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Abstract: Unemployment rates differ dramatically across European regions. This paper analyses these differences by integrating institutional and spatial perspectives into a unified theoretical framework. An econometric model is then used to analyse differences among European NUTS2 regions. The results of random-effects models indicate that there are four key factors that explain regional unemployment rates. Flexible labour market regulations and above-average levels of interpersonal trust are institutional factors that reduce unemployment. Accessibility factors such as inter-regional transport connectivity and local access to skilled workers have similarly substantial effects. Whether a region belongs to the Eurozone or not seems to be less important.

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1 Introduction

Europe consists of a heterogeneous collection of regions. Different regions have different economic structures, apply different policies and have differential access to resources. One oft-noted consequence of this heterogeneity is that regional labour markets have very different unemployment rates.

In the wake of the 2008 financial crisis, many macroeconomists have argued that the Eurozone is too large. According to this view, the Eurozone is incapable of using monetary means to counter cyclical unemployment problems since its member states are too different. Others believe that the monetary focus is misguided, and that the problems are of a different and more 'structural' nature. But 'structure' means different things to different people. Institutional economists stress the importance of formal and informal labour market institutions. Spatial economists and economic geographers focus on differences in accessibility and the spatial extent of labour markets. Yet others pinpoint the role of human capital, and the perceived lack thereof in certain 'lagging' regions.

Unfortunately, there has been a tendency in the past for adherents of different 'schools' to talk past one another. This paper represents an attempt to integrate different perspectives into a unified framework.

The next section of the paper provides a brief summary of a popular macroeconomic treatment of unemployment, focusing on Okun's law. The third section adopts a neo-institutional approach to explore possible causes of involuntary unemployment; monetary policy then becomes one of many institutional components. Space is introduced next, which allows us to consider the role of accessibility as a determinant of labour productivity. An integration of institutional and spatial perspectives paves the way for some rudimentary modelling, which forms the basis for an empirical econometric model. In the penultimate

section of the paper, we present our econometric estimates of the institutional and spatial effects. The concluding section sums up the policy implications for European regions.

2 The macroeconomics of unemployment

Increasing unemployment usually reflects decreasing demand in conjunction with cyclical downturns. In nations that (explicitly or implicitly) belong to the Eurozone, currency depreciations or devaluations cannot counteract a fall in demand within a single nation, unlike elsewhere. A business cycle of the type that recently affected the European economy consists of the following protracted sequence of causes and effects:

1. A decrease in loanable funds.
2. Reduced global demand, caused by the monetary multiplier.
3. Reduced production and trade, caused by reduced global demand.
4. Less production and trade cause higher unemployment rates, lower inflation rates and lower interest rates.

This causal process has been modelled and elaborated upon by numerous macroeconomists, including Keynes (1936), Okun (1962), Lee (2000), Mankiw and Reis (2002), Phelps (2007) and Blanchard (2009).

Building on Keynesian theory, Okun (1962) contends that changes to demand and growth affect unemployment according to the following model, which has been modified to reflect more recent findings:

$$\Delta u = -\alpha(g - \beta); \tag{1}$$

where

Δu = annual change in the unemployment rate above the natural rate of unemployment;

α = response rate to an increased rate of production (and demand) growth;

g = the GDP growth rate, caused by changes to global demand;

β = the sum of the growth rates of labour supply and labour productivity.

The magnitude of α has regularly been found to be well below one, reflecting the impact of institutional and other frictions (Blanchard, 2009). IMF economists have proposed a slightly different version of Okun's α (Ball, Leigh and Loungani, 2012). The modified equation is

$$\Delta u = \alpha \Delta y + \varepsilon_t \; ; \tag{3}$$

where

Δu = deviation from the natural rate of unemployment;

Δy = deviation from the natural rate of GDP growth.

Table 1 shows estimates of this modified Okun's α for 20 OECD economies, with the assumption that the estimated parameters remained stable over the studied time period.

TABLE 1 ABOUT HERE

According to these estimates, countries such as Austria, Japan, Portugal and Italy have low levels of 'employment responsiveness' to changes in economic growth, which we and many other economists interpret as being caused by institutional rigidities in their labour markets. The unemployment function used in our estimations contains explicit institutional variables and is consistent with the modified Okun's-law equations.

Most macroeconomic models do not explicitly address the impact of institutions on employment rates; they only do so implicitly through the magnitude of parameters such as Okun's α. While such estimated parameters may *reflect* institutional differences, these models fail to show how institutional differences cause different effects or magnitudes. However, the results of their general equilibrium models allow Acemoglu and Autor (2013, 213) to conclude that 'a greater exogenous separation rate, higher discount rates, higher costs of creating vacancies, higher bargaining power of workers, higher unemployment benefits lead to higher unemployment.'

We believe that the institutional structure is one of the most important factors for explaining unemployment, and it is therefore to institutions that we turn next.

3 Institutions and unemployment

In a region where unemployment corresponds to the textbook model of supply and demand, there will be no involuntary unemployment. A fall in demand will simply translate into lower real wages, other things being equal. There are however two sets of factors that may push the price of labour above the market-clearing price. The first set is more widely appreciated than the second one; it deals with labour market rigidities that have been introduced via the legal system. A noted example is the minimum wage, which make workers with expected marginal products below the minimum wage unemployable.

The other institutional set of factors relates to norms and conventions. These are the *informal* institutions of a society. New institutional economists such as North (1990) and Williamson (1985) note that contracts – including employment contracts – are subject to unavoidable transaction costs in a boundedly rational world. Formal *and* informal institutions influence the average transaction-cost level in a nation or region. For example, simple and transparent laws (formal institutions) and high levels of trust (informal institutions) make contracting less costly, facilitating gains from trade. Transaction costs are lower when potential exchange partners – such as an employer and a job-seeker – have greater trust in the legal system and/or each other.

Both formal and informal institutions may therefore affect the performance of labour markets. But a specific institution does not always affect different industries or occupations in a uniform way. Since different regions have different mixtures of industries and occupations, the same institutional structure sometimes lead to divergent regional outcomes within a single nation.

In order to illustrate potential regional divergence, one may consider a formal institutional combination that implies rigid labour markets: a high minimum wage, centralized collective wage bargaining and restrictions against firing workers. A high minimum wage will only affect workers with expected marginal contributions to output that are sufficiently low; minimum wage legislation is irrelevant to highly productive workers. Likewise, collective wage bargaining only affect unionized industries or occupations; in other sectors of the economy, such bargaining will have no or negligible impact. Hiring-and-firing regulations also affect different sectors in different ways.

Formal labour market institutions tend to primarily affect *unskilled* and/or *unionized* workers with *non-idiosyncratic tasks*. The archetypal unskilled, unionized worker with a standardized work description is an assembly-line worker in a large manufacturing plant.

Conversely, consultants, celebrity chefs and novelists are examples of skilled, non-unionized workers with idiosyncratic tasks. Such workers are often engaged in the creation of new knowledge within time-limited project employment. Call project-based knowledge workers *type-A workers.* It is clear that the share of type-A workers varies dramatically from region to region, even within the same country. The implication is that the impact of labour market regulations will decrease with an increase in the share of type-A workers in a region. Regulations that promise lifetime employment with high and rising wages within established large firms will affect the unemployment rates of 'lagging regions' such as Greece or southern Italy more than it will affect 'knowledge regions' such as southeast England or southwest Scandinavia.

Informal institutions are unfortunately less amenable to measurement than formal ones. Even so, numerous studies point to the importance of interpersonal trust for economic development (Dasgupta, 1988; Redding, 1990; Putnam, 1993; Fukuyama, 1995). In Europe, empirical studies of impersonal trust usually show that Scandinavia is the highest-trust part of the continent (Inglehart, 1997). Since higher levels of trust implies lower transaction costs and thus more contracting opportunities, one should thus expect − *ceteris paribus* − lower unemployment (and larger firms) in high-trust regions than elsewhere.

A special case of a formal institution that may affect labour market performance is the choice of currency and its associated monetary policy. Since many macroeconomists and politicians have emphasized this factor, it merits special consideration.

The Euro

In a flexible labour market, lower wages enable firms to retain full employment even when demand for their output is falling. In rigid labour markets, depreciation and currency

devaluation serve as alternative means of achieving full employment, since stable nominal wages are then equivalent to lower real wages.

In this context, it is important to remember that a labour market is not necessarily or even mostly national. Urban economic theory shows that labour markets tend to coincide with functional urban regions, which can be delimited with the help of commuting patterns, time distances, or price-distance gradients in the land market (Cheshire and Gordon, 1998; Johansson et al., 2002, 2003). This implies that the usefulness of monetary policy as a means of reducing unemployment hinges on the spatial alignment of currency and labour market areas.

The Eurozone is much larger than any labour market area, which necessitates a flexible labour market policies. This spatial divergence is not as extreme in other European currency areas. Even so, countries such as Britain and Sweden each have one currency area but numerous regional labour markets. The closest correspondence between a currency area and a labour market arises when the currency area covers an unusually small land area. In Europe, Iceland is probably best placed at countering unemployment caused by wage rigidities, since the largest labour market area accounts for two thirds of the currency-area population.

Measuring overall institutional characteristics

Labour market regulations involve a host of policy instruments, with complicated substitution effects and complementarities. In addition, the implementation of each instrument lends itself to quantitative differentiation and flexible exemptions. For example, collective wage bargaining is unusually comprehensive in Austria, but there is no minimum wage legislation. Such complexities point to the need for an overall measure of labour market flexibility. In our empirical analysis, we use the 'labour market regulations' component of the annual

Economic Freedom of the World index of the Fraser Institute (Gwartney, Lawson and Hall, 2013). It consists of the following six subcomponents: hiring regulations and minimum wage; hiring and firing regulations; centralized collective wage bargaining; hours regulations; mandated cost of worker dismissal; and conscription. While conscription can be expected to misallocate labour rather than increase unemployment, the other five components should be expected to increase labour market rigidity by adding to employers' explicit and implicit labour costs. The measure is scaled from 0 to 10, where a score of 10 implies maximum labour market flexibility.

Measures of informal institutional quality focus on the level of trust in a society, since there is a straightforward linkage from the prevalence of opportunistic behaviour via social trust to transaction costs (Williamson, 1985). In a high-trust setting, it becomes less important to double-check information about potential exchange partners. Both employers and employees become more likely to give each other the benefit of the doubt, which lowers both contracting and monitoring costs. Bjørnskov (2003) contends that some measure of social trust is the best proxy for informal institutions, and further that omission of a trust variable in econometric specifications will tend to overestimate the importance of formal institutions.

The most widely used measure of social trust is the percentage of a population agreeing with the statement 'most people can be trusted,' as opposed to 'you need to be very careful when dealing with people.' This question has been included in all interview surveys of the World Values Survey. We use decomposed observations tabulated by Tabellini (2005), with regional NUTS1 observations between 1990 and 1999 for eight large European countries, and national observations in the remaining countries.

Table 2 shows the top-5 and bottom-5 countries (or regions) as regards labour market flexibility (2000 and 2010) and social trust (1990-1999). Labour market institutions have been consistently more flexible than elsewhere in a few countries such as Switzerland and the

United Kingdom, while Greece has belonged to the five countries with the least flexible labour markets throughout the studied period. In general, however, there was a liberalizing tendency, with all countries attaining higher scores in 2010 than in 2000. Several of the countries with the smallest 'flexibility increments' were in southern Europe, so that by 2010 three of the hardest-hit countries during the crisis – Greece, Spain and Portugal – also had among the most regulated labour markets in its wake.

Table 2 also shows that the Nordic countries along with a Dutch region exhibited the highest level of trust. Trust measurements tend to be unusually stable in an inter-temporal sense, with hardly any long-term trend in either direction.

TABLE 2 ABOUT HERE

4 Regional economic structure and unemployment

Many if not all European regions have experienced greater unemployment after 2008. Some countries and regions have been severely affected, while others have not experienced any increase in unemployment at all. While the unemployment rate more than doubled in the Spanish region of Catalonia between 2007 and 2012, it *decreased* in the German *Land* of Bremen.

Moretti (2013) contends that the increasing knowledge orientation of the world's richest nations is accompanied by widening economic and social differences across regions. Using theories from economic geography to analyse development trends in different American regions, Moretti (ibid.) shows that regional divergence crystallized in the 1980s and is now quite obvious. Productivity and wages have increased in regions with high shares of knowledge-intensive industries as well as high shares of workers with tertiary degrees.

These regions tend to have low or decreasing unemployment and increasing productivity, wages and labour force participation rates. They also tend to experience net population gains. Regions at the other end of the 'knowledge scale' exhibit the opposite development patterns. Moretti describes this structural change as follows:

> At the one extreme there are brain hubs—cities with a well-educated labor force and a strong innovation sector. They are growing, adding good jobs and attracting even more skilled workers. At the other extreme are cities once dominated by traditional manufacturing, which are declining rapidly, losing jobs and residents. In the middle are a number of cities that could go either way. (Moretti, 2013, 13-14)

When analysing the labour market impact of the current crisis in the EU, it is of course important to isolate the influence of the structural changes that Moretti describes. A regularity that urban and regional economists often investigate is the accessibility of 'brain hubs' within transport and communication networks.

Regional accessibility and its effect on employment

In a number of studies, accessibility to resources and markets has been identified as the most important determinant of productivity, including labour productivity. Thus a high and growing employment rate tends to follow high or increasing accessibility. Early contributions used simple measures of accessibility such as the size of the population or the economy in functional urban regions (Fujita, 1989; Ciccone and Hall, 1996). The assumption was that all benefits from access to markets or knowledge would be captured within integrated spatial labour markets. Other studies employed measures of accessibility where interaction benefits decrease with increasing time distances between economic agents (Andersson et al., 1990;

Johansson, 1993). Later empirical studies have shown that the accessibility effect of the time distance variable is highly non-linear (Johansson et al., 2003).

A high level of accessibility to knowledge, other resources and markets interacts with internal and external scale economies in production to create high levels of general productivity in a region. Only the most accessible regions will have sufficient access to markets to allow the establishment of the widest possible range of industries and occupations. If we assume the per capita labour production function of region r to be homogeneous of degree 1 (for example a CES or Cobb-Douglas function), with accessibility A_r as a neutral productivity factor so that $q_r = A_r \, f(k_r)$, where q_r is value added per worker and k_{ri} is the capital used per worker, then per capita output as well as employment will increase with increases in the accessibility of the region. Thus econometric analyses of regional employment should include accessibility to markets and knowledge, in addition to various institutional variables.

5 Modelling regional labour markets

Four variables are simultaneously determined in a regional labour market. These variables are the local supply of labour, firms' demand for labour, employment, and wages.

In a competitive regional labour market, employment and wages adjust until marginal labour productivity equals the wage. Only 'natural unemployment' can exist in such a market, as a result of workers' movements between firms and in and out of the workforce. However, in real European labour markets, frictions such as institutional and educational shortcomings cause rigidities, which imply less than full employment. In many parts of Europe, such structural unemployment consists of falling demand for workers with few or

obsolescent skills combined with labour market rigidities and/or living costs that make such workers unemployable in the absence of migration to regions with lower costs and wages.

In each region, the labour supply depends on the observed rate of unemployment – leading to out-migration of young people – as well as unemployment benefits and the number of 'stayers' (i.e. population in age groups with negligible out-migration). The supply of labour from net in-migration is an increasing function of a region's relative wages. The real wage should obviously account for differences in housing costs, since such costs will influence the perceived attractiveness of location-specific wage offers.

A possible regional labour supply function is thus

$$S_{it} = aU_{it} + bB_{it} + cR_{it} + g(w/w_{av})_{it} + k \qquad (4)$$

where

S_{it} = labour supply in region i at time t;

U_{it} = observed unemployment rate in region i at time t;

B_{it}= unemployment benefits as a share of the wage in region i at time t;

R_{it} = the number of stayers in region i at time t;

$(w/w_{av})_{it}$= real per capita wage in region i at time t relative to the national average.

The regional demand for labour

We can assume that an industry's regional demand for labour is determined by industry-specific comparative advantages in production and trade. In the classic theory of comparative advantage, natural resource availability is the key factor. Although natural resources still play a role in location decisions, other factors are more important in most European regions. With the rapid increase in educational attainment, the relative regional supply of human capital has

become the most common source of regional comparative advantage. The impact of human capital on the location of high-tech and other knowledge-intensive industries has been the concern of numerous contributions to the regional economics literature (e.g. Rauch, 1993; Gennaioli et al., 2013).

In addition, inter-regional accessibility has become ever more important to firms as part of their location and trading strategies (Andersson et al., 1990). Early trade and location theories assume that stationary production factors are decisive for firms' decisions (Ohlin, 1933; Beckmann, 1952). Later theories cast doubt on such assumptions, paying increasing attention to dynamic models where firms' location and trading decisions depend on product-cycle phenomena (Vernon, 1966; Andersson and Johansson, 1984). In contemporary theories, comparative advantages are intrinsically dynamic, and include the effects of scientific creativity, industrial R&D and innovation (Andersson and Beckmann, 2009; Moretti, 2013).

The schematic structure of the new dynamic models of comparative advantage is as follows. Creativity creates the impulse for later innovations. As creative outputs rarely lead to successful economic innovations, there are low-probability-driven scale economies in such dynamic creative processes. Consequently, most dynamic comparative advantages depend for their realization on being located in large and accessible urban regions.

At the same time, urban growth is never unbounded. Negative feedbacks exist in the vicinity of stable equilibria, the most obvious being increasing land costs and congestion phenomena. The demand for labour is thus curbed at some point. Summarizing, we arrive at the following – empirically testable – labour demand function:

$$D_{it} = \alpha(\text{w}\,/w_{av})_{it} + \beta\,A(M)_{it} + \gamma A(R)_{it} + \delta H_{it} + \eta I_{it} + \lambda X_{it} + \varepsilon_{it} \qquad (5)$$

where

D_{it} = demand for labour;

$(w/w_{av})_{it}$ = real unit labour cost relative to the national average;

$A(M)_{it}$ = accessibility to markets;

$A(R)_{it}$ = accessibility to research capacity;

H_{it} = regional availability of human capital;

I_{it} = innovation capacity;

X_{it} = institutional quality index.

In a frictionless economy, labour demand would equal labour supply in each region, with the relative wage rate acting as the equilibrating variable. This equilibrium implies full employment in each region. National and regional institutional constraints and frictions abound in Europe, however, leading to substantial unemployment in many of its regions.

Empirical studies of European labour markets show that there is systematic structural unemployment above and apart from any business cycle effects. An institutional factor is operable in those cases where the negotiated or minimum wage exceeds some workers' marginal product of labour. To illustrate this, assume that two regions have the same supply of labour while demand is much greater in one of them. In this case, demand is greater in one region because it benefits from greater accessibility. If national collective wage bargaining has resulted in the same wage in both regions, it would imply higher unemployment in the less accessible region. This institutionally induced unemployment is of course reduced in the long run, since observed unemployment tends to cause a gradual reduction in the supply of labour.

Modelling employment and unemployment

In view of the above, the following model represents the labour market equilibrium condition for each of the N regions:

$$L_{it} = D_{it} = S_{it}(U_{it}) - U_{it};$$ (6)

Equilibrium in a full-employment market is usually defined as a fixed-point solution to a system of excess demand functions (*Z*), with the wage as the equilibrating variable (i.e. *Z*(*w*) = 0). With unemployment and institutional labour market rigidities, the fixed-point problem is one where regional unemployment, U_i, is the main equilibrating variable, which implies that regional unemployment becomes endogenous. The corresponding excess demand functions are

$$Z_i(\mathbf{u}) = D_i^* - S_i(\mathbf{u}) - U_i \; ; \; (i=1, \ldots, N);$$ (7)

where $\mathbf{u}$ is a vector of unemployment in *N* regions ($\mathbf{u} = (U_1, U_2, \ldots, U_N)$. D_i^* is the given level of demand for labour in region *i*. This yields two reduced forms, which we use as the starting point for our econometric analysis. The employment function is then

$$L = \alpha_1 A(M)_{it} + \alpha_2 A(R)_{it} + \alpha_3 H_{it} + \alpha_4 I_{it} + \alpha_5 U_{it} + \alpha_6 X_{it} + \varepsilon_{1it};$$ (8)

while the unemployment function is

$$U_{it} = \beta_1 A(M)_{it} + \beta_2 A(R)_{it} + \beta_3 H_{it} + \beta_4 I_{it} + \beta_5 X_{it} + \varepsilon_{2it}.$$ (9)

where X_{it} is a measure of relevant (formal and informal) institutional quality, perhaps approximated by more partial measures in empirical estimations. The variables may be untransformed or transformed; the plus signs imply linearizable functions.

6 Unemployment in Europe's regions

The unemployment rate – whether short-term or long-term – is the leading indicator for describing the state of a national or regional labour market. Alternative measures include the labour force participation and employment rates. Figure 1 – which consists of three graphs – provides an overview of employment in Europe's NUTS2 regions between 2000 and 2012.[1]

FIGURE 1 ABOUT HERE

The three graphs show a similar pattern: the median short-term and long-term unemployment rates exhibit a moderate downward trend until just before the financial crisis in 2008, with this trend being most pronounced in NUTS2 regions with the highest unemployment rates ('p10' refers to the 10th percentile of NUTS2 regions). There are substantial unemployment and employment gaps between Europe's best and worst-performing regions. This gap widens after 2008, whether measured as short-term or long-term unemployment rates or as employment as a percentage of the relevant age group.[2]

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[1] The NUTS (Nomenclature des unités territoriales statistiques) classification is a hierarchical system for the territorial decomposition of the European Union. It comprises major regions (NUTS1), basic regions (NUTS2) and small regions (NUTS3). There are currently 98 NUTS1 and 273 NUTS2 regions in the EU. Because of missing observations, Graphs A, B and C refer to 233-271, 188-262 and 238-271 NUTS2 regions, respectively.
[2] The unemployment rate measures employed persons as a percentage of the economically active population (those being employed or unemployed) aged between 20 and 64. The employment rate measures employed persons as a percentage of the total population aged between 20 and 64. Long-term unemployment refers to those who have been registered as unemployed for more than six months.

We use all three employment indicators as dependent variables in our econometric models, so as to get a more nuanced picture of how the explanatory variables suggested by the theoretical models may explain the relative 'health' of Europe's regional labour markets. An assumption of the theoretical models is that the analysed regions coincide with functional urban regions in the labour market sense. Some NUTS2 regions do in fact belong to the same functional urban region; the resulting interdependencies are addressed by also estimating employment functions for the larger NUTS1 regions.[3]

Eurostat is the source of most of our empirical observations, but there are a few exceptions. The accessibility-to-market variable corresponds to a rating of NUTS2 regions regarding accessibility competitiveness. The rating refers to three variables: 'population living in surrounding regions weighted by travel time along motorways,' 'population living in surrounding regions weighted by travel time along railways' and 'daily number of passenger flights accessible within 90 [minutes'] drive' (Annoni and Dijkstra, 2013, 46). Figure 2 shows a map of the relative accessibility of NUTS2 regions in the European Union, which Annoni and Dijkstra label as 'infrastructure.'

FIGURE 2 ABOUT HERE

Our functional specification includes three proxies for institutional quality. We make a distinction between countries that are *de facto* members of the Eurozone and those that are not. As mentioned earlier, a nation-based index measures institutional labour market flexibility (Gwartney, Lawson and Hall, 2013), while a NUTS1-based index of 'social trust' proxies for transaction cost differences (Tabellini, 2005).

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[3] Amsterdam, Berlin, Brussels, London, Prague and Vienna are the most conspicuous examples of NUTS2 regions being smaller than commuting regions. The inter-regional accessibility measure merges two or more NUTS2 regions in the case of the six cities mentioned above. The normal population size for a NUTS1 region is between 3 and 7 million.

Table 3 presents descriptive statistics for all included variables in the functions that refer to NUTS2 regions. Appendix Table A1 gives corresponding statistics for NUTS1 regions. Population growth is an added variable that addresses differences in attractiveness to migrants across regions.

TABLE 3 ABOUT HERE

7 Econometric estimation results

The econometric estimations are based on adaptations of (8) and (9). Obviously, there are no perfect available measures, so the estimated variable effects refer to what we consider to be serviceable proxies. For example, the accessibility variable is a proxy for inter-regional accessibility to both markets and research capacity, while the education and high-tech employment variables proxy for a mixture of intra-regional accessibility to research capacity, human capital and innovation. Measures of labour market flexibility, social trust and the Euro effect all refer to institutional quality. In addition, the income variable is not a pure wage variable (and even less of a pure *market* wage variable), since it includes a variety of income sources, and may thus also capture non-wage effects such as returns from intra-regional and extra-regional investments, residual agglomeration economies and increments to market income from various direct or indirect subsidies. Two demographic variables ('population growth' and 'stayers') have been added to the theoretical model to capture some of the dynamics associated with regional attractiveness and labour mobility.

All three models are estimated using random-effects instrumental variable regression. We apply the instrumental-variable approach to cope with the endogeneity of income, which is simultaneous with employment. Regional mean life expectancy is used as an instrument, owing to its high correlation with income but low correlation with employment.

Table 4 presents the results of the three estimations, with employment, unemployment and long-term unemployment as the respective dependent variables. In spite of measurement imperfections, the results are unambiguous regarding the effects of institutions and accessibility.

TABLE 4 ABOUT HERE

Institutional quality

The proxies for formal and informal institutional quality are associated with the expected effects, and all six estimates are significant. Labour market flexibility has a particularly strong negative association with the general unemployment rate, but there is also a significant (p<.01) negative effect on the long-term unemployment rate and a significant (p<.05) positive effect on the proportion of the population that is gainfully employed. The negative effect on the general unemployment rate implies that a one-unit increase in the labour market regulation index (which implies a less regulated labour market) is associated with a -.75 percentage point decrease in the unemployment rate. Put differently, it also implies that the regulatory difference between the maximum and minimum measured flexibility in the 2001-2010 period should be expected to yield an unemployment rate that is 4.3 percentage points higher in the most rigid European regulatory environment, other things being equal.

The level of social trust has employment effects that are similarly substantial. Among EU member nations or regions, the difference between the most trusting Dutch region (Oost Nederland) and the least trusting member state (Cyprus) should lead us to expect an unemployment rate that is about 3.5 percentage points higher in the latter (*ceteris paribus*), as well as an increase in the employment rate of more than six percentage points. The latter effect is between four and five times greater than the effect from the maximum difference

attributable to labour market flexibility, although one should bear in mind that the differences in levels of trust are more dramatic than the legal differences. There is a clear contrast between a high-trust business environment – which facilitates relational contracting – in north-western Europe, and a low-trust environment in the east and south (with some notable exceptions, such as southern Europe's high-trust anomaly of northern Italy, which in this respect resembles northern Europe more than Sicily).

The Euro effect is less unequivocal. Being in the Euro zone does not significantly affect either short-term or long-term unemployment, although it is associated with two percentage points fewer people of the relevant age group being in employment at any given time. It should be noted, however, that this currency effect is not robust, unlike the regulation and trust effects; there is no significant Euro effect on employment for the larger NUTS1 regions. Instead, there is an insignificant positive effect (see Table A1).

Inter-regional accessibility

Europe's most accessible regions comprise regions along the western European 'blue-banana' corridor from London to Milan, and large regions outside Europe's economic core with international airport connectivity (see Figure 2). As predicted by regional economic theory, the effect of accessibility on employment is substantial, highly significant and positive. The effect is also robust across specifications. When comparing the most and least accessible regions in the European Union, the expected difference in unemployment rates is as high as four percentage points, while the expected employment rate difference is as high as 7.2 percentage points. Seen in this light, inter-regional accessibility to markets and input providers should be considered the most important single factor influencing employment, accounting for a similar impact as the aggregate of all the institutional factors. Note, however, that the variability in general accessibility is substantial across regions.

Intra-regional accessibility (regional human capital and innovation potential)

The percentage of workers in high-tech industries and the percentage of the population with tertiary education both represent attempts to capture intra-regional accessibility to the type of human capital that tends to endow firms with the main source of comparative advantage in a knowledge-intensive economy. The positive effect of high-tech employment on employment and the negative effect on both types of unemployment rates are consistently significant and robust. The most and least high-tech regions are associated with an employment rate difference of 5.2 percentage points and a corresponding difference in unemployment rates of 4.2 percentage points. These are substantial effects.

The estimated education effects are more contradictory. While the educated share has a significant positive effect on the employment rate, it also raises the short-term unemployment rate, while the long-term rate is not influenced at all. The positive effect on employment is not corroborated by NUTS1 data, but the short-term unemployment effect is (see Table A1). We should note, however, that while there is a significant positive correlation between high-tech employment and tertiary education (r=.58), the correlation between trust and education (r=.61) and income and education (r=.63) is stronger than the correlation of either of these variables with high-tech employment (r=.35 and r=.45, respectively). The ambiguous education estimates may thus at least partly be due to confounding. Another possible source is the fact that education in natural science, medicine and engineering affect employability more than certain other types of higher education – for example in history, philosophy or sociology.

Other variables

The other four variables are not the main concerns of this study, and thus take on the role of *ceteris-paribus* controls. The population growth rate equals the sum of the excess of births over deaths and the net in-migration rate. As regards the latter, it should partly reflect the attractiveness of the regional labour market, evidenced primarily by high real wages and a low unemployment rate (there are also other sources of attractiveness, such as sunny and mild weather for retirees). Given Europe's low birth rates and the higher mobility of people aged 20 to 29 than others, it is likely that the labour market effect dominates. As expected, there is a robust and significant association between population growth and good employment prospects at the NUTS2 level, but not at the NUTS1 level. This may point to the relative importance of job-seeking migration to neighbouring as opposed to distant NUTS2 regions with superior employment prospects

The 'stayers' variable represents an attempt to capture the immobile portion of the population, which is associated with the persistence of unemployment. The effect is as expected, with lower employment and higher unemployment associated with more stayers, especially when measured with NUTS2 data.

The income effect is ambiguous, with more employment and less long-term unemployment at the NUTS2 level (Table 5), but with more short-term unemployment expected at the NUTS1 level (Table A1). This variable is difficult to interpret, since it reflects the balance of partly contradictory factors. The factor that captures residual agglomeration economies should become more pronounced the closer the spatial unit approximates the spatial extent of such economies. The implication in light of the results would be that NUTS2 make more economic sense than NUTS1 regions.

8 Conclusion: the importance of institutions and accessibility for Europe's regions

The theoretical and empirical analyses of unemployment in Europe's regions offer clear guidelines. They can be summed up by stating that accessibility and institutions matter. More informatively, we offer the following five pieces of advice for regional policy-makers.

First, labour market flexibility is good for employment. Avoidance of minimum wages, collective wage bargaining and firing restrictions reduce employers' labour costs, making them more willing to hire more workers. This effect is especially important for 'outsiders' in the labour market, such as young people and immigrants. Denmark offers one successful example of labour market deregulation, whereby the redistributive instruments of the welfare state have been decoupled from employers' labour costs ('flexicurity').

Second, a high level of trust has a substantial effect on regional employment. Greater social trust implies lower transaction costs, which makes contracting less costly, including labour-market contracting. Our empirical results corroborate this line of reasoning, although – as Putnam (1993) points out – building trust takes time.

Third, inter-regional accessibility matters. This is good news for cities near Europe's economic centre of gravity, such as Brussels or Zurich. But the situation in more peripheral regions is not hopeless. Investments in transport infrastructure can improve this type of accessibility, and the effect is most pronounced in isolated areas.

Fourth, intra-regional accessibility also matters, especially local access to appropriate human capital. Such capital mainly consists of creative knowledge workers. This is good news for large metropolitan areas, as well as for smaller university towns.

Fifth, the effect of not having a national currency or monetary policy seems at most to be minor. This is partly because national currency areas such as those of the British pound or the Swedish *krona* are akin to smaller versions of the Eurozone, since they also comprise

more than one regional labour market area. A more important aspect may be that monetary policy only becomes essential when labour market institutions are too rigid. With sufficient labour market flexibility, wages or working conditions (i.e. implicit wages) can adjust to take cyclical downturns into account.

We conclude on a more topical note by noting that one implication of our results is that recent unemployment crises such as the one in Greece should not focus on the role of the Euro. A more fruitful strategy for sustainable recovery would be to liberalize labour markets while fighting corruption and investing in transport infrastructure and R&D.

Appendix

INSERT TABLE A1 HERE

INSERT TABLE A2 HERE

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Table 1: Estimated modified Okun's α for 20 developed economies, 1980-2007

| Country	Estimated Okun's α	Country	Estimated Okun's α
Australia	-.536	Japan	-.152
Austria	-.136	Netherlands	-.511
Belgium	-.511	New Zealand	-.341
Canada	-.432	Norway	-.294
Denmark	-.434	Portugal	-.268
Finland	-.504	Spain	-.852
France	-.367	Sweden	-.524
Germany	-.367	Switzerland	-.234
Ireland	-.406	United Kingdom	-.343
Italy	-.254	United States	-.454

Source: Ball, Leigh and Loungani (2012); *Note*: Natural rates are based on the Hodrick-Prescott filter (Hodrick and Prescott, 1997)

Table 2: Top 5 and bottom 5 European countries or regions; labour market flexibility (2000 and 2010) and social trust (1990-1999)

Labour market flexibility			**Social trust**	
Rank	**2000**	**2010**	**Rank**	**1990-1999**
Top 5 countries/regions				
1	United Kingdom	United Kingdom	1	Norway
2	Iceland	Switzerland	2	Netherlands: East
3	Romania	Ireland	3	Sweden
4	Switzerland	Iceland	4	Denmark
5	Hungary	Bulgaria	5	Finland
Bottom 5 countries/regions				
25	Italy	Turkey	91	Romania
26	Greece	Portugal	92	France: Paris Basin E W
27	Sweden	Spain	93	Macedonia
28	Finland	Greece	94	Turkey
29	Germany	Norway	95	Cyprus

Sources: Gwartney, Lawson and Hall (2013); Tabellini (2005)
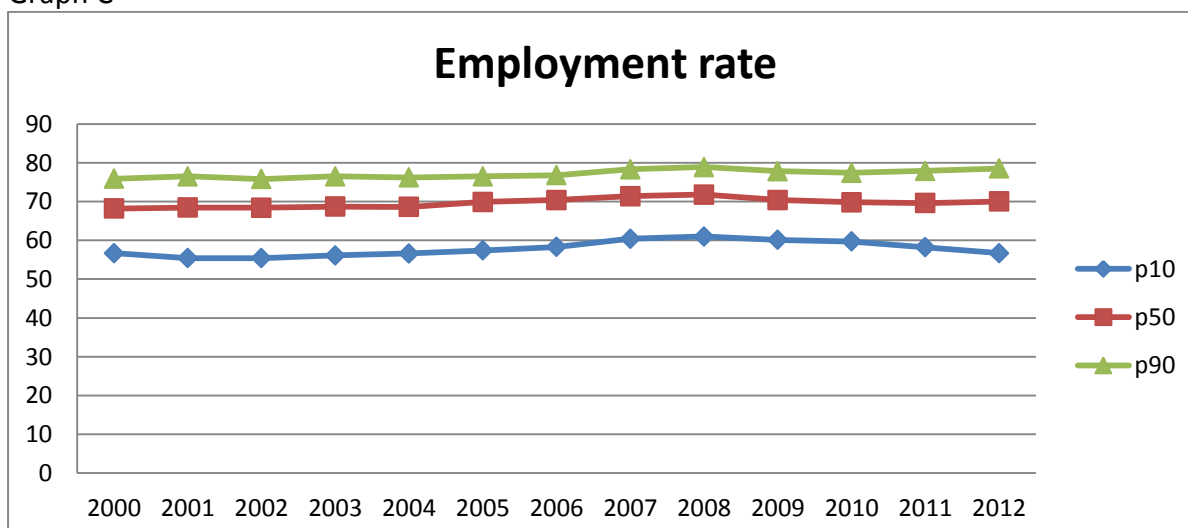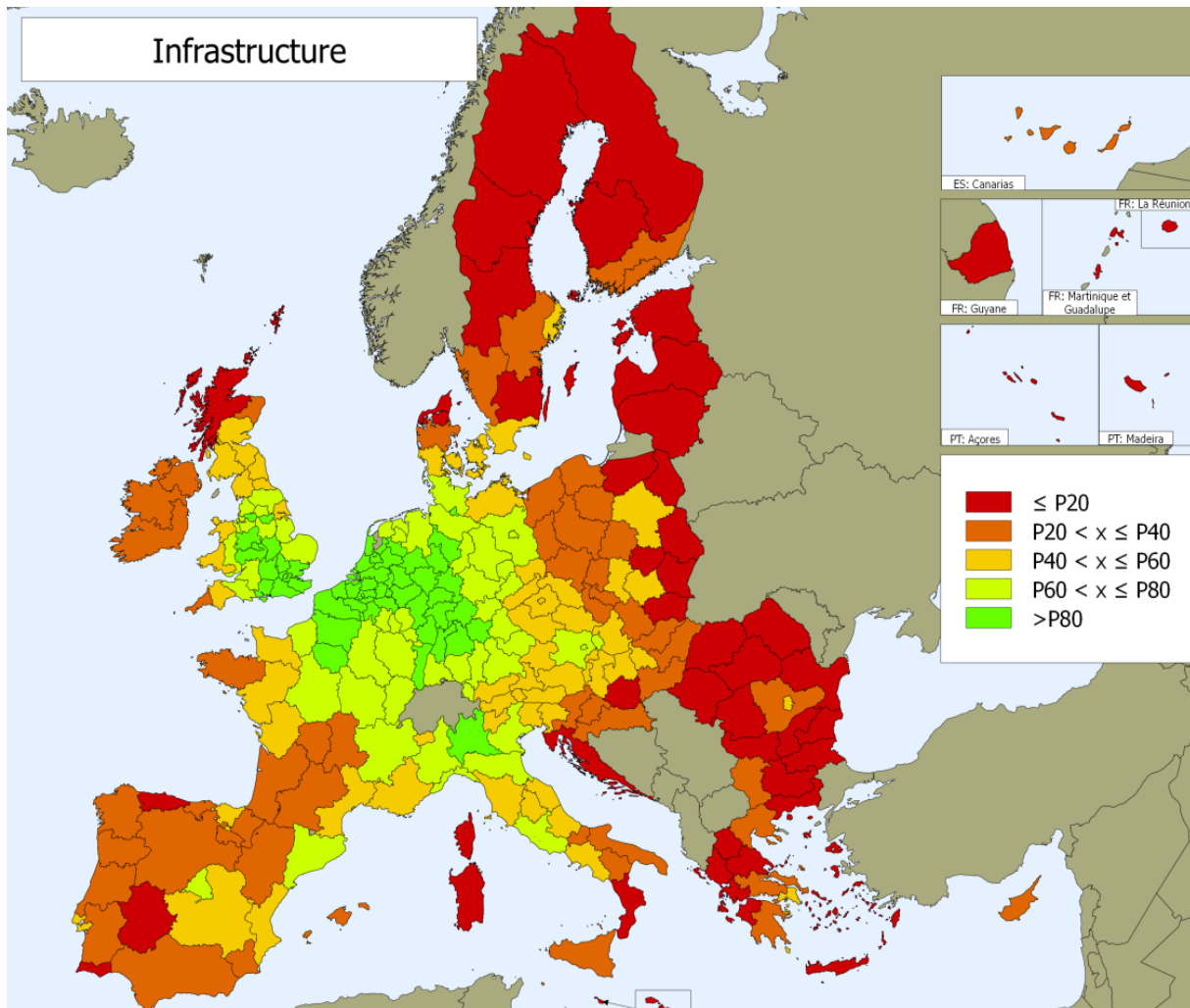
Graph A
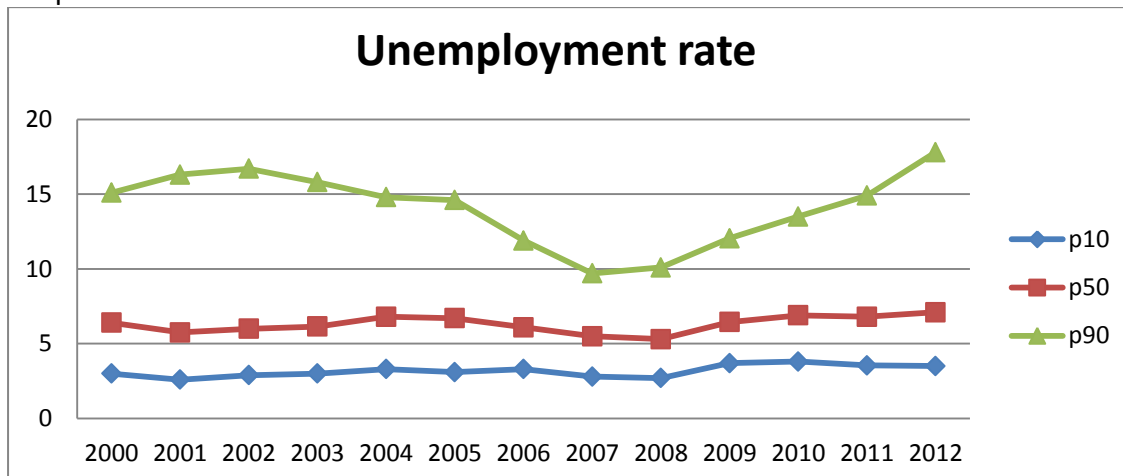
Graph B
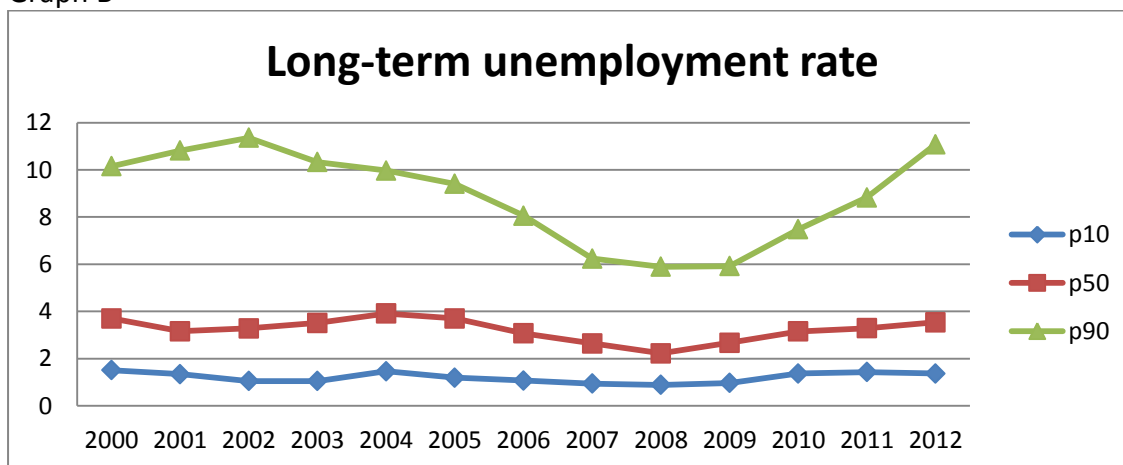
Graph C

Figure 1: Unemployment, long-term unemployment and employment in NUTS2 regions (EU), 2000-2012 (rates at the 10th, 50th and 90th percentiles of included NUTS2 regions)

Source: Annoni and Dijkstra (2013, 49)
Figure 2: Interregional accessibility; NUTS2 regions (EU)

Table 3: Descriptive statistics for NUTS2 regions[1]

Variable (Code)	Mean	St. Dev.	Min	Max	Source
Institutional Variables					
Labour Market Rules (**FLEX**)	5.89	1.47	2.80	8.50	Gwartney, Lawson and Hall (2013)
Trust Index (1990-1999) (**TRUST**)	34.05	12.27	14.20	64.10	Tabellini (2005)
Euro (Dummy)[3] (**EURO**)	.60	.49	0.00	1.00	
Accessibility Variables					
Accessibility (**ACCESS**)	-.27	.92	-1.31	2.13	Annoni and Dijkstra (2013)
High-Tech Employment[2] (**HITECH**)	3.91	1.82	.50	12.79	Eurostat: R&D Expenditure/Personnel
Tertiary Education[2] (**EDU**)	22.73	7.57	6.70	44.10	Eurostat: Regional Education Statistics
Control Variables					
Primary Income (€)[2] (**INCOME**)	15,330	6,699	977	30,523	Eurostat: Regional Economic Accounts
Population Growth Rate[2] (**POPGROWTH**)	.34	.62	-2.99	3.18	Eurostat: Regional Demographic Statistics
Population (30-74)[2] (**STAYERS**)	1,169,616	912,651	132,084	6,244,142	Eurostat: Regional Demographic Statistics
EU Accession Year (**EUYEAR**)	1974	20	1952	2007	First year of EU membership
Instrumental Variable					
Life Expectancy (**LIFE**)	78.91	2.64	71.00	84.00	Eurostat: Regional Demographic Statistics

[1] EU countries (NUTS codes) with complete sets of NUTS2 observations: AT; BE; BG; CZ; DE; ES; FR; HU; IT; NL; PL; PT; RO; SE; UK. Countries with partial sets: DK; FI; GR; IE; SI; SK. Excluded countries, due to missing variables: CY; EE; HR; LT; LU; LV; MT.

[2] **POPGROWTH** is measured as the average percentage growth over the preceding 3 years. **STAYERS** refer to the current population aged between 30 and 74. **EDU** is the percentage of the population aged 25 to 64 years with completed tertiary education (ISCED 1997 of 5 or 6). **HITECH** is the percentage of employment in high technology industries, including high-technology manufacturing and knowledge-intensive high-technology services. **INCOME** refers to the income generated directly from market transactions. This includes as the main item income from the sale of labour as a factor of production. Private households can also receive income from assets, particularly interest income, dividends and rents. In addition, there is income from net operating surpluses and self-employment. Interest and rents payable are recorded as negative income. The balance is the primary income of private households.

[3] Countries included in the empirical analysis with the Euro or a currency pegged to the Euro: AT; BE; DE; DK; ES; FI; FR; GR; IE; IT; NL; PT, SI; SK (from 2005). The remaining 7 analysed countries (8 before 2005) are *de facto* outside the Eurozone.

*Table 4: Random-effects IV models; dependent variables: employed as share of population aged 20-64 (**EM**); unemployed as share of labour force aged 20-64 (**UNEM**); long-term unemployed as share of labour force aged 20-64 (**LTU**); NUTS2 regions (EU), 2001-2010*

VARIABLES (Notes)	EM Estimate (Standard Error)	UNEM Estimate (Standard Error)	LTU Estimate (Standard Error)	Expected Signs (EMP; UNEM; LTU)
Institutional Variables				
FLEX (*t*-1)	.229** (.136)	-.752*** (.089)	-.271*** (.059)	(+; −; −)
TRUST (1990-1999 Average)	.112*** (.030)	-.065*** (.016)	-.031*** (.007)	(+; −; −)
EURO (Dummy)	-2.066** (.893)	.088 (.408)	.286 (.235)	(−; +; +)
Accessibility Variables				
ACCESS (Fixed)	2.105*** (.364)	-1.161*** (.177)	-.425*** (.096)	(+; −; −)
HITECH	.422*** (.095)	-.340*** (.070)	-.174*** (.046)	(+; −; −)
EDU	.129*** (.030)	.065[a] (.020)	.005 (.012)	(+; −; −)
Control Variables				
INCOME (Logs; Instrument: Life Expectancy)	2.801** (1.379)	.456 (.533)	-1.108*** (.333)	(?; ?; ?)
POPGROWTH (3-year Average)	1.397*** (.172)	-2.093*** (.167)	-1.137*** (.127)	(+; −; −)
STAYERS (Logs)	-2.077*** (.365)	1.434*** (.188)	.538*** (.105)	(−; +; +)
EUYEAR	.062*** (.024)	-.002 (.011)	-.031*** (.007)	(?; ?; ?)
Year Dummies	Yes	Yes	Yes	
Regression Statistics				
Wald χ^2 (19)	*1,256*	*857*	*856*	
ρ	*.77*	*.36*	*.11*	
*Observations (Region*Years)*	*1,684*	*1,684*	*1,453*	
Number of NUTS2 Regions	*213*	*213*	*203*	

*p<.010; **p<.05; ***p<.01 (one-tailed test, except **INCOME** and **EUYEAR**); [a] opposite sign (two-tailed test: p<.01).

Table A1: Descriptive statistics for NUTS1 regions

Variable Code	Mean	St. Dev.	Min	Max
FLEX	5.84	1.49	2.80	8.50
TRUST	33.98	11.50	14.20	64.10
EURO	.64	.48	0.00	1.00
ACCESS	-.13	.87	-1.25	1.99
HITECH	4.17	1.68	.70	9.31
EDU	24.00	7.00	9.00	41.00
INCOME	15,901	6,437	1,133	29,726
POPGROWTH	.38	.60	-1.93	2.72
STAYERS	3,327,975	2,013,019	398,012	10,800,000
EUYEAR	1974	20	1952	2007
LIFE	79.02	2.49	72.00	84.00

Table A2: Random-effects IV models; NUTS1 regions (EU), 2001-2010

VARIABLES	EM	UNEM	LTU	Expected Signs
FLEX	1.031***	-1.268***	-.753***	(+; −; −)
	(.373)	(.181)	(.105)	
TRUST	.332***	-.145***	-.068***	(+; −; −)
	(.110)	(.035)	(.018)	
EURO	1.682	-1.553[a]	-.906[b]	(−; +; +)
	(2.723)	(.985)	(.506)	
ACCESS	2.610***	-1.711***	-.627***	(+; −; −)
	(.957)	(.463)	(.237)	
HITECH	.899***	-.461***	-.308***	(+; −; −)
	(.321)	(.162)	(.094)	
EDU	.052	.090[b]	.032	(+; −; −)
	(.079)	(.047)	(.026)	
INCOME	.052	.090*	.032	(?; ?; ?)
	(.079)	(.047)	(.026)	
POPGROWTH	.052	.090[b]	.032	(+; −; −)
	(.079)	(.047)	(.026)	
STAYERS	-1.812**	.962**	.318	(−; +; +)
	(.952)	(.482)	(.249)	
EUYEAR	-.070	.032	-.017	(?; ?; ?)
	(.083)	(.029)	(.014)	
Year Dummies	Yes	Yes	Yes	
*Observations (Region*Years)*	*655*	*655*	*651*	
Number of NUTS1 Regions	*80*	*80*	*80*	

*p<.010; **p<.05; ***p<.01 (one-tailed test, except **INCOME** and **EUYEAR**); [a] opposite sign (two-tailed test: .05<p<.10); [b] opposite sign (two-tailed test: .01<p<.05).