5.4	5.0	4.4	3.9	3.5	3.6	3.9	4.0	3.8	3.6	-1.8	-33.3
Belgium	5.4	5.6	4.8	3.7	3.2	3.7	3.7	4.1	4.4	4.2	-1.2	-22.2
Denmark	1.5	1.3	1.1	0.9	0.9	0.9	1.1	1.2	1.1	0.8	-0.7	-46.7
Germany	4.6	4.5	4.1	3.7	3.7	3.9	4.5	5.4	5.0	4.7	+0.1	+2.2
Ireland	5.6	3.9	2.4	1.6	1.3	1.3	1.5	1.6	1.5	1.4	-4.2	-75.0
Greece	5.3	5.8	6.5	6.1	5.5	5.3	5.3	5.6	5.1	4.8	-0.5	-9.4
Spain	8.7	7.5	5.7	4.6	3.7	3.7	3.7	3.4	2.2	1.9	-6.8	-78.2
France	4.7	4.5	4.1	3.5	3.0	3.0	3.7	3.9	4.0	4.0	-0.7	-14.9
Italy	7.3	6.8	6.7	6.3	5.7	5.1	4.9	4.0	3.9	3.4	-3.9	-53.4
Luxembourg	0.9	0.9	0.7	0.6	0.6	0.7	0.9	1.1	1.2	1.4	+0.5	55.6
Netherlands	2.3	1.5	1.2	0.8	0.6	0.7	1.0	1.6	1.9	1.7	-0.6	-26.1
Austria	1.3	1.3	1.2	1.0	0.9	1.1	1.1	1.3	1.3	1.3	0.0	0.0
Portugal	3.2	2.2	1.8	1.7	1.5	1.7	2.2	2.9	3.7	3.8	+0.6	+18.8
Finland	4.9	4.1	3.0	2.8	2.5	2.3	2.3	2.1	2.2	1.9	-3.0	-61.2
Sweden	3.1	2.6	1.9	1.4	1.0	1.0	1.0	1.2	1.2	1.1	-2.0	-64.5
U. K.	2.5	1.9	1.7	1.4	1.3	1.1	1.1	1.0	1.0	1.2	-1.3	-52.0
<i>Coeff. of var.</i>	<i>0.549</i>	<i>0.591</i>	<i>0.655</i>	<i>0.711</i>	<i>0.725</i>	<i>0.685</i>	<i>0.633</i>	<i>0.595</i>	<i>0.576</i>	<i>0.579</i>		
U. S.	0.4	0.4	0.3	0.2	0.3	0.5	0.7	0.7	0.6	n.a.	+0.2	+50.0
Japan	0.7	0.8	1	1.2	1.3	1.7	1.8	1.6	1.5	n.a.	+0.8	+114.3

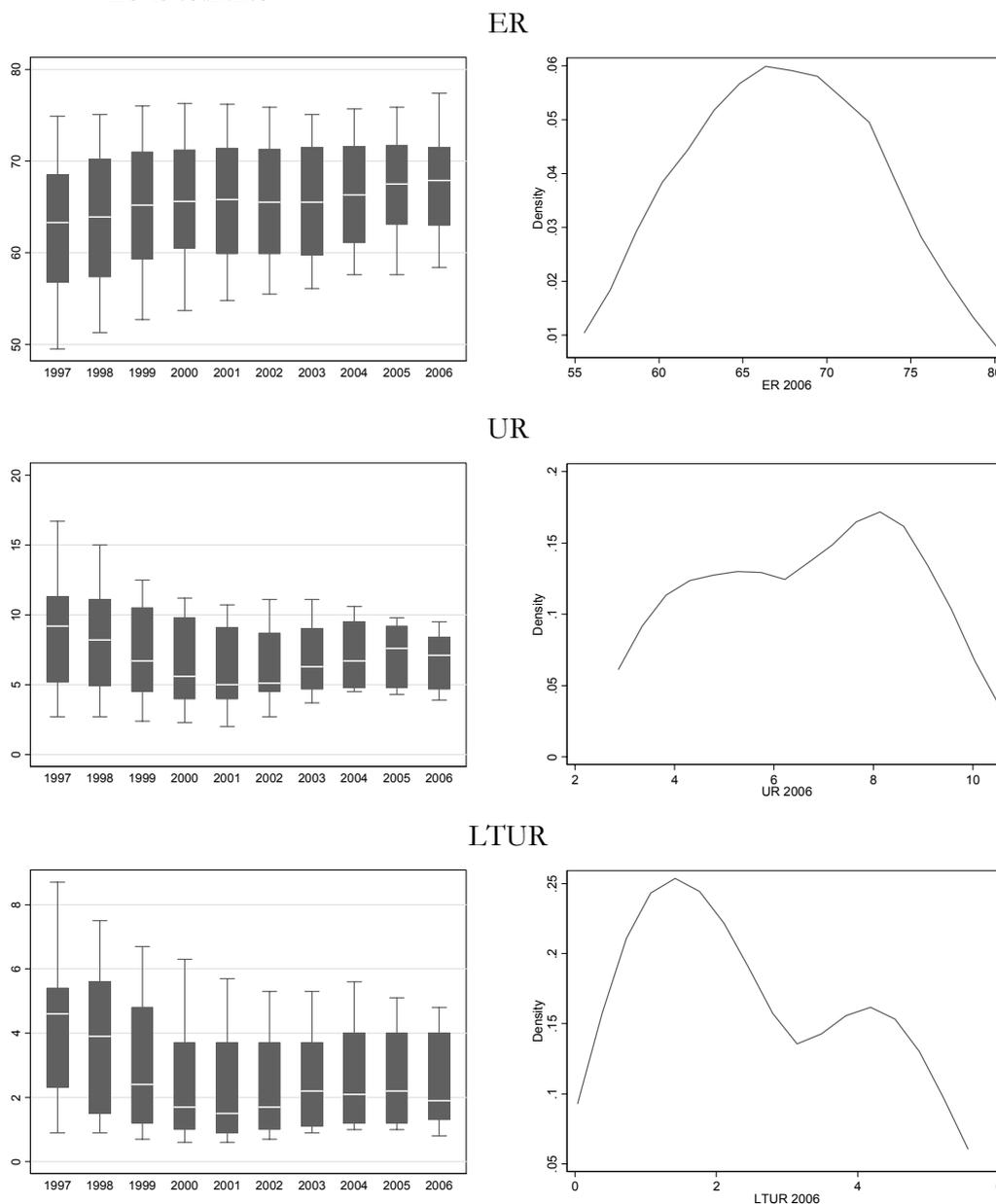
Note: (1) LTUR = long-term unemployment x 100 / labour force

(2) Δ 1997-2005 for US and Japan

Source: Eurostat (online database).

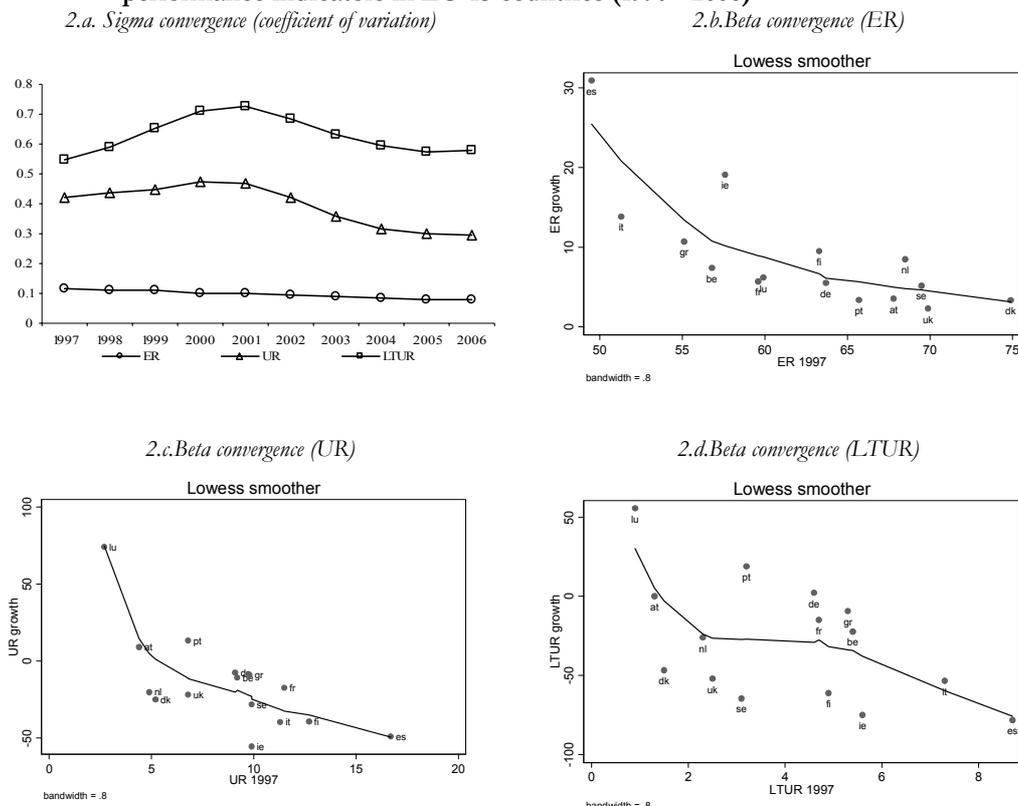
As for LTUR, remarkably good performance by Spain, Ireland, Italy and Finland emerged inside a generally positive framework. LTUR had a much higher level of dispersion compared with UR and, especially, ER. A sigma convergence trend has emerged since 2001 (table 5 and diagram 2a), whereas beta convergence was clearcut during the period (diagram 2c). The bimodality of the distribution of LTUR is more evident when compared with UR (diagram 1).

**Diagram 1. Box plots (1997-2006) and k-density estimates (2006) of basic labour market indicators in EU-15 countries**



Source: our elaborations on Eurostat data (online database).

**Diagram 2. Sigma and beta (non-parametric) convergence dynamics of labour market performance indicators in EU-15 countries (1997 - 2006)**



Source: our elaborations on Eurostat data (online database).

Moving on now to regional level descriptive analysis, a first observation regards the median performance over the period considered, which is positive for ER but shows a U-shape for unemployment indicators (table 6, diagram 3).

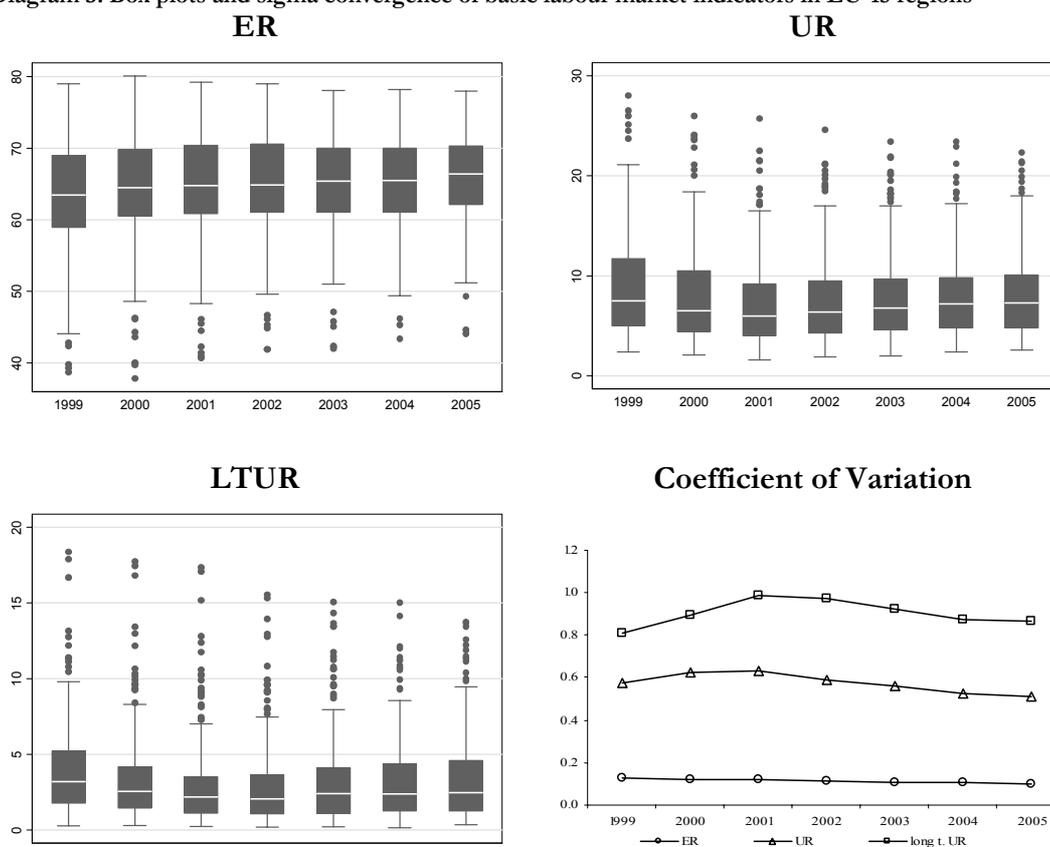
**Table 6. Summary statistics for labour market performance indicators of EU-15 regions**

	1999	2000	2001	2002	2003	2004	2005
<b>ER</b>							
Mean	63.1	64.2	64.7	64.8	65.1	65.1	65.8
Median	63.5	64.5	64.8	64.9	65.4	65.5	66.4
Minimum	38.7	37.8	40.7	41.9	42.0	43.4	44.1
Maximum	79.0	80.1	79.2	79.0	78.1	78.2	78.0
<i>Coeff. of variation</i>	<i>0.125</i>	<i>0.122</i>	<i>0.119</i>	<i>0.115</i>	<i>0.109</i>	<i>0.103</i>	<i>0.100</i>
<b>UR</b>							
Mean	9.1	8.1	7.3	7.6	7.9	8.1	8.1
Median	7.5	6.5	6.0	6.4	6.8	7.2	7.3
Minimum	2.4	2.1	1.6	1.9	2.0	2.4	2.6
Maximum	28.0	26.0	25.7	24.6	23.4	23.4	22.3
<i>Coeff. of variation</i>	<i>0.575</i>	<i>0.623</i>	<i>0.631</i>	<i>0.589</i>	<i>0.560</i>	<i>0.527</i>	<i>0.510</i>
<b>LTUR</b>							
Mean	4.1	3.6	3.1	3.1	3.3	3.4	3.4
Median	3.2	2.6	2.2	2.1	2.4	2.4	2.5
Minimum	0.3	0.3	0.2	0.2	0.2	0.2	0.4
Maximum	18.4	17.7	17.4	15.5	15.1	15.0	13.7
<i>Coeff. of variation</i>	<i>0.810</i>	<i>0.891</i>	<i>0.985</i>	<i>0.972</i>	<i>0.925</i>	<i>0.875</i>	<i>0.866</i>

Source: our elaborations on Eurostat data (online database).

The extent of the distribution of ER in 1999 ranges from 38.7 (itf6 – Calabria, Italy) to 79.0 (ukj1 Berkshire, Bucks and Oxfordshire, UK) and falls in 2005 (from 44.1 of itg1 – Sicily, Italy, to 78.0 of ukj1 Berkshire, Bucks and Oxfordshire, UK). The decreasing trend in the variability of the distribution shows sigma convergence (diagram 3), as also witnessed by the increased probability of falling in the modal value of the k-density distribution (diagram 4). This process is clearly accompanied by very widespread growth of regional ER, corresponding to a clearcut forward movement of the distribution. The relatively stronger ER growth over the period of the worst performers in 1999 produces a marked beta convergence trend.

Diagram 3. Box plots and sigma convergence of basic labour market indicators in EU-15 regions



Source: our elaborations on Eurostat data (online database).

Complementary information can be drawn from the transition probability matrix of table 7. The distribution of ER (and subsequently of UR and LTUR) are divided into five quintiles, and row reading of the matrix highlights the probability of a region persisting in the same quintile of distribution (along the diagonal) or moving to the next or previous one. For example, a region falling in the first quintile of the ER distribution in 1999 had probabilities of 83% of persisting in the same relative position and of 17% of moving to the next one during the seven years considered. As regards the second quintile in 1999, the probability of moving to a higher class was more than three times that of going down to the first quintile. Similarly, the probability of a region in the third quintile in 1999 of going forward was more than

double that of going backwards. It is also interesting to note how persistence probability increases as position in the initial distribution increases.

**Table 7. Transition matrixes: probability of moving to another quintile for the EU-15 regions (1999-2005)**

<i>ER</i>						
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>Total</i>
<i>1</i>	82.8	16.8	0.4	0.0	0.0	100.0
<i>2</i>	6.2	74.0	19.8	0.0	0.0	100.0
<i>3</i>	0.0	6.8	77.3	15.9	0.0	100.0
<i>4</i>	0.0	0.0	6.9	78.1	15.1	100.0
<i>5</i>	0.0	0.0	0.0	9.2	90.8	100.0
<i>Total</i>	18.8	19.5	21.1	20.1	20.5	100.0

<i>UR</i>						
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>Total</i>
<i>1</i>	85.0	15.0	0.0	0.0	0.0	100.0
<i>2</i>	16.5	61.9	20.8	0.9	0.0	100.0
<i>3</i>	0.5	22.5	57.7	19.4	0.0	100.0
<i>4</i>	0.5	2.4	19.1	72.3	5.7	100.0
<i>5</i>	0.0	0.0	0.4	14.1	85.5	100.0
<i>Total</i>	22.6	20.1	19.2	19.8	18.3	100.0

<i>LTUR</i>						
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>Total</i>
<i>1</i>	84.2	15.3	0.5	0.0	0.0	100.0
<i>2</i>	23.5	62.4	13.7	0.4	0.0	100.0
<i>3</i>	0.0	21.8	57.6	20.5	0.0	100.0
<i>4</i>	0.0	3.6	27.1	61.3	8.0	100.0
<i>5</i>	0.0	0.0	0.0	10.0	90.0	100.0
<i>Total</i>	21.5	21.0	20.1	18.7	18.7	100.0

Source: our elaborations on Eurostat data (online database).

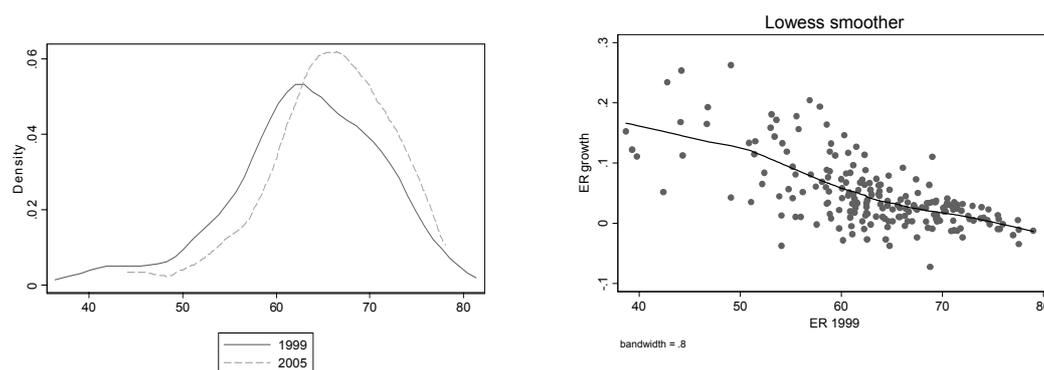
A slightly different picture of EU-15 regional labour markets emerges when the UR and LTUR indicators are considered. As already noted, the mean and median trends first decreased and then, after 2001, increased. That year also saw the inversion of sigma divergence trends of the distribution (diagram 3). The indicators, again with variability levels four (UR) and seven (LTUR) times that of ER, confirm the outstanding disparity of labour market performance in EU-15. The UR distribution ranges from 2.4% in lu-00, Luxembourg<sup>28</sup> to 28% in itf6 – Calabria (Italy) in 1999, and from 2.6% in ukg1 - Herefordshire, Worcestershire and Warwickshire (UK) to 22.3 in dee2 – Halle (Germany) seven years later. As regards LTUR, the best and worst performers in 1999 were respectively the Italian itd1 - Provincia Autonoma Bolzano-Bozen and itf6 – Calabria. Seven years later, the lowest level was observed in ukg1 - Herefordshire, Worcestershire and Warwickshire (UK) and the highest in dee1 – Dessau (Germany).

<sup>28</sup> Apart from the specific case of Luxembourg, other regions present similarly very low unemployment rates: in particular, itd1 - Provincia Autonoma Bolzano-Bozen (I), with 33; Tyrol (AU) and pt16 - Centro (PT) reveal a 2.5% unemployment rate.

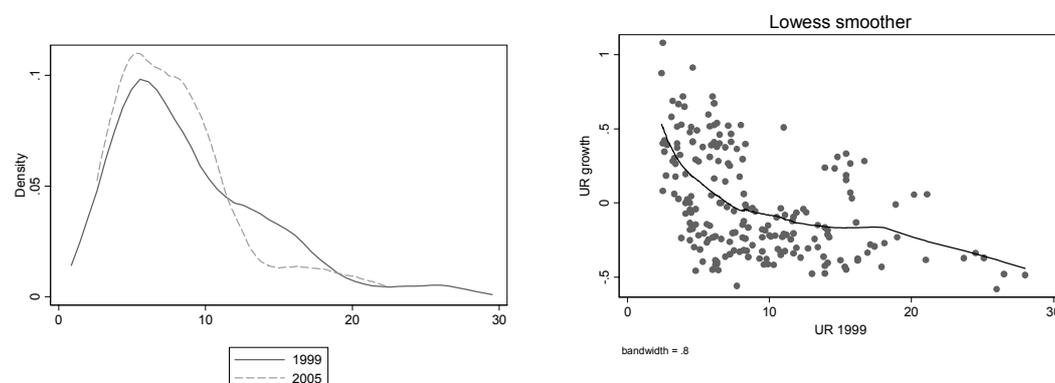
The shapes of the distributions shown in diagram 4 do not highlight a general improvement like that described by the ER forward shift of the distribution, whereas the increased probability of falling in the modal class confirms an albeit weak sigma convergence trend, also marked by the reduced extent of the probability distribution. As regards Lowess estimates, a beta-convergence pattern takes place in terms of UR, whereas a sigma convergence has emerged since 2001.

Diagram 4. K-density estimates (1999 and 2005) and *lowess* beta-convergence trends (1999-2005) of basic labour market indicators in EU-15 regions

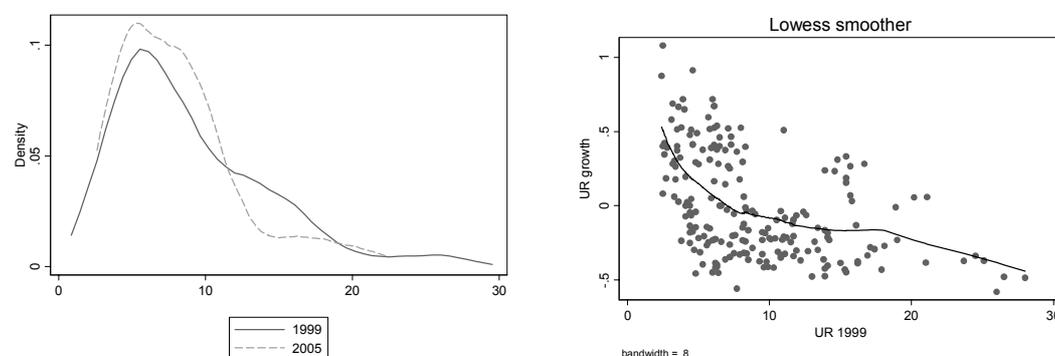
#### ER



#### UR



#### LTUR



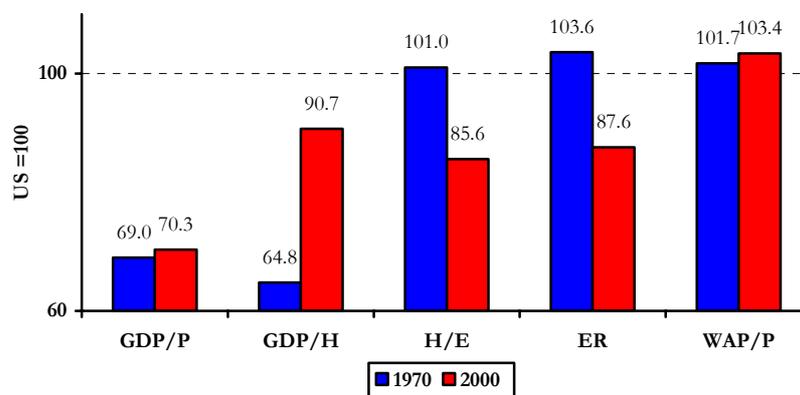
Source: our elaborations on Eurostat data (online database).

The differences in the behaviour of ER *versus* UR and LTUR distributions are even more marked when the transition probability matrixes are examined (note that, for the two unemployment indicators, moving to the upper quintile is to the detriment of the relative labour market performance). One first feature to be noted is a kind of higher (compared with ER) probability of moving to another relative position, as shown by widespread lower persistence probabilities and the non-zero likelihood of moving to another non-contiguous class. For example, a region falling in the fourth quartile of the UR distribution had a 6% probability of falling in the worst class in 2004, but also probabilities of 19% of entering the third quintile, 2.5 % of entering the second quintile, and even 0.5% of reaching the first-class club. Similar observations may be made for LTUR where, however, the probability of a region worsening its relative position increased compared with UR.

#### 4. 3 Employment (and unemployment) changes and GDP growth rates

Europe (EU-15) is usually instanced as having a worse labour market performance compared with the US. With decomposition [5], we graphically present (figure 1) the compared changes which occurred in the period 1970-2000 in these two economic areas (all variables are expressed as percentages of US values). The following relative (compared) real dynamics and convergence processes emerged: (i) per capita GDP convergence between the two areas was very weak, and the European per capita GDP remained around 70% that of the US; (ii) remarkable changes occurred in labour productivity (measured as GDP/hours worked): productivity in EU-15 increased from 65% to more than 90% of US levels; (iii) at the same time, average working hours per employed person (initially similar between EU-15 and US) underwent a significant relative drop in EU-15, of up to 85% of US levels; (iv) a remarkable relative change occurred in the employment rate: starting from a situation of slightly better performance in EU-15 in 1970 (employment rate 3.6% higher), in 2000 the EU-15 reached an employment rate of 87.6% of the US level (as a result of prevailing job-less growth in EU-15 and significant net job creation in the US economy).

Figure 1 – Compared real dynamics and convergence: US (=100) and EU-15 (1970 and 2000)



Source: our elaborations on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

Legend: GDP/P = GDP/population = per capita GDP.

GDP/H = GDP/hours worked = labour productivity.

H/E = hours worked/employment = annual average in working hour per employed person.

ER = employment x 100/working age population (15-64) = employment rate

WAP/P = working age population (15-64)/population.

In order to analyse the more recent years (1997-2006) in EU-15 countries, let us now examine some evidence about the direct relationship between GDP growth and labour market indicators and (un)employment aggregates. This is done at country level by computing the correlation coefficient between annual GDP and employment growth rates in the decade (table 8); running a pooled bivariate regression of the annual employment growth versus annual GDP growth (table 9); and calculating the elasticity of employment to growth (table 10). As regards regional levels, we use here very simple bivariate regressions (tables 11 and 12) between growth rates of real GDP and (i) employment/unemployment level growth, and (ii) ER, UR and LTUR dynamics.

**Table 8. Annual GDP growth rates and % employment changes**

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	corr.
EU-15	<i>GDP</i>	2.6	2.9	3.0	3.8	1.9	1.1	1.1	2.3	1.6	2.8	0.860
	<i>Empl.</i>	1.0	1.7	1.9	2.2	1.4	0.7	0.5	0.7	0.8	1.3	(0.001)
EMU-12	<i>GDP</i>	2.6	2.8	3.0	3.8	1.9	0.9	0.8	2.0	1.5	2.7	0.870
	<i>Empl.</i>	0.9	1.9	2.0	2.4	1.5	0.7	0.4	0.7	0.8	1.4	(0.001)
Belgium	<i>GDP</i>	3.5	1.7	3.4	3.7	0.8	1.5	1.0	3.0	1.1	3.2	0.275
	<i>Empl.</i>	0.5	1.6	1.3	2.0	1.4	-0.1	0.0	0.6	1.0	0.9	(0.441)
Denmark	<i>GDP</i>	3.2	2.2	2.6	3.5	0.7	0.5	0.4	2.1	3.1	3.2	0.631
	<i>Empl.</i>	1.2	1.5	1.0	0.4	0.8	-0.1	-1.3	0.0	0.7	1.8	(0.051)
Germany	<i>GDP</i>	1.8	2.0	2.0	3.2	1.2	0.0	-0.2	1.2	0.9	2.8	0.874
	<i>Empl.</i>	-0.1	1.2	1.4	1.9	0.4	-0.6	-0.9	0.4	-0.1	0.7	(0.001)
Ireland	<i>GDP</i>	11.7	8.5	10.7	9.4	5.8	6.0	4.3	4.3	5.5	6.0	0.673
	<i>Empl.</i>	5.6	8.6	6.2	4.6	3.0	1.8	2.0	3.1	4.6	4.2	(0.033)
Greece	<i>GDP</i>	3.6	3.4	3.4	4.5	5.1	3.8	4.8	4.7	3.7	4.3	0.162
	<i>Empl.</i>	-0.5	2.9	0.3	0.5	0.3	0.2	1.5	3.4	0.9	1.4	(0.654)
Spain	<i>GDP</i>	3.9	4.5	4.7	5.0	3.6	2.7	3.0	3.2	3.5	3.9	0.928
	<i>Empl.</i>	3.6	4.5	4.6	5.1	3.2	2.4	3.1	3.5	3.8	3.3	(0.000)
France	<i>GDP</i>	2.2	3.5	3.3	3.9	1.9	1.0	1.1	2.5	1.7	2.0	0.722
	<i>Empl.</i>	0.4	1.5	2.0	2.7	1.8	0.6	0.1	0.0	0.5	0.8	(0.018)
Italy	<i>GDP</i>	1.9	1.4	1.9	3.6	1.8	0.3	0.0	1.2	0.1	1.9	0.319
	<i>Empl.</i>	0.3	1.0	1.1	1.9	2.2	1.6	1.5	0.4	0.3	1.7	(0.369)
Luxemb.	<i>GDP</i>	5.9	6.5	8.4	8.4	2.5	3.8	1.3	3.6	4.0	6.2	0.588
	<i>Empl.</i>	3.1	4.5	5.0	5.5	5.6	2.9	1.8	2.3	3.0	3.7	(0.074)
Netherl.	<i>GDP</i>	4.3	3.9	4.7	3.9	1.9	0.1	0.3	2.0	1.5	2.9	0.823
	<i>Empl.</i>	3.3	4.1	3.9	3.1	2.6	0.5	-0.5	-0.9	0.0	1.2	(0.004)
Austria	<i>GDP</i>	1.8	3.6	3.3	3.4	0.8	0.9	1.1	2.4	2.0	3.1	0.761
	<i>Empl.</i>	0.9	1.3	1.6	1.0	0.6	-0.1	0.0	0.0	0.5	1.4	(0.011)
Portugal	<i>GDP</i>	4.2	4.8	3.9	3.9	2.0	0.8	-0.7	1.3	0.5	1.3	0.925
	<i>Empl.</i>	n.a.	n.a.	1.9	1.7	1.6	0.5	-0.4	0.1	0.0	0.6	(0.001)
Finland	<i>GDP</i>	6.1	5.2	3.9	5.0	2.6	1.6	1.8	3.7	2.9	5.5	0.704
	<i>Empl.</i>	3.3	2.0	2.5	2.2	1.5	1.0	0.1	0.4	1.4	1.4	(0.023)
Sweden	<i>GDP</i>	2.3	3.7	4.5	4.3	1.1	2.0	1.7	4.1	2.9	4.2	0.392
	<i>Empl.</i>	-1.3	1.6	2.1	2.4	1.9	0.2	-0.3	-0.6	0.4	1.8	(0.262)
U. K.	<i>GDP</i>	3.0	3.3	3.0	3.8	2.4	2.1	2.7	3.3	1.9	2.8	0.436
	<i>Empl.</i>	1.8	1.0	1.4	1.2	0.8	0.8	1.0	1.0	0.9	0.8	(0.208)
U.S.	<i>GDP</i>	4.5	4.2	4.4	3.7	0.8	1.6	2.5	3.9	3.2	3.3	0.928
	<i>Empl.</i>	2.3	2.1	1.9	2.0	-0.7	-0.3	0.9	1.1	1.7	1.9	(0.001)

Source: Eurostat online database and our elaborations.

Note: p-values of correlation coefficients in brackets.

For each of the EU-15 countries, table 8 shows the annual GDP growth rates, the corresponding percentage increase in employment, and their levels of correlation. For some countries the positive relationship is high and significant (especially Spain and Portugal), whereas in many others the correlation coefficient is low and/or not significant. However, the generally low and declining growth rates in the decade (Ireland is the well-known exception) were not accompanied by significant deterioration in employment (as always happened in other periods of low growth, like the early 1980s and early 1990s) and an unexpected job-rich (low-growth period) emerged.

When the data of table 8 is used to run a pooled bivariate regression of annual employment growth versus annual GDP growth for the EU-15 countries, we obtain the outcomes shown in table 9. The relationship is positive and significant and, according to the size of the coefficient, an annual GDP growth of 1% would be accompanied by a 0.6% increase in employment.

**Table 9. Pooled bivariate regressions between GDP and employment growth (1997-2006) in EU-15**

148 observation*	coefficient	% Empl. growth	p-values
% GDP growth	0.598		0.000
constant	-0.249		0.136
<i>Adjusted R<sup>2</sup></i>	0.544		

Data on employment growth in Portugal for 1997 and 1998 are missing

Lastly, we provide a simple calculation of the index of employment elasticity to growth over the period 1997-2006 (table 10). The index is very unstable across years and countries. The elasticity data generally confirm how the slowing down of growth rates in the most recent years was accompanied, in several cases, by unexpected employment growth.

**Table 10. Employment elasticity with respect to GDP in EU-15 countries**

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
EU-15	0.38	0.59	0.63	0.58	0.74	0.64	0.45	0.30	0.50	0.46
EMU-12	0.35	0.68	0.67	0.63	0.79	0.78	0.50	0.35	0.53	0.52
Belgium	0.14	0.94	0.38	0.54	1.75	-0.07	0.00	0.20	0.91	0.28
Denmark	0.38	0.68	0.38	0.11	1.14	-0.20	-3.25	0.00	0.23	0.56
Germany	-0.06	0.60	0.70	0.59	0.33	n.a.	4.50	0.33	-0.11	0.25
Ireland	0.48	1.01	0.58	0.49	0.52	0.30	0.47	0.72	0.84	0.70
Greece	-0.14	0.85	0.09	0.11	0.06	0.05	0.31	0.72	0.24	0.33
Spain	0.92	1.00	0.98	1.02	0.89	0.89	1.03	1.09	1.09	0.85
France	0.18	0.43	0.61	0.69	0.95	0.60	0.09	0.00	0.29	0.40
Italy	0.16	0.71	0.58	0.53	1.22	5.33	n.a.	0.33	3.00	0.89
Luxembourg	0.53	0.69	0.60	0.65	2.24	0.76	1.38	0.64	0.75	0.60
Netherlands	0.77	1.05	0.83	0.79	1.37	5.00	-1.67	-0.45	0.00	0.41
Austria	0.50	0.36	0.48	0.29	0.75	-0.11	0.00	0.00	0.25	0.45
Portugal	n.a.	n.a.	0.49	0.44	0.80	0.63	0.57	0.08	0.00	0.46
Finland	0.54	0.38	0.64	0.44	0.58	0.63	0.06	0.11	0.48	0.25
Sweden	-0.57	0.43	0.47	0.56	1.73	0.10	-0.18	-0.15	0.14	0.43
U. K.	0.60	0.30	0.47	0.32	0.33	0.38	0.37	0.30	0.47	0.29

Source: our processing of Eurostat data.

Note: Elasticity is defined as Employment % change / GDP % change.

Also at regional level - as expected, considering the many variables influencing labour market performance and evolution described in section 2 - the data reveal that the direct relationship between GDP growth and labour market indicator dynamics has quite limited explicative power. This is shown by the very low values of the R-squared associated with the estimates listed in table 11.

**Table 11. Bivariate regression between change of labour market indicators and GDP % growth at regional level (1999-2005)**

<i>187 observations</i>	Dependent variables					
	% ER growth		% UR growth		% LTUR growth	
	coefficient	p-values	coefficient	p-values	coefficient	p-values
% GDP growth	0.207	<i>0.003</i>	-1.944	<i>0.000</i>	-3.103	<i>0.000</i>
Constant	0.022	<i>0.013</i>	0.214	<i>0.000</i>	0.258	<i>0.000</i>
<i>Adjusted R<sup>2</sup></i>	<i>0.042</i>		<i>0.104</i>		<i>0.160</i>	

The GDP coefficients are always of the expected sign and statistically significant. In these models, the size of the GDP coefficient is remarkable especially for the unemployment indicators, suggesting that a 1% growth in GDP would be associated with a reduction in UR of about 2% and of more than 3% in LTUR (of their initial levels, e.g., from 10% to 9.8% of UR).

Similar considerations may be made for table 12, in which the dependent variables are growth rates in employment and unemployment aggregates. Again, the GDP coefficients are all significant and their size is remarkable, since a 1% increase in GDP would be accompanied by a 0.6% increase in employment, and falls of 1.7% and 3% in unemployment and long-term unemployment, respectively. It is also noteworthy how the explicative power (R-squared) of this bivariate models increases for employment and decreases for unemployment indicators with respect to those of table 11.

**Table 12. Bivariate regression between GDP % growth and (un)employment growth (1999-2005) at regional level**

<i>187 observations</i>	Dependent variables					
	% Empl. growth		% Unempl. growth		% Long T. unempl. growth	
	coefficient	p-values	coefficient	p-values	coefficient	p-values
% GDP growth	0.610	<i>0.000</i>	-1.683	<i>0.000</i>	-3.009	<i>0.000</i>
	0.007	<i>0.596</i>	0.244	<i>0.000</i>	0.295	<i>0.000</i>
<i>Adjusted R<sup>2</sup></i>	<i>0.151</i>		<i>0.067</i>		<i>0.137</i>	

In any case, the results shown in tables 11 and 12 are interesting, since they provide another simple view of the differences in outcomes obtained by using employment versus unemployment indicators.

Summarising, the generally low growth rate of the period considered was not accompanied by a worsening in labour market conditions, unlike what happened in the early 1980s and early 1990s. On the contrary, labour market performance was characterised by a general improvement, according to both employment and unemployment indicators.

This evidence, together with that of the relative importance of GDP dynamics on labour market performance at regional level, suggests examining different explicative variables, used below.

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#### 4. 4 Determinants of regional labour market performance: econometric analyses

In this section, in order to examine the determinants of regional labour market performance, we present results from the specification of various models by means of econometric (cross-section and panel data) estimates<sup>29</sup>.

##### 4. 4. 1 Database and estimation details and strategy

As the determinants of (un)employment differences and dynamics across EU-15 regions are extremely difficult to examine, we preferred to estimate and present empirical results from many equations (with different sub-sets of explicative variables) by means of various econometric approaches. The set of explicative variables<sup>30</sup> may be separated into four groups: (i) development/growth and sectoral indicators; (ii) price variables (labour cost); (iii) institutional indicators; (iv) other variables. In the first group, we consider per capita GDP as an indicator of economic development and the sectoral composition of employment as structural/development variables. In some estimates, we also consider per capita GDP growth rates. As price variables, we use the hourly labour cost in industry and services. The set of institutional variables is particularly large for labour market institutions (EPL, fiscal wedge, degrees of centralisation, co-ordination and coverage of collective wage bargaining, active and passive labour market policies, weekly working time, spread of part-time), but it also includes an indicator of product market regulation. We are aware of the huge difficulties in assessing the labour market performance effects of institutions and institutional changes (e.g., due to the uncertain shape and duration of the distribution of the impact over time). In spite of the (partial) limitations due to the short period considered and the lack of some data, we also consider institutional changes over time and across regions using “weight variables” at regional level. Of course, the short period considered may lead to under- or over-estimations or to the emergence of unexpected relationships. For example, although in a long-run perspective it is difficult to predict a clear and stable relationship between employment protection legislation and labour market performance, in the short term a positive link between EPL and employment change may emerge, since in recession or stagnation phases it may be easier for firms in countries/regions with low EPL to fire workers in declining sectors. We are also aware of possible problems of direction of causality of the relationship between labour market performance and various institutional and policy settings, particularly active and passive labour market policies (which are partially endogenous variables). However, the structure of the dataset (mix of regional and country level data; see description below), the limited time-span available for many variables and the nature of some indicators (score variables) make it quite difficult to address this problem from the econometric viewpoint<sup>31</sup>. Lastly, a fourth group of heterogeneous variables

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<sup>29</sup> Therefore, in this paper, we do not (econometrically) analyse the determinants of national labour market performance differential and dynamics. This topic is well-known to have been extensively analysed (both theoretically and empirically) in the economic literature.

<sup>30</sup> For a check-list of the variables used in studying regional unemployment rate differentials, see Elhorst (2003). This author also provides a very useful review of the most important empirical and theoretical literature on regional UR differences.

<sup>31</sup> Refinement of this point is one important aim of future research.

(including, for example, regional population density) is considered. The variables are listed and defined in table A2 of the Appendix.

Using differing equations and econometric methods does allow us to highlight the degree of (in)stability of the value and sign of the parameters of the explicative variables, at least partially. We are also aware that the relative effect of each explicative variable may change over time, and that the existence of “systemic effects” is likely: different quali-quantitative combinations of variables, through complex interactions, may produce additional effects on labour market performance<sup>32</sup>. As regards the database, the set of regions examined in the previous section had to be reduced, due to lack of data referring to institutional features, and consists of 187 regions of EU-15 countries (excluding Ireland, Greece and Luxembourg) observed over a seven-year period (1999-2005).

Using institutional variables poses other specific problems. Since they represent peculiar national features, they are obviously available only at country level. However, their impact may differ regionally, according to the structural characteristics of the regional systems in question. Thus, in order to capture the different strength of specific institutions at regional level, their value was weighted, where possible, with a relevant regional indicator. For example, the Employment Protection Legislation Index (EPL 2), levels of bargaining centralisation (CENTR), bargaining coordination (COORD), collective bargaining coverage (COVER) and trade union density (UNION) were weighted for the share of employees out of total employment at regional level. Expenditure in passive labour market policies in the percentage of GDP (PASS\_POL) was corrected for the “unemployment/population” ratio at regional level.

Secondly, all country-level institutional variables except trade union density (UNION)<sup>33</sup> were only available for some years/periods. For those indicators available for two years/periods close to 1999 and 2003, the intermediate years and the years 2004 and 2005 were estimated by means of linear interpolation<sup>34</sup>. Other variables for which only one year/period was available around the time-span 1999-2003 were assumed to be uniform over the five years<sup>35</sup>. On one hand, these features are a limitation to empirical analysis; on the other, they reflect both country specificity (corrected for the regional impact of institutions) and the relative temporal stability of the institutional settings considered.

For cross-section analyses (section 4.4.2), we produced estimations for the first and final years of the considered period by using all explicative variables in two specification models (tables 14 and 15). We also carried out many other bivariate and multivariate estimates, in order to study the determinants of changes in the three dependent variables during the period in question (section 4.4.3; tables 16 and 17).

<sup>32</sup> Some researches define and highlight the possible “institutional equivalence” of various institutional systems (e.g., Bruno and Garofalo, 1999). In particular, it is possible that various “sets of institutional factors”, interacting with other variables, have similar effects on (un)employment performance. In addition, we cannot exclude the fact that similar “sets of institutional variables” have significantly different effects on labour market performance (Signorelli, 2000).

<sup>33</sup> This variable is available online at the OECD database for the years 1999 to 2001 (or 2002 for few countries). The remaining years were estimated by linear interpolation.

<sup>34</sup> This is the case for EPL 2, which has two available values for the late 1990s and 2003, respectively; for PMRI, available for 1998 and 2003.

<sup>35</sup> These are: collective bargaining coverage (COVER), available for 2000; and bargaining centralisation (CENTR) and (COORD), available for the period 1995-2000.

Lastly, we produced panel econometric estimations (section 4.4.4; tables 18, 19, 20) using four different specifications for each model (ER, UR, LTUR). Before starting panel estimation procedures, we ran a pooled Ordinary Least Square estimate in order to identify the most evident correlations among regressors, to prevent multicollinearity. Variance Inflation Factors (VIF) suggested excluding DIPEN from the analysis (this variable was used to weight various institutional features). We then performed standard panel data estimates by comparing fixed versus random effects estimates. The significance of the temporal effects indicated that they should be included in the models, whereas the Hausman test unequivocally indicated the use of fixed effects models (see tables 18, 19, 20). This was consistent with previous panel analyses carried out at regional level in this field. For all three (fixed effects) models, the standard diagnostic test showed residual autocorrelation (Wooldridge test), heteroschedasticity (modified Wald test) and contemporaneous correlation (Breusch Pagan LM test). This suggested applying a Prais-Winsten regression correlated panels corrected standard error (PCSEs) estimators. Since the corresponding STATA commands do not automatically provide fixed effects estimates, it was necessary to introduce the 186 (n-1) regional dummy variables (not listed in the tables for the sake of brevity). However, the changes in the significance levels of the estimated coefficients were negligible for the three models.

The presence of the contemporaneous correlation of residuals (two or more units have correlated errors at the same time) indicated the probable existence of unobservable features of some regions, due to unobservable features in other ones. In the case of spatial data, this may reveal the typical phenomenon of spatial autocorrelation, which arises when the value assumed by a variable in a given place is correlated (positively or negatively) with the value assumed by the same variable in a different place or in a set of different places. This may be due essentially to: (a) measurement errors for observations referring to contiguous geographic units; (b) actual spatial interaction patterns. Spatial interaction may be highlighted descriptively (e.g., with the classical Moran I spatial correlation index) or considered in econometric analysis by means of specific techniques (starting from Anselin, 1988). In both cases, the technical precondition to the inclusion of spatial effects is the availability of a weights (or spatial lags) matrix able to express the connections between the geographic units in question. Depending on the nature of the phenomenon, weight may be represented in various ways. In our case, we considered the matrix of the inverse geographical distance between the capital city (or the most highly populated city) of each region.

To assess the necessity of correcting the econometric estimates by means of spatial effects models, we calculated Moran's I spatial autocorrelation index on the three basic labour market performance indicators, using the whole set of 203 regions available (see table 13 and diagram 5)<sup>36</sup>.

**Table 13. Dynamics of Moran's spatial correlation Index in EU-15 regions (203 units)**

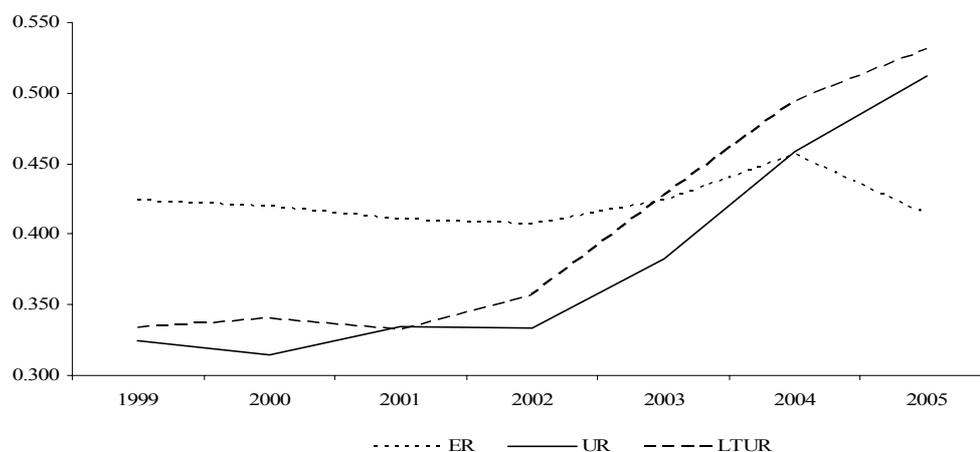
	1999	2000	2001	2002	2003	2004	2005
ER	0.424	0.419	0.410	0.407	0.424	0.456	0.414
UR	0.324	0.315	0.335	0.334	0.383	0.459	0.512
LTUR	0.333	0.340	0.332	0.357	0.427	0.494	0.531

\* All correlations are significant at 99%

<sup>36</sup> The outcomes do not change if the Moran Index is calculated on the 187 regions used for panel regressions.

These results are consistent with the evidence (see, for example, Overmans and Puga, 2002) of employment/unemployment regional clusters in Europe and with the many studies examining regional spatial correlation patterns in labour market indicators (Niebuhr, 2003; Burridge and Gordon, 1981; Mohlo, 1995; Badinger and Url, 2002; Aragon et al., 2003; Blanchard and Katz, 1992; Decressin and Fatàs, 1995; Elhorst, 2003, and the many references quoted therein on pp. 738-9). They also show how ER has initially a greater positive spatial correlation with respect to UR and LTUR, which decreases in the last year. Conversely, the trend strongly increases for the unemployment indicators, especially after 2002.

**Diagram 5. Dynamics of Moran spatial autocorrelation Index in EU-15 regions for three basic labour market indicators (203 regions)**



On these bases, we included spatial effects in the panel econometric estimates. As the econometric literature shows, traditional spatial autoregressive models may present: (a) the dependent variable correlated with its spatial lag (spatial LAG model); the error term affected by spatial autocorrelation (spatial ERROR model); or (c) both spatial LAG and ERROR correlations<sup>37</sup>. In the first case, a typical omitted variable problem arises, which cannot be solved by means of OLS estimation (due to simultaneity/endogeneity) and must be tackled using Maximum Likelihood (ML), Instrumental Variables (IV) and Robust approach estimates. Alternative methods of estimation are also recommended in the case of spatial ERROR correlation (Atzeni et al., 2004). In our empirical analysis, we used the MATLAB spatial econometric tools to run ML estimates for fixed effects panel spatial LAG and spatial ERROR models (for results, see third and fourth columns of tables 18, 19 and 20, respectively).

<sup>37</sup> In formal terms, following Atzeni et al. (2004), if  $W$  is the weight matrix, the starting point is:

$$y = \rho W y + X\beta + \varepsilon \quad \text{and} \quad \varepsilon = \lambda W \varepsilon + \eta,$$

with

$\eta \sim N(0, O)$ , and the diagonal elements of the  $O$  covariance matrix of errors  $O_{ij} = h_i(z_{\alpha})$ ;

$\beta$  is a vector  $K \times 1$  of parameters associated with explicative variables  $X$  (matrix  $N \times K$ );

$\rho$  is the coefficient of the spatially lagged dependent variable;

$\lambda$  is the coefficient of a spatial autoregressive structure for disturbance  $\varepsilon$ .

We obtain a spatial LAG model if  $\lambda = \alpha = 0$  and  $y = \rho W y + X\beta + \varepsilon$ .

We obtain a spatial ERROR model if  $\rho = \alpha = 0$  and  $y = X\beta + (I - \lambda W)^{-1} \eta$ .

#### 4. 4. 2 Results of cross-section analyses

Cross-section analyses produced using the first specification model<sup>38</sup> for the years 1999 and 2005 provided the following main results (table 14): (i) long-term unemployment negatively affects employment rates, with increasing strength in 2005; (ii) the level of economic development (regional per capita GDP) affects ER positively and both UR and LTUR negatively; (iii) higher weekly working hours influence ER negatively, whereas its impact is positive on UR and LTUR, but not always significantly; (iv) higher population density determines lower ER and higher UR and LTUR, at low significance levels; (v) labour cost negatively affects unemployment rates, whereas its sign and significance for LTUR and ER are unstable; (vi) higher ALMP reduce UR and LTUR, whereas the coefficient is not significant for ER; (vii) conversely, passive labour policies increase ER, but also UR and LTUR; (viii) product market regulation increases unemployment rates and has a negative effect on ER; (ix) centralisation of wage bargaining has greatly changing effects on ER and UR, whereas a U-inverted shape relationship emerges for LTUR; (x) the effect of the degree of co-ordination is positive for ER and negative (but not significant) for unemployment rates; (xi) TAX\_WEDGE is positively related to unemployment rates and negatively to ER in 2005; (xii) EPL, bargaining coverage and union density show not significant and/or very unstable results.

**Table 14. Econometric estimates: model 1 – institutional variable not corrected (1999 and 2003)**

	ER				UR				LTUR			
	1999		2005		1999		2005		1999		2005	
	Coeff.	P_values										
LTUR	-1.384	0.000	-2.530	0.000								
CDE	-0.131	0.212	0.113	0.241	-0.243	0.006	-0.226	0.000	-0.146	0.036	-0.088	0.033
F	0.323	0.105	0.067	0.698	-0.559	0.001	-0.201	0.060	-0.386	0.003	-0.170	0.021
GHI	-0.236	0.026	0.033	0.732	-0.151	0.084	-0.200	0.001	-0.119	0.088	-0.084	0.043
JK	0.359	0.002	0.214	0.029	-0.246	0.009	-0.152	0.012	-0.105	0.160	-0.084	0.043
L_Q	-0.331	0.008	-0.066	0.523	-0.021	0.841	-0.059	0.354	0.039	0.636	0.028	0.518
GDP	0.250	0.001	0.221	0.000	-0.284	0.000	-0.139	0.000	-0.198	0.000	-0.071	0.002
HOURS_corr	-0.276	0.002	-0.022	0.844	0.164	0.022	-0.070	0.315	0.120	0.035	0.066	0.166
DIPEN	-0.001	0.995	-0.129	0.091	0.109	0.123	0.156	0.001	0.060	0.288	0.049	0.136
DENS	-1.654	0.000	-1.875	0.000	0.996	0.000	0.849	0.000	0.582	0.005	0.319	0.004
LAB_COST	-0.215	0.754	1.808	0.000	-2.331	0.000	-0.967	0.000	-1.055	0.020	0.129	0.285
TAX_WEDGE	0.004	0.992	-1.518	0.000	1.067	0.001	0.428	0.000	0.576	0.018	-0.012	0.876
ACT_POL	-2.544	0.157	-1.884	0.468	-3.936	0.007	-3.627	0.024	-3.969	0.001	-2.457	0.026
PASS_POL_corr	0.232	0.041	1.059	0.000	0.954	0.000	0.686	0.000	0.520	0.000	0.486	0.000
PMRI	-9.045	0.007	-9.487	0.044	5.694	0.039	-1.078	0.686	4.738	0.031	10.619	0.000
EPL_2	0.090	0.982	-0.248	0.837	-6.961	0.033	0.065	0.931	-3.536	0.173	0.336	0.514
CENTR	-5.762	0.203	19.535	0.000	6.353	0.085	-8.233	0.000	9.222	0.002	2.541	0.096
CENTR_2	0.486	0.508	-2.993	0.000	-1.680	0.005	0.889	0.006	-1.837	0.000	-0.476	0.031
COORD	5.709	0.002	5.310	0.000	-3.176	0.041	-0.142	0.773	-1.499	0.223	-0.551	0.106
COVER	0.119	0.097	-0.284	0.000	0.023	0.698	0.141	0.004	-0.084	0.077	-0.101	0.003
UNION	1.834	0.711	6.731	0.102	-8.767	0.036	3.705	0.132	-2.711	0.412	6.358	0.000
_cons	97.521	0.000	62.266	0.000	29.985	0.001	20.962	0.000	7.073	0.321	-9.932	0.051
Adjusted R2	0.915		0.906		0.865		0.909		0.782		0.913	

<sup>38</sup> In the first model, variables EPL\_2, CENTR, COORD, COVER and UNION are not corrected by the share of employees at regional level.

In the 2005 models we also examined the lagged effects of employment protection legislation (by simply including the EPL\_2 variable for 2004 and 2003 in the model). These lagged variables show negative (but not significant) coefficients in the “ER” model and positive (but not significant) coefficients in the “UR” and “LTUR” models.

The second specification (table 15) (models with variables EPL\_2, CENTR, COORD, COVER and UNION, corrected by share of employees on total employment at regional level) substantially confirms the outcomes obtained with the previous specification, also with regard to the EPL\_2 lagged variables<sup>39</sup>.

**Table 15. Econometric estimates: model 2 - institutional variable corrected (1999 and 2005)**

	ER				UR				LTUR			
	1999		2005		1999		2005		1999		2005	
	Coeff.	<i>P_values</i>	Coeff.	<i>P_values</i>	Coeff.	<i>P_values</i>	Coeff.	<i>P_values</i>	Coeff.	<i>P_values</i>	Coeff.	<i>P_values</i>
LTUR	-1.352	0.000	-2.434	0.000								
CDE	-0.203	0.057	0.124	0.219	-0.274	0.004	-0.232	0.000	-0.173	0.021	-0.081	0.053
F	0.258	0.186	0.188	0.288	-0.470	0.007	-0.202	0.054	-0.302	0.028	-0.145	0.048
GHI	-0.302	0.005	0.070	0.484	-0.169	0.075	-0.200	0.001	-0.136	0.072	-0.074	0.074
JK	0.290	0.011	0.250	0.015	-0.254	0.012	-0.160	0.009	-0.109	0.176	-0.071	0.092
L_Q	-0.446	0.001	-0.077	0.480	-0.059	0.606	-0.066	0.305	0.001	0.987	0.034	0.447
GDP	0.252	0.001	0.229	0.000	-0.247	0.000	-0.140	0.000	-0.169	0.001	-0.070	0.003
HOURS_corr	-0.343	0.000	-0.172	0.111	0.182	0.014	-0.055	0.391	0.112	0.057	0.035	0.439
DIPEN	-0.315	0.012	-0.170	0.099	0.489	0.000	0.140	0.021	0.313	0.000	0.103	0.015
DENS	-1.597	0.000	-1.812	0.000	0.912	0.001	0.856	0.000	0.532	0.014	0.335	0.003
LAB_COST	0.523	0.459	1.473	0.000	-1.798	0.004	-0.907	0.000	-0.803	0.108	0.043	0.706
TAX_WEDGE	-0.278	0.461	-1.274	0.000	0.932	0.005	0.428	0.000	0.569	0.032	0.037	0.605
ACT_POL	-2.187	0.168	-2.494	0.354	-1.604	0.249	-3.464	0.030	-2.606	0.019	-2.570	0.021
PASS_POL_corr	0.216	0.042	1.008	0.000	0.896	0.000	0.679	0.000	0.477	0.000	0.489	0.000
PMRI	-14.028	0.000	5.994	0.191	5.289	0.062	-0.080	0.975	4.002	0.077	9.494	0.000
EPL_2_corr	9.304	0.067	-0.360	0.822	-4.499	0.318	0.348	0.716	-1.361	0.705	0.174	0.794
CENTR_corr	-16.740	0.001	14.481	0.000	3.467	0.428	-9.261	0.000	6.804	0.052	1.238	0.394
CENTR_2_corr	2.647	0.007	-2.622	0.000	-1.415	0.093	1.178	0.001	-1.714	0.011	-0.359	0.139
COORD_corr	5.669	0.005	6.662	0.000	-5.479	0.002	-0.322	0.558	-3.309	0.018	-0.492	0.200
COVER_corr	0.121	0.134	-0.222	0.011	-0.031	0.662	0.136	0.008	-0.125	0.027	-0.083	0.020
UNION_corr	8.325	0.185	5.324	0.275	-6.954	0.214	4.786	0.092	-1.554	0.727	6.405	0.001
_cons	132.339	0.000	73.414	0.000	-6.387	0.579	20.614	0.013	-15.219	0.021	-12.837	0.026
<i>Adjusted R2</i>	0.917		0.899		0.852		0.909		0.762		0.911	

<sup>39</sup> In order to assess the possible existence of complementarity effects between labour and product markets regulation levels, in other estimations (not reported here, but available upon request) we also considered, in addition to EPL\_2 and PMRI, also their interaction. The interaction variables reveal greatly changing results in different years, and their inclusion does not change the sign or significance of the coefficients of the other variables. However, in-depth analysis of complementarity of institutional settings may be one future development of the present research.

#### 4. 4. 3 Results of determinants of changes in (un)employment rates

We estimated various models in order to examine some determinants of the changes in the three dependent variables in the period 1999-2005.

In the various specifications, we examined the changes in some institutional indicators as explicative variables. In the last two models we also added changes in labour costs.

The main results (statistically significant) of models 1-4, with only one explicative variable, are summarised as follows: (i) the effects of EPL changes are statistically significant only on UR and LTUR, but not in the expected direction; (ii) as regards changes in weekly hours, a surprising inverse relationship arises with changes in LTUR and UR, while not significant impacts on ER change emerge; (iii) growth in the tax wedge unexpectedly affect the dynamics of unemployment negatively (not significant effects on ER).

The following results (statistically significant) arise in models 5 and 6 considering, as explicative variables, changes in the main institutional variables: (i) changes in ALMP have a positive relationship with changes in ER and a negative one with changes in UR and LTUR; (ii) the opposite relationship (with respect to ALMP) occurs for changes in passive labour policies; (iii) changes in the degree of product market regulation have a negative relationship with changes in ER and a positive one with changes in UR and LTUR; (iv) the opposite relationship (with respect to PMRI) occurs for changes in EPL; (v) as regards changes in bargaining indicators<sup>40</sup>, growth of centralisation is positively associated with ER growth and negatively with that of UR and LTUR.

The introduction of a quadratic term explores the possibility of a U-shaped relationship (in dynamic terms) for the degree of centralisation, which does not emerge as statistically significant<sup>41</sup>; last, (vi) changes in union density have an inverse relationship with changes in ER and a positive and significant one with changes in LTUR.

In the last two models (7-8), we consider changes in labour costs in addition to the main institutional variables, with the following results: (i) the signs of the parameters of the institutional variables are not affected by the introduction of the new variable; (ii) changes in labour costs have a negative relationship with ER and a positive relationship with changes in UR, whereas effects on changes in LTUR are not statistically significant. The introduction of quadratic terms for CENTR highlights a possible inverted U-shaped relationship between changes in the degree of centralisation and changes in ER.

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<sup>40</sup> As explained in the data description, their level (not corrected by the share of dependent employment) does not change during the period considered, so that the dynamics of the corrected variables are only due to changes in share of employees. Of course, this variation is the same for the three variables, so that (in terms of variations) they are perfectly collinear, and the sign of the surviving one also applies to the remaining ones.

<sup>41</sup> In order to assess the impact of these (time-unchanging, except for the weight component) variables on the estimated models, we also run regressions 5 to 8 excluding them (available upon request). This did not change the signs and significance of the remaining variables.

Table 16. Econometric estimates: changes between 1999 and 2005

<i>187 observations</i>		$\Delta ER$		$\Delta UR$		$\Delta LTUR$	
		coeff.	p-values	coeff.	p-values	coeff.	p-values
(1)	EPL_2	-0.045	0.144	-0.428	0.022	-0.708	0.003
	_cons	0.045	0.000	-0.018	0.494	-0.112	0.001
	<i>Adj R-squared =</i>	0.006		0.023		0.040	
(2)	EPL_2_corr	0.000	0.994	-0.625	0.001	-0.944	0.000
	_cons	0.046	0.000	-0.017	0.497	-0.110	0.001
	<i>Adj R-squared =</i>	-0.005		0.057		0.078	
(3)	HOURS_corr	0.040	0.581	-2.851	0.000	-2.942	0.000
	_cons	0.049	0.000	-0.190	0.000	-0.285	0.000
	<i>Adj R-squared =</i>	-0.004		0.218		0.135	
(4)	TAX_WEDGE	0.004	0.913	-0.551	0.024	-0.873	0.006
	_cons	0.046	0.000	0.006	0.807	-0.073	0.035
	<i>Adj R-squared =</i>	-0.005		0.022		0.035	
(5)	ACT_POL	0.146	0.000	-0.383	0.000	-0.548	0.000
	PASS_POL_corr	-0.063	0.000	0.630	0.000	0.807	0.000
	PMRI	-0.365	0.000	0.775	0.000	0.880	0.001
	EPL_2_corr	0.169	0.000	-0.086	0.383	-0.427	0.014
	CENTR_corr	0.609	0.000	-0.885	0.036	-2.148	0.004
	UNION_corr	-0.425	0.000	0.209	0.156	1.166	0.000
	_cons	-0.088	0.000	0.169	0.002	0.174	0.071
	<i>Adj R-squared =</i>	0.588		0.897		0.815	
(6)	ACT_POL	0.145	0.000	-0.386	0.000	-0.541	0.000
	PASS_POL_corr	-0.063	0.000	0.631	0.000	0.804	0.000
	PMRI	-0.364	0.000	0.777	0.000	0.876	0.002
	EPL_2_corr	0.170	0.000	-0.082	0.411	-0.437	0.012
	CENTR_corr	0.718	0.000	-0.527	0.343	-2.868	0.003
	CENTR_2_corr	-1.916	0.352	-6.256	0.321	12.564	0.253
	UNION_corr	-0.440	0.000	0.161	0.300	1.263	0.000
	<i>Adj R-squared =</i>	0.587		0.897		0.815	
(7)	ACT_POL	0.121	0.000	-0.327	0.000	-0.552	0.000
	PASS_POL_corr	-0.064	0.000	0.632	0.000	0.807	0.000
	PMRI	-0.294	0.000	0.617	0.000	0.891	0.002
	EPL_2_corr	0.214	0.000	-0.188	0.055	-0.420	0.020
	CENTR_corr	0.351	0.009	-0.308	0.468	-2.188	0.005
	UNION_corr	-0.285	0.000	-0.106	0.505	1.187	0.000
	LAB_COST	-0.228	0.000	0.511	0.000	-0.035	0.873
	<i>Adj R-squared =</i>	0.657		0.906		0.814	
(8)	ACT_POL	0.118	0.000	-0.329	0.000	-0.540	0.000
	PASS_POL_corr	-0.064	0.000	0.632	0.000	0.804	0.000
	PMRI	-0.289	0.000	0.620	0.000	0.874	0.002
	EPL_2_corr	0.220	0.000	-0.185	0.061	-0.438	0.015
	CENTR_corr	0.560	0.001	-0.195	0.717	-2.865	0.004
	CENTR_2_corr	-3.897	0.039	-2.109	0.730	12.614	0.259
	UNION_corr	-0.307	0.000	-0.118	0.469	1.260	0.000
	<i>Adj R-squared =</i>	0.664		0.906		0.814	

Lastly, we provide evidence of spatial autocorrelation at the regional level of changes in variables across the 1999-2005 period (table 17)<sup>42</sup>. All the changes in variables show positive and 99% statistically significant spatial autocorrelations, except for the employment share of

<sup>42</sup> Of course, the institutional (not corrected) variables which do not vary in the period (CENTR, COORD and COVER) are not included, since their changes are always zero.

traditional services (GHI). The level of the coefficient is remarkable for some labour market variables, for which it exceeds 0.5. The higher coefficients of the institutional indicators obviously depend on the fact that they are measured at country level.

**Table 17. Moran I index of global spatial correlation for changes (1999-2005) of all variables considered (regional level)**

Variable	Moran's I	P-value	Variable	Moran's I	P-value
EMP	0.254	0.000	HOURS	0.331	0.000
ER	0.314	0.000	HOURS_corr	0.589	0.000
UNEMPL	0.523	0.000	DENS	0.178	0.000
UR	0.534	0.000	LAB_COST	0.624	0.000
LONG_UNEMP	0.520	0.000	TAX_WEDGE	0.552	0.000
LTUR	0.523	0.000	ACT_POL	0.503	0.000
CDE	0.433	0.000	PASS_POL	1.033	0.000
F	0.562	0.000	PASS_POL_corr	0.712	0.000
GHI	0.051	0.069	IRBM	0.825	0.000
JK	0.329	0.000	EPL_2	0.715	0.000
L_Q	0.256	0.000	EPL_2_corr	0.669	0.000
GDP (per capita)	0.412	0.000	CENTR_corr	0.336	0.000
GDP	0.418	0.000	CENTR_2_corr	0.107	0.000
PART_T	0.380	0.000	COORD_corr	0.336	0.000
FULL_T	0.519	0.000	COVER_corr	0.336	0.000
DIPEN	0.336	0.000	UNION	0.709	0.000
SELF	0.236	0.000	UNION_corr	0.652	0.000

#### 4. 4. 4 Results of panel analysis

The four econometric specifications (fixed effects, fixed effects correlated PCSE, fixed effects with spatial lags on the dependent variable, fixed effects with spatial lags on the error terms) for each dependent variable provide results which are almost identical in terms of coefficient signs, levels and significance. This suggests that the outcomes obtained may be considered reliable and that the explanatory variables already capture spatial interactions.

Among the economic and structural variables presumed to influence ER (table 18), a negative impact is played by LTUR and population density. The latter suggests that urban regions probably attract labour supply and at the same time are less able to provide those “sub-optimal” employment opportunities usually offered in rural regions (in terms of under-employment in farming and farming-related sectors). Instead, a positive role on ER is played by relative regional industry specialisation in business (JK) and public (L\_Q) services. Other industry structure variables (CDE, F, and GHI), as well as per capita GDP levels, have no significant impacts. The number of hours worked weekly (HOURS\_corr) is steadily negative, but significant (at 90%) only in spatial econometric specifications.

Labour cost levels negatively affect employment rate, as expected, while the size of the TAX\_WEDGE does not seem to have any statistically significant relationship with ER. Conversely, labour policy variables (ACT\_POL and PASS\_POL) are steadily significant, and positive and negative, respectively.

As regards the set of institutional variables, the product market regulation index (PMRI) plays a persistent negative role, whereas the opposite occurs for EPL. The latter relationship also persists with the inclusion in the models of lagged (one or two years) EPL variables. Among the remaining institutional variables, only UNION density is steadily significant, and its higher levels are associated with worse ER performance. The remaining institutional variables show mainly insignificant and unstable results<sup>43</sup>.

<sup>43</sup> For this and the following models, we also ran estimates (available upon request) excluding the time-invariant indicators (except for the weight component), but the sign and significance of the remaining variables did not change.

Table 18. Econometric estimates (dependent variable: employment rate) (1999-2005)

ER	Fixed effects		Correlated PCSE (fe)*		ML (fe) (spatial lag- $\rho$ )		ML (fe) (spatial error- $\lambda$ )	
	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values
LTUR	-0.541	0.000	-0.543	0.000	-0.469	0.000	-0.535	0.000
CDE	-0.053	0.223	-0.065	0.239	-0.027	0.475	-0.007	0.849
F	0.016	0.786	0.008	0.923	-0.020	0.696	-0.019	0.724
GHI	-0.011	0.800	-0.020	0.720	-0.005	0.893	0.019	0.632
JK	0.109	0.037	0.089	0.145	0.090	0.047	0.110	0.019
L_Q	0.126	0.001	0.103	0.113	0.118	0.000	0.128	0.000
GDP	-0.046	0.548	-0.037	0.681	-0.004	0.947	0.018	0.791
HOURS_corr	-0.056	0.177	-0.071	0.312	-0.066	0.066	-0.074	0.070
DENS	-9.696	0.000	-9.565	0.000	-8.165	0.000	-7.521	0.000
LAB_COST	-0.162	0.001	-0.153	0.102	-0.132	0.001	-0.182	0.001
TAX_WEDGE	0.044	0.128	0.029	0.643	0.010	0.699	0.027	0.431
ACT_POL	2.501	0.000	2.262	0.007	1.689	0.000	2.975	0.000
PASS_POL_corr	-0.181	0.000	-0.160	0.013	-0.152	0.000	-0.187	0.000
PMRI	-4.805	0.000	-4.667	0.000	-3.394	0.000	-5.284	0.000
EPL_2_corr	3.825	0.000	3.736	0.000	3.261	0.000	4.664	0.000
CENTR_corr	21.811	0.105	23.464	0.233	7.503	0.519	-10.209	0.408
CENTR_corr_2	-2.729	0.082	-2.790	0.169	-1.334	0.327	0.431	0.765
COORD_corr	-18.834	0.024	-17.725	0.201	-12.168	0.092	-3.757	0.613
COVER_corr	0.098	0.681	0.029	0.932	0.182	0.377	0.264	0.211
UNION_corr	-13.838	0.008	-13.002	0.120	-14.079	0.002	-22.073	0.000
dummy_1999	0.500	0.295	0.466	0.454	0.719	0.082	0.793	0.136
dummy_2000	0.673	0.085	0.687	0.144	0.749	0.027	0.952	0.030
dummy_2001	0.436	0.180	0.462	0.237	0.448	0.112	0.640	0.083
dummy_2002	0.137	0.584	0.160	0.583	0.236	0.277	0.296	0.312
dummy_2003	0.028	0.879	0.041	0.836	0.116	0.462	0.108	0.634
dummy_2004	-0.382	0.003	-0.364	0.001	-0.199	0.077	-0.347	0.053
_cons	66.993	0.000	110.136	0.000	-	-	-	-
<i>n. of observations</i>	1309		1309		1309		1309	
<i>n. of groups</i>	187		187		187		187	
<i>F (26,1096)</i>	67.170	0.000						
<i>R-sq within</i>	0.614							
<i>R sq between</i>	0.000							
<i>R sq overall</i>	0.001							
<i>R squared</i>	-	-	0.983		0.986		0.986	
<i>Hausman Test</i>	705.300	0.000						
<i>Wooldridge test</i>	91.603	0.000						
<i>Modified Wald (heteroskedasticity)</i>	3899.850	0.000						
<i>Breusch-Pagan LM (contemp. correlation)</i>	25752.913	0.000						
$\rho$ (AR 1 term)			0.151					
$\rho / \lambda$ (spatial effects terms)					0.359	0.000	0.440	0.000

\* Coefficients and p\_values of regional fixed effects omitted for sake of brevity

The second set of estimates (table 19) provides evidence of a negative impact on UR of CDE, GHI, JK and L\_Q specialisation. Similarly, HOURS and TAX\_WEDGE have a negative and significant coefficient. Per capita GDP is never significant at 5% (and only in two models at 10%). Increasing labour costs tend to raise unemployment rates, which are also associated with the most urban contexts (positive sign of DENS). As regards the variables assumed as quantitative proxies of labour policies, ACT\_POL is significant only in

the spatial models, whereas passive policies are steadily associated with higher UR. Growing product market regulation (PMRI) also “positively” influences unemployment rates<sup>44</sup>.

**Table 19. Econometric estimates (dependent variable: unemployment rate) (1999-2005)**

UR	Fixed effects		Correlated PCSE (fe)*		ML (fe) (spatial lag- $\rho$ )		ML (fe) (spatial error- $\lambda$ )	
	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values
CDE	-0.112	0.000	-0.078	0.097	-0.122	0.000	-0.100	0.000
F	0.029	0.484	0.025	0.690	0.064	0.069	0.070	0.034
GHI	-0.130	0.000	-0.096	0.032	-0.113	0.000	-0.095	0.000
JK	-0.101	0.006	-0.080	0.038	-0.074	0.017	-0.054	0.060
L_Q	-0.126	0.000	-0.102	0.008	-0.117	0.000	-0.115	0.000
GDP	-0.091	0.088	-0.091	0.273	-0.060	0.186	-0.068	0.091
HOURS_corr	-0.102	0.001	-0.071	0.147	-0.052	0.041	-0.061	0.021
DENS	3.605	0.018	3.611	0.000	2.335	0.072	0.096	0.934
LAB_COST	0.272	0.000	0.262	0.000	0.242	0.000	0.270	0.000
TAX_WEDGE	-0.146	0.000	-0.132	0.002	-0.093	0.000	-0.116	0.000
ACT_POL	0.314	0.332	0.298	0.645	0.761	0.006	0.539	0.159
PASS_POL_corr	1.005	0.000	0.984	0.000	0.884	0.000	1.014	0.000
PMRI	2.306	0.000	2.174	0.005	1.572	0.000	2.852	0.000
EPL_2_corr	-0.067	0.864	0.003	0.997	-0.171	0.609	-0.170	0.705
CENTR_corr	-31.568	0.001	-34.298	0.005	-33.020	0.000	-29.611	0.000
CENTR_corr_2	5.771	0.000	5.697	0.000	5.686	0.000	4.763	0.000
COORD_corr	7.634	0.193	5.837	0.499	6.339	0.203	5.220	0.253
COVER_corr	0.149	0.375	0.261	0.363	0.256	0.073	0.240	0.066
UNION_corr	-10.558	0.004	-10.079	0.061	-5.528	0.076	2.949	0.440
dummy_1999	0.662	0.049	0.649	0.305	0.566	0.048	-0.133	0.741
dummy_2000	1.026	0.000	0.972	0.076	0.965	0.000	0.319	0.353
dummy_2001	0.632	0.006	0.575	0.222	0.787	0.000	0.136	0.646
dummy_2002	0.341	0.054	0.306	0.377	0.406	0.007	-0.046	0.853
dummy_2003	-0.017	0.894	-0.030	0.891	0.033	0.761	-0.307	0.140
dummy_2004	0.081	0.372	0.063	0.566	0.072	0.354	-0.097	0.597
_cons	29.210	0.000	12.490	0.275	-	-	-	-
<i>n. of observations</i>	1309		1309		1309		1309	
<i>n. of groups</i>	187		187		187		187	
F (25, 1097)	161.050							
R-sq within	0.786							
R sq between	0.367							
R sq overall	0.382							
R squared			0.975		0.983		0.987	
Hausman Test	118.560	0.000						
Wooldridge test	73.381	0.000						
Modified Wald (heteroskedasticity)	49790.730	0.000						
Breusch-Pagan LM (contemp. correlation)	32140.835	0.000						
$\rho$ (AR 1 term)			0.245					
$\rho / \lambda$ (spatial effects terms)					0.325	0.000	0.687	0.000

\* Coefficients and p-values of regional fixed effects omitted for sake of brevity

<sup>44</sup> If employment protection legislation (also in lagged form) and bargaining coordination levels are not significant, an increasing bargaining centralisation (associated with its quadratic form) reduces UR, with decreasing marginal effects (the significance of the U-shaped pattern reveals that a positive relationship emerges only after very high levels of centralisation. Lastly, the degree of bargaining coverage (COVER) is associated with higher UR (significant in the spatial models), whereas union density coefficient does not play a clear and statistically significant role.

The third group of estimations (referring to LTUR; table 20) shows some remarkable differences with respect to the previous one. Specialisation in business services is the only significant variable among the industry indicators; GDP and HOURS\_corr are not significant; population density decreases long-term unemployment, and stronger ACT\_POL are associated with lower LTUR. The positive and significant relationships with PMRI and union density are also confirmed for LTUR; EPL is never significant.

Table 20. Econometric estimates (dependent variable: long-term unemployment rate) (1999-2005)

Long Term UR	Fixed effects		Correlated PCSE (fe)*		ML (fe) (spatial lag- $\rho$ )		ML (fe) (spatial error- $\lambda$ )	
	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values	Coeff.	p-values
CDE	-0.040	0.093	-0.035	0.229	-0.032	0.105	0.001	0.977
F	-0.050	0.124	-0.048	0.152	-0.008	0.773	0.004	0.888
GHI	-0.061	0.011	-0.056	0.037	-0.040	0.045	-0.024	0.228
JK	-0.098	0.001	-0.098	0.000	-0.060	0.010	-0.033	0.154
L_Q	-0.012	0.548	-0.013	0.596	0.005	0.761	0.013	0.449
GDP	0.013	0.756	0.007	0.851	0.015	0.669	-0.027	0.404
HOURS_corr	-0.015	0.522	-0.010	0.782	0.001	0.954	-0.022	0.300
DENS	-1.778	0.133	-1.671	0.004	-1.864	0.058	-1.516	0.096
LAB_COST	0.113	0.000	0.111	0.004	0.104	0.000	0.133	0.000
TAX_WEDGE	-0.082	0.000	-0.079	0.002	-0.048	0.000	-0.081	0.000
ACT_POL	-0.650	0.010	-0.691	0.049	-0.084	0.691	-0.641	0.031
PASS_POL_c~r	0.564	0.000	0.557	0.000	0.467	0.000	0.558	0.000
PMRI	1.498	0.000	1.496	0.004	0.841	0.001	2.059	0.000
EPL_2_corr	0.421	0.166	0.407	0.355	0.255	0.313	0.444	0.203
CENTR_corr	-29.026	0.000	-29.468	0.001	-27.001	0.000	-20.606	0.001
CENTR_corr_2	3.601	0.000	3.595	0.000	3.387	0.000	2.581	0.000
COORD_corr	11.168	0.014	10.809	0.065	8.183	0.030	2.844	0.430
COVER_corr	0.050	0.703	0.072	0.610	0.122	0.258	0.106	0.303
UNION_corr	8.608	0.002	8.553	0.046	9.559	0.000	17.708	0.000
dummy_1999	-0.051	0.846	-0.070	0.872	-0.008	0.971	-0.665	0.033
dummy_2000	0.410	0.055	0.382	0.299	0.397	0.025	-0.103	0.697
dummy_2001	0.238	0.180	0.212	0.490	0.356	0.016	-0.169	0.455
dummy_2002	-0.047	0.733	-0.065	0.775	0.080	0.487	-0.361	0.055
dummy_2003	-0.099	0.319	-0.106	0.455	-0.041	0.624	-0.349	0.026
dummy_2004	-0.030	0.666	-0.034	0.638	-0.012	0.837	-0.161	0.235
_cons	21.920	0.000	36.593	0.000	-	-	-	-
<i>n. of observations</i>	1309		1309		1309		1309	
<i>n. of groups</i>	187		187		187		187	
F (25, 1097)	100.920							
R-sq within	0.697							
R sq between	0.015							
R sq overall	0.021							
R squared			0.970		0.978		0.981	
Hausman Test	159.170	0.000						
Wooldridge test	50.571	0.000						
Modified Wald (heteroskedasticity)	26251.370	0.000						
Breusch-Pagan LM (contemp. correlation)	24259.791	0.000						
$\rho$ (AR 1 term)			0.084					
$\rho / \lambda$ (spatial effects terms)					0.409	0.000	0.665	0.000

\* Coefficients and p\_values of regional fixed effects omitted for sake of brevity

## 5. Summary of main results

In this section we summarise the main results of the compared empirical examination of our three labour market performance indicators, distinguishing two levels, national and regional.

As regards national level (EU-15 countries), we highlight the following main empirical evidence for the period 1997-2006:

- (A) notwithstanding a generally low and decreasing annual GDP growth rate (EU-15 average of +2.3% in the whole period and +1.8% over the last five years), a widespread and unexpected improvement in labour market performance occurred (over 18 million new jobs created, all employees, of which over two-thirds with permanent contracts and half with part-time contracts; ER increased in all countries, and by 12.5% on average; UR and LTUR decreased in 12 out of 15 countries, by -24.5% and -35.4% on average, respectively);
- (B) correlation coefficients and elasticity between GDP growth and changes in labour market performance indicators are quite unstable over time and across countries, but clearly highlight the fact that the recent slowing down of growth rates was generally accompanied by surprising (un)employment improvements;
- (C) in the whole period considered, clear beta convergence emerges for ER, UR and LTUR (in ER terms, this means convergence towards the main quantitative objective of the European Employment Strategy); sigma convergence also occurred in the whole period for ER and started later for UR and LTUR (since 2000 and 2001, respectively), the latter two showing much higher dispersion than the former;
- (D) in spite of the above general converging trends, remarkable national differences still existed in 2006 in terms of ER (58.4 of Italy vs. 77.4 of Denmark), UR (9.5 of France vs. 3.9 of Denmark and Netherlands) and LTUR (4.7 of Germany vs. 0.8 of Denmark);
- (E) similarly, labour market performance improvements occurred in EU-15 and EMU-12 aggregates;

As for the regional NUTS 2 level, we highlight some results of (i) comparative and convergence analyses and (ii) econometric examination of the determinants of regional labour market performance in the period 1999-2005:

- (F) median performance over the period considered is positive for ER but shows a U-shape for unemployment indicators;
- (G) transition matrixes highlighted a widespread lower persistence probabilities for UR and LTUR with respect to ER;
- (H) lowess beta convergence dynamics emerged for all three indicators; sigma convergence occurred for ER (throughout the period) and for UR and LTUR (since 2001), the latter two showing much higher dispersion than the former.;
- (I) in spite of the above prevailing converging dynamics, remarkable regional differences still existed in 2005 in terms of ER (44.1 of Sicily, Italy vs. 78.0 of Berkshire, Bucks and Oxfordshire, UK), UR (22.3 of Halle, Germany vs. 2.6 of Herefordshire, Worcestershire and Warwickshire, UK) and LTUR (13.7 of Dessau, Germany vs. 0.4 of Herefordshire, Worcestershire and Warwickshire, UK);
- (L) bivariate regressions confirmed the limited explicative power of the relationship between GDP growth rates and labour market dynamics in the period 1999-2005;

- (M) cross-section analyses (for 1999 and 2005) provided the following main results: (i) long-term unemployment negatively affects employment rates, with increased strength in 2005; (ii) the level of economic development (per capita GDP) affects ER positively and both UR and LTUR negatively; (iii) higher weekly working hours influence ER negatively, whereas its impact is positive on UR and LTUR, but not always significantly; (iv) higher population density determines lower ER and higher UR and LTUR, at low significance levels; (v) labour cost affects unemployment rates negatively, whereas its sign and significance for LTUR and ER are unstable; (vi) higher ALMP reduce UR and LTUR, whereas the coefficient is not significant for ER; (vii) conversely, passive labour policies increase ER, but also UR and LTUR; (viii) product market regulation increases unemployment rates and has a negative effect on ER; (ix) TAX\_WEDGE is positively related to unemployment rates and negatively to ER in 2005.
- (N) Study of the determinants of ER, UR and LTUR changes (1999-2005) provides interesting results, although they are probably influenced by the short period considered and by cyclical conditions: (i) the effects of EPL changes are statistically significant only on UR and LTUR, but not in the expected direction; (ii) as regards changes in weekly hours, a surprising inverse relationship arises with changes in LTUR and UR, whereas not significant impacts on ER changes emerge; (iii) tax wedge changes inversely affect the dynamics of unemployment. Moreover, the following results (statistically significant) arise in the two models in which changes in the main institutional indicators were used as explicative variables: (i) changes in ALMP have a positive relationship with changes in ER and a negative one with changes in UR and LTUR; (ii) the opposite occurs for changes in passive labour policies; (iii) changes in the degree of product market regulation have a negative relationship with changes in ER and a positive one with changes in UR and LTUR; (iv) the opposite occurs for changes in EPL; (v) changes in union density have an inverse relationship with changes in ER and a positive and significant one with changes in LTUR. In the last two models, considering changes in (hourly) labour cost in addition to the main institutional variables, we obtained the following main results: (i) the signs of the parameters of the institutional variables are not affected by the introduction of the new variable; (ii) changes in labour costs have a negative relationship with ER dynamics and a positive relationship with changes in UR.
- (O) The four different econometric approaches used for panel estimates provided almost identical results in terms of coefficient signs, levels and significance, and this suggests that the outcomes obtained may be considered reliable. In particular, the following outcomes were particularly interesting: (i) a higher degree of product market regulation played a clearly negative role on labour market performance indicators; (ii) the effects of EPL were not significant on UR or LTUR, but were positive on ER; (iii) passive labour policies showed a negative effect on ER and a positive relationship with UR and LTUR, highlighting the crucial importance of effective design (eligibility, duration, etc.) in order to avoid undesirable effects; (iv) active labour market policies played an important positive role in improving ER and reducing LTUR; (v) union density showed a significant and negative effect on ER and UR, whereas the relationship was positive with LTUR; (vi) the tax wedge had no significant effects on ER, but revealed an unexpected inverse relationship with UR and LTUR; (vii) labour costs affect ER

negatively and UR and LTUR positively; (ix) the number of hours worked weekly (HOURS\_corr) is steadily negative with ER (significant at 90% only in the spatial econometric specifications), but it is also negative and significant with UR; (viii) the negative impact on ER determined by LTUR suggests the crucial importance of specific active policies aimed at reducing permanent labour exclusion and hysteresis phenomena; (ix) population density had a negative significant effect on ER and LTUR, but a positive one on UR; one explanation is that urban regions attract more labour supply, but are less able to provide those “sub-optimal” employment opportunities usually offered in rural areas, whereas permanent exclusion from employment is less probable; (x) a positive role on ER is played by relative regional industry specialisation in business (JK) and public (L\_Q) services, whereas a negative and significant impact on UR and LTUR of specialisation in the industry sector (CDE), traditional services (GHI), business (JK) and public (L\_Q) services (the latter not significant for LTUR) emerged. Obviously, a higher share of employment in public services was related to higher ER and lower UR, mainly due to the particular characteristics and regional polarisation of this sector; (xi) lastly, it is particularly interesting that regional per capita GDP is never significant in explaining ER and LTUR, while a limited significance (with negative sign) occurred in only two UR models.

## 6. Policy implications and further research

Lastly, this section presents some policy implications deriving from the above evidence and results, and suggests some directions for further research.

Study of the reasons for the (unexpected) improvement in labour market performance in EU-15 countries was beyond the scope of this paper. However, we can exclude (i) a “growth-led” effect<sup>45</sup>, (ii) a “macro-economic (fiscal) policy effect”<sup>46</sup> and (iii) a “single-currency effect”<sup>47</sup>. Instead, the direct and indirect effects of the European Employment Strategy (launched in 1997) on national (and regional) employment improvements, which are extremely difficult to assess, cannot easily be excluded. These hypothetical positive effects had already been emphasised in a previous research (Perugini and Signorelli, 2004) and are reinforced by the present update of analysis. The EES produced some direct effects through the European Social Fund, but we argue that it may, especially, have produced indirect effects with its suggestions (guidelines) for structural labour market reforms and policy

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<sup>45</sup> In addition to the evidence of low and declining GDP growth, the econometric results clearly excluded this effect.

<sup>46</sup> As is well-known, generally restrictive macro-economic policies were required of many EU-15 countries, in order to achieve the financial convergence goals defined by the Maastricht Treaty criteria (1992) in view of EMU membership, and (partly) confirmed in the recently reformed (2005) “Stability and Growth Pact” signed in 1997.

<sup>47</sup> The Optimal Currency Area theories mainly focus on the necessity to have a high degree of (geographical) labour mobility in order to avoid undesirable labour market performance effects. Considering the well-known low labour mobility in European countries and regions (with respect to the US), it should be recalled that this was one of the main reasons against the establishment of a monetary union in Europe; but the announced dramatic employment effects never happened, notwithstanding the prevailing real exchange rate appreciation of the Euro. However, we stress that complex migration phenomena was not considered in this paper and, obviously, they are (partly) different across EU-15 regions and countries, and change over time, with various effects on labour market performance and dynamics.

interventions addressed to national (and regional) governments<sup>48</sup>. In particular, these labour reforms and policies probably favoured a partial emersion of “irregular employment”, especially in countries with a higher weight of shadow economy<sup>49</sup>.

As for the regional level of investigation, in general terms the econometric analyses emphasise some difficulties in obtaining clearcut, stable results on the determinants of regional labour market differentials and dynamics, according to: (i) the specification model and estimate technique adopted, and (ii) the employment or unemployment indicator used. Obviously, the main characteristics of the causal links arising from these empirical analyses (sign and intensity, but especially the “robustness” of the results) also contribute to defining the degree of uncertainty about the probable impact of various economic policies and institutional reforms, which is one of the crucial factors to be considered (ex-ante) by policy-makers. Therefore, we argue that our approach may favour the initial selection and ranking of the most important variables which (partly) explain the differences and dynamics in regional (un)employment indicators. In particular, moving from the evidence that development/growth variables cannot significantly contribute towards explaining the huge differences and recent dynamics in regional labour market performance, and considering the unclear effects of sector specialisation (with some exceptions), the role of a few institutional factors (especially product market regulation<sup>50</sup> and active labour market policies<sup>51</sup>) and labour costs emerged, with clear and quite stable effects on performance indicators. This evidence especially addresses: (i) wider diffusion of ALMP best practices and more effective implementation of passive policies; (ii) the definition of structural policies aimed at reducing the degree of product market regulation. In addition, many results highlight an inverse relationship between labour

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<sup>48</sup> The EES is well-known as a “dynamic” open method of co-ordination of European (national and regional) employment policies, based on guidelines periodically addressed to member states according to their specific labour market performance dynamics and institutional characteristics and changes. According to the European Employment Guidelines, each country annually presents a National Reform Programme and an Employment Report focusing on implemented policies and on labour market performance changes. We recall here only three features of the EES: (i) it devotes attention to the process of exchange of information between member states, allowing better assessment of the transferability of good practices, (ii) it attributes a key role to active labour market policies and (iii) since 2000, it has provided a better definition of clearer quantitative ER objectives, with greater emphasis on net employment creation rather than unemployment reduction and, in addition, it has been integrated in the more general “Lisbon Strategy” (launched in 2000 and reformed in 2005). In 2005 the European Commission decided that the Employment Guidelines and the Broad Economic Policy Guidelines should be fully reviewed only every three years. Recently, in its “Green Paper” and Communication (November 22, 2006 and June 27, 2007, respectively) the European Commission (i) launched a broad open public debate for favouring a better definition of the so-called “flexicurity” approach and (ii) proposed the establishment of common principles of flexicurity to promote more and better jobs by combining flexibility and security for workers and companies.

<sup>49</sup> If this is the case, the stagnation of labour productivity may be partly explained by the fact that “emerged” employment has, at least initially, a productivity level below the average of regular employment.

<sup>50</sup> The degree of product market regulation is defined by considering (i) state control of business enterprises, (ii) legal and administrative barriers to entrepreneurship and (iii) barriers to international trade and investment.

<sup>51</sup> The set of active labour market policies is quite large and include the support to (i) private and public job matching services, (ii) training programmes (personalised for unemployed and/or addressed to specific groups of disadvantaged people).

costs and labour market performance, suggesting the importance of industrial relations systems favouring “wage moderation”<sup>52</sup>.

Although positive net job creation is one of the key instruments favouring social inclusion<sup>53</sup>, it is necessary to recall that this paper aimed at examining labour market performance differentials and dynamics in *quantitative and stock* terms<sup>54</sup>. Further analyses of (i) both *quantitative* and *qualitative* performance indicators (i.e., more and better jobs, but also higher productivity and wages, etc.) and (ii) using a stock-flow approach (i.e., also considering flows “in and out” of the different statuses of persons employed, unemployed, out of the labour force, employed in temporary contracts, permanently employed, etc.) would be very useful. On the first point, Marelli’s paper (in this issue) emphasises how one key challenge for EU countries and regions is the spread of “virtuous models” of growth, characterised by significant increases in employment and even larger productivity gains<sup>55</sup>. This would be the best “landing” after a long period (from 1970s to the mid-1990s) of prevailing “intensive models” of growth in EU-15 (with significant productivity gains and low or negative net job creation), recently followed by the spread of “extensive models” of growth (with significant improvements in employment, but generally low GDP and productivity growth rates)<sup>56</sup>. On the second point, Boeri and Garibaldi (2007) highlight a “transitional honeymoon effect” on net job creation produced by labour

<sup>52</sup> It is not simple to properly define “wage moderation”, but it depends crucially on a better link between wages (labour costs) and productivity - both levels and dynamics - across regions, firms and workers, and over time.

<sup>53</sup> Higher ER (and lower UR and LTUR) favours socially sustainable economic development. We recall the important effect (through the “fiscal wedge”) of a higher ER for the dynamic sustainability of the European “welfare state systems”.

<sup>54</sup> In other words, the aim of the paper is to shed light on the evidence of countries and especially regions with comparatively more and/or increasing jobs (opportunities) and less and/or decreasing (long-term) unemployment.

<sup>55</sup> Productivity gains may allow sustainable increases in real wages which, affecting consumers’ expenditure, can further reinforce “virtuous models”.

<sup>56</sup> Whereas the European Employment Strategy may be “suspected” of positive direct and indirect effects on (national and regional) labour market performance dynamics, the Lisbon Strategy was certainly not followed by the declared gains in compared competitiveness and growth, mainly as a consequence of very limited implementation (see, e.g., Perugini and Signorelli, 2005b). The European Commission and European Central Bank recommendations mainly focus on levels and dynamics of national public finance balances (deficit and debt with respect to GDP), whereas attention paid to the levels and compositions of the EU budget (around 1% of EU GDP, with a still high - over 40% - weight of expenditure for the agricultural sector) and national budgets (with a public expenditure of around 50% of the GDP and a marginal weight of public investments) is generally insufficient. We argue that significant modifications to the compositions of national (and sub-national) budgets, together with a gradual reduction of their levels with respect to GDP, are of crucial importance in favouring the spread of “virtuous models” of growth and may be partly favoured by better implementation of the reformed “Stability and Growth Pact”. As for the EU budget, an increase of incidence with respect to GDP would be desirable but not realistic in the short-medium term, whereas there are still significant margins for further improvements in the effective allocation of EU resources. However, the declared key objective of “more growth and jobs for all EU regions and cities” adopted for the new Structural Funds (2007-2013) is consistent with the European “Growth and Jobs Agenda” launched in 2005. Obviously, it is absolutely necessary to avoid the EU falling headlong into the worst of the possible “models of growth” characterised by low or negative dynamics in both employment and productivity (and GDP). Many theoretical and empirical researches clearly attributed to the quantity and/or quality of (public and private) investment in human capital (basic and academic education, on the job training, life-long learning, etc.) a key role for favouring better GDP growth rates and higher productivity gains.

market reforms increasing flexibility “at the margin”, but it would be useful: (i) to explain why, in some countries, the honeymoon is lasting so long, and (ii) to better define the conditions for improving further the “bridge function towards permanent jobs” played by temporary and training contracts.

Lastly, at least the following two further research developments of this paper are of particular interest<sup>57</sup>: (i) examination of possible interactions between various institutional variables, in order to detect “systemic effects” and possible situations of “institutional equivalence”, i.e., different institutional “baskets” allowing similar high degrees of performance; (ii) joint and integrated analysis of the determinants of both national and regional labour market performance differentials and dynamics.

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<sup>57</sup> Obviously a key condition for favouring the above and other empirical research development at sub-national levels is related to the availability of new economic, structural and institutional data (e.g. institutional data at NUTS 2 level and sectoral - NACE two-digits classification - GDP and employment data at NUTS 3 level).

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## Appendix

Table A1. Female Employment rate (ER) levels and dynamics (EES objective: more than 60% by 2010)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	$\Delta$ 1997-2006 <sup>1</sup>	
											p. p.	%
EU-15	50.8	51.6	53.0	54.1	55.0	55.6	56.0	56.8	57.4	58.4	+7.6	+15.0
EMU-12	47.7	48.6	50.1	51.4	52.4	53.1	53.6	54.5	55.2	56.4	+8.7	+18.2
Belgium	46.5	47.6	50.4	51.5	51.0	51.4	51.8	52.6	53.8	54.0	+7.5	+16.1
Denmark	69.1	70.2	71.1	71.6	72.0	71.7	70.5	71.6	71.9	73.4	+4.3	+6.2
Germany	55.3	55.8	57.4	58.1	58.7	58.9	58.9	59.2	59.6	61.5	+6.2	+11.2
Ireland	45.9	49.0	52.0	53.9	54.9	55.4	55.7	56.5	58.3	59.3	+13.4	+29.2
Greece	39.3	40.5	41.0	41.7	41.5	42.9	44.3	45.2	46.1	47.4	+8.1	+20.6
Spain	34.6	35.8	38.5	41.3	43.1	44.4	46.3	48.3	51.2	53.2	+18.6	+53.8
France	52.4	53.1	54.0	55.2	56.0	56.7	57.3	57.4	57.6	57.7	+5.3	+10.1
Italy	36.4	37.3	38.3	39.6	41.1	42.0	42.7	45.2	45.3	46.3	+9.9	+27.2
Luxembourg	45.3	46.2	48.6	50.1	50.9	51.6	50.9	51.9	53.7	54.6	+9.3	+20.5
Netherlands	58.0	60.1	62.3	63.5	65.2	66.2	66.0	65.8	66.4	67.7	+9.7	+16.7
Austria	58.6	58.8	59.6	59.6	60.7	61.3	61.6	60.7	62.0	63.5	+4.9	+8.4
Portugal	56.5	58.2	59.4	60.5	61.3	61.4	61.4	61.7	61.7	62.0	+5.5	+9.7
Finland	60.3	61.2	63.4	64.2	65.4	66.2	65.7	65.6	66.5	67.3	+7.0	+11.6
Sweden	67.2	67.9	69.4	70.9	72.3	72.2	71.5	70.5	70.4	70.7	+3.5	+5.2
U. K.	63.1	63.6	64.2	64.7	65.0	65.2	65.3	65.6	65.9	65.8	+2.7	+4.3
<b>Coeff. of var.</b>	<i>0,206</i>	<i>0,199</i>	<i>0,190</i>	<i>0,180</i>	<i>0,178</i>	<i>0,170</i>	<i>0,159</i>	<i>0,146</i>	<i>0,138</i>	<i>0,135</i>		
U. S.	67.1	67.4	67.6	67.8	67.1	66.1	65.7	65.4	65.6	n.a.	-1.5	-2.2
Japan	57.6	57.2	56.7	56.7	57.0	56.5	56.8	57.4	58.1	n.a.	+0.5	+0.9

Source: Eurostat

Note: (1)  $\Delta$  1997-2005 for U.S. and Japan.

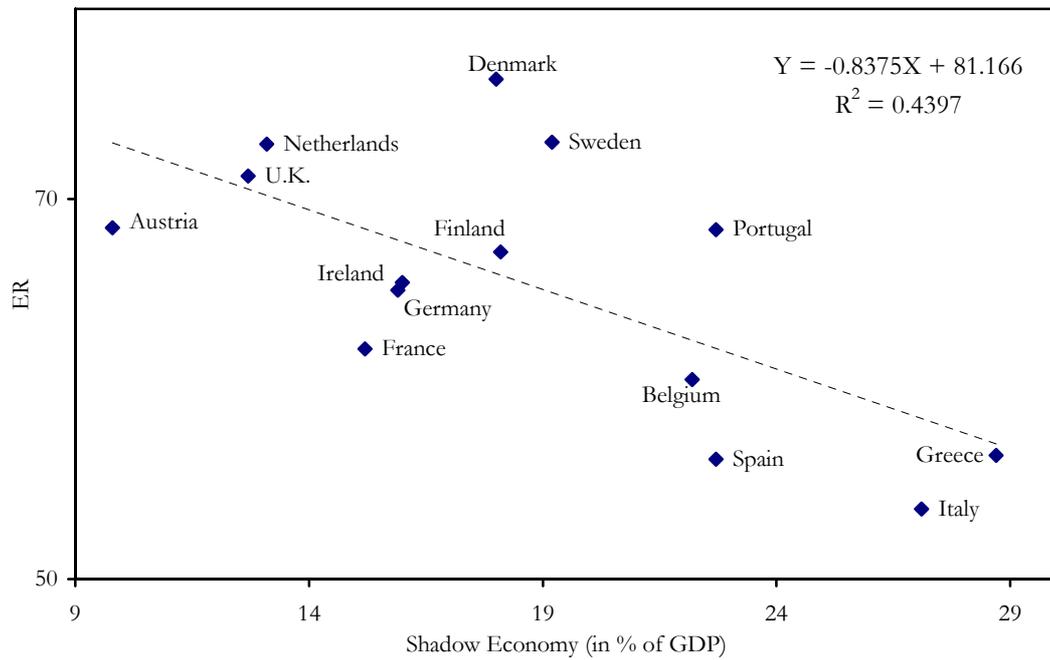
Table A2. 55-64 Employment rate (ER) levels and dynamics (EES objective: more than 50% by 2010)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	$\Delta$ 1997-2006 <sup>1</sup>	
											p. p.	%
EU-15	36.4	36.6	37.1	37.8	38.8	40.2	41.7	42.5	44.1	45.3	+8.9	+24.5
EMU-12	33.5	33.5	33.9	34.4	35.2	36.5	37.9	38.6	40.4	41.7	+8.2	+24.5
Belgium	22.1	22.9	24.6	26.3	25.1	26.6	28.1	30.0	31.8	32.0	+9.9	+44.8
Denmark	51.7	52.0	54.5	55.7	58.0	57.9	60.2	60.3	59.5	60.7	+9.0	+17.4
Germany	38.1	37.7	37.8	37.6	37.9	38.9	39.9	41.8	45.4	48.4	+10.3	+27.0
Ireland	40.4	41.7	43.7	45.3	46.8	48.0	49.0	49.5	51.6	53.1	+12.7	+31.4
Greece	41.0	39.0	39.3	39.0	38.2	39.2	41.3	39.4	41.6	42.3	+1.3	+3.2
Spain	34.1	35.1	35.0	37.0	39.2	39.6	40.7	41.3	43.1	44.1	+10.0	+29.3
France	29.0	28.3	28.8	29.9	31.9	34.7	36.8	37.3	37.9	37.6	+8.6	+29.7
Italy	27.9	27.7	27.6	27.7	28.0	28.9	30.3	30.5	31.4	32.5	+4.6	+16.5
Luxembourg	23.9	25.1	26.4	26.7	25.6	28.1	30.3	30.4	31.7	33.2	+9.3	+38.9
Netherlands	32.0	33.9	36.4	38.2	39.6	42.3	44.3	45.2	46.1	47.7	+15.7	+49.1
Austria	28.3	28.4	29.7	28.8	28.9	29.1	30.3	28.8	31.8	35.5	+7.2	+25.4
Portugal	48.5	49.6	50.1	50.7	50.2	51.4	51.6	50.3	50.5	50.1	+1.6	+3.3
Finland	35.6	36.2	39.0	41.6	45.7	47.8	49.6	50.9	52.7	54.5	+18.9	+53.1
Sweden	62.6	63.0	63.9	64.9	66.7	68.0	68.6	69.1	69.4	69.6	+7.0	+11.2
U. K.	48.3	49.0	49.6	50.7	52.2	53.4	55.4	56.2	56.9	57.4	+9.1	+18.8
<b>Coeff. of var.</b>	<i>0.302</i>	<i>0.299</i>	<i>0.292</i>	<i>0.290</i>	<i>0.301</i>	<i>0.287</i>	<i>0.274</i>	<i>0.274</i>	<i>0.253</i>	<i>0.243</i>		
U. S.	57.2	57.7	57.7	57.8	58.6	59.5	59.9	59.9	60.8	n.a.	+3.6	+6.3
Japan	64.2	63.8	63.4	62.8	62.0	61.6	62.1	63.0	63.9	n.a.	-0.3	-0.5

Source: Eurostat

Note: (1)  $\Delta$  1997-2005 for U.S. and Japan.

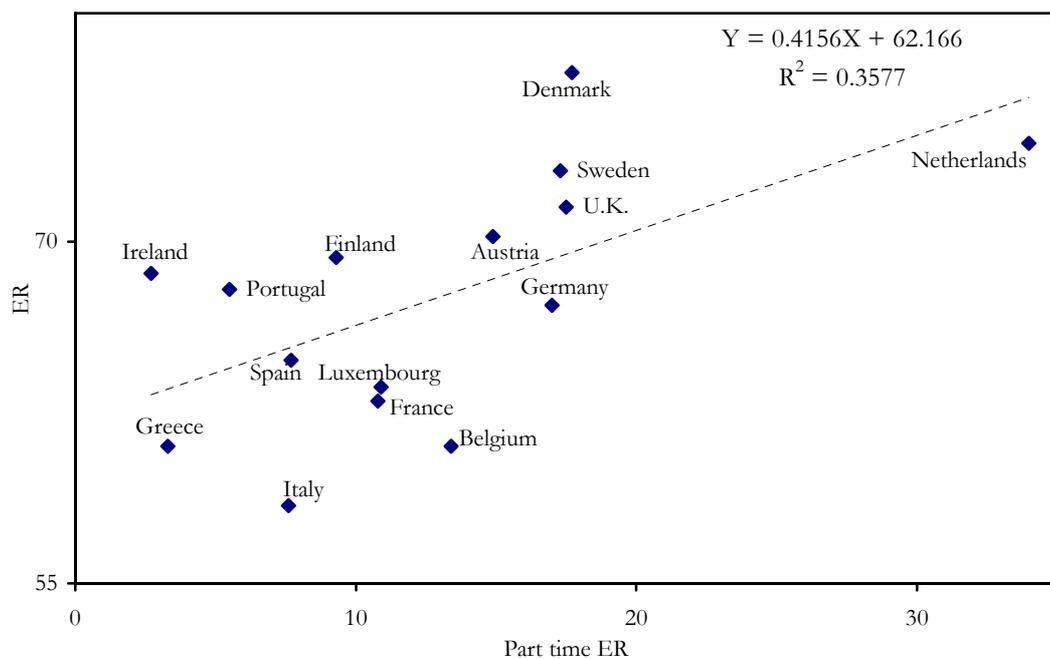
Figure A1. Employment rate (ER) and the size of shadow economy (2000)



Source: elaboration on Eurostat data (ER) and Schneider (2003) calculations based on “currency demand approach” (shadow economy).

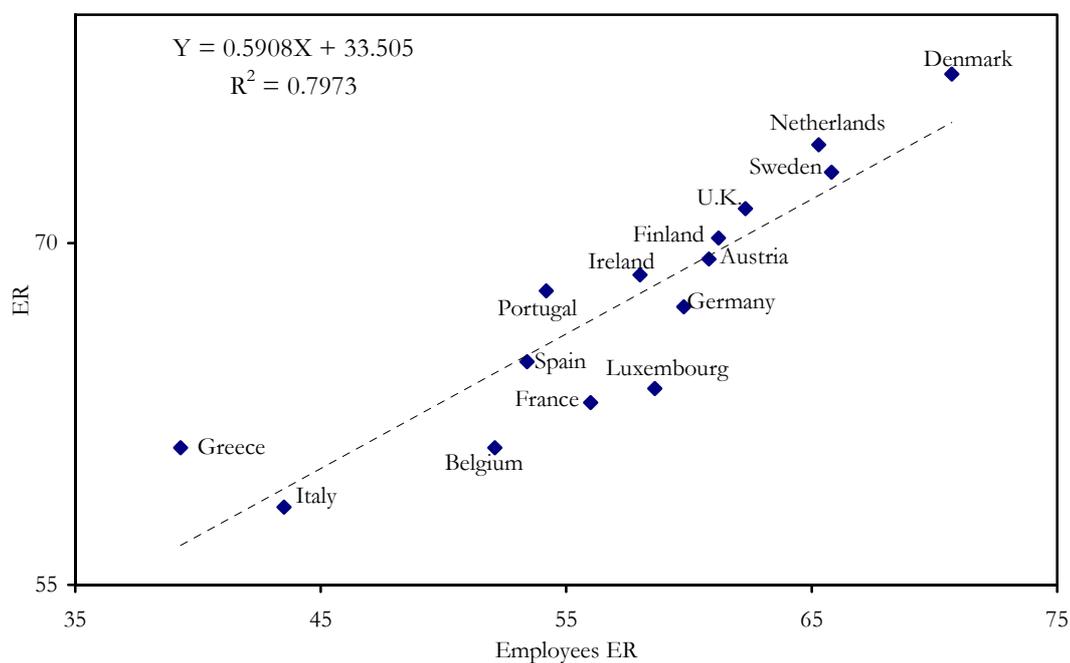
Note: Data not available for Luxemburg.

Figure A2. Employment rate (ER) and part time ER (2006)



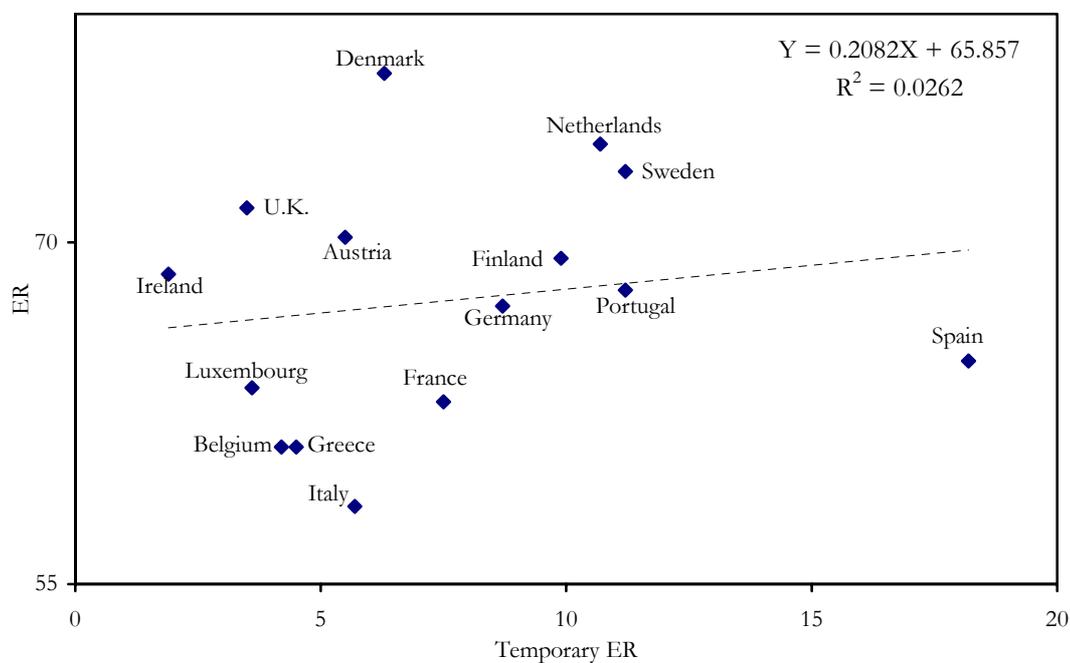
Source: elaboration on Eurostat data

Figure A3. Employment rate (ER) and employees ER (2006)



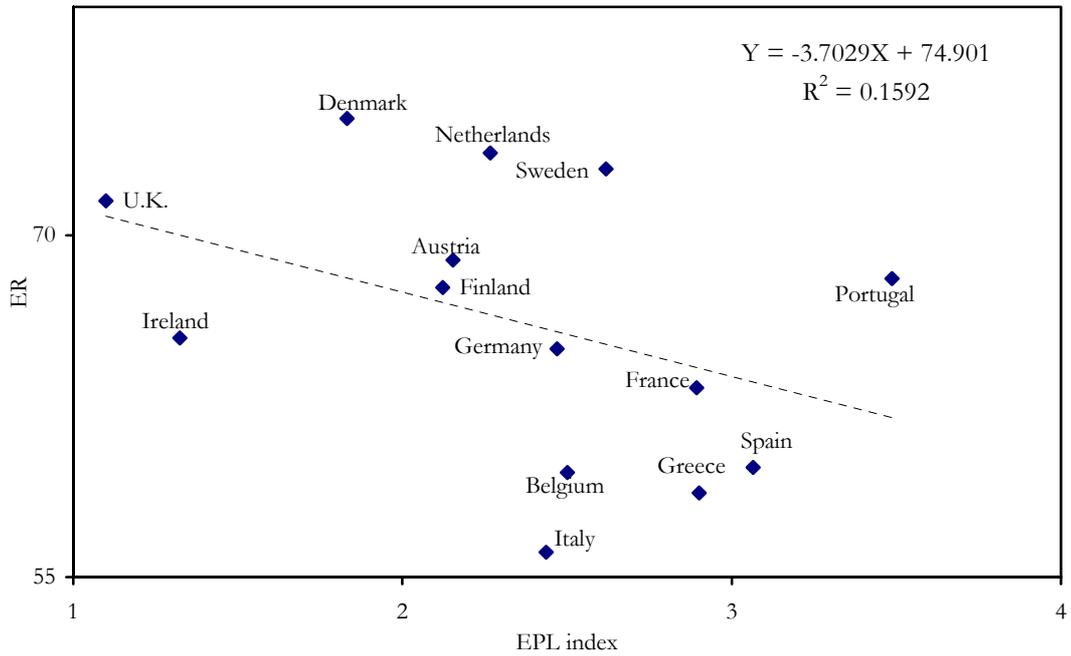
Source: elaboration on Eurostat data

Figure A4. Employment rate (ER, 2006) and temporary ER (2006)



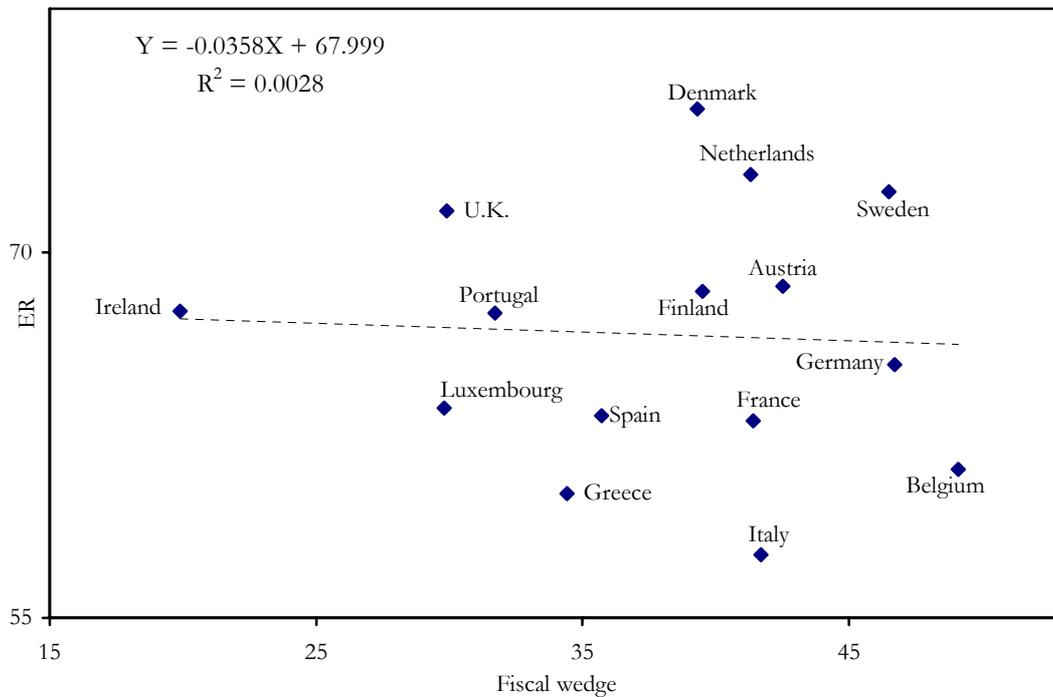
Source: elaboration on Eurostat data

Figure A5. Employment rate (ER, 2003) and EPL-2 (2003)



Source: elaboration on Eurostat data and OECD (2004) for EPL-2.  
 Note: Data not available for Luxemburg.

Figure A6. Employment rate (ER, 2005) and fiscal wedge (2005)



Source: elaboration on Eurostat data

Table A3. NUTS 2 regions considered in empirical analysis

BELGIUM		FRANCE		ITALY		SWEDEN		AUSTRIA	
be10	Brussels	fr10	Île de France	itc1	Piemonte	se01	Stockholm	at11	Burgenland
be21	Prov. Antwerpen	fr21	Champagne-Ardenne	itc2	Valle d'Aosta	se02	Östra Mellansverige	at12	Niederösterreich
be22	Prov. Limburg (B)	fr22	Picardie	itc3	Liguria	se04	Sydsverige	at13	Wien
be23	Prov. Oost-Vlaanderen	fr23	Haute-Normandie	itc4	Lombardia	se06	Norra Mellansverige	at21	Kärnten
be24	Prov. Vlaams Brabant	fr24	Centre	itd1	Pr. Aut. Bolzano	se07	Mellersta Norrland	at22	Steiermark
be25	Prov. West-Vlaanderen	fr25	Basse-Normandie	itd2	Prov. Aut. Trento	se08	Övre Norrland	at31	Oberösterreich
be31	Prov. Brabant Wallon	fr26	Bourgogne	itd3	Veneto	se09	Småland med öarna	at32	Salzburg
be32	Prov. Hainaut	fr30	Nord - Pas-de-Calais	itd4	Friuli-Venezia Giulia	se0a	Västsvrige	at33	Tirol
be33	Prov. Liège	fr41	Lorraine	itd5	Emilia-Romagna		<b>GREECE*</b>	at34	Vorarlberg
be34	Prov. Luxembourg (B)	fr42	Alsace	ite1	Toscana	gr11	Anat. Maked. Thraki		<b>FINLAND</b>
be35	Prov. Namur	fr43	Franche-Comté	ite2	Umbria	gr12	Kentriki Makedonia	fi13	Itä-Suomi
	<b>SPAIN</b>	fr51	Pays de la Loire	ite3	Marche	gr13	Dytiki Makedonia	fi18	Etelä-Suomi
es11	Galicia	fr52	Bretagne	ite4	Marche	gr14	Thessalia	fi19	Länsi-Suomi
es12	Principado de Asturias	fr53	Poitou-Charentes	itf1	Abruzzo	gr21	Ipeiros	fi1a	Pohjois-Suomi
es13	Cantabria	fr61	Aquitaine	itf2	Molise	gr22	Ionia Nisia		<b>NETHERLANDS</b>
es21	Pais Vasco	fr62	Midi-Pyrénées	itf3	Campania	gr23	Dytiki Ellada	nl11	Groningen
es22	Com. Foral de Navarra	fr63	Limousin	itf4	Puglia	gr24	Stereia Ellada	nl12	Friesland
es23	La Rioja	fr71	Rhône-Alpes	itf5	Basilicata	gr25	Peloponnisos	nl13	Drenthe
es24	Aragón	fr72	Auvergne	itf6	Calabria	gr30	Attiki	nl21	Overijssel
es30	Comunidad de Madrid	fr81	Languedoc-Roussillon	itg1	Sicilia	gr41	Voreio Aigaio	nl22	Gelderland
es41	Castilla y León	fr82	Prov.-Alpes-Côte d'Azur	itg2	Sardegna	gr42	Notio Aigaio	nl23	Flevoland
es42	Castilla-la Mancha	fr83	Corse		<b>LUXEMBOURG *</b>	gr43	Kriti	nl31	Utrecht
es43	Extremadura		<b>PORTUGAL</b>	lu00	Luxembourg		<b>DENMARK</b>	nl32	Noord-Holland
es51	Cataluña	pt11	Norte			dk00	Denmark	nl33	Zuid-Holland
es52	Comunidad Valenciana	pt15	Algarve				<b>IRELAND*</b>	nl34	Zeeland
es53	Illes Balears	pt16	Centro (PT)			ie01	Border, Midl. West.	nl41	Noord-Brabant
es61	Andalucía	pt17	Lisboa			ie02	South. and Eastern	nl42	Limburg (NL)
es62	Región de Murcia	pt18	Alentejo						

GERMANY		UNITED KINGDOM	
de11	Stuttgart	ukc1	Tees Valley and Durham
de12	Karlsruhe	uke2	Northumberland, Tyne and Wear
de13	Freiburg	ukd1	Cumbria
de14	Tübingen	ukd2	Cheshire
de21	Oberbayern	ukd3	Greater Manchester
de22	Niederbayern	ukd4	Lancashire
de23	Oberpfalz	ukd5	Merseyside
de24	Oberfranken	uke1	East Riding and North Lincolns.
de25	Mittelfranken	uke2	North Yorkshire
de26	Unterfranken	uke3	South Yorkshire
de27	Schwaben	uke4	West Yorkshire
de30	Berlin	ukf1	Derbyshire and Nottinghamshire
de41	Brand. - Nordost	ukf2	Leic., Rutland and Northants
de42	Brand. - Südwest	ukf3	Lincolnshire
de50	Bremen	ukg1	Hereford., Worc. and Warks
de60	Hamburg	ukg2	Shropshire and Staffordshire
de71	Darmstadt	ukg3	West Midlands
de72	Gießen	ukh1	East Anglia
de73	Kassel	ukh2	Bedfordshire, Hertfordshire
de80	Mecklenburg-Vorp.	ukh3	Essex
de91	Braunschweig	uki1	Inner London
de92	Hannover	uki2	Outer London
de93	Lüneburg	ukj1	Berkshire, Bucks and Oxfordshire
de94	Weser-Ems	ukj2	Surrey, East and West Sussex
dea1	Düsseldorf	ukj3	Hampshire and Isle of Wight
dea2	Köln	ukj4	Kent
dea3	Münster	ukk1	Glouc, Wilt. and North Somerset
dea4	Detmold	ukk2	Dorset and Somerset
dea5	Arnsberg	ukk3	Cornwall and Isles of Scilly
deb1	Koblenz	ukk4	Devon
deb2	Trier	ukl1	West Wales and The Valleys
deb3	Rheinessen-Pfalz	ukl2	East Wales
dec0	Saarland	ukm1	North Eastern Scotland
ded1	Chemnitz	ukm2	Eastern Scotland
ded2	Dresden	ukm3	South Western Scotland
ded3	Leipzig	ukm4	Highlands and Islands
dee1	Dessau	ukn0	Northern Ireland
dec2	Halle		
dec3	Magdeburg		
def0	Schleswig-Holstein		
deg0	Thüringen		

\* The regions of these countries were excluded in the analysis of section 4.3 and 4.4

Table A4. Variables used in descriptive and econometric analysis

<i>Variable</i>	Description	<i>Source</i>
ER	Employment rate (Employed / population aged 15-64)	<i>Eurostat Regio</i>
UR	Unemployment Rate (Unemployed / Labour Force)	<i>Eurostat Regio</i>
LTUR	Long Term Unemployment Rate (Long-term unemployed - 12 months and more/Labour Force)	<i>Eurostat Regio</i>
CDE	% of total employment in Industry sector (excluding construction)	<i>Eurostat Regio</i>
F	% of total employment in Construction sector	<i>Eurostat Regio</i>
GHI	% of total employment in traditional services (Wholesale and retail trade, repair of motor vehicles, motorcycles, and personal and household goods; hotels and restaurants; transport, storage and communication)	<i>Eurostat Regio</i>
JK	% of total employment in Financial intermediation; real estate, renting and business activities	<i>Eurostat Regio</i>
L_Q	% of total employment in Public administration and defence, compulsory social security; education; health and social work; other community, social and personal service activities; private households with employed persons; extra-territorial organisations and bodies	<i>Eurostat Regio</i>
GDP	Per capita Gross Domestic Product in Purchasing Power Parity	<i>Eurostat Regio</i>
PART_TIME	Share of part-time workers on total employment	<i>Eurostat Regio</i>
HOURS_corr <sup>α</sup>	Average number of usual weekly hours of work in main job (full-time).	<i>Eurostat Regio</i>
DIPEN	Share of employees on total employment	<i>Eurostat Regio</i>
DENS	Population density	<i>Eurostat Regio</i>
LAB_COST <sup>β</sup>	Hourly labour costs, Industry and services (excluding public administration), Purchasing Power Parity	<i>Eurostat</i>
TAX_WEDGE <sup>β</sup>	Tax wedge on labour cost: relative tax burden for an employed person with low earnings	<i>Eurostat</i>
ACT_POL <sup>β</sup>	Expenditure in Active Labour Market Policies (ALMP) (categories 2-7) in % of GDP	<i>Eurostat</i>
PASS_POL_corr <sup>γ</sup>	Expenditure in Passive Labour Market Policies (PLMP) (categories 8-9) in % of GDP	<i>Eurostat</i>
PMRI <sup>β</sup>	Product Market Regulation Index (0-6, from last to most restrictive)	<i>Oecd, Economic and Policy Reforms: going for growth 2005b</i>
EPL_2 <sup>β</sup> EPL_2_corr <sup>δ</sup>	Overall Employment Protection Legislation Index (Version 2)	<i>Oecd Employment Outlook 2004</i>
CENTR <sup>β</sup> CENTR_corr <sup>δ</sup>	Level of Bargaining Centralisation (range: 1-5)	<i>Oecd Employment Outlook 2004</i>
COORD <sup>β</sup> COORD_corr <sup>δ</sup>	Level of Bargaining Coordination (range: 1-5)	<i>Oecd Employment Outlook 2004</i>
COVER <sup>β</sup> COVER_corr <sup>δ</sup>	Collective Bargaining Coverage	<i>Oecd Employment Outlook 2004</i>
UNION <sup>β</sup> UNION_corr <sup>δ</sup>	Trade Union Density	<i>Oecd on line database</i>

<sup>α</sup> Variable at regional level weighted for the regional share of full time workers on total employment

<sup>β</sup> Variable at national level assumed uniform for all corresponding regions

<sup>γ</sup> Variable at national level weighted for unemployment/population ratio at regional level

<sup>δ</sup> Variable at national level weighted for the regional share of employees on total employment