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ABSTRACT

The Impact of Institutions on the Employment Performance in European Labour Markets*

This paper investigates the role of institutions for labour market performance across European countries. As participation rates have been rather stable over the past, the unemployment problem is mainly caused by shortages in labour demand. Labour demand is expressed by its structural parameters, such as the elasticities of employment to output and factor prices. Institutional variables include employment protection legislation, the structure of wage bargaining, measures describing the tax and transfer system and active labour market policies. As cointegration between employment, output and factor prices is detected, labour demand equations are fitted in levels by efficient estimation techniques. To account for possible structural change, time varying parameter models and aysmmetries due to the business cycle situation are considered. Then, labour demand elasticities are explained by institutions using panel fixed effects regressions. The results suggest that higher flexibility and incentives of households to work appear to be appropriate strategies to improve the employment record. The employment response to economic conditions is stronger in a more deregulated environment, and the absorption of shocks can be relieved. However, the institutional database should be improved in order to arrive at more definite policy conclusions.

JEL Classification: E24, J23, J51

Keywords: EU employment, labour market institutions

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1 Introduction

Despite some progress in the 2nd half of the 1990s, labour market performance in the European Union (EU) has been rather weak. Participation rates are significantly below the Lisbon target and unemployment is still at high levels. Currently, the unemployment rate is around 8 percent, and is predicted to stay at this level for the near future. Also, unemployment is persistent over time. According to OECD measures, a substantial part of the unemployed are long term unemployed. They have been out of the labour market for more than 1 year, and a third of them have been out for more than 2 years. A longer period of unemployment reduces the employability of people and aggravates the problem of social exclusion.

The unemployment record is accompanied by relatively low employment and participation rates[3]. After a gradual pick up in the 2nd half of the 1990s, employment rates are about 65 percent, not far below the Lisbon goal (70 percent). However, the gaps are wider for specific groups of the labour force: young (43) and old (42) people, women (56) and lower educated (55). The correlation between unemployment and employment rates is –0.9 over the last decade. Hence, the unemployment problem is not caused by a higher participation.

-Figure 1 about here-

The weak performance is especially striking when compared to other countries, see figure 1. Unemployment rates in the EU fell below one half of the US in the aftermath of the first oil crisis, but exceeded this level by a factor larger than 1.5 in 2002. In 1973, both economies had almost the same employment rate. Since then, participation increased in the US, but was rather stable in the EU. At the same time, the experience is quite heterogeneous across regions: differences between EU members are larger than the difference between the EU average and the US. For example, the UK experienced relatively high unemployment rates in the 1980s, but they have been fallen even below

[3] Employment rates refer to employment-population ratios, that is, the number of persons employed divided by the total population in the working age (15 to 64). Participation rates include the unemployed in the nominator.

the average since then. In contrast, Germany changed from a country with low unemployment to a position on the average.

To some extent, labour market institutions may account for this outcome. Rigid institutions can reduce the chance of flexible adjustment in response to shocks. Examples include employment protection legislation, the system of wage bargaining, measures of the tax and transfer system, and active labour market policies. Over the last years, several papers have examined this issue, see for example Nickell (1997), Blanchard and Wolfers (2000), Kahn (2000), Bertola, Blau and Kahn (2001), Blanchard and Portugal (2001), Besley and Burgess (2004) and Neumark and Wascher (2004). Most researchers have looked on the relation between institutions and unemployment. Some authors have also reported evidence on the link between institutitions and employment, see Nickell (1997) and EU Commission (2004), among others.

This contribution of this paper to the literature is twofold. First, the impact of institutions on aggregate labour demand behaviour is investigated. As participation rates were almost stable over the last decades, the deterioration in unemployment is mainly caused by shortages in labour demand, see Bean (1994). The latter is described by its structural parameters, such as the elasticities of employment to output and factor prices. As cointegration holds between the variables involved, labour demand equations are fitted in levels. To account for possible structural change, time varying parameter models are considered. Then, labour demand elasticities are explained by institutions using panel fixed effects regressions. The panel approach is able to distinguish between the impact of institutions and other sociodemographic characteristics, thereby avoiding deficits of a cross section analysis. The second contribution of the paper is the distinction between regular and temporary employment protection based on OECD (2004) measures. This is of particular interest, as deregulations in recent years have centered on the facilitation of fixed term contracts, for example in Italy and Germany. In contrast, protection of regular employment often did not change. Overall, the results suggest that greater flexibility and higher incentives of households to work appear to be appropriate strategies to improve the employment record. The employment response to economic conditions is stronger in more deregulated environments, and the absorption of shocks can be relieved. However, the institutional database should be improved in order to arrive at more definite policy conclusions.

The paper is organized as follows. Next, a standard labour demand equation is obtained from cost minimization behaviour of firms, and the parameters of interest are derived (section 2). Then, the role of institutions is discussed and results of the literature are reviewed (section 3). The empirical analysis proceeds in two steps. First, the integration and cointegration properties of the variables in the labour demand function are investigated, and estimates of elasticities are presented for a sample of EU countries (section 4). Afterwards, the impacts of institutions on these measures are examined (section 5). Finally, section 6 concludes. The data involved in the study are described in detail in an appendix.

2 Labour demand behaviour

According to the standard economic theory, profit maximizing firms are faced by output demand and factor prices, both of them exogeneous, see Hammermesh (1993). Due to duality, optimal behaviour can be inferred from the analysis of the cost function. Conditioned on output demand, cost minimizing labour and capital input quantities are obtained by taken the the partial derivatives of the total cost function with respect to factor prices (Shephard 's lemma). Using a log linear approximation, labour demand L^* can be stated as

$$(1) \qquad L_t^* = \alpha_1 T_t + \beta_1 Y_t + \delta_1 w_t + \theta_1 r_t \ , \ \beta_1 > 0 \ , \ \delta_1 < 0 \ , \theta_1 > 0$$

where Y is output, w the wage, and r the rental price of capital. Factor prices are measured in real terms, implying that the output price moves one-by-one with nominal factor prices. Technological progress T is assumed to be Hicks neutral and proxied by a linear time trend. The parameters β, δ and θ denote the elasticities of labour demand to output, wages and capital prices, respectively. Higher demand for goods will raise, while an increase in relative factor prices either due to a rise in wages or a fall in the rental price of capital will lower the demand for labour input. Due to imperfections such as institutional or cost restrictions, adjustment to the economic environment might not be instanteneous. Actual employment only partially reacts

$$(2) \qquad \Delta L_t = \lambda (L_{t-1}^* - L_{t-1}) \ , \ \lambda \in (0,1)$$

towards the level desired by firms. The higher the degree of persistence λ, the lower the employment response in the short run. By substituting the labour demand function into (2) an error correction mechanism

$$(3) \qquad \Delta L_t = -\lambda(L_{t-1} - \alpha_1 T_{t-1} - \beta_1 Y_{t-1} - \delta_1 w_{t-1} - \theta_1 r_{t-1})$$

is implied, which can be enhanced by a more complex dynamic structure. However, the long run equilibrium (ΔL=0) can be already inferred from the analysis of (1). After replacing labour demand by actual employment, this equation can be interpreted as a cointegration relationship. The parameters of the cointegration vector are the elasticities to be examined.

Two comments are in order. First, due to the possible nonstationarity of the variables in the labour demand function, standard tests of the cointegration vector are biased, as the asymptotic distribution of the OLS estimator is affected by nuisance parameters. To get reliable estimates of the elasticities, efficient estimation techniques are employed. They control for endogeneous feedback of the regressors and serial correlation, thereby avoiding the OLS deficits, see Saikkonen (1991). Second, the analysis assumes that cointegration can be confirmed. In contrast, if cointegration does not hold, a first difference specification without error correction

$$(4) \qquad \Delta L_t = \alpha_2 \Delta T_t + \beta_2 \Delta Y_t + \delta_2 \Delta w_t + \theta_2 \Delta r_t \ , \ \beta_2 > 0 \ , \ \delta_2 < 0 \ , \theta_2 > 0$$

would be the right way to proceed. Although the variables are not linked in levels, a relationship between their changes eventually exists. The parameters in (4) can be interpreted as short run elasticities.

3 The role of labour market regulations

Generally, institutions are of key importance for a smooth working of the labour market, see Agell (1999), Blanchard (2004) and Bertola (2004). Information problems of both workers and firms generate imperfections in the matching and monitoring process. Different degrees of market power of wage contractors and the risk of becoming unemployed require an appropriate institutional mix. On the other hand, regulations cause

rigidities which can impede the reallocation of labour in response to shocks. Overly restrictive elements may worsen the employment performance. To examine this issue, a set of variables has been developed in the literature, covering different institutional aspects: employment protection legislation, the structure of wage bargaining, measures of the tax and transfer system and active labour market policies.

Employment protection legislation may increase the costs to firms of employing workers and to readjust labour input over the course of the business cycle. Dismissals are more difficult and firms are more cautious about filling vacancies. A higher degree of job security might raise the bargaining power of insiders. However, employment relationships are more stable. Stronger employment protection can support investments in firm specific human capital, thereby inducing productivity and competitiveness gains, see Pissarides (2001) and Belot and van Ours (2002). Employment protection can also work as a substitute for incomplete unemployment insurance, see Boeri, Conde-Ruiz and Galasso (2003).

Trade unions play an important role in wage bargaining in Europe. Greater union power tends to raise wages above the competitive equilibrium. This effect may be boosted if strict employment protection schemes and generous unemployment benefits are available. Working contracts often do not bind only the bargaining parties, but also employers and employees within a region or sector. It has become common practice for employers to apply the terms and conditions of collective contracts to their total workforce, whether unionised or not. Administrative extensions can make collective agreements more binding within a sector, and cover employers who actually did not sign the contracts (OECD, 2004). Collective bargaining may lead to a compressed wage structure with low differentiation across skills and regions. Wage floors can be pushed up for the low-skilled, thereby worsening their employment chances. However, if bargaining is highly centralized or coordinated, the response of wages to macroeconomic conditions might be stronger, see Calmfors and Driffill (1988).

Higher unemployment benefits and longer benefit duration periods reduce the gap between net labour income and public transfers, and thus the incentives of households to work. The unemployed are more choosy to fill vacancies, and the matching process is less effective. As the fear of unemployment declines, an upward pressure on wages is

generated. The positive impact of benefit levels and durations on the length of unemployment spells is well documented by numerous microeconometric studies. Nevertheless, a rise in unemployment benefits can also increase the incentives for human capital accumulation. As the search process can last some periods, the chances to get an appropriate job might be enlarged. Participation in the labour force might become more attractive, as it is a prerequisite to be eligible for the benefits.

Active labour market policies aim to improve the chances of people to move back into work (OECD, 2003). These policies are of particular relevance for the low productivity workers who had been priced out in the labour market. As the employability of participants is improved, labour market performance should increase. On the other hand, regular work is in danger to be crowded out, as firms have the incentive to replace it by subsidized labour (Calmfors, Forslund and Hemström, 2002). Especially in East Germany, public services employment companies have competed with private firms. In addition, policies have to be financed through taxes and contributions. Training programmes might not match with the qualifications really demanded by firms, see Martin and Grubb (2001).

Taxes on labour widen the wedge between employer's costs and worker's income. If taxes are passed to the employers, effective employment costs increase, thereby reducing labour demand. If higher taxes are compensated by lower wages, the product wage paid by firms is unchanged, but the consumption wage received by households declines. The distance to the transfer payment is narrowed, and the incentives of households to work are reduced. Hence, rising labour taxes have a negative impact on the employment record, see Daveri and Tabellini (2000). High marginal tax rates can generate inactivity traps in the low income-low productivity segment.

Blanchard and Wolfers (2000) have identified two striking features of the evolution of EU unemployment: its general rise since the 1970s, and the heterogeneity of the individual country experience. While adverse supply shocks like the oil crises or a slowdown in productivity growth might explain the weak labour market performance, there is insufficient heterogeneity in these shocks to justify cross country differences. Institutions can account for these differences, but many of them were already in place when unemployment was low. However, interactions between shocks and institutions might

explain the development, as the reallocation of labour in response to shocks can be prolonged. Therefore, researchers have controlled for interactions between institutions and shocks, and also within the set of institutions, stressing the relevance of the institutional mix, see Belot and van Ours (2001).

Overall, the evidence on the institutional impact is rather weak, and findings are often not robust, see Flanagan (1999), Aidt and Tzannatos (2002) and Baker, Glyn, Howell and Schmitt (2002) for surveys. Blanchard and Wolfers (2000) found results supporting the interaction hypothesis. Shocks have larger and more persistent effects in countries with stricter institutions, see also Fitoussi, Jestaz, Phelps and Zoega (2000). Due to Bertola, Blau and Kahn (2001) the interaction of demographic/macroeconomic shocks and labour market institutions is crucial to explain the US shift from a country with relative high to relative low unemployment rates. In contrast, Nickell, Nunziata and Ochel (2005) did not find support for the interaction hypothesis.

Other contributions have focused on certain institutional aspects. Employment protection legislation seems to have almost no impact on the course of total unemployment. The duration of unemployment spells and worker flows are affected in the opposite direction, implying that the net effect can be ambigious indeed, see Blanchard and Portugal (2001). Also, the impact of firing costs on labour demand might depend on the state of the business cycle, see Chen, Snower and Zoega (2002). Strength of trade unions tends to raise unemployment (Elmeskov, Martin and Scarpetta, 1998). But this effect is usually compensated, if wage bargaining is highly centralized or coordinated. If unions are important, a more compressed wage structure is in place, see Kahn (2000). Hence, relative employment is lower for the low-skilled and the youth. On the other hand, propensities to attend school increase, as education bear lower opportunity costs. Minimum wages generate employment losses among the youth, especially in the high regulated economies, see Neumark and Wascher (2004). A significant part of the better performance in the 2nd half of the 1990s in most Euro area labour markets can be traced to decreasing labour taxes, see Mourre (2004).

Comparing the actual outcome with a model assuming fixed institutions over time, Nickell, Nunziata, Ochel and Quintini (2002) are able to explain half of the unemployment experience by institutional shifts over the 1960-95 period, especially in the tax and

transfer system. But, this finding is built upon high levels of endogeneous persistence as reflected by the coefficient of the lagged dependent variable. The persistence should be caused by institutions, but is left unexplained. In the IMF (2003) study, institutions and their interactions have played a vital role for the evolution of unemployment in France and Italy, but not in Germany.

4 Empirical analysis of labour demand

Labour demand analysis is done with annual data taken from the AMECO database of the European Commission. The sample covers the EU countries. Due to data availability, Greece and the new member states are excluded. To avoid a bias due to the presence of very small countries in the sample, Luxembourg is joined with Belgium, using GDP weights. In sum, 13 countries are studied over the 1973-2002 period. Country specific time series are obtained for employment, real GDP, real compensation per employee and real interest rates, where the latter is a proxy for the rental price of capital. Exact variables definitions are given in the appendix. Apart from real interest rates, all series enter the empirical analysis in logs.

-Table 1 about here-

The first step is to check for integration and cointegration of the variables involved, as these properties determine the appropriate empirical setup. To examine the presence of a unit root in the individual series, ADF and KPSS tests are employed, see table 1. The lag length of the ADF regressions is determined by the general-to-simple procedure of Campbell and Perron (1991). The consistent estimator of the long run residual variance needed for the KPSS statistics is obtained by the Bartlett kernel and the automatic bandwidth parameter approach as suggested by Newey and West (1994). The variables are specified with a constant and a linear time trend, except of the rental price of capital, where only the constant is included. As a rule, the ADF test cannot reject the null of a unit root, while the KPSS test rejects the null of no unit root for the series in levels.

Hence, all variables are nonstationary and integrated of order 1, as stationarity is broadly confirmed for the first differences.

Results of the Johansen (1991) trace and maximum eigenvalue (λ-max) tests on cointegration are exhibited in table 2. The trace statistic evaluates the null of no cointegration against the alternative of at most 1 cointegration vector. The λ-max test examines the significance of this relationship. The lag orders of the VAR's are determined by the Schwartz criterion, where a maximum of 2 periods is considered. This corresponds to a 3 year lag in the level VAR representation. All models include an unrestricted constant. Furthermore, a linear time trend due to technological progress is allowed, but restricted to enter the long run. In the first setup, the system consists of all the variables, while in an alternative setup the rental price of capital is excluded to save degrees of freedom. Generally, the null of no cointegration is rejected, in particular by the trace statistic. This can be confirmed by the λ-max test for most countries. For Denmark, Italy and Spain, the λ-max statistic is slightly below the 0.1 critical value. In the model without the rental price of capital, the overall evidence is supported, more or less. Hence, the variables in the labour demand function appear to be cointegrated, implying that the level approach (1) outperforms the difference specification.

-Table 2 about here-

In principle, the cointegration vector can be derived from the Johansen procedure. However, this is not highly recommendable. Apart from multicollinearity problems and imprecise estimates in a VAR setting, the long run relation is not uniquely identified. For this reason, the vector is estimated by means of single equation analysis. It has been widely acknowledged, however, that the asymptotic distribution of the OLS estimator is affected by nuisance parameters. To get reliable parameter estimates, efficient estimation techniques are employed. They control for endogeneous feedback of the regressors and serial correlation, thereby avoiding the OLS deficits, see Saikkonen (1991) and Hendry (1995). In particular, dynamic OLS is applied. Here, the long run is augmented by lead and lagged differences of the explanatories to control for endogeneous feedback. Lagged differences of the dependent variable are included in case if the residuals

show serial correlation. In this setting, the relevance of the individual regressors can be inferred by means of conventional tests.

Country-by-country labour demand equations are displayed in table 3. Due to the unification, a break occurs in the German time series in 1991. It has been removed by impulse and step dummies. To save space, stationary terms in the regressions are not reported. Also, the model variant with the rental price of capital is excluded from presentation, as this variable is significant only for some countries. Full results can be obtained from the authors upon request.

-Table 3 about here-

All explanatory variables show the expected signs, implying that a standard labour demand equation can be justified for the EU countries. In the majority of cases, the output elasticity is not significantly different from 1. Real wage elasticities are lower than output elasticities in absolute value, but show stronger variation across the member states. Technological progress leads to a decline in labour demand by approximately 1.5 percent a year in most countries. According to standard specification tests, the equations seem to be well behaved. For example, the Ljung-Box Q-statistic usually fails to detect autocorrelation, where Spain is the only exception.

5 The institutional impact on labour demand

Next, the output and real wage elasticities are explained by labour market institutions by means of panel fixed effects regressions. To develop a panel structure, labour demand elasticities are allowed to vary. In fact, the parameters might be subject to change because of institutional reforms, and the decline in total factor productivity in Europe has been acknowledged by several commentators (European Commission, 2003). Although the elasticities reported in table 3 are fairly stable over time, they show some (possibly insignificant) variation, if the equations are analysed over certain subperiods. Note that a model with constant parameters would inevitably lead to a cross section analysis. The gains arising from the panel approach are threefold. First, the panel model is able to dis-

tinguish between the impacts of institutions and other sociodemographic factors, since the latter are binded in the country specific fixed effects. Second, the effects of institutional change can be studied and third, the degrees of freedom are enhanced. To account for possible instability, time varying parameters are determined using recursive dynamic OLS. Moreover, the cyclical situation of the economy can be addressed. In particular, a different institutional impact is allowed depending on whether output growth is below its average or not. Initially all the equations are run over the 1973-1985 period, and the first set of coefficients is computed (corresponding to 1985). Afterwards, the period is prolonged by 1, and the process is repeated until the end of the sample. As a result, country-by-country time series of the elasticities are obtained.

Labour market institutions include the strength of employment protection, the structure of the wage bargaining process, measures of the tax and transfer system and active labour market policies. Employment protection legislation is considered both for regular and temporary working contracts. This is of particular interest, as deregulations in recent years have centered on the facilitation of fixed term contracts, while protection of regular employment often did not change at all (Young, 2003). The institutional setup for wage negotiations is described by trade union densities, the coverage of wages bargained by unions, and the degree of coordination and centralization, at which bargaining actually takes place. The tax and transfer system is captured by benefits available to the unemployed and the tax wedge on labour income. Regarding active labour market policies, public employment services are separated from labour market training measures, as both strategies may have different impacts on labour demand elasticities. The bulk of the institutional data have been taken from the OECD (2004) employment outlook, and exact variables definitions are provided in the appendix.

-Table 4 about here-

The panel fixed effects models are based on annual data covering the 1985-2002 period, as estimates of labour demand elasticities are not available earlier. The specifications representing the best empirical fit are shown in table 4. Initially, all institutions and possible aymmetric effects over the business cycle are included in the equations. However,

as institutions adjust only slowly, the regressors are highly correlated. This leads to imprecise estimates of the parameters, even in the fixed effects setting. As a consequence, the large models hide the relevant forces at work, and they need to be simplified successively. Simplification starts from different points to get a more robust picture. Nevertheless, most of the regressor candidates are significant in the equations. The only exception is the tax wedge, which turned out to be insignificant in all specifications. Overall, the institutional framework is important to explain aggregate labour demand behaviour. As some institutions are measured on a rank scale, only the signs of the impacts should be interpreted.

The most striking feature is the high significance of employment protection legislation for the output and for the real wage elasticity. The stronger the employment protection, the lower the employment response to output changes, in particular in periods of an economic upturn. Hoarding of labour is more important in countries with higher protection. The ordering of the coefficients indicates, that protection of regular work hampers the adjustment of labour to a larger extent than protection for temporary working contracts. In addition, stronger presence of unions and higher coordination will dampen the employment reaction to output. Furthermore, active labour market policy measures enter with a positive sign, which is difficult to interpret. These policies tend to improve the qualifications of the labour force, in particular in the low productivity segment, and a human capital effect widens the employment reaction to output. However, labour market training measures will have virtually no effect in an economic downturn. An alternative interpretation is based on the fact that an output change will normally reduce active labour market policies, as the latter are defined as expenditure shares in GDP. In this repect, the positive sign in table 4 actually points to a lower employment reaction.

Stronger employment protection for regular working contracts will raise the real wage elasticity, that is, the elasticity declines in absolute value. Hence, the real wage will be less important for employment, eventually due to the insider-outsider argument. A similar result can be found for wage negotiations. The more regulated the bargaining process the lower the firms ability to re-adjust the level of employment in line with wage fluctuations. Trade union densities and centralization of bargaining are the most important variables in this manner, while bargaining coverage shows some compensating effect. High unemployment benefits are expected to reduce the incentives for households to

work and lower the real wage elasticity. Finally, both measures of active labour market policies exert a negative impact. Again, the interpretation is not straightforward. Policy programmes act as a buffer to the first labour market, and an increased availability of these measures enable firms to adjust labour input to a higher extent. Interactions between active labour market policies and centralization or coordination measures would support this view, as bargaining parties can define a buffer role easier in centralized systems. Indeed, interactions between active labour market policies and centralization turn out to be significant. However, they are not included in the table 4, as this will not improve the fit of the equations. While the other regressors are not affected, single active labour market policy measures loose their relevance at all.

7 Conclusions

In this paper, the role of institutions for aggregated labour demand is investigated for a sample of EU member states. Labour demand is expressed by its structural parameters, such as the elasticities of employment to output and factor prices. Institutional variables include employment protection legislation for regular and temporary working contracts, the structure of wage bargaining (union densities, bargaining coverage, coordination and centralization), measures describing the tax and transfer system and active labour market policies (public employment services and labour market training). First, the analysis shows that standard labour demand equations can be justified for all countries considered. The variables of the labour demand function are cointegrated, and the long run elasticities are estimated with correct signs. Second, labour market institutions are important in explaining the employment response to output and real wages. Most findings have sensible interpretations, emphasizing that the employment reaction to economic conditions is stronger in more deregulated economies.

To improve the labour market performance, policies should try to introduce more flexibility in labour markets. Compared to the current setting, a less stringent employment protection legislation seems to be favourable, while both the need for flexibility of firms and security of workers have to be taken into account. Furthermore, the transfer systems should be more aligned to support the incentives for households to work. Recently, some progress have been made in this direction, such as the liberalization of temporary

work arrangements. However, according to the regression results, protection of regular employment is also highly important. In fact, it remained mostly unaltered by the recent policy reforms.

But institutions do not tell the whole story. Only the minor part of the employment elasticities can be explained by the institutional setup. The bulk of the explanation is due to country specific effects. On the other hand, institutions are partly embedded in these measures, as they change only gradually. Anyway, the institutional database should be improved to arrive at more definite policy conclusions, see Bertola, Boeri and Cazes (2000). More differentiation among the variables is certainly needed to investigate deregulation strategies more thoroughly.

Figure 1: Unemployment and employment rates (lower panel) in the EU15 and the US

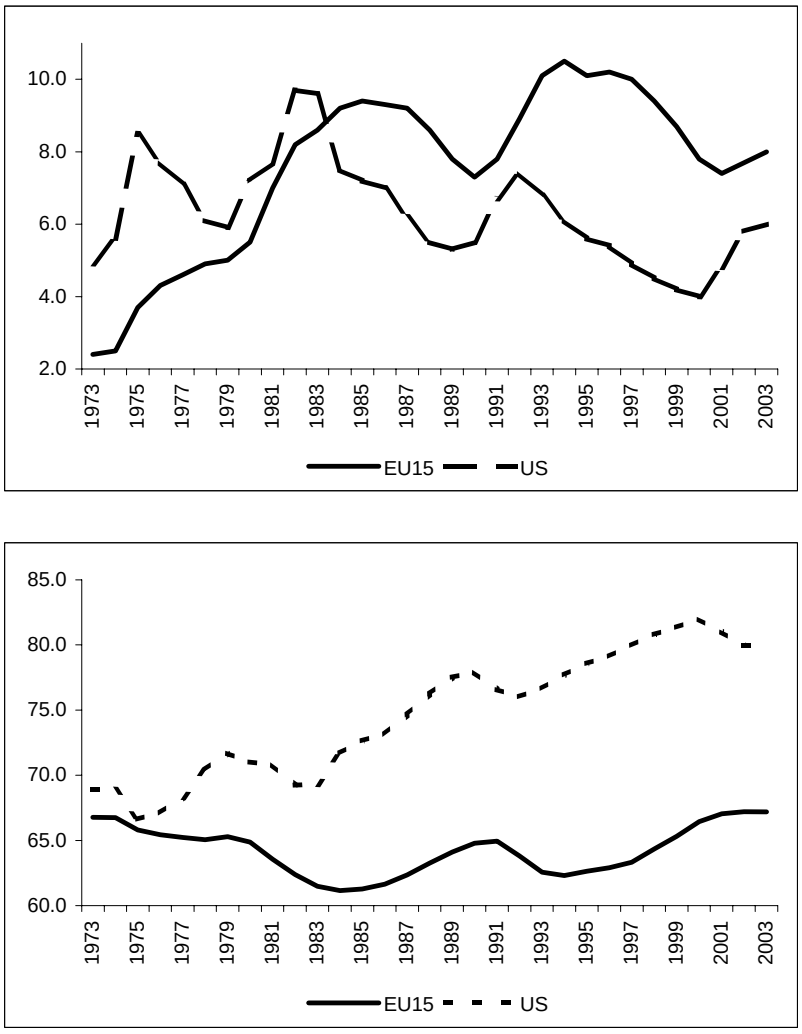

Table 1: Unit root tests of the variables involved

Employment

	ADF		KPSS			ADF		KPSS	
AT	-2.339	-3.034*	0.155*	0.205	IT	-2.440	-2.988*	0.121	0.138
BL	-2.869	-2.947*	0.156*	0.308	NL	-1.421	-5.064*	0.149*	0.413
DK	-2.823	-3.592*	0.062	0.099	PO	-2.353	-3.665*	0.169*	0.287
FI	-3.658*	-3.247*	0.089	0.099	SP	-1.504	-2.625	0.166*	0.400
FR	-1.950	-2.630	0.146*	0.267	SW	-2.842	-1.836	0.124	0.137
GE	-2.294	-4.997*	0.110	0.130	UK	-2.497	-4.762*	0.100	0.107
IR	-1.176	-2.065	0.168*	0.391					

Output

	ADF		KPSS			ADF		KPSS	
AT	-2.527	-6.150*	0.082	0.064	IT	-1.243	-6.219*	0.170*	0.374
BL	-2.855	-6.545*	0.108	0.068	NL	-2.333	-2.719	0.156*	0.160
DK	-2.344	-5.134*	0.125	0.156	PO	-5.634*	-4.492*	0.059	0.075
FI	-3.067	-2.614	0.092	0.088	SP	-3.026	-2.993*	0.125	0.132
FR	-2.504	-3.716*	0.093	0.096	SW	-4.259*	-3.408*	0.071	0.103
GE	-2.226	-3.732*	0.089	0.130	UK	-3.123	-4.123*	0.123	0.228
IR	-0.225	-3.039*	0.168*	0.394					

Real wages

	ADF		KPSS			ADF		KPSS	
AT	-4.011*	-2.836	0.107	0.376	IT	-1.947	-4.527*	0.169*	0.550*
BL	-3.061	-3.927*	0.160*	0.374	NL	-2.273	-3.141*	0.081	0.209
DK	-2.286	-6.241*	0.140	0.129	PO	-2.872	-3.596*	0.119	0.143
FI	-2.173	-4.722*	0.180*	0.368	SP	-2.490	-2.566	0.157*	0.484*
FR	-5.062*	-2.913	0.169*	0.518*	SW	-0.541	-4.397*	0.159*	0.213
GE	-3.481	-6.806*	0.148*	0.331	UK	-1.517	-4.114*	0.124	0.153
IR	-3.474	-5.153*	0.169*	0.491*					

Rental price of capital

	ADF		KPSS			ADF		KPSS	
AT	-0.886	-4.837*	0.605*	0.500*	IT	-1.420	-3.252*	0.394	0.361
BL	-0.673	-3.899*	0.422	0.323	NL	-1.649	-5.867*	0.553*	0.220
DK	-0.627	-6.961*	0.592*	0.200	PO	-1.027	-3.217*	0.256	0.479*
FI	-0.439	-4.688*	0.367	0.399	SP	-0.691	-6.958*	0.671*	0.295
FR	-0.574	-4.416*	0.521*	0.250	SW	-0.813	-5.412*	0.335	0.426
GE	-1.687	-4.390*	0.557*	0.116	UK	-0.430	-6.206*	0.664*	0.500*
IR	-0.424	-2.968	0.606*	0.265					

AT=Austria, BL=Belgium (+Luxembourg) DK=Denmark, FI=Finland, FR=France, GE=Germany, IR=Ireland, IT= Italy, NL=Netherlands, PO=Portugal, SP=Spain, SW=Sweden, UK=United Kingdom. The first (second) column in the ADF or KPSS section refers to the level (differenced) variable. Level variables have a linear trend, except of the rental price of capital, where only a constant is considered. In differences, all models include a constant. A * indicates the rejection of the null hypothesis of nonstationarity (ADF) or stationarity (KPSS) at least on the 0.05 level of significance.

Table 2: Johansen cointegration tests

Employment, output real wages and rental price of capital

	Lag	Trace	λ-max		Lag	Trace	λ-max
AT	1	67.036*	34.684*	IT	1	65.186*	27.053
BL	1	68.815*	35.734*	NL	1	89.378*	44.473*
DK	1	69.811*	28.609	PO	1	87.625*	43.901*
FI	2	82.361*	33.645*	SP	1	77.392*	28.137
FR	2	78.401*	31.074	SW	2	88.163*	42.334*
GE	1	88.152*	44.441*	UK	1	82.266*	36.363*
IR	1	83.897*	37.211*				

Employment, output and real wages

	Lag	Trace	λ-max		Lag	Trace	λ-max
AT	1	44.006*	28.976*	IT	1	40.364	23.877
BL	1	43.282*	25.712	NL	1	65.022*	38.394*
DK	1	37.064	24.891	PO	2	43.361*	27.747*
FI	2	44.896*	19.792	SP	1	40.836	21.564
FR	2	55.500*	25.840*	SW	2	43.627*	23.228
GE	2	63.048*	34.952*	UK	1	57.987*	30.123*
IR	1	44.216*	23.268				

AT=Austria, BL=Belgium (+Luxembourg) DK=Denmark, FI=Finland, FR=France, GE=Germany, IR=Ireland, IT=Italy, NL=Netherlands, PO=Portugal, SP=Spain, SW=Sweden, UK=United Kingdom. All models include an unrestricted constant and a linear trend restricted to the cointegration relationship. A * indicates the rejection of the null hypothesis of no cointegration at least on the 0.05 level of significance. Critical values are from MacKinnon, Haug, and Michelis (1999).

Table 3: Estimation of labour demand, 1973-2002

	Constant	Output	Real wage	Trend	R2	Q(2)
AT	4.657 (0.456)	1.035 (0.112)	-0.341 (0.125)	-0.019 (0.003)	0.958	4.838
BL	4.244 (0.402)	0.963 (0.077)	-0.205 (0.056)	-0.015 (0.002)	0.986	0.831
DK	3.923 (0.499)	1.390 (0.130)	-0.989 (0.159)	-0.012 (0.001)	0.964	3.089
FI	4.967 (0.197)	1.109 (0.027)	-0.611 (0.055)	-0.017 (0.001)	0.994	3.337
FR	5.748 (0.956)	0.750 (0.165)	-0.233 (0.121)	-0.009 (0.003)	0.953	0.446
GE	4.557 (0.250)	1.102 (0.024)	-0.617 (0.048)	-0.008 (0.002)	0.999	2.471
IR	5.275 (0.421)	0.846 (0.045)	-0.339 (0.120)	-0.018 (0.004)	0.994	0.325
IT	7.077 (0.718)	0.745 (0.135)	-0.647 (0.195)	-0.005 (0.003)	0.932	3.867
NL	1.667 (0.457)	1.329 (0.089)	-0.084 (0.034)	-0.015 (0.002)	0.994	5.254
PO	6.817 (0.364)	0.525 (0.118)	-0.147 (0.087)	-0.011 (0.003)	0.909	1.362
SP	1.822 (1.109)	1.643 (0.139)	-0.561 (0.157)	-0.025 (0.005)	0.985	7.984
SW	0.762 (0.626)	1.152 (0.083)	-0.125 (0.070)	-0.018 (0.002)	0.912	3.356
UK	3.835 (0.280)	1.115 (0.062)	-0.180 (0.076)	-0.018 (0.001)	0.985	4.844

AT=Austria, BL=Belgium (+Luxembourg), DK=Denmark, FI=Finland, FR=France, GE=Germany, IR=Ireland, IT= Italy, NL=Netherlands, PO=Portugal, SP=Spain, SW=Sweden, UK=United Kingdom. R2=adjusted R-squared, Q(2)= Ljung Box statistic for autocorrelation up to lag 2, standard errors in parantheses.

Table 4: Impact of institutions on labour demand elasticities

	Output	Real wage
EPLR	-0.293 (0.058)	0.344 (0.052)
EPLT	-0.127 (0.020)	
EPLT*DU	0.037 (0.012)	
DEN	-1.857 (0.306)	2.138 (0.258)
COV		-0.719 (0.292)
COV*DU		-0.134 (0.043)
COO	-0.174 (0.037)	
CEN		0.132 (0.042)
BRR		-1.180 (0.344)
TAX		
ALMP1	2.209 (0.382)	-0.864 (0.331)
ALMP2	0.209 (0.012)	-0.398 (0.088)
ALMP2*DU	-0.256 (0.094)	0.321 (0.094)
R2	0.801	0.843

BRR=benefit replacement rate. EPL=employment protection for regular (R) and temporary (T) working contracts, DEN=trade union density, COV=bargaining coverage, COO=bargaining coordination, CEN=bargaining centralization, TAX=tax wedge, ALMP=active labour market policies: public employment services (1), labour market training measures (2). DU=dummy to capture business cycle situation. DU=1 if output growth is below its average, 0 otherwise. R2=adjusted R-squared, standard errors in parantheses.

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Appendix: Data definitions and sources

The sample runs from 1973-2002, using annual data for 13 EU member states: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom. The series for Belgium include Luxembourg. GDP and employment refer to the sum of the figures in these two countries, and factor prices have been aggregated using real GDP weights.

All macroeconomic data have been taken from the AMECO database of the European Commission, which is available at (http://europa.eu.int/comm/economy_finance/indicators_en. htm). Country-by-country time series are obtained for employment in persons, GDP at current market prices, labour compensation per employee, long term nominal interest rates, and the GDP deflator (1995=100). Nominal GDP and compensation per employee are deflated by GDP prices to compute the real variables used in the analysis. The real interest rate is proxied as the difference between the long term interst rate and annual inflation in GDP prices. Apart from real interest rates, all series enter the analysis in logs.

The bulk of the institutional data have been taken from the OECD (2004) employment outlook, chapters 2 and 3, available at www.oecd.org. Institutional data are considered over the 1985-2002 period. Because of insufficient degrees of freedom, labour demand elasticities are not estimated for an earlier time span.

Some institutional variables are measured on a rank scale, including employment protection legislation for regular and temporary working contracts, bargaining coordination and bargaining centralization, where a higher number refers to stronger regulation. For example, bargaining coordination is scaled in the [1;5] interval, where 1 is bargaining at the firms level, with no coordination by upper-level associations, and 5 is coordination by peak confederations of unions and employers associations where even the government can impose a wage freeze. Other variables are quantitative. Trade union densities show the share of workers organized in unions. The rate of workers governed by unionized contracts is measured by bargaining coverage. Benefit replacement rates are obtained as a percentage of earnings before tax, averaged over different family types. The tax wedge refers to the sum of the rates of employment taxes, social contributions and indirect taxes. The two categories of active labour market policies, public employment

services and labour market training are expressed as expenditure shares in nominal GDP.

Some of the institutional data are initially not available at the annual frequency. Instead, the OECD (2004) reports five or ten year data for employment protection legislation, bargaining coverage, coordinantion and centralziation. In these cases, the database is extended to match with the annual frequency. For employment protection of regular and temporary work, intermediate values have been calculated using the OECD (2004) table 2.A2.6, where information about the timing of the reforms in this variable is provided for the past 20 years. Measures of the bargaining process were interpolated with a recourse to the Nickell and Nunziata (2001) database. The latter holds annual data, but is available only up to 1995. However, Nickell (2003) has reported an update to cover a more recent period.