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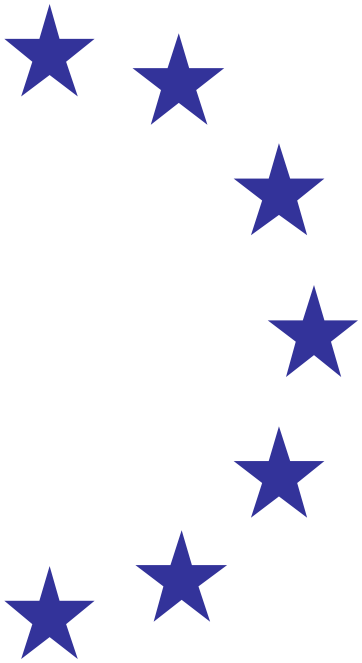

THE CONTRIBUTION OF WAGE DEVELOPMENTS TO LABOUR MARKET PERFORMANCE

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Executive summary[1]

This report presents the results of the project "**The contribution of wage developments to labour market performance**". The objective of the project is to examine the short- and long-run wage-price setting mechanisms in the European Union (EU), their main determinants and the impact on employment and unemployment in order to achieve a better understanding of the cyclical pattern and the absorption of nominal and real shocks which can be potential sources of divergence across EU member states, and, also to quantify the contribution of wage developments to the evolution of employment and unemployment.

The report is structured in four parts. The first part describes the main objectives of the project. The second part includes a comprehensive and critical review of the recent literature on empirical estimates of **labour market performance**: The third part consists of the **empirical elaboration of wage and employment determinants** in the Euro area, the EU member states and the United States (US), paying special attention to the role of labour market institutions. Finally, the fourth part summarises the main findings in order to help the European Commission in assessing the **most appropriate structural reforms for the labour market**.

As shown in the **second part** of the report, despite some progress in the second half of the 1990s, **labour market performance** in the EU has been rather weak. Unemployment is still at high levels, and participation rates in the labour market are significantly below the Lisbon target. According to OECD measures, the proportion of employed people compared to the population of working age is 64.8 percent in 2003, compared to 71.2 percent in the US. Europe therefore had a deficit of about 20 million jobs in 2003. As a consequence, many people in Europe do not have the chance to create wealth and to participate in the labour market. In 2003, 8% of the active population - i.e. about 14.2 million people - were unsuccessfully seeking immediate work.

[1] Disclaimer: The views expressed represent exclusively the positions of the authors and do not necessarily correspond to those of the European Commission.

Unemployment has been growing in the EU since the seventies achieving two digit figures during the nineties as a result of adverse economic shocks (slowdown in total factor productivity growth, oil crisis and the evolution of real interest rates). Moreover, unemployment has shown a high degree of persistence. In fact, about the half of unemployed are long-term unemployed. They have been out of the labour market during more than one year and around a third of them have been out of the market during more than two years. This reduces their employability and contributes to aggravate the problem of the social exclusion.

Unemployment is especially relevant for particular groups of the labour force: young and older workers, disabled workers and ethnic minorities. Although there has been a clear increase in the participation rates of women during the last decades, the labour market continues favouring the men: the female unemployment rates are, in general, higher than men's and their activity rates are lower. Moreover, women have to face discrimination in terms of wages and in terms of opportunities of professional career.

Another important characteristic of the European labour markets is the heterogeneity of individual country experiences. For example, in the large euro area economies –France, Germany, Italy and Spain- unemployment rates are currently around 10 percent, while in some smaller member states like Austria and the Netherlands, the rates reach only half of this level. It is also worth mentioning that with the accession of the new member states, this heterogeneity is even higher.

The **evolution of wages** plays a crucial role in explaining the labour market performance. In order to reduce unemployment, nominal wages have to increase by less than the sum of price inflation and productivity growth. Excess wage increases can contribute to a rise in inflation or a slowdown in employment growth or both.

However, wages above the competitive equilibrium level can be justified for a number of reasons. Perhaps the most popular argument concerns efficiency wages (see Stiglitz (1987) and Weiss (1991) for a survey). Firms consider wages not only as costs, but also

as important incentives for the employed to work harder and more efficiently than they would do if they were paid at the market clearing level. According to this view, higher wages could increase firms' profits, as they reduce employees' time-wasting, fluctuations in employment staff and training costs, and improve the selection of new employees (the adverse selection approach). High unemployment might reduce the efficiency premium paid by employers, as a weak labour market performance will prevent workers from time-wasting.

Furthermore, the insider-outsider-approach (Lindbeck and Snower, 2001) provides a rationale for the persistence of unemployment. Even in periods of low economic activity, the employed (insiders) try to increase wages without considering the situation of the unemployed (outsiders). The aim of the insiders is to obtain wages that are as high as possible, but not so high that the outsiders can offer their work under more favourable conditions. In fact, the premium that can be exploited by insiders is limited, by the costs of job turnovers (hiring, firing and search costs), investments in human capital, and costs of training on the job, among other factors. As a result of the premium received by insiders, lower levels of production and employment are optimal for firms, compared to the competitive environment. As a consequence, the workers remain employed, but the unemployed only have a low probability of finding work again. Unemployment is going to persist over time, once a job is lost. The actual power of insiders is closely linked to the institutional framework. In particular, generous systems of unemployment benefits will relieve the insiders' position.

It is difficult to blame present low rates of net job creation in the euro area on excessive wage increases in general. Since the 1980s, real labour costs per employee in the euro area have increased by much less than productivity and by only slightly more than in the US. Annual nominal wage growth has declined around the mid of the 1990s, even before the beginning of the economic recession. Since then, wage growth rates have sped up slightly in most countries.

In addition, labour market outcomes are a result of the institutional framework. Properly designed **institutions** are of vital importance in the smooth working of the labour mar-

ket. Information problems for both workers and firms generate imperfections in the matching and monitoring process. The different market power of wage contractors and the risk of becoming unemployed require an appropriate mix of the institutional framework. However, regulations can also cause rigidities as they may hinder the reallocation of labour as a response to structural shocks. Overly restrictive elements may actually worsen the performance of employment.

If institutions reduce wage flexibility, a smooth adjustment of labour input is more complicated. For example, wage-setting rules can refer to a trend or past productivity growth, which may cause wages to lag behind the business cycle. Low inflation rates can also increase stickiness, as workers are resistant to nominal wage cuts. In the case of price-indexed wages, wage-price spirals may begin. Furthermore, the structure of the bargaining process is important, as it determines the length of the contracts. As a result of rising costs, collective negotiations take place at longer time intervals than bargaining at individual firm level. The longer the interval, the lower the wage response to actual conditions. The introduction of the EMU has possibly led to a higher macroeconomic stability in the recent past. Uncertainties have declined, and the risk of agreeing on long-term contracts has fallen. Consistent with this view is the increasing use of mult-iannual wage contracts in some member states.

However, the impact of institutions is not limited to the wage formation process. For example, employment protection legislation strengthens the bargaining power of insiders compared to outsiders, implying that the responsiveness of wages to economic conditions is lowered. The design of tax and unemployment benefit systems has an impact on the duration and the extent of job seeking. In the low productivity-low income segment, the availability of benefits and the difference between them and a minimum wage might generate persistent unemployment traps. In order to examine the institutional impact on wages and employment, a set of variables has been developed in the literature, covering various aspects of the institutional set-up. In particular, the structure of wage determination, especially the role of trade unions, the strength of employment protection legislation, measures in favour of the unemployed, such as unemployment benefits and active labour market policies, and taxes on labour are considered.

As a rule, EU labour markets are more regulated than those in the US. For example, trade unions are less important in the US. Union densities are rather low and at the same level as in France, while the coverage of unionised wages has fallen below 20 percent since the beginning of the 1990s. Neither the centralisation nor the co-ordination of wage bargaining have played an important role. Employment protection is even weaker than in the UK, which offers the minimum provisions among the EU member states. Furthermore, expenditures on active labour policies are very low, partly because of the better employment performance.

Taking these results into account, **the third part** of the study has focused on the analysis of wage and employment determinants in the euro area, the EU member states and the US and its relationship to labour market institutions. The analysis in this third part is split into two parts, which are concerned with a wage and employment analysis. Both variables are explained using standard models. According to the wage curve literature, the **real wage is linked to unemployment rates and labour productivity**. **Employment is explained within a labour demand framework, with output and the real wage being the most important variables**. We consider both time series and structural models. By means of the two approaches, the adjustment behaviour of labour markets either due to shocks or changes in the explanatory variables is analyzed.

In the context of the time series models, **accumulated impulse responses as well as variance decompositions serve as endogenous variables in a cross-country regression to investigate the impact of labour market institutions**. In the **structural variant, which is justified from the economic point of view, real wage and employment elasticities are considered instead**. Similar to the time series approach, the estimated elasticities are explained by the institutional variables using cross section and panel fixed effects techniques. The institutions comprise measures regarding employment protection legislation, the structure of the wage bargaining process (union density, bargaining coverage, co-ordination and centralization), unemployment benefit, the tax wedge and active labour market policies.

Our main findings are as follows: regarding the wage and employment equations, the explanatory variables show the expected signs, and dynamic adjustment behaviour is in line with economic reasoning. There is a positive impact of productivity on the real wage, whereas unemployment has a negative effect. Employment depends positively on output and negatively on the real wage. Because the signs are as expected, the results can be used to perform the further step of the analysis by regressing adjustment parameters on the institutional variables.

The obtained estimates also permit to affirm **that the Euro area and the EU-15 have a similar degree of labour flexibility than the one observed for the US except for the response of real wages to unemployment**. It is worth mentioning that **country rankings are quite different when looking at the different indicators of flexibility** that have been considered: the response of real wages to unemployment and to productivity and the response of employment to real wages and to productivity. These results can be understood as evidence that focusing on the relationship between wages and unemployment to assess labour market flexibility will be extremely simplistic. **More complex indicators integrating the different aspects should be investigated in further research.**

Next, using these different measures as endogenous variables in regression models, and considering **different methods, techniques and datasets** in order to guarantee the **robustness** of the results, we have found **evidence of the impact of institutions on the speed and size of the adjustment to shocks by real wages and employment**.

Generally speaking, we found that both in the short-term and in the long-term, **stronger bargaining centralisation and higher union density tend to reduce the real wage response to an unemployment shock, while active labour market policies (training programs in particular) have a positive effect on this reaction**. As regards the **response of real wages to a productivity shock, the most important variables are centralisation, employment protection legislation for temporary working contracts and benefit replacement rates, and all three have negative effects**. When using time-varying models, the most striking differences with the previous results are twofold.

Firstly, the co-ordination variable is now significant and with the expected positive sign,; and secondly, the variable proxying active labour market policies (measured as public employment services and administration) now shows a negative sign instead of the positive one found in the previous model. One possible explanation for this result is related to the time dimension of the approach used. In particular, increased demand for labour due to a productivity shock could lead to temporary pressure on the labour market, because people engaged in active labour market programmes are not at the disposal of private firms when the output change takes place and real wages can increase as part of this pressure.

As far as the **effects of employment on the real wage shock** are concerned, **an increase in trade union strength and stronger employment protection legislation will limit employment losses**. Similarly, they limit the employment gains in case of a negative real wage shock. Firms in countries with more extensive employment protection can be expected to hoard labour to a higher extent. **Active labour market policies also reduce the employment response**. By contrast, **the economic situation is more important if bargaining is centralised**. Finally, **higher benefit replacement rates tend to widen the employment reaction**.

With regard to **the reaction of employment to a shock in productivity, the impact of institutions usually increases with the time elapsed after the shock**. **A stronger presence of trade unions (union density, bargaining coverage) generally tends to reduce the response of employment to an output shock, while the effect is compensated for by a higher degree of co-ordination and centralisation.** The response of employment to an output shock thus tends to be **larger in more co-ordinated systems**. **Active labour market policies enter with a positive sign**, whether they are measured by public employment services or training measures. **Employment protection variables and the tax wedge measure proved to be insignificant** in all the models considered.

In the employment models, the most striking difference with the constant parameter approach is the occurrence of employment protection legislation in the varying elasticity

model and its high level of significance. There are good reasons for considering employment protection as a measure which behaves asymmetrically over the business cycle. It is less importance during booms, but becomes more important during recessions, when firms try to reduce their number of employees. In the constant elasticity approach, it is implicitly assumed that the relevant elasticities are constant over the various phases of the business cycle. This is perhaps too great an assumption, and leads to statistical significant impacts on employment. In the varying parameter approach, the elasticities are allowed to change over time and this behaviour may be more appropriate for reflecting the behaviour of firms over the various phases of the business cycle.

The evidence obtained when considering **interactions between different institutional variables** in the context of the panel of fixed effects models showed that **there are some institutions that seem to operate in an indirect way**. For example, the combination of the tax wedge with certain variables such as benefit replacement rates or co-ordination provides significant results. This can be interpreted as evidence that the role of the tax wedge is not only relevant *per se*, but also through other indirect mechanisms. The combination of certain characteristics related to the role of unions in collective bargaining such as union density, centralisation, co-ordination or coverage also seems to reinforce the role of these aspects as determinants of the response of real wages both to unemployment and productivity shocks.

As a summary, **adjustment to shocks in European labour markets (which are characterised by a low mobility) is clearly influenced by institutions**. In more **deregulated labour markets which also have a lower presence of trade unions, the response of real wages and employment to shocks is particularly faster and larger**. An additional aspect that should be stressed is that **institutions seem to be more determinant in the employment response to certain shocks than in the case of real wages**. In other words, institutions have significant effects on the responses of both employment and real wages, but these effects are more significant for employment.

However, as shown in the **fourth part**, the **policy implications** from the results are not straightforward: It is important to analyse why labour market institutions are as they are

and whether there may be other reasons apart from the unfavourable impact on adjustment mechanisms which keep them as they are (European Commission, 2004). In fact, the central question is how labour market institutions should be designed in order to secure benefits, while as far as possible avoiding the distortions that provide little benefit in terms of social protection. An additional aspect to tackle into consideration is the stability of the goodness of institutions over time. In particular, the best performing institutions over a certain period of time may not necessarily be the same ones in the future. In fact, the results obtained for employment protection legislation in the varying elasticity model showed that there are good reasons for considering that the impact of certain institutions may be asymmetric during the business cycle. Taken the asymmetry into account, there might be also a long-run effect if impacts are accumulated over subsequent cycles. For example, if the effect is higher in recessions in terms of its absolute value, the accumulated effect is also influenced. Of course, the duration of recessions was shorter than the duration of expansions in previous years, and this would compensate for a non-zero accumulated effect. As we understand it, this is a key aspect that merits further analysis.

Summarising, to the best of our knowledge, this study is at least one of the first to analyze the impacts of institutions on wages and employment on the EU level. Therefore, the main focus is to find out whether statistical significant relationships exist and in which direction these interactions operate. Thus, we do not put much emphasis on the size of the coefficients of certain institutions, but more on their signs. In this sense, the direction of the impacts should have economic meaningful interpretations. Hence, the study is somewhat preliminary and important questions are left unanswered. They are dedicated for further research.

First part. Introduction and objectives

1. Introduction and objectives

The rising globalization of markets and the introduction of the Economic and Monetary Union (EMU) lead to a higher competition in the European Union (EU). Companies are less able to increase prices, and income that could be allocated in wage bargaining is reduced. Advances in competition are accompanied by the suppression of transaction costs, declining information costs and uncertainty. On the macroeconomic side, increased integration, higher price stability achieved by the European Central Bank and the resizing of the public sector by means of the Stability and Growth Pact are expected to create the conditions for higher growth and employment. However, the loss of competence in terms of nominal exchange rates, the centralisation of monetary policy, and fewer opportunities for independent fiscal policies limit the countries' capacity to react against adverse shocks. Different economic developments across countries highlight the importance of appropriate adjustment mechanisms. According to the work of Mundell (1961) and Kenen (1969) on optimum currency areas, three mechanisms are especially important - factor mobility, fiscal transfers and wage flexibility.

As capital is already highly mobile, factor mobility is mainly concerned with labour migration towards the better-performing regions. Empirical studies usually show a relative low degree of labour mobility in Europe, both at national (Padoa Schioppa, 1991) and EU level (European Commission, 1990, De Grauwe and Vanhaverbeke, 1991 and Decressin and Fatás, 1995). However, inter-territorial equilibrium, social cohesion and the maintenance of environment and political co-existence advise against high mobility rates in Europe.

A second mechanism is related to fiscal transfers from a central EU budget to regions in recessions. Empirical evidence in the US has stressed the importance of fiscal compensation (see Sala-i-Martin and Sachs (1992) and Bayoumi and Masson (1995)). The lack of a fiscal mechanism for regional stabilisation has enabled several authors to predict obstacles to the performance of the EU economy.

Thirdly, more flexible wages would be needed to absorb shocks and business cycle fluctuations in a smoother way, without generating the costs of labour mobility. In the event of cyclical divergence across countries, real exchange adjustment between EMU member states requires different unit labour costs. As a result of the lack of national instruments, wages have to bear a higher part of the adjustment process. However, the literature has pointed out that there is an insufficient response by wages to shocks. As a consequence, adjustment tends to be come by means of quantities - migration in the US, labour force participation and unemployment in Europe - instead of adjustment by means of wages and prices. For this reason, a key aspect in evaluating the potential risks of the EMU is therefore wage flexibility.

The objective of the project is to examine the short- and long-run wage-price setting mechanisms in the EU, their main determinants and the impact on employment and unemployment in order to:

- Achieve a better understanding of the cyclical pattern and the absorption of nominal and real shocks which can be potential sources of divergence across EU member states

- Quantify the contribution of wage developments to the evolution of employment and unemployment

In order to achieve the objectives mentioned above, the rest of the report is structured in three parts. The second part includes a comprehensive and critical review of the recent literature on empirical estimates of labour market performance: The third part consists of the empirical elaboration of wage and employment determinants in the Euro area, the EU member states and the United States (US), paying special attention to the role of labour market institutions. Finally, the fourth part summarises the main findings in order to help the European Commission in assessing the most appropriate structural reforms for the labour market.

In specific terms, the first part of the report includes an overview of the evolution of unemployment, employment, wages and labour costs in the large EU countries (Germany, France, Italy, Spain and the UK). The aggregate EU experience is also compared to the US.

The third part of the report includes a comprehensive and critical review of the recent literature on the link between wages and employment, labour market institutions and the debate on the use of wage and Phillips curves. It also provides results for wage and employment determinants in the EU and the US, putting special emphasis on the role of labour market institutions. In order to gain some insights into the dynamic behaviour of wages, employment, unemployment and output, we set up VAR and structural equation models for each of the 15 EU member states, for the Euro area and the EU15 as entire regions and for the US using annual data from 1970 to 2003.Different approximations to the concept of labour market flexibility are obtained based on the estimation of these models and these measures are then treated as endogenous in linear regression models, in which where different institutional characteristics are introduced as explanatory variables.

The results of this analysis provide interesting conclusions for the assessment of the most appropriate structural reforms for the labour market, which are summarised in the fourth part of the report.

Second part. Labour market developments

2. Introduction

One of the objectives of this first part of the study is to provide an overview of the evolution of unemployment and employment in the large EU countries (Germany, France, Italy, Spain and the UK). The aggregate EU experience is also compared to the US. Macroeconomic data for the most relevant labour market variables are analysed in the next section with this in mind. Special attention is paid to the analysis of long-term unemployment rates, unemployment rates for specific groups (women, young people and the less educated), activity rates and part-time employment rates.

Wages play a crucial role in explaining the evolution of employment. From the perspective of workers, they represent labour income, which can be spent on consumption and saving. From the employers' point of view, wages are labour costs and determine the relationship of labour to production. At the competitive equilibrium, real wages should be equal to labour productivity. However, this rule will support a stable employment level and is not sufficient to improve the chances of the unemployed to find work. In order to reduce unemployment, nominal wages must increase by less than the sum of price inflation and productivity growth. Excess wage increases can contribute to a rise in inflation or a slowdown in employment growth, or both. Taking this into account, we focus on the evolution of nominal and real wages, but also on nominal and real unit labour costs for the EU aggregates, the US and for the large EU countries.

In order to explain the heterogeneity observed among countries, various contributions have shown that properly designed institutions are of vital importance in the smooth working of the labour market. Information problems for both workers and firms generate imperfections in the matching and monitoring process. The different market power of wage contractors and the risk of becoming unemployed require an appropriate mix of the institutional framework. However, regulations can also cause rigidities as they may hinder the reallocation of labour as a response to structural shocks. Overly restrictive

elements may actually worsen the performance of employment. The next section therefore provides a review of the role of institutions in explaining cross-country differences in labour market adjustments.

The consideration of these three issues (the evolution of employment and unemployment, the relationship between wages and productivity and the role of institutions) provides the framework for carrying out empirical analysis of the contribution of wage developments to labour market performance that will be presented in the third part of the report.

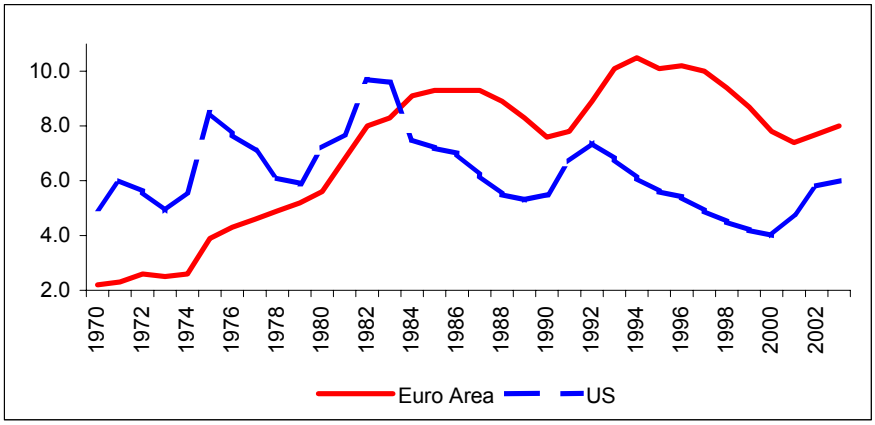
3. The evolution of employment and unemployment

Despite some progress in the second half of the 1990s, labour market performance in the EU has been rather weak. Unemployment is still at high levels, and participation rates in the labour market are significantly below the Lisbon target. According to OECD measures, the proportion of employed people compared to the population of working age is 64.8 percent in 2003, compared to 71.2 percent in the US. Europe therefore had a deficit of about 20 million jobs in 2003. As a consequence, many people in Europe do not have the chance to create wealth and to participate in the labour market. In 2003, 8% of the active population - i.e. about 14.2 million people - were unsuccessfully seeking immediate work.

EU unemployment has been growing since the 1970s (see Graph 1). Starting at relatively low levels at the beginning of the period, unemployment rates rose in the US from 1984 onwards, and reached double-digit figures in the first half of the 1990s. While US unemployment was rather stable over time, unemployment in the EU showed a clear upward trend in the first part of the sample. The rate has dropped slightly since the second half of the 1990s, but continued to rise again during the last economic recession. Nevertheless, the series is still below the level reached in the mid-1990s.

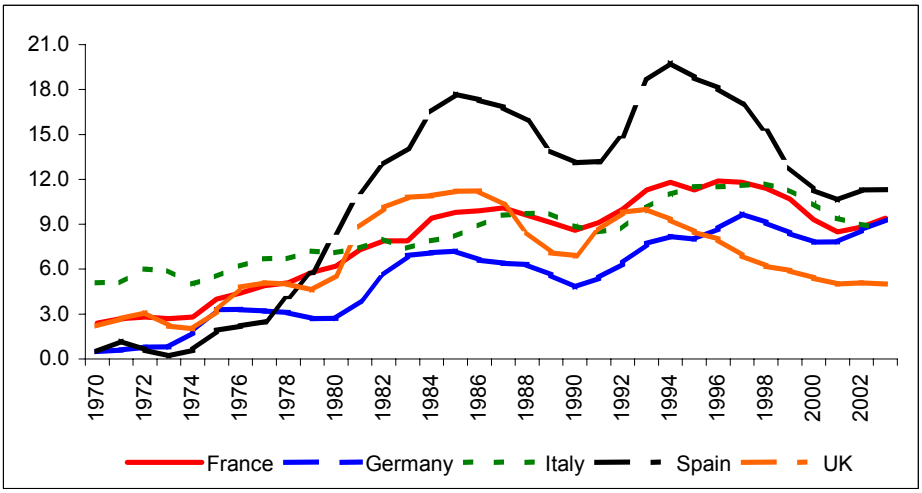
However, if we compare unemployment rates in 1970 with the ones observed in 2003, a decrease can be observed only for Ireland. Unemployment rates are currently fluctuating in the large Euro area economies –France, Germany, Italy and Spain - at around 10 percent. In some smaller member states like Austria and the Netherlands, the rates are at half this level. During the last decade, the record seems to be better in the EU countries, that are not in the Euro area, and in the UK in particular. Unemployment doubled during the 1990s in Germany, and was rather stable in France and Italy. By contrast, the UK and Spain experienced a substantial drop in unemployment. However, the Spanish unemployment rate began at a very high level (see Graph 2).

Graph 1: Development of unemployment rates



Source: AMECO.

Graph 2: Evolution of national unemployment rates

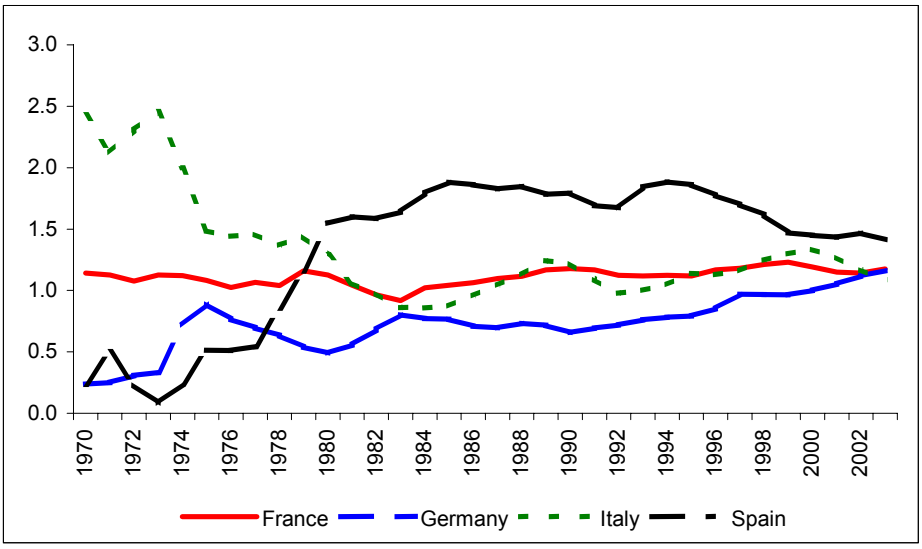


Source: AMECO.

The dispersion of EU unemployment rates has fallen over time. The relationship of unemployment rates in the main Euro area countries to the EU average is shown in Graph 3. In the 1970s, the unemployment experience was considerably more heterogeneous. On the eve of the first oil crisis in 1973, the Italian unemployment rate exceeded that of the EU by a multiple of 2.5, while in Germany, the rate was only 0.3 of the average. In the early 1980s, the Spanish unemployment rate was twice as high as the average, but recovered during the second half of the 1990s. Apart from the Spanish experience, the bulk of unemployment convergence between the main Euro area countries can be traced

to the 1980s, and is not linked to the introduction of the EMU. However, substantial heterogeneities remain, if development in the smaller member states and non Euro area EU members is taken into account. Moreover, the heterogeneity is showing a tendency to widen again with the accession of the new member states.

Graph 3: Unemployment rates as a multiple of the EU (EU=1)



Source: AMECO.

Unlike the US experience, EU unemployment has been highly persistent across all member states. On average, around half of the unemployed are long-term unemployed. These workers have been out of the labour market for longer than one year and around a third of them have been out of work for more than two years. A long period of unemployment reduces their employability and contributes to aggravate the problem of social exclusion. The long-term rates are one of the main sources explaining different the adjustment processes of national labour markets.

Long-term unemployment rates are highest in Italy and Germany and relatively low in the UK. However, even the UK rates exceed the US level by a factor of 2 (see Table 1). The rates have fallen since the mid-1990s in most countries for the first time, except for Germany, where the development has been affected by the country's unification. Long-term unemployment is caused by structural factors, such as regional and skill mis-

matches. These rates are therefore barely affected by short-run movements in aggregate demand.

Table 1: Evolution of long-term unemployment rates

Duration of unemployment 12 month or longer. Percentages of total unemployment

	1990	1995	2000	2003
EU15	48.7	50.1	46.9	43.4
Germany	46.8	48.7	50.4	50.0
France	38.1	42.3	42.6	33.8
Italy	69.2	63.6	61.3	58.2
Spain	54.0	56.9	47.6	39.8
UK	34.4	43.6	28.0	23.0
US	5.5	9.7	6.0	11.8

Source: OECD employment outlook, various issues.

The analytical framework for examining the developments of long-term unemployment rates is given by the NAIRU or the NAWRU, which is the unemployment rate consistent with stable price or wage inflation, respectively. Their difference to the actual unemployment rate can be used as a measure for temporary unemployment, which is affected by short-run fluctuations. Temporary unemployment will fall over the business cycle. Labour market reforms should therefore try to reduce the NAIRU. As a result of the effects of hysteresis on the evolution of EU unemployment, the concept of a time-varying NAIRU seems to be appropriate (see Gordon (1997)). Recent estimates in this field have been provided by Fabiani and Mestre (2000) and McMorrow and Roeger (2000).

Labour market performance differs markedly across groups of workers. In fact, unemployment usually exceeds its average for women, the youth, the less educated and ethnic minorities (see Table 2).

Table 2: Unemployment rates for specific groups (2003)

-Percentages of persons unemployed with respect to the appropriate reference group

	Overall	Women	Youth	Old	Lower educated
EU15	7.8	8.6	14.7	5.7	9.8
Germany	9.3	8.9	10.6	9.7	15.3
France	9.4	10.4	20.2	5.8	11.8
Italy	8.7	11.7	26.3	3.8	9.0
Spain	11.4	16.0	22.7	6.9	11.2
UK	4.9	4.1	11.5	3.3	8.5
US	6.1	5.7	12.4	4.1	10.2

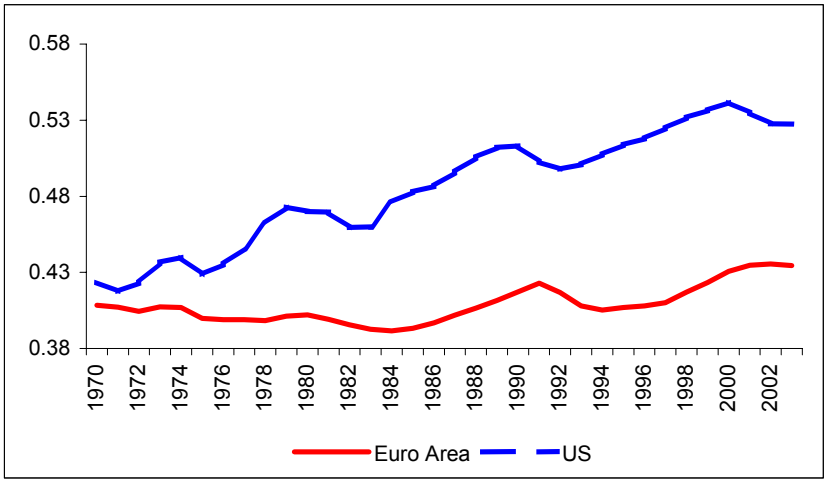
The reference group consists of persons aged 15-64 (overall), women aged 15-64, persons aged 15-24 (young), persons aged 55-64 (old), lower educated aged 25-24. Lower educated (less than upper secondary education) rates are for 2002.
Source: OECD employment outlook (2004).

The widest discrepancies between gender unemployment rates are in Italy and Spain. The pattern of higher female unemployment holds for the majority of EU countries, but not for Germany and the UK. Although there has been a clear increase in female participation in the labour force in recent decades, the labour market continues to favour men - female unemployment rates are usually higher and participation rates usually lower than for men. Women also have to face discrimination in terms of wages and professional career opportunities. In most EU countries, youth unemployment is far above the average, except for Germany and some smaller member states (Austria, the Netherlands). Here, the numbers are the same as the overall rate. Labour market perspectives for young people are particularly poor in the new EU member states. Unemployment rates among the less educated are above average in Germany, France and the UK, but of comparable size to the overall rate in Italy and Spain. Apart from the German economy, unemployment rates for older workers are below average. As a result of extensive measures for early retirement, participation rates are also rather low in this group.

Activity rates (the ratio of employment to total population) has increased slightly since the 1970s, but are still far below than those in US (see Graph 4). Two developments should be recognised here. Firstly, demographic evolution is relevant, which is related

to the decrease in birth rates since mid 1970s and the increase in migration in recent decades. In recent years, net migration inflows alone account for the rise in EU population. Secondly, shifts in the participation of certain worker groups have to be taken into account. The rising female participation and the lower participation of younger and older workers are particularly important.

Graph 4: Development of activity rates



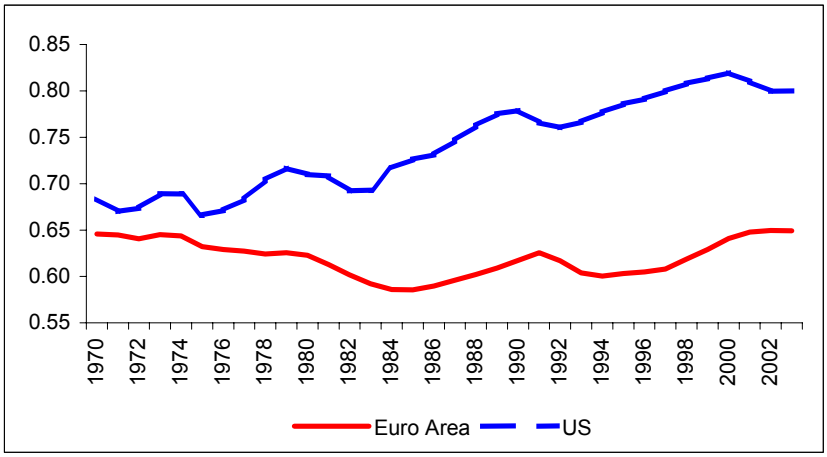
Source: AMECO.

The EU is also faced with lower employment and participation rates. The unemployment experience is therefore by no means a result of a higher participation. For example, the correlation between EU unemployment and employment rates has been –0.87 during the last decade. Employment rates are defined as employment/population ratios, where the number of employed aged 15 to 64 is divided by the working population, i.e. the total population in the same age group. For participation rates, the unemployed are also included in the nominator.

Apart from some oscillations, both employment and participation rates have grown steadily in the US. By contrast, they have been rather stable in the EU. Employment rates are shown in Graph 5. The current EU level is exactly the same as it was in 1970. Since the 1970s, the employment rate dropped in the aftermath of the two oil crises until the mid-1980s. As a result of the economic expansion in the second half of the 1980s, the rates recovered and reached similar levels as those observed at the beginning of the

period as a whole. However, the trend reversed again in the early 1990s. An upward movement can be seen since 1995, which has been accompanied by a reduction in unemployment and long-term unemployment in most countries. The increase stopped in 2002 in response to the recent economic slowdown. Compared to recent recessions, employment rates have showed so far greater resilience, possibly because of labour market reforms in some countries. While employment fell in the agricultural and industrial sectors, services continued to expand, although at a slower pace.

Graph 5: Development of employment rates

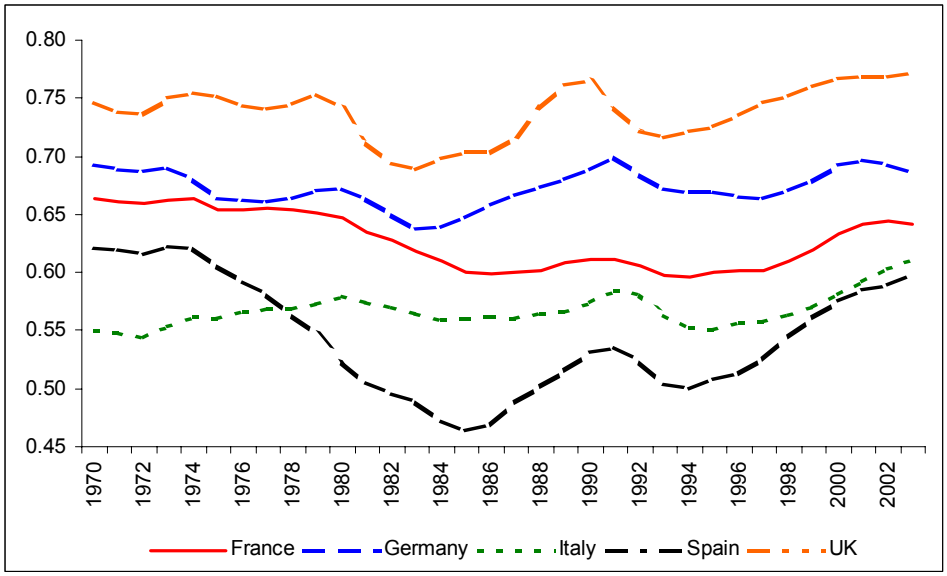


Source: AMECO.

It is worth emphazising that the different behaviour of the employment rate is by no means attributable to the slower expansion of the working population in the US. In fact, the population aged 15 to 64 increased by 25 percent in the Euro area over the period as a whole, but by 47 percent in the US. If the Euro area had had the same demographic evolution as in the US, current employment rates would be not 65 percent, but would instead be only 57 percent. The US economy has thus supplied far more jobs for its working force. Furthermore, the Euro area and the US records cannot be traced to different developments in self-employment. Since the 1980s, self-employment rates have declined slightly in both regions. Graph 5 thus shows mainly different trends in the labour market performance of employees. It will be argued later that these developments can be traced back to differences in the evolution of potential output and labour productivity. Wages are also relevant in this setting.

As for unemployment rates, there are clear cross-country differences in the employment record. Employment rates have risen in most countries since the second half of the 1980s. Spain has made the most significant progress among the large economies, with the latest acceleration starting in the second half of the 1990s. By contrast, employment rates in Germany were not affected by this development and have remained almost constant (see Graph 6). Austria, the Netherlands, Sweden and the UK have employment rates substantially above the EU average, while the rates are lower especially in Belgium, Italy, Spain and Greece.

Graph 6: Evolution of national employment rates



Source: AMECO.

According to OECD measures, current employment rates are 65 percent, which is not far below the Lisbon goal. However, because of the weak economic recovery, the rise in the employment rate is not expected to continue in the near future. The intermediate target of 67 percent for 2005 will probably be missed, and the 2010 target of 70 percent is in danger. The gaps are even wider for women, young people, older workers and the less educated (see Table 3). The average activity rate for young people is roughly 20 percent below the overall rate in the EU15. As demographic trends will gradually increase the share of older workers, they are going to lower the overall employment rate in the near future. The Stockholm council set a target of 50 percent for the employment rate among older workers for 2010, but current figures are significantly below this level.

As a result of technical progress and a more rapid globalisation of production activities, the employment perspectives for the less educated have worsened, and unemployment rates are usually higher in this group. In general terms, employment rates tend to increase with the level of educational attainment. In 2003, employment rates for the lesser educated (below secondary education) were only slightly above 50 percent, compared to more than 80 percent for highly skilled people (tertiary education completed). Low (highly) skilled workers account for roughly one third (one fifth) of the labour force.

Table 3: Specific employment/population ratios (2003)

	Overall	Women	Youth	Old	Lower educated
EU15	64.8	56.1	42.6	42.3	55.1
Germany	64.6	58.7	42.4	39.0	50.9
France	61.9	56.0	24.1	39.3	57.8
Italy	56.2	42.7	26.0	30.3	49.8
Spain	60.7	46.8	36.8	40.8	55.6
UK	72.9	66.4	59.8	55.5	52.9
US	71.2	65.7	53.9	59.9	57.0

Employment/population ratios refer to persons employed with respect to a reference group. It consists of women aged 15-64, persons aged 15-24 (young), persons aged 55-64 (old), and the lower educated aged 25-24. The lower educated (less than upper secondary education) rates refer to 2002.
Source: OECD (2004b) employment outlook.

Some progress has been made in recent years due to the liberalisation of temporary contracts with low separation costs and exceptions for small businesses and business start-ups (see Young (2003). The job content of output growth tends to rise over time due, in part, to the more intensive use of temporary contracts and part time employment. Firms can choose not to renew temporary contracts in recessions, and if production expands, they can quickly hire new workers without running the risks associated with high redundancy costs. However, the role of temporary contracts is not limited to a cyclical buffer, as they can also act as a screening device. Once an exception to the rule of permanent employment, temporary contracts now represent a significant share of overall employment. According to Eurostat estimates, 15 percent of men and 13 percent of women had fixed term work agreements in 2000. The highest proportions were recorded in the 15-19 age group, which was partly due to training and probation periods. 48% of

women employees and 56% of men in this age group were working on a temporary basis. In principle, temporary contracts might crowd out the more traditional forms of work agreements. According to estimates from the European Commission (2002), temporary and permanent working contracts are not perfect substitutes.

Unfortunately, there is little time series evidence available for temporary work. Evolution in part time employment can be considered as a substitute, although this variable does not really focus on the distinction between permanent and temporary work arrangements. In 2003, 17 percent of workers were in part time employment, an increase of 3.5 percentage points since the beginning of the 1990s. The rise in the part time rate is most striking in Germany, Italy and Spain, where some figures have grown by around 50 percent (see Table 4). By contrast, part time rates have been quite stable in France. Among the large EU countries, the largest share of part time workers can be found in the UK. In some smaller member states, part time rates are even higher, especially in the Netherlands.

Table 4: Evolution of part time employment rates

-Part time employment as a percentage of total employment

	1990	1995	2000	2003
EU15	13.3	15.5	16.2	16.6
Germany	13.4	14.2	17.6	19.6
France	12.2	14.8	14.2	12.9
Italy	8.9	11.5	12.2	12.0
Spain	4.6	6.9	7.7	7.8
UK	20.1	22.5	23.0	23.3
US	14.1	13.3	12.6	13.2

Source: OECD Employment outlook, various issues.

Part time contracts are more frequent for women, young people and older workers.30 percent of women currently in employment in the EU15 have a part time job, compared to only 6 percent of men at work. The share of women in part time employment is almost 80 percent, and has fallen slightly during the last decade.

Finally, information on the evolution of annual working hours is shown in Table 5.Working hours per employee in the most important EU member states show a more or less declining trend, which may be caused by a cut in standard working hours and by a rising share of part time work. By contrast, working hours in the US were almost stable. In the analysis presented in the empirical part of the report, the hours worked in the overall economy are used as an additional source of information, which supplements the evidence based on employment per person.

Table 5: Evolution of annual working hours per employee

	1980	1990	1995	2000	2003
Germany	1695.9	1566.0	1520.4	1463.3	1446.0
France	1696.5	1558.1	1539.0	1443.3	1398.0
Italy	1723.8	1674.0	1635.0	1612.0	1590.0
Spain	2003.4	1823.9	1814.2	1813.3	1799.0
UK	1758.5	1698.0	1667.4	1652.7	1618.8
US	1831.4	1819.0	1839.9	1878.9	1863.9

Source: Groningen Growth and Development Centre (GGDC), Total Economy Database.

4. Wages, productivity and unit labour costs

Wages play a crucial role in explaining the evolution of employment. From the perspective of workers, they represent labour income, which can be spent on consumption and saving. From the employers' point of view, wages are labour costs and determine the relationship of labour to production. More specifically, the relation to the user costs of capital governs the appropriate mix of factor inputs. At the competitive equilibrium, real wages should be equal to labour productivity. However, this rule will support a stable employment level and is not sufficient to improve the chances of the unemployed to find work. In order to reduce unemployment, nominal wages have to increase by less than the sum of price inflation and productivity growth. Excess wage increases can contribute to a rise in inflation or a slowdown in employment growth, or both.

However, there are some justifications to agree on wages above the competitive equilibrium level. Perhaps the most popular argument concerns efficiency wages (see Stiglitz (1987) and Weiss (1991) for a survey). Firms consider wages not only as costs, but also as important incentives for the employed to work harder and more efficiently than they would do if they were paid at the market clearing level. According to this view, higher wages could increase firms' profits, as they reduce employees' time wasting, fluctuations in employment staff and training costs, and improve the selection of new employees (the adverse selection approach). High unemployment might reduce the efficiency premium paid by employers, as a weak labour market performance will prevent workers from time wasting.

Furthermore, the insider-outsider-approach (Lindbeck and Snower, 2001) provides a rationale for the persistence of unemployment. Even in periods of low economic activity, the employed (insiders) try to increase wages without considering the situation of the unemployed (outsiders). The aim of the insiders is to obtain wages that are as high as possible, but not so high that the outsiders can offer their work under more favourable conditions. In fact, the premium that can be exploited by insiders is limited, by the costs of job turnovers (hiring, firing and search costs), investments in human capital,

and costs of training on the job, among other factors. As a result of the premium received by insiders, lower levels of production and employment are optimal for firms, compared to the competitive environment. As a consequence, the workers remain employed, but the unemployed only have a low probability of finding work again. Unemployment is going to persist over time, once a job is lost. The actual power of insiders is closely linked to the institutional framework. In particular, generous systems of unemployment benefits will relieve the insiders' position.

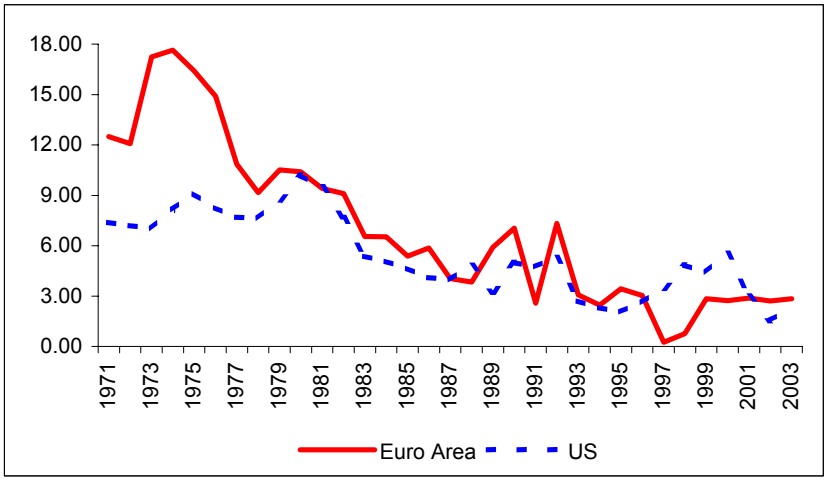
In addition, differentials between competitive and actual wages may be caused by implicit contracts (see Azariadis and Stiglitz (1983) for a survey). Here, both employers and employees are risk averse and try to smooth income and profits over time. Implicit contracts have two dimensions - the usual labour contract, where the wage rate and other working conditions are settled, and an insurance contract. During the duration of the contract, employees are not allowed to leave the firm, and in exchange, firms promise no dismissals despite possible reductions in output. Measures can include reemployment guarantees after temporary dismissals, or a time gap between work and payment, among others. In recessions, the employees' risk of losing their job is lower than it would be without the contract. In upturns, employers will receive lower productivity gains. The risk is therefore shared between the parties negotiating the employment contract.

Empirical evidence for wage formation rules is controversial. For example, efficiency wage or insiders premia are not directly observable, and the share of implicit contracts in actual contracts is hard to identify. Only indirect evidence can be obtained, as certain implications of the rules can be tested. However, this evidence is by no means exclusively in favour of one distinctive approach. The ambiguity is caused by proxy variables used in the empirical set-up. Even in the event of statistical significance, the proxies might also serve as explanations for some alternative theories of the wage formation process. One can at least argue that the evidence is compatible with certain implications of the hypothesis tested. Research on wage determination has therefore directed its interest towards the institutional settings of the economy in order to obtain better approximations to the actual wage bargaining processes (see Checchi and Lucifora (2002)

and Nunziata (2003)). This point will be elaborated on in more detail in later sections of the report.

Nominal wages per employee in the Euro area and the US have converged, especially over the past 20 years. The annual growth rates of nominal compensation per employee are shown in Graph 7. The oil price hikes in the 1970s led to a decline in the purchasing power of workers in both regions. However, in a situation of very low unemployment rates and high union membership in the Euro area, trade unions tried to compensate for the losses by excessive wage demands. Wage-price spirals were prevalent, especially during the first crisis. Since the 1980s, when monetary policy adopted a more restrictive path, nominal wage growth has been of comparable size in both regions. The temporary divergence between the two series in around 1990 was a result of German unification. As a result of unification, Germany experienced an economic boom, while activity was already declining in other member states. Given the weight of the German economy in the EU, wage developments in that country have a significant impact on the evolution of the whole aggregate. In the ICT boom during the second half of the 1990s, nominal wage growth in the US was temporarily above the Euro area level. The overall correlation between the two series is 0.72, if the computation starts in 1990, and only slightly lower if the 1980s are included.

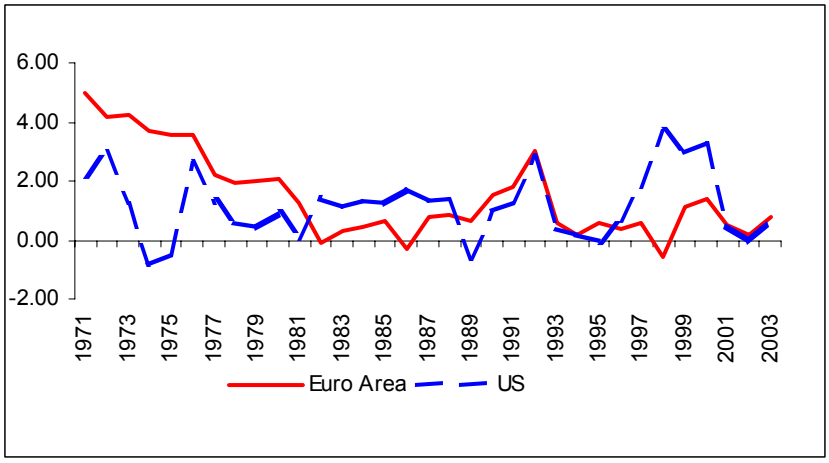
Graph 7: Growth rates of nominal compensation per employee



Source: AMECO.

However, factor demands are governed by the evolution of real variables and price inflation therefore has to be taken into account. Graph 8 shows the dynamics of real wages per employee, where nominal compensation figures have been deflated by GDP prices (1995=100). If consumer prices are used instead, the evidence is broadly unchanged. The correlation between real wage inflation is lower than that for nominal wage inflation, with a correlation coefficient of 0.43 during the last decade, and 0.29 when the 1980s are included. As a result of lower price inflation rates, the US wage acceleration during the second half of the 1990s was more pronounced in real than in nominal terms. The upward trend in the Euro area started later, and was less remarkable. In recent years, real wage growth has declined sharply in the US due to the economic recession, but has done so only slowly in the Euro area, where the responses to business cycle fluctuations have been weaker.

Graph 8: Growth rates of real compensation per employee

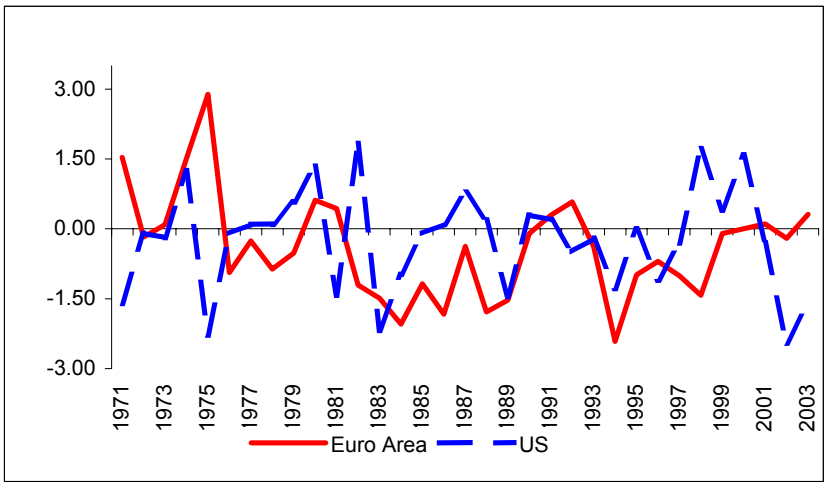


Source: AMECO.

The evolution of real wages has to be examined in the light of the evolution of labour productivity, as both variables affect the profit prospects of firms. For this reason, Graph 9 shows the growth rates of real unit labour costs per employee. As the reduction in US labour productivity was limited to 2001, followed by a strong rebound in this measure, the decrease in real unit labour costs in recent years has even been stronger than for real wages. In contrast, Euro area real unit labour costs show almost no cyclical behaviour. In particular, labour productivity did not recover until the end of the sample

period. Although growth in real unit labour costs appears to be quite resistent to business cycle fluctuations, it is more cyclical than real wage growth as labour productivity is included in the former measure.

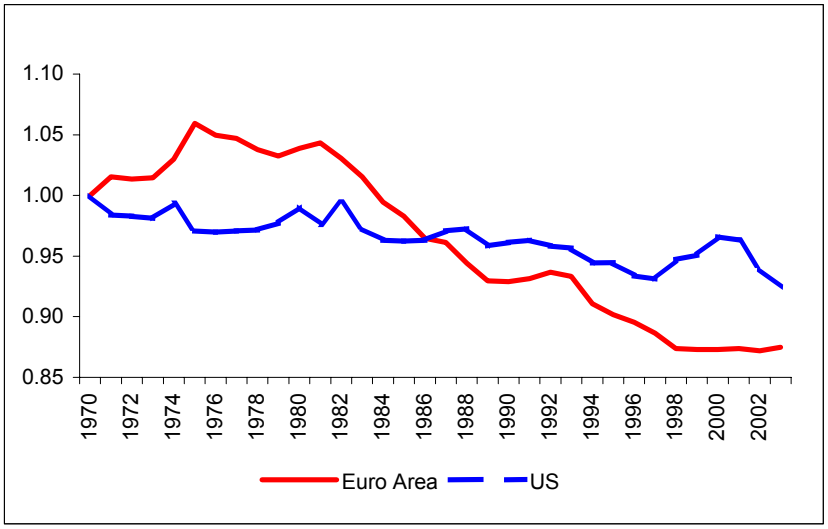
Graph 9: Growth rates of real unit labour costs per employee



Source: AMECO.

Real unit labour costs since 1970 have fallen in both regions. In most years, the acceleration of labour productivity was more marked in the EU, and the slowdown was therefore more pronounced here (see Graph 10). In principle, this development should support the competitiveness of Euro area firms in world markets. However, the relative cost advantages were not be not long lasting. They have fallen during the recent downturn, as Euro area real unit labour costs proved to be rather resistant to the decline of economic activity. Based on this measure, EU firms have experienced a cost disadvantage on average, as the appreciation of the Euro against the US dollar has to be taken into account.

Graph 10: Evolution of real unit labour costs per employee (1970=1)



Source: AMECO.

A disaggregation of the EU experience is provided in Tables 6 and 7. Inflation rates for nominal and real compensation per employee are shown for the larger member states. Table 8 shows the evidence for real unit labour costs. All numbers refer to average rates over the respective period, and are obtained as geometric means. Across the entire sample, annual nominal wage inflation rates dropped from double-digit figures to a rather narrow band. During the last subperiod, they have ranged between 1.6 (Germany) and 4.0 (Spain). Germany has shown a relative flat wage inflation profile, while the other countries have experienced a relative stronger decline in this measure. Real wage inflation rates have also been reduced, although for a smaller interval. The only countries with longer periods of real wage cuts are Italy (1996-2000) and Spain (2001-2003). The evolution in Germany in the first period of the 1990s was affected by unification.

Table 6: Nominal wage inflation per employee in the largest EU economies

	EU15	Euro area	France	Germany	Italy	Spain	UK
1970-1975	14.3	15.1	14.0	10.2	16.9	18.7	17.3
1976-1980	10.8	10.2	13.2	6.0	19.6	21.9	14.9
1981-1985	6.6	6.9	9.6	3.1	13.4	11.8	7.4
1986-1990	5.5	5.2	4.1	3.2	8.8	8.0	8.4
1991-1995	3.2	4.0	2.9	5.3	4.4	6.5	4.0
1996-2000	3.6	1.6	2.2	1.3	2.0	2.8	5.0
2001-2003	2.0	2.8	2.7	1.6	3.2	4.0	3.9

Source: AMECO

Table 7: Real wage inflation per employee in the largest EU economies

	EU15	Euro area	France	Germany	Italy	Spain	UK
1970-1975	4.0	4.1	4.3	3.6	4.1	5.8	3.8
1976-1980	1.8	2.1	2.8	1.9	1.9	2.8	0.2
1981-1985	0.5	0.3	1.3	0.1	0.2	0.5	1.6
1986-1990	1.2	1.0	1.0	1.0	1.8	1.4	1.7
1991-1995	1.1	1.1	0.9	1.9	0.2	1.4	1.3
1996-2000	1.0	0.6	1.3	0.8	-0.2	0.1	2.6
2001-2003	0.6	0.5	1.0	0.3	0.1	-0.3	0.7

Source: AMECO

Table 8: Growth of real unit labour costs per employee in the largest EU economies

	EU15	Euro area	France	Germany	Italy	Spain	UK
1970-1975	1.3	1.2	1.3	1.0	1.9	0.8	1.9
1976-1980	-0.3	-0.3	0.4	-0.2	-0.5	-0.4	-1.0
1981-1985	-1.4	-1.5	-0.9	-1.3	-1.1	-2.4	-1.0
1986-1990	-0.5	-0.9	-1.4	-0.8	-0.5	0.5	0.8
1991-1995	-1.0	-0.8	-0.7	-0.1	-2.2	-0.6	-1.6
1996-2000	-0.3	-0.6	-0.3	-0.3	-1.4	-0.5	0.9
2001-2003	-0.1	0.1	0.7	-0.6	0.7	-0.8	-0.4

Source: AMECO

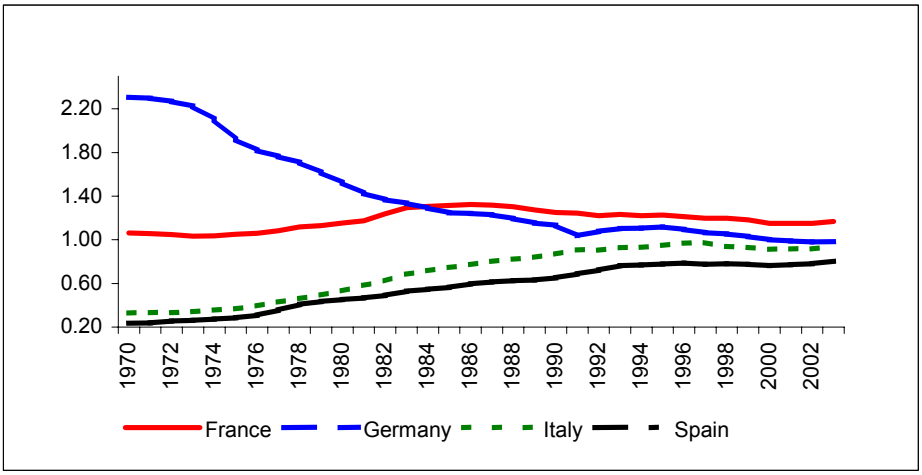
The overall fall in real unit labour costs in the Euro area is accompanied by a roughly similar evolution in all large member countries. Although the decline in real unit labour costs came to a halt in the aggregate during the recent period, Germany and Spain experienced further falls. Within the group of the smaller member states, Finland, Greece and Ireland have experienced a significant decrease during the last decade, which reached almost 20 percent in the case of Ireland. By contrast, real unit labour costs increased in Portugal by 11 percent.

Nominal wages per employee are shown in Graph 11 for the larger Euro area members. They have been computed in comparison to the EU level (EU=1). There has been substantial convergence in nominal wages, but much of this process occurred in the 1980s. Nominal convergence therefore did not wait for the introduction of the EMU. For example, in 1970, workers in Germany earned 2.2 times the compensation in the EU. They currently have an annual income that is nearly average. It is important that the reduction of this spread could be seen even before the unification. By contrast, Italian workers started at a level of 33 percent and now receive 94 percent of the average compensation. In recent years, nominal wage convergence has not continued, and wage differentials across countries have remained rather stable. In 2003, nominal earnings in the large countries have varied between a multiple of 0.8 (Spain) and 1.17 (France). Portugal (0.52) and Greece (0.66) fall below this interval, while Luxembourg (1.34), the Netherlands (1.25) and Belgium (1.22) exceed the range.

Although nominal convergence can be seen in all the large Euro area members, persistent discrepancies can be observed for the real variables. See Graph 12 for the real wage and Graph 13 for the real unit labour costs. Relative competitiveness positions have therefore been mostly unaltered. Real unit labour costs in Italy are lower than the EU average by about 20 percent. As real compensation of Italian workers is 10 percent below the average, the development is linked to higher productivity levels in this country.

Graph 11: Nominal compensation per employee

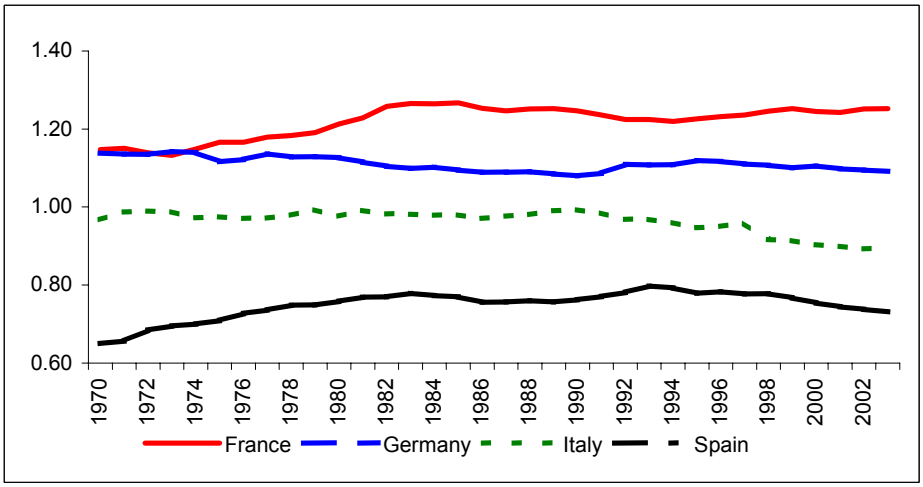
-as a multiple of the EU level (EU=1)



Source: AMECO.

Graph 12: Real compensation per employee

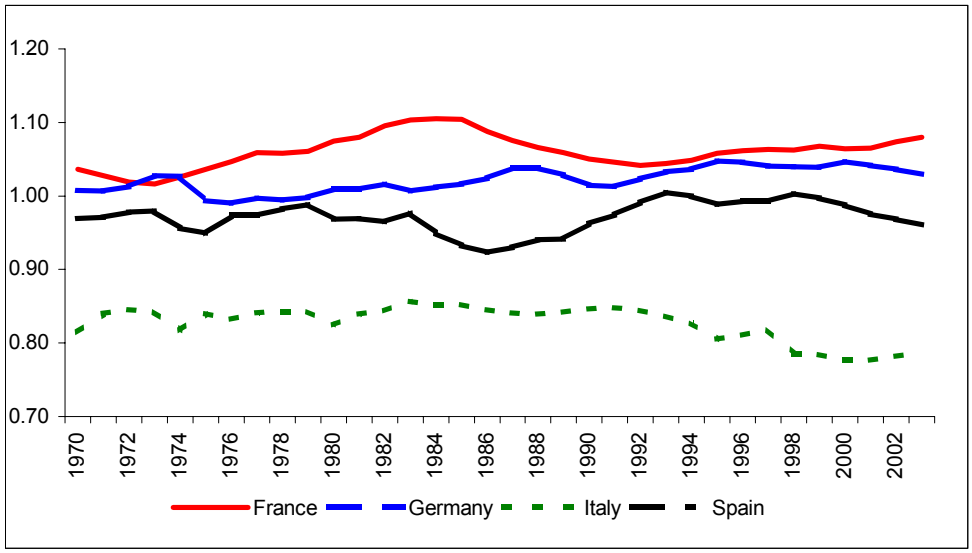
-as a multiple of the EU level (EU=1)



Source: AMECO, Own Calculations.

Graph 13: Real unit labour costs per employee

-as a multiple of the EU level (EU=1)



Source: AMECO, Own Calculations.

There are several arguments justifying a reduction in the differentials of wage and cost levels, including migration, the Balassa-Samuelson effect, the role of trade unions and market competition. Migration could enhance the wage convergence process, if workers move from low wages countries to those with high wages. However, cultural and especially language barriers might prevent an equalisation. Because of the Balassa-Samuelson (B-S) theorem, labour productivity growth is higher in the tradable than in the non-tradable sector. Because of spillovers, productivity growth in the tradable sector is the guiding principle for overall wage demands. As a consequence, wage inflation in the non-tradable sector will exceed productivity growth. Typically, the non-tradable sector is more relevant in low than in high-wage economies. Given similar advances in productivity growth in the tradable sector across countries, a process towards wage equalisation can be initialised. Furthermore, the introduction of the EMU could reduce wage differentials due to a demonstration or fair wage effect (European Commission, 1997). The opportunity to compare labour outcomes in a single currency could enhance nominal and real wage convergence. On the other hand, competition might have reduced productivity adjusted wage differentials across Euro area countries. This would

imply that there is a convergence not in nominal or real wages, but in terms of unit labour costs.

The empirical evidence in these arguments is not straightforward. For example, Alberola and Tyrväinen (1998) have reported results supporting the B-S effect, but only for three economies - Germany, Spain, and Belgium. Erickson and Kuruvilla (1994) detected no convergence in unit labour costs, while Jung and Doroodian (2000), using a more extensive data set, found a convergence in manufacturing labour costs between Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK. Suriñach *et al.* (2002) analysed the convergence of wages, productivity and unit labour costs by means of unit root and co-integration tests. Their results indicate that over the last 20 years, there has been a reduction in the disparities between Euro area countries in terms of wages but not in terms of productivity. They also found that the introduction of the Euro does not seem to have accelerated the process of wage equalisation.

5. Labour market institutions

5.1. Relevance of the institutional framework

Properly designed institutions are of vital importance for a smooth working of the labour market (see Agell (1999), Blanchard (2004) and Bertola (2004). Information problems for both workers and firms generate imperfections in the matching and monitoring process. The different market power of wage contractors and the risk of becoming unemployed require an appropriate mixture of the institutional framework. However, regulations can also cause rigidities as they may hinder the reallocation of labour as a response to structural shocks. Overly restrictive elements may actually worsen the performance of employment.

If institutions reduce wage flexibility, a smooth adjustment of labour input is more complicated. For example, wage-setting rules can refer to a trend or past productivity growth, which may cause wages to lag behind the business cycle. Low inflation rates can also increase stickiness, as workers are resistant to nominal wage cuts (see Holden (2004)). In the case of price-indexed wages, wage-price spirals may begin. Furthermore, the structure of the bargaining process is important, as it determines the length of the contracts. As a result of rising costs, collective negotiations take place at longer time intervals than bargaining at individual firm level. The longer the interval, the lower the wage response to actual conditions. The introduction of the EMU has possibly led to a higher macroeconomic stability in the recent past. Uncertainties have declined, and the risk of agreeing on long-term contracts has fallen. Consistent with this view is the increasing use of multiannual wage contracts in some member states.

However, the impact of institutions is not limited to the wage formation process. For example, employment protection legislation strengthens the bargaining power of insiders compared to outsiders, implying that the responsiveness of wages to economic conditions is lowered. The design of tax and unemployment benefit systems has an impact on the duration and the extent of job seeking. In the low productivity-low income seg-

ment, the availability of benefits and the difference between them and a minimum wage might generate persistent unemployment traps. In order to examine the institutional impact on wages and employment, a set of variables has been developed in the literature, covering various aspects of the institutional set-up. In particular, the structure of wage determination, especially the role of trade unions, the strength of employment protection legislation, measures in favour of the unemployed, such as unemployment benefits and active labour market policies, and taxes on labour are considered. The main sources are the OECD (2004b) and the Nickell and Nunziata (2001) labour market institutional database developed by Nickell *et al*. (2003).

Trade unions are highly important in the structure of the wage bargaining process. Greater union power tends to raise wages above the competitive equilibrium, implying that the wage level may be too high compared to productivity growth. This effect may be boosted in countries with strict employment protection schemes and extensive measures in favour of the unemployed. Union power is reflected in both union membership (union density), and in the degree of coverage of unionised contracts, i.e. the extent to which salaried workers are subject to union-negotiated conditions. Contracts on wages and other working conditions often bind not only the bargaining parties, but also employers and employees within a region or sector. It has become common practice for the vast majority of employers to apply the terms and conditions of collective contracts to their workforce as a whole, whether unionised or not. In addition, administrative extensions can make collective agreements more binding within a sector, and cover employers who did not really sign the contracts (see OECD (2004b)). Collective bargaining may also lead to a more compressed wage structure with low differentiation across skills and regions. In this case, wage floors are pushed up for the least skilled, thereby worsening their employment perspectives.

A further aspect of the wage setting process refers to bargaining co-ordination and centralisation. These variables focus on the level at which collective contracts are negotiated and formally set in the economy, either at firm, sector, regional or national level. Opening (opt-out) clauses or company employment agreements allow firms to deviate from centralised agreements to the detriment of employees. For example, the bargaining

parties might agree on downward pay variations. The use of these clauses (especially in Germany) introduces more decentralisation in the wage-finding process, although their adaptability is limited by the favourability principle - in general, deviations from collective contracts should be in favour of the employees. If bargaining coverage is accompanied by a high degree of centralisation, employment can be supported (see Calmfors and Driffill (1988)). Centralised bargaining can facilitate the responsiveness of aggregate wage demands to macroeconomic conditions, especially compared to bargaining at the industrial or sector level, given that union negotiators are more aware of the macroeconomic effects of wage settlements. In this view, the nominal wage is a potential policy instrument for affecting the real exchange rate, which can make the objectives of the Stability and Growth Pact easier to achieve (see Hancke and Soskice (2003)).

Stricter employment protection legislation (EPL) may raise the effective costs to firms of employing workers and the costs of adjusting employment smoothly over the business cycle. Redundancies become more difficult and firms become more cautious about filling vacancies. A higher degree of job security can be compensated for by lower wage growth, as risk-adverse workers see job security as a premium for unemployment insurance. However, stricter protection increases also the bargaining power of insiders and unionised workers. On the benefit side, regular employment appears to be more stable. As personnel selection within firms becomes more effective, involuntary separations are reduced. Moreover, a higher degree of employment protection can support investments in firm-specific human capital, thereby inducing productivity and competitiveness gains (see Pissarides (2001) and Belot and van Ours (2001)).

Higher unemployment benefits and longer duration periods for benefits reduce the gap between net wage earnings (take-home pay) and transfer payments, and households¡ incentives to work. The unemployed become more choosy about filling vacancies, and the matching process is less effective. As the fear of unemployment declines, upward pressure on wages is generated. However, generous unemployment benefits could also increase the incentives for human capital accumulation. As the search process can last some time, the chance of obtaining an appropriate job is improved, and investments in human capital are better protected.

Active labour market policies aim to reduce people's dependency on unemployment benefits by improving their chances to move into work. These measures are of particular importance for the less skilled (see OECD (2003)). Strategies include public employment services, labour market training, and measures for the young and disabled. As the employability of the participants is enhanced, the overall labour market performance should increase. However, regular employment is in danger of being replaced by subsidised work, at least partially. In East Germany in particular, substantial crowding out effects are reported, which are caused by public service employment and administration. These policies have to be financed by taxes and social security contributions. Training programs might not match the qualifications demanded by firms (see Martin and Grubb (2001)).

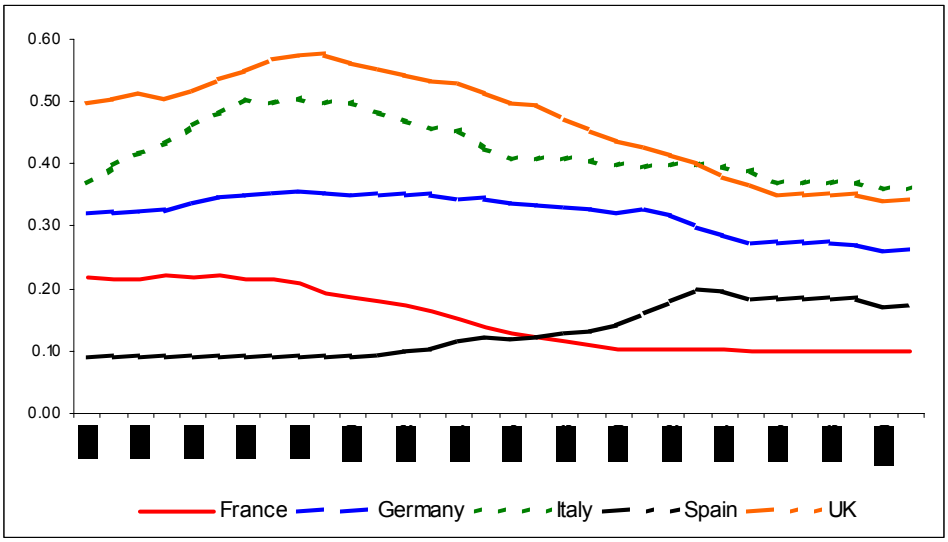
Taxes on labour enhance the wedge between the wages as employer's costs (the product wage) and wages as worker's income (the consumption wage). Insofar as taxes are passed on to employers, the effective costs of employment increase, thereby reducing labour demand. If higher taxes are compensated for by lower wages, the product wage paid by firms is unchanged, but the consumption wage received by households declines. The distance to transfer payments is narrowed, and incentives to work are reduced. In overall terms, rising labour taxes should have a negative impact on the employment rate. Moreover, high marginal tax rates can generate inactivity traps in the low income-low productivity segment.

5.2. Institutional trends for EU countries

In this section, we analyse the observed trends of labour market institutions among EU countries. In particular, we will focus on trade union densities, coverage, centralisation and coordination of bargaining, employment protection legislation, benefit replacement rates, active labour market policies and the tax wedge. The main source for institutional data is the OECD Employment outlook, but, in some cases, we had to merge information from this database to other such as Nickell and Nunziata (2001) or Nickell *et al.* (2003).

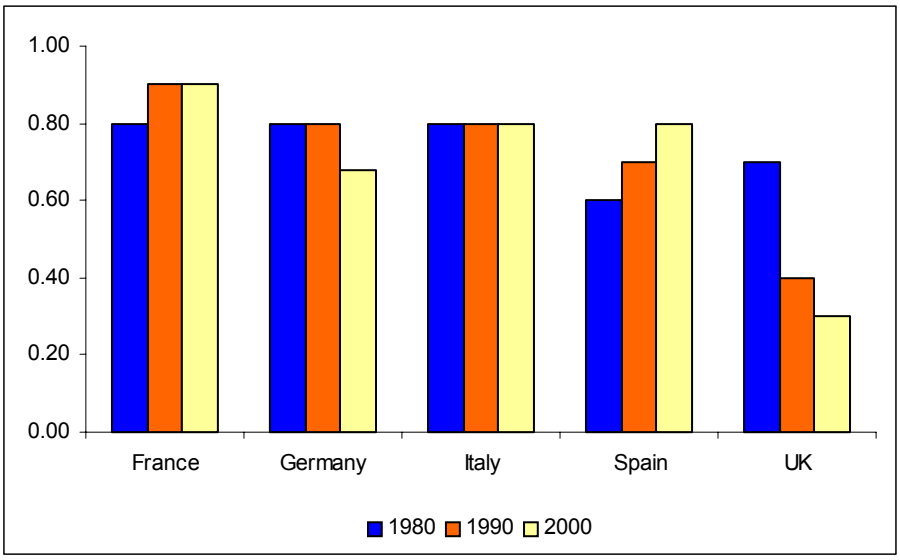
Union densities have declined in the larger EU countries (see Graph 14). The most marked reduction can be seen in the UK. Here, the share of unionised workers fell from almost 60 percent in the late 1970s to 35 percent at the end of the sample. Union membership is particularly high in the Scandinavian countries, where rates exceed 70 percent, or even 80 percent in the case of Sweden. Compared to the EU experience, rates have been extraordinary low in France. However, this variable does not fully describe the real power of unions, as bargaining coverage is a complementary indicator for union presence (see Graph 15). In overall terms, coverage rates show greater stability than union membership, except for the UK. In most cases, the coverage of unionised bargained wages is higher than the share of union members and exceeds the latter by a factor of 2 or 3 in Germany and Italy and 9 in France. EU union densities and coverage rates are interrelated, with a correlation coefficient of 0.2 in 2000. When France is removed as an outlier, the correlation almost doubles.

Graph 14: Trade union densities in the large EU countries



Source: OECD (2004b), Employment Outlook, Nickell and Nunziata (2001), Nickell *et al.* (2003).

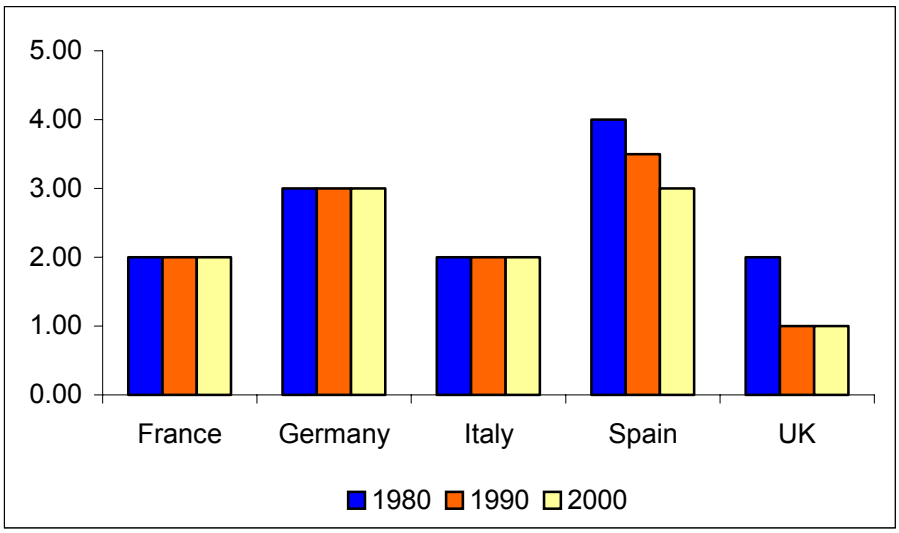
Graph 15: Coverage of unionized bargained wages in large EU countries



Source: OECD (2004b), Employment Outlook.

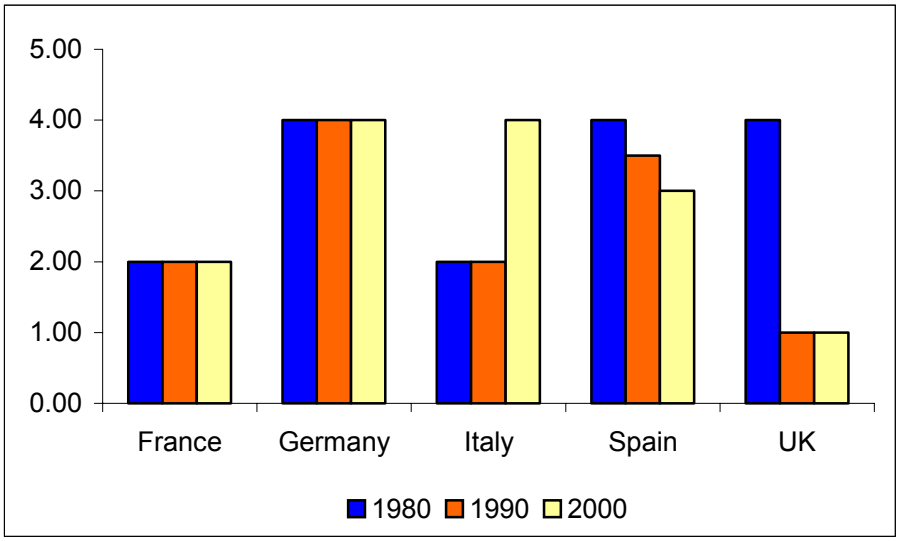
Indicators of centralisation and co-ordination in the wage bargaining process are shown in Graphs 16 and 17. The numbers are rank-scaled and fall in the [1, 5] interval, with higher values indicating more centralisation or co-ordination, respectively. For example, a value of 1 means that wages are negotiated predominantly at individual company level (centralisation), with only minimal or even no co-ordination by higher level associations (co-ordination) while the maximum value of 5 points implies an overriding importance of central agreements for the economy. Co-ordination is established by top level confederations involving organisations of employees, trade unions and/or the government (see OECD (2004b) for the exact description of the indicators domain). The measures are correlated across EU member states, with a coefficient above 0.7 at the end of the sample period. The indicators have remained unchanged in France and Germany over the past decades. A tendency towards decentralisation and deco-ordination can be observed for the UK.

Graph 16: Centralisation of bargaining in the large EU countries



Source: OECD (2004b), Employment Outlook.

Graph 17: Coordination of bargaining in the large EU countries



Source: OECD (2004b), Employment Outlook.

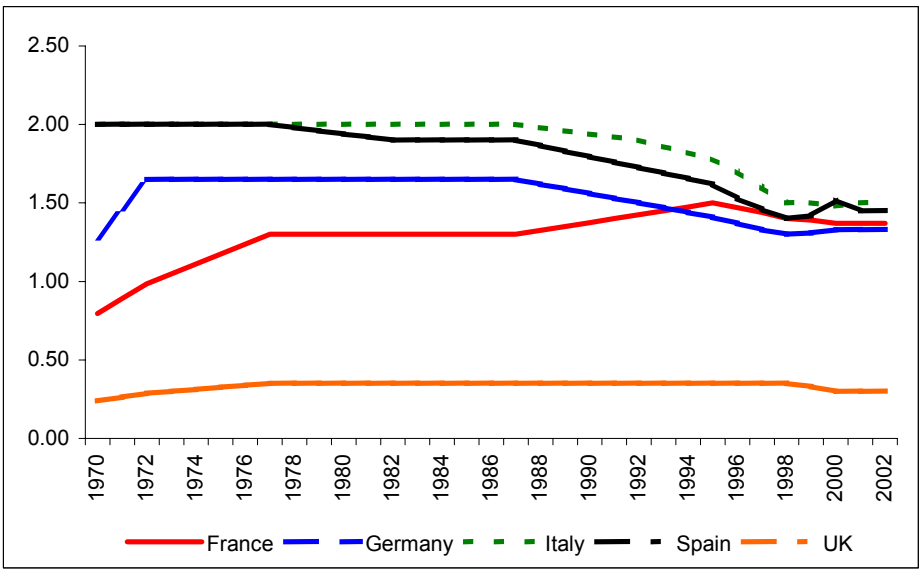
Employment protection legislation (EPL) will have the aforementioned indirect effects on the wage setting process, and the evolution of employment and unemployment. This variable has several dimensions, such as requirements for collective dismissals, legislative conditions under which an individual dismissal can be seen as justified or fair, procedural inconveniences that the employer may face when starting the dismissal process,

and notice and severance pay regulations for no-fault individual dismissals. In addition, EPL provisions are different for regular and temporary work, and court interpretations of the legal framework have to be taken into account.

Unfortunately, an EPL indicator based on a comprehensive collection of several dimensions has only been available since the late 1990s. As a substitute, the OECD has computed an index which refers to provisions for regular and temporary employment contracts. This indicator is available for the late 1980s, the late 1990s and 2002. It is not therefore really suitable for an analysis involving time series data. For this reason, the Nickell and Nunziata (2001) and Nickell *et al.* (2003) indicator is chosen instead (see Graph 18). The indicator is ranked in the interval [0, 2], and increases with the strictness of regulation. Its correlation with the OECD measure is almost 1 in the late 1980s and late 1990s. As a result of the interpolation of the Blanchard and Wolfers (2000) data, the Nickell and Nunziata (2001)-Nickell *et al.* (2003) series is obtained with an annual frequency, although only up to 1998. OECD figures are used to extend the period up to 2002, where missing values are removed by linear interpolation.

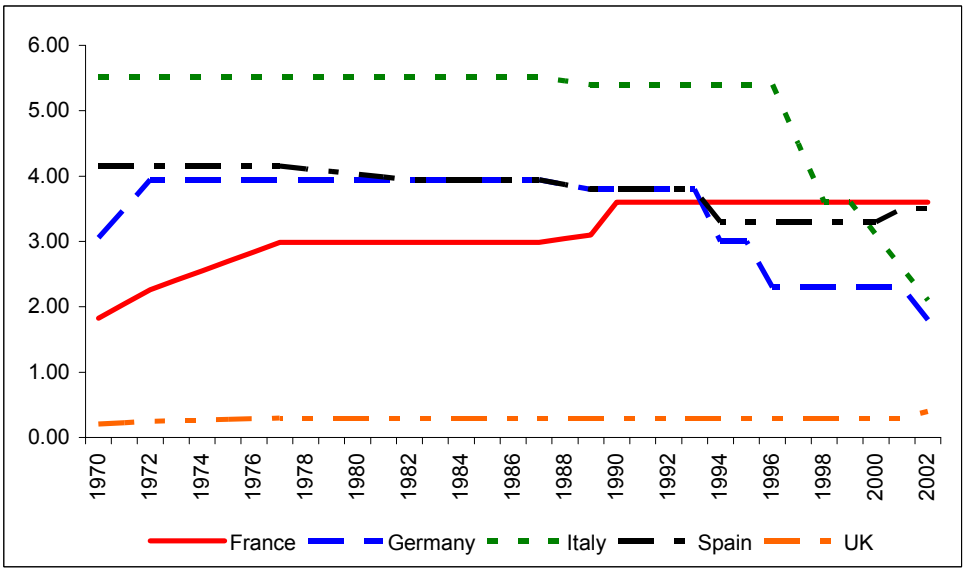
The differences in the EPL measure across countries have decreased over time. Apart from this evolution, EPL is strictest in Germany, France, Italy and Spain, and less restrictive in the UK and Ireland. A number of countries have recently liberalised EPL, especially for temporary employment (see Graph 19), in particular Germany and Italy (see OECD (2004a). In Germany, temporary work agencies have been introduced to a greater extent, while progress in Italy has been linked to both temporary work agencies and the ease of fixed term agreements. By contrast, EPL for regular unemployment has been largely unaffected during the last decades (see Young (2003) for a survey). For this reason, we also consider employment protection legislation for fixed term contracts (see Graph 19). This is of particular interest, as deregulation in recent years has focused on the provision of these contracts, while protection of regular employment often did not change at all (Young, 2003).

Graph 18: Employment protection legislation in the large EU countries



Source: Nickell and Nunziata (2001), Nickell *et al.* (2003), OECD (2004b), Employment outlook

Graph 19: Employment protection legislation for temporary contracts in the large EU countries

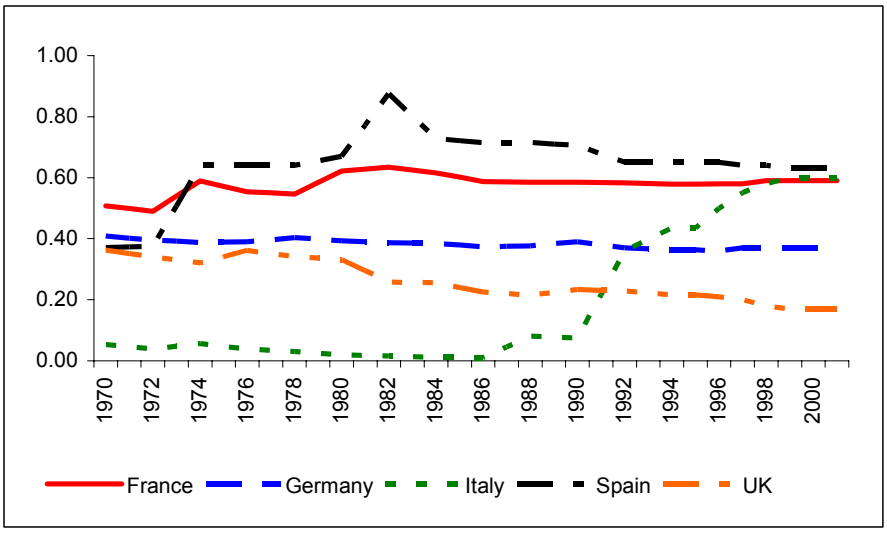


Source: OECD (2004b), Employment outlook. Please note that figures 18 (EPL) and 19 (EPL for temporary working contracts) are measured on a different rank scale. The first one is due to Nickell and Nunziata (2001), while the other one according to OECD (2004). Overall employment protection legislation (EPL) is obtained from the Nickell and Nunziata (2001) database, where the series have been prolonged by OECD (2004) measures. EPL for temporary working contracts has been taken from OECD (2004). However, this series is not reported before 1985. For the 1970-1985 period, it is assumed that EPL for temporary contracts behaves in the same way as the overall measure reported by Nickell and Nunziata (2001).

Benefit replacement ratios are shown in Graph 20. The OECD reports one observation every two years. The data is interpolated to arrive at an annual frequency. The numbers refer to the first year of unemployment benefits, and are averaged over different family types of recipients, as the benefits are often distributed according to the composition of the family. Most ratios have been stable throughout the entire sample, with a slight decline in the UK. In Italy, a strong raise in benefits can be seen at the beginning of the 1990s. In fact, Italy did not have a comparable benefit system for most of the post-war period. In the early years, the unemployed were entitled to a certain amount of money per day.

Graph 20: Benefit replacement rates in the large EU countries

percentage of average earnings before tax



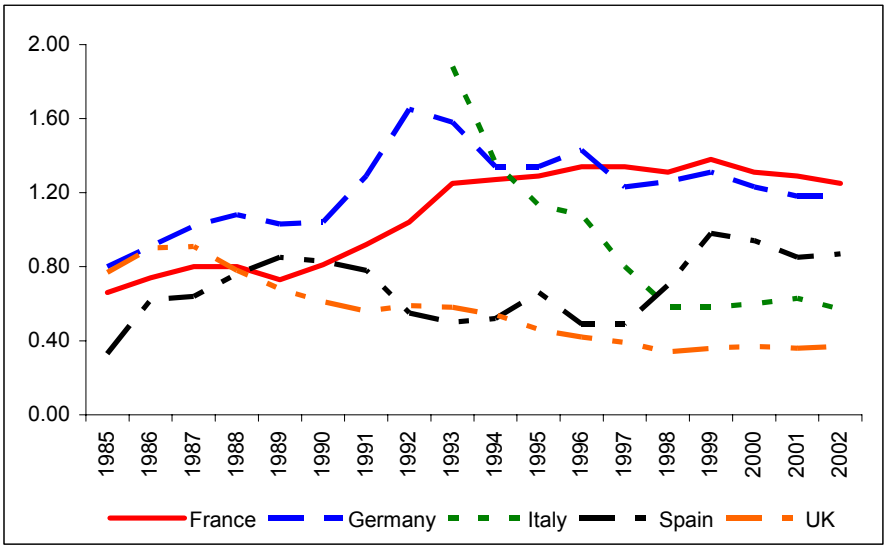
Source: OECD, Institutional database.

Figures for expenditure on active labour market policies have been available since 1985, although not until for Italy (see Figure 21). As for the other institutions, the differences across countries are striking. A slight downward trend can be seen for the UK. In France, the policies became more relevant during the economic downturn of the first half of the 1990s, and have been almost stable since then. The higher German spending in this period can be traced to the country's unification. Since the second half of the 1990s, Spain has increased expenditure from 0.5 to almost 1 percent of GDP, which is mainly due to a stronger subsidy of regular employment in the private sector. In the group of the smaller EU member states, active labour market policy measures are most

relevant in the Netherlands. The ratios in Belgium and the Scandinavian countries also exceed 1 percent of GDP.

Graph 21: Active labour market policies in the large EU countries

percentage of nominal GDP

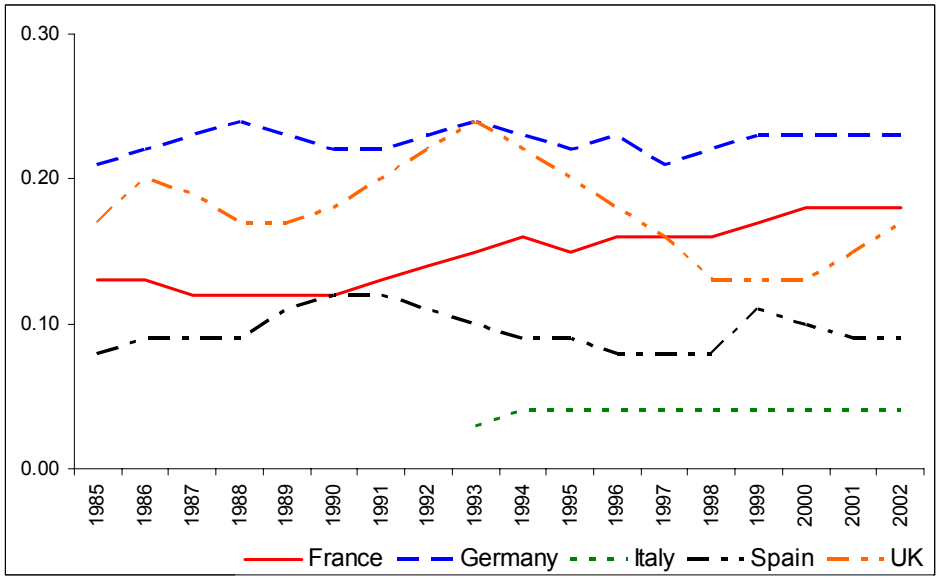


Source: OECD, Employment outlook, various issues.

In Figures 22 and 23, active labour market policies are separated into public employment services and administration and training programs, as both strategies may have different impacts on labour demand elasticities. As can be seen, the differences in terms of public employment services are still quite significant among the countries being considered, while for training programs, the differences have reduced in line with the previous figure.

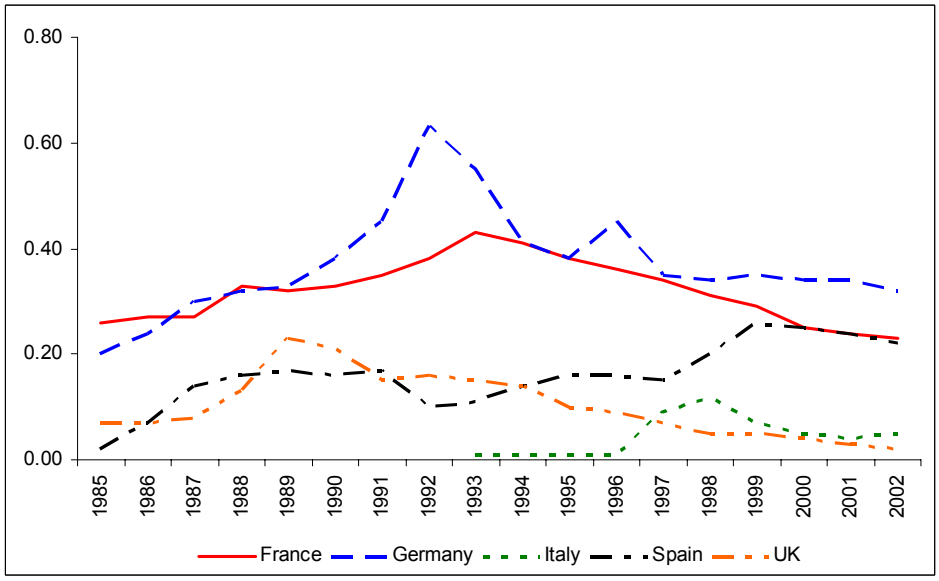
To conclude the institutional survey, the tax wedge is shown in Graph 24. It is obtained as the sum of the employment tax rate (including employers' national insurance contributions), the direct tax rate and the indirect tax rate, where indirect taxes have been lowered by subsidies, and private consumption is used as the benchmark amount. Until the 1990s, the variable rose over time, with its most notable increase in Spain. Since the beginning of the 1990s, the tax wedge has been almost stable. Only UK and Irish workers experienced a slight decrease.

Graph 22: Active labour market policies (public employment services) in the large EU countries



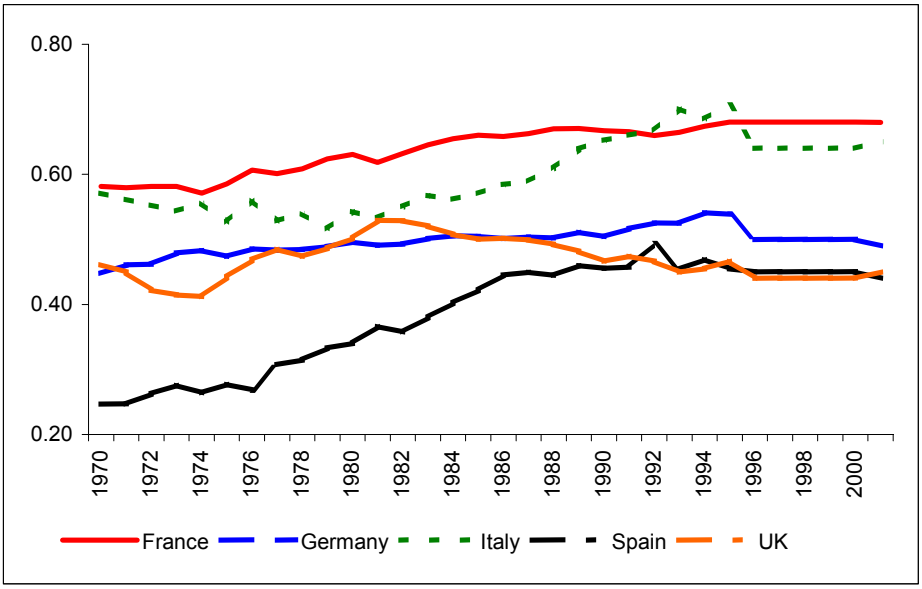
Source: OECD, Employment outlook, various issues.

Graph 23: Active labour market policies (training programs) in the large EU countries



Source: OECD, Employment outlook, various issues.

Graph 24: Tax wedge in the large EU countries



Source: Nickell and Nunziata (2001), Nickell *et al.* (2003).

As a rule, EU labour markets are more regulated than those in the US. For example, trade unions are less important in the US. Union densities are rather low and at the same level as in France, while the coverage of unionised wages has fallen below 20 percent since the beginning of the 1990s. Neither the centralisation nor the co-ordination of wage bargaining have played an important role. Employment protection is even weaker than in the UK, which offers the minimum provisions among the EU member states. Furthermore, expenditures on active labour policies are very low, partly because of the better employment performance.

5.3. Effects of institutions on labour market performance

This section briefly summarises the previous literature on the effects of institutions on labour market performance.

Blanchard and Wolfers (2000) have identified two striking features of the evolution of European unemployment. These are the general rise in unemployment since the 1970s due to the effects of hysteresis, and the heterogeneity of individual countries' experi-

ences. While adverse supply shocks can potentially explain much of the increase in unemployment, there is insufficient heterogeneity in these shocks to explain cross-country differences. For example, the oil price shocks hit the EU member states in a generally similar way. However, labour market institutions can account for cross-country differences. Nevertheless, many of these institutions were already in place, when unemployment was at low levels. Even if the institutions were not designed properly, they can hardly be blamed on their own for the rise in unemployment. However, interactions between macroeconomic shocks and institutions might in fact explain the development. More recent studies have controlled not only for interactions between institutions and macroeconomic shocks, but also within the set of institutions, stressing the relevance of the appropriate institutional mix (see Belot and van Ours (2001). For example, the bargaining power of insiders in the wage determination process will be larger in countries with a more generous unemployment benefit system. A rise in labour taxes will also have worse effects in these economies, as the distance between the work and transfer payment is narrowed.

Using a panel of OECD countries, Blanchard and Wolfers (2000) found that the interaction between macroeconomic shocks and institutions is crucial in explaining the stylised facts. They test two model specifications, and each offers significant support for the interactions hypothesis. The first variant assumes that there are common but unobservable shocks across countries, while the second one constructs time series for these shocks. In both models, the shocks have a larger and more persistent effect in states with stricter labour market institutions. Blanchard and Wolfers (2000) interpret these results as suggesting that institutions affect the relevance of the unemployed in the wage-setting process, thereby determining the evolution of unemployment rates after a shock.

Bertola *et al.* (2001) considered a panel of OECD countries in order to explain why the US has moved from a position of relatively high to low unemployment during the last 3 decades, and report similar results. While macroeconomic and demographic shocks or labour market institutions in isolation explain only a modest portion of the evolution, the interaction of these shocks and labour market institutions is the most crucial factor

in explaining the shift. After controlling for fixed effects, high employment seems to be associated with lower wages and higher income inequality. These findings suggest that the relative reduction in US unemployment has partly been caused by a higher flexibility of labour markets, which allow shocks to affect real wages and costs to a larger extent.

The evidence from other studies is not straightforward (see Baker *et al.* (2002) and Aidt and Tzannatos (2002) for surveys). EPL seems to have almost no impact on the course of unemployment. Stricter protection of jobs increases the long-term unemployment rate, but the effect is no longer significant when the overall unemployment rate is considered. Recent OECD (2004a) estimates suggest that stricter EPL raises employment for prime age men but lowers employment for young people and women, with the overall effect of a net reduction. However, these bivariate associations tend to be weaker or entirely absent when multivariate techniques with additional variables are used. The evidence is more robust for EPL tending to increase self-employment and lower turnover rates in the labour market. According to the latter result, fewer individuals become unemployed in those countries with stricter EPL, but once unemployed, they face a higher risk of remaining unemployed for a long period of time.

Strong trade unions are associated with higher real wages, inflation and unemployment. However, this effect is compensated for if wage-setting is highly centralised or co-ordinated on both the employers' and employees' side. The higher the union densities, bargaining coverage and co-ordination, the smaller the income inequality and the impact of sectoral developments on wages (see OECD (2004b). According to the Krugman (1994) hypothesis, demand moved against the less skilled in the industrial countries, with unemployment being the price of continued wage compression in the EU. By contrast, strong employment performance in the US was associated with a rising inequality in incomes.

By comparing the actual outcome with a model assuming fixed institutions over time, Nickell *et al.* (2003) were able to explain half of the unemployment experience by institutional shifts over the 1960-1995 period, especially in taxes and transfers. However,

the result is built upon strong levels of endogenous persistence, as reflected by a high coefficient of the lagged dependent variable in the regressions. This persistence should be caused by the institutional framework, but is left unexplained in the model. In the IMF study (2003), institutions and interaction terms play a vital role in the evolution of unemployment in France and Italy, but not in Germany.

Third part. Empirical analysis

6. Theoretical models used in the analysis

As highlighted in chapter 1, a key aspect in evaluating the potential risks of the EMU is labour market flexibility. It can be defined as the speed with which labour market variables like wages and employment react to macroeconomic conditions. Various forms of flexibility can be distinguished (see European Commission (2002)). On the wage side, they include *i*) real wage flexibility, i.e. the responsiveness of real wages to quantities (unemployment, external competitiveness, labour productivity), *ii*) nominal wage flexibility, i.e. the reaction of nominal wages to changes in price levels and *iii*) relative wage flexibility, i.e. the speed of nominal wages' adjustment to the composition of the supply and demand for labour, including the extent of wage dispersion across regions, sectors and skills. For the adjustment of employment, the reaction to shocks in output and the real wage is important.

6.1. Wage and Phillips curves

Wage flexibility is analysed by means of wage and Phillips curves. In these models, wages or wage inflation rates are explained by certain variables, and the responsiveness of wages to these variables can be seen as an indicator of flexibility.

The wage curve shows the level of wages to individual conditions, such as gender, education, marital status, age and skills, and local labour market conditions, usually proxied by regional and group specific unemployment rates (see Blanchflower and Oswald, (1990, 1994 and 1995)). Wages are lower if unemployment is high, with an average elasticity of –0.1. Doubling the local rate of unemployment will thus lead to a 10 percent drop in the regional wage level, all else being constant. Initially the concept refers to a microeconomic analysis, where workers' specific variables are included to explain individual wages. However, the concept can also be applied on the macroeconomic level to regions or countries. In a panel framework, the curve is defined as:

$$w_{rt} = \alpha U_{rt} + \beta X_{rt} + \phi_r + \theta_t + \varepsilon_{rt}, \qquad (1)$$

where w denotes the wage level, U unemployment, and X denotes individual characteristics. Fixed regional and time effects are included, where r indicates the cross section (regional) and t the time series dimension. Blanchflower and Oswald (1990, 1994) examined the relationship for a large number of countries including the US, the UK, Australia and Canada. The robustness of their findings has been widely confirmed by many empirical studies (see Nijkamp and Poot (2005) for a review.

In general, the gradient of the wage curve – the reaction of wages to unemployment, as a measure for real wage flexibility - can differ across groups of workers, industries, regions or countries for various reasons. The response of senior workers' wages tends to be rather weak, whereas wages for those recently hired are more closely linked to labour market conditions. Firm-specific human capital will generate a wedge between the productivity level at the current employer and outside opportunity wages, which has an impact on responsiveness to the unemployment rate. Union-bargained and public sector wages are affected by business cycle and labour market conditions to a lesser extent, and the degree of union bargaining coverage should have an impact on the wage level. Heterogeneity across workers may be shown by group specific unemployment rates. For example, higher unemployment for unskilled workers should have almost no impact on skilled workers' wages, once their own unemployment is taken into account.

At a microeconomic level, the negative correlation between wages and unemployment might appear for other reasons. In a labour contract model, regions differ in their amenity values. To the extent that these characteristics are permanent, there should be a correlation between wage levels and long-run unemployment rates. However, this correlation is often found to be positive, at least for the US (see Bell *et al.* (2002)). Alternatively, non-unionized wages could react more sharply to unemployment. A third justification refers to efficiency wage models, where firms pay a higher wage to prevent employees from time-wasting. Because the penalty for time-wasting is greater the longer the expected period to find a new job, the wage premium is likely to be lower in regions

with high unemployment. Different premiums for groups of workers may account for different wage curve gradients.

Although Blanchflower and Oswald (1994) present a wide range of evidence on the appropriate functional form of the wage curve and find non-linearities, they conclude that a log-linear form is a good approximation. Estimation of the wage-curve relationship is carried out using cross section, time series and panel regressions. However, as the local unemployment rate does not vary with individuals, the effective degrees of freedom involved in estimation are far less then the number of workers. In some studies, only a few regional labour markets are considered. Furthermore, the fact that local unemployment does not vary between individuals in the same region implies that the errors will be correlated over the cross section. This means that standard errors of the unemployment elasticity will be biased (see Moulton (1990). As an alternative, Blanchflower and Oswald (1994 and 1995) suggested averaging over the individuals of a particular region, with results that did not show significant changes under this specification. Furthermore, the issue of simultaneity has to be taken into account, as wage levels could also affect unemployment rates. In a micro-econometric setting this effect can be neglected, as the micro outcome is unlikely to have a feedback on a macroeconomic variable. As a consequence, this source of bias is ignored in most studies.

As Blanchflower and Oswald (1995) have pointed out, the wage curve is distinct from the Phillips curve. The latter provides an alternative framework for analysing wage dynamics. The Phillips curve suggests a relationship between wage inflation and the unemployment gap, which is used as a measure of tightness in the labour market (see Blanchard and Katz (1997). The unemployment gap is the difference between actual unemployment and a time-varying NAIRU (see Gordon (1997). This relationship is affected by various shocks to labour productivity, the terms of trade, or import prices. The long-run Phillips curve is restricted to being vertical. In that case, inflation depends only on nominal factors, and not on equilibrium unemployment. Equivalently, nominal shocks have no impact on real variables in the long-run. If this is the case, the coefficients of lagged inflation changes sum to 1.

The Phillips curve is usually estimated by means of a macroeconomic time series or panel data, while the wage curve is often estimated using microeconomic data in a cross section or a panel model. The Lipsey (1963) specification of the Phillips curve is based on individual labour markets and implies that the rate of change in wages depends on the unemployment rate. By contrast, unemployment is important for the wage level under a wage curve specification. The two models can be discriminated by means of the equation:

$$w_{rt} = \alpha U_{rt} + \beta X_{rt} + \lambda w_{rt-1} + \phi_r + \theta_t + \varepsilon_{rt}, \qquad (2)$$

as a test of λ=0 versus λ=1 is a test of the wage curve versus the Phillips curve approach. If the empirical values of λ were close to 0, this will imply that the wage curve is superior. However, the presence of a lagged endogenous variable would lead to estimates being inconsistent, if the errors are serially correlated. A first difference formulation:

$$\Delta w_{rt} = \alpha_1 U_{rt} + \alpha_2 U_{rt-1} + \beta_1 X_{rt} + \beta_2 X_{rt-1} + \delta_t + \Delta\varepsilon_{rt}, \qquad (3)$$

therefore might be more appropriate, where δ is a renormalised time effect. The restriction α_2=-α_1 is implied by the wage curve, while α_2=0 would support the Phillips curve specification. In the empirical section, both models are employed at the macroeconomic level to determine wage behaviour in the EU member states. This procedure ensures that country individual estimates for the degree of wage flexibility can be obtained.

6.2. Labour demand specification and employment

A second measure of labour market flexibility is related to the reaction of employment to changes output and real wages. According to the standard economic theory, profit maximising firms are faced by output demand and factor prices, which are both exogenous (see Hammermesh (1993)). As a result of duality, optimal behaviour can be inferred from the analysis of the cost function. Cost minimising labour and capital input

quantities are determined by output demand and obtained by taking 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:

$$L_t^* = \beta_1 Y_t + \partial_1 w_t + \theta_1 r_t, \ \beta_1 > 0, \partial_1 < 0, \theta_1 > 0 \quad , \tag{4}$$

where Y is output, w the real wage, and r the real rental price of capital. Prices are measured in real terms, implying that the output price moves in line with nominal factor prices. The parameters β, δ and θ denote the elasticities of labour demand to output, wages and capital prices, respectively. Stronger demand for goods will raise labour input, while an increase in relative factor prices due either to a rise in wages or a fall in the rental price of capital will lower it. The larger the elasticities in absolute value, the higher the response of employment to macroeconomic conditions, that is, the higher the degree of labour market flexibility. Due to imperfections such as institutional or cost restrictions, adjustment to the economic environment might not be instantaneous. Actual employment only partially reacts:

$$\Delta L_t = \lambda (L_{t-1}^* - L_{t-1}) \, , \lambda \in (0,1) \, , \tag{5}$$

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 (5) an error correction mechanism:

$$\Delta L_t = -\lambda \left(L_{t-1} - \beta_1 Y_{t-1} - \partial_1 w_{t-1} - \theta_1 r_{t-1} \right), \tag{6}$$

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 (4). After replacing labour demand with actual employment, this equation can be interpreted as a co-integration relationship. The parameters of the co-integration vector are the elasticities to be examined.

However, the analysis assumes that the variables in the labour demand function are co-integrated. By contrast, if co-integration does not hold, a first difference specification without error correction:

$$\Delta L_t = \beta_2 \Delta Y_t + \partial_2 \Delta w_t + \theta_2 \Delta r_t, \ \beta_2 > 0, \partial_2 < 0, \theta_2 > 0, \tag{7}$$

is the right way to proceed. Although the variables are not linked in levels, a relationship between their changes may exist. The parameters in (7) may be interpreted as short-run elasticities.

6.3. Implications for the empirical analysis

The theoretical models used in the analysis are quite standard as they are discussed in textbooks. As the analysis is for the EU as a whole, we need a sufficiently general framework of labour markets to analyze the possible impacts of macroeconomic conditions on wages and employment. For this reason, we refer to common specifications of wage and labour demand curves across countries. However, we allow for different coefficients and elasticities for the single countries. Therefore, we restrained from country individual specifications, although more complex country models could be more adequate in some cases.

As pointed out by Pissarides (2003), although labour market flexibility has been discussed widely, it has been defined in a number of different ways. This chapter has introduced two different concepts of labour market flexibility. While the first one consists in quantifying the reaction of real wages to shocks in unemployment and productivity, the second one measures the response of employment to changes in output and real wages. Both concepts are related to adjustments through the labour market after disequilibrium. Real wage flexibility determines the overall balance of supply and demand in the labour market and is a key substitute for the adjustment roles of the nominal exchange rate and an independent monetary policy. However, the reactions of employment to changes in real wages and output are more related to the capacity of the econ-

omy to create jobs after a positive shock. Both aspects are relevant to describe and understand how labour markets function and how can this working be affected by labour market institutions.

Whether measures of labour market flexibility are derived from level or first difference specifications is mainly an empirical question. However, it should be keep in mind that a level specification is often favorable from an economic point of view. In particular, the labour demand equation is obtained in levels from optimization behaviour of firms. In contrast, the first difference specification could be only justified by statistical arguments.

7. Overview of the statistical tools applied in the study

As mentioned above, the objective of the empirical analysis is to provide evidence of wage and employment determinants in the Euro area, the EU member states and the US and their relationship to labour market institutions. However, prior to presenting and discussing the results, we give an overview of the econometric techniques used here to draw inference on the behaviour of wages and employment to shocks in labour market conditions.

From a practical point of view, econometric tools can be divided into two major groups. The first group is concerned with time series procedures, namely VAR models and its features for analysing the response in one variable due to a shock in another variable over time (impulse-response analysis) as well as the decomposition of the variance of the forecast errors into its major determinants. The second group, named "structural", starts from standard regression equations, takes the estimated coefficients (here: elasticities) and tries to explain the behaviour of the elasticities by institutional factors. The analysis is performed for a sample of 13 EU member countries using annual data over the 1970-2003 period. Because of data availability, Luxembourg and Greece are excluded. Aggregate EU (EU12, EU15) and US series are also considered.

7.1. Time series properties and cointegration

The first step in the analysis is to test for the integration and co-integration properties of the variables involved. This provides the guidelines for the further analysis. The tests can be conducted for individual countries or for a panel of countries. It has been widely acknowledged that standard unit root and co-integration tests may have a low power against stationary alternatives for the important cases (see Campbell and Perron (1991), for example). As an alternative, recently developed panel unit root and co-integration tests are applied. Since the time series dimension is enhanced by the cross section, the results rely on a broader information set. Gains in power are thus expected, and more

reliable evidence can be obtained. On the other hand, new problems arise. In specific terms, contemporaneous correlation among the panel members may bias the test results (see O'Connell (1998) for the unit root case).

The panel co-integration tests suggested by Pedroni (1999) extend the residual based Engle and Granger (1987) two-step strategy. Firstly, the co-integration equation is estimated separately for each panel member. Secondly, the residuals are examined with respect to the unit root feature. If the null is rejected, the long-run equilibrium exists, but the co-integration vector may be different for each cross section. Deterministic components are also allowed to be individual-specific.

In order to test for co-integration, the residuals are pooled either along the "within" or the "between" dimension of the panel, giving rise to the panel and group mean statistics (see Pedroni, 1999). In the former, the statistics are constructed by summing both numerator and denominator terms for the individuals separately, while in the latter, the numerator is divided by the denominator prior to the summation. As a consequence, in the case of the panel statistics the auto-regressive parameter is restricted to being the same for all cross sections. If the null is rejected, the variables in question are co-integrated for all panel members. In the group statistics, the auto-regressive parameter is allowed to vary over the cross-section, as the statistics amount to the average of individual statistics. If the null is rejected, co-integration holds at least for one individual. Group tests therefore offer an additional source of heterogeneity among the panel members. Both panel and group statistics are based on augmented Dickey Fuller (ADF) and Phillips-Perron (PP) method. Pedroni (1999) suggests 4 panel and 3 group statistics.

Overall, the evidence from the Pedroni tests in Tables 9 and 10 is not straightforward. In particular, the ADF based tests reject the null of no co-integration, implying that the level specification is appropriate. However, this finding is not confirmed by the PP and variance ratio tests, as they do not reject the null hypothesis at the 5% level. To be on the safe side, both level and first difference specifications are used. This strategy also reinforces the robustness of the results. Nevertheless, the discussion presented below will concentrate on the level models, while results obtained with the first difference ap-

proach are included in an annex. Level models are often more consistent with the economic point of view. In addition, due to the unit root literature in a time series context, ADF based tests perform often better than PP alternatives. This might be also the case in a panel setting.

Table 9: Panel cointegration tests: real wage model

	Pedroni (1999)	
	Panel Statistics	Group Statistics
Variance ratio	1.312*	
Rho statistic	-0.774	0.643
PP statistic	-1.463*	-0.715
ADF statistic	-2.430***	-2.520***

Statistics are asymptotically distributed as normal. The statistics are described in detail in Pedroni (1999). The variance ratio test is right-sided, while the other tests are left-sided. A *, **, and *** indicates the rejection of the null hypothesis of no cointegration on the 0.1, 0.05 and 0.01 level of significance.

Table 10: Panel cointegration tests: employment model

	Pedroni (1999)	
	Panel Statistics	Group Statistics
Variance ratio	1.532*	
Rho statistic	0.659	1.733**
PP statistic	-0.101	0.414
ADF statistic	-2.413***	-2.337***

Statistics are asymptotically distributed as normal. The statistics are described in detail in Pedroni (1999). The variance ratio test is right-sided, while the other tests are left-sided. A *, **, and *** indicates the rejection of the null hypothesis of no cointegration on the 0.1, 0.05 and 0.01 level of significance.

Furthermore, the structural analysis is carried out not only for fixed elasticities, but also for time-varying coefficients. Although the bulk of the analysis is concerned with the constant parameter regime, the varying parameter approach enables us to draw additional conclusions on the impact of institutions on wages and employment. Possible interactions between institutions in particular can be studied. Information can also be

gained as to whether the impact of the institutions has changed over time and how wages and employment might be affected. However, this procedure serves primarily as a check for robustness against the results obtained in the constant parameter case. In addition, the institutional impact can be separated from socio-demographic characteristics.

Apart from the institutional data, all variables are measured in logs, and for reasons of clearness, not all results will be reported in the main text of the following chapters. However, detailed results for all specifications will be given in the annex to each chapter.

7.2. Vector Autoregressive models (VAR models)

A VAR model consists at least of two (economic) variables which enter the system. The total number of variables in a VAR model is indicated by k, and is called the dimension of the system. Each variable in the system appears in each equation of the model. There are thus no exclusion restrictions as in the traditional econometric practice of building economic models. Furthermore, and contrary to (formerly) standard econometric practice, no distinction is made in order to classify the variables into subgroups like endogenous variables, exogenous variables, predetermined variables, etc. This means that each variable is treated alike. Problems involved in looking for adequate instruments in the case of possible endogeneity of some regressors are not therefore present. A further main distinction compared to standard regression models is the absence of contemporaneous explanatory variables in a VAR model; i.e., the current period residuals of a VAR model are just the one-step-ahead forecast errors of the system.

Given that each variable of a VAR model appears in each equation of the k-dimensional model, and that each variable enters with the same lag length (dynamic specification of the VAR model up to lag order p), the model is usually overparameterized, and no attempts are made to give a meaningful interpretation of the estimated coefficients of the system. Instead, using the estimated coefficients, the model is transformed in a way that

allows studying the dynamic behaviour of the system. This is done by estimating the so-called impulse-response analysis.

However, prior to transforming the estimated model in its so-called moving average-representation, a proper specification of the dynamics of the system has to be determined, i.e., how many lags (up to order p) should be included in the VAR model. Several procedures for determining the lag length of a VAR model are available. Asymptotically, they are indistinguishable, but the results of the different methods may differ for finite samples. Here, we decided to use the Schwarz criterion for determining the lag length. Generally speaking, the researcher has to insert a maximum lag length, for example six periods, and the system then calculates the corresponding Schwarz criterion for all possible lag length models. To decide the optimal lag length, p is selected for the minimum of the Schwarz criterion. This empirically selected p is then used as the lag length for each variable in the k-dimensional VAR-model.

Despite fixing p and k, the researcher has to decide whether the model should be specified in levels or in first differences. This is closely related to the question of whether the variables of interest in the VAR model are non-stationary (i.e., there is a unit root in the data) or stationary (i.e., there is no unit root in the data). If the variables of the VAR model are stationary, then it is advisable to estimate the model in levels. The same strategy applies if non-stationary variables are co-integrated. However, if the variables fail to co-integrate, then the model must be estimated in first differences. In this case, the variables are related only in the short run, but not in the long run. Due to the inconclusive cointegration results in the previous section, we run each VAR model twice – for a level and first difference specification.

Several deterministic components (constant, trend) can be included in the VAR specification. A possible time trend is restricted to the level model. Here it can account for trend-stationarity of the long-run equilibrium, and reduce the problem of spurious correlation. Moreover, the oil price enters the VAR models as a proxy for adverse supply shocks. It is included in the specifications to emphazise its importance in the development of the countries considered. In the past, oil crises led to significant downturns in

economic activity. However, the oil price is treated as exogenous, i.e. it does not depend on the other variables of the system.

In sum, we specified the following alternative VAR models for each country (or region):

Model 1: real wage, unemployment, productivity, constant
Model 2: real wage, unemployment, productivity, constant, oil price
Model 3: real wage, unemployment, productivity, constant, linear trend
Model 4: real wage, unemployment, productivity, constant, oil price, linear trend

The final model is selected by means of the information criteria.

7.2.1. Impulse-response analysis

The dynamics of the VAR system are analyzed in two ways. We look at the patterns of impulse-response functions and on the decomposition of the forecast error variance (innovation accounting). Of course, the informational content of both procedures is the same, but the way the information is prepared differs.

For the impulse-response function, the VAR-model is transformed into a moving average model of infinite order (MA representation), which allows the corresponding moving average coefficients to be given an interpretation in terms of multipliers. The impulse-response function can be calculated for each period indicating the value of the multiplier for that period, or alternatively as an accumulated series, adding all previous values of the impulse-response function up to period h. The accumulated impulse-response functions show the total effect of a shock on the variable from the beginning of the shock up to period h, which might be more interesting from an economic point of view. For both variants, we construct 95-% confidence limits. In the following, we present both variants of the impulse-response analysis. Depending on the behaviour of the accumulated impulse-response function, a shock can approximately classified as temporary or as permanent. If after h periods of the occurrence of the shock the accumulated

impulse-response function is significantly different from zero, then the shock is seen to be permanent. If the value is not close to zero, this suggests interpreting the shock as temporary. However, it should be mentioned that this interpretation is somewhat suggestive.

The impulse-response analysis shows the dynamic adjustment of the variables in the VAR model to certain shocks. These shocks may occur in each variable of the system. The analysis of the impulse-response pattern is usually not unique but may depend to a large extent on the way the variables enter the system (the so-called ordering of the variables). One possibility to overcome the problem is given by the proper choice of the shock. In most applications the choice is made in favour of a Cholesky decomposition of the corresponding weighting scheme to orthogonalize the system. If a choice in favour of so-called generalized impulses is made instead, as has been suggested by Pesaran and Shin (1998), then the ordering of the variables in the systems no longer plays any role. This is the way we proceed in the report here.

7.2.2. Variance decomposition

The second tool for analysing the VAR model is the variance decomposition or innovation accounting approach. Here it is asked which part of the forecast error variance can be traced to the different shocks. In this sense, the decomposition provides information on the relative importance of each shock in affecting the adjustment path of the variables in the VAR model. Both impulse response analysis and variance decomposition are directed to analyze dynamic adjustment processes in the system. It is important to note, however, that the tools serves as complements and not alternatives. For example, the impulse response might indicate a negative reaction of a variable to a certain shock, while the effectmust be positive in terms of the variance decomposition. More general, the variance decomposition informs about the increasing or decreasing importance of the variables of the system over time, measured as percentage proportion of the total variance. Thus figures related to variance decomposition must be always positive, regardless of the signs of the corresponding impulse response functions.

7.2.3. The impact of institutions on the adjustment of labour markets

In order to gain insights into the possible impacts of labour market institutions on the behaviour of wages and employment, we take the values of the accumulated impulse-response functions and variance decompositions 2, 5 and 10 periods after the shock occurred. The different periods can be justified by the following argument: as institutions are rather rigid and change only slowly over time we would not expect strong influences in the short run. On the other hand, if institutions affect labour market performance, this should occur within the 10 years period. Effects taken place after 10 years are not very plausible. Given the aim of the study to test for the possible impact of institutions we think that the chosen time span is sufficiently long.

As institutions are part of operating conditions of an economy, their effects should show up more in the intermediate or long run. Therefore the level specification is more appropriate to investigate their impact. Again, the first difference specification serves as a robustness check.

For each of the three periods a separate cross section regression is specified and estimated. Here, the endogenous variable is the accumulated impulse response or the share of the forecast error variance across countries after the chosen periods. The explanatory variables in these regressions are the various institutional measures discussed in chapter 5. All institutional variables are tested first in a bivariate regression, and the final specification is determined using appropriate selection procedures for adding and deleting additional institutional variables. This search procedure also includes various interaction terms among the explanatory variables when they appear useful in the corresponding regression.

Care must be given to the interpretation of the signs of the coefficients in the cross section regressions based on the impulse response and variance decomposition data. In the impulse response cases, the endogenous can be positive or negative. In the case of the variance decomposition only positive values can appear. Therefore, a comparison of the

signs across the two approaches is not really meaningful. Especially, opposite signs are no indication of conflicting results.

7.3. The structural approach

In the structural approach, we basically repeat the steps taken in the VAR part with some major differences that need to be mentioned. Firstly, the tests of the impact of labour market institutions on wages and employment are based on behavioural equations instead of time series modelling. The variable to be explained is the real wage for the analysis of wages (chapter 8) and either employment in persons or hours worked for the analysis of employment (chapter 9). In each case, a two-step procedure has been adopted. For the case of employment, an employment equation (interpreted as a labour demand equation) is estimated as the first step by running a regression including the real wage and GDP as explanatory variables. Because estimation is done in logs, the estimated coefficients correspond to the relevant elasticities (short-cut: wage elasticity = elasticity of employment to a change in the real wage, etc.).These estimated elasticities (one for each country included in the analysis) are taken in a second step as variables to be explained by the institutional labour market indicators (including measures of active labour market policy, etc.). Here we present two alternative procedures and results. The first set of results is based on the assumption of constant elasticities, and the second on the assumption of time-varying elasticities. For the case where constant elasticities are used, the estimated model is purely a cross section approach. In the varying parameter model, the underlying structural equations have been estimated recursively by adding one additional observation after each point in time. In this case, we obtain a vector of elasticities for each country, which, when pooled together, constitute a panel-model, where the institutional impact can be determined. A similar procedure is adopted for real wages.

To clarify the distinction between the alternative empirical approaches we emphasize that the VAR approach and its technical tools mainly serve to analyze the dynamic adjustment behaviour of wages and employment in response to different shocks. By construction, VAR models do not refer explicity to economic theory and do not differenti-

ate between endogenous and exogenous variables. Therefore, they are of limited use delivering economically interpretable coefficients. In contrast the stuctural models capture aggregate behaviour in the economy explicity. The coefficients can be seen as elasticities and thus have a direct economic interpretation. The elasticities refer to the long run in the level specification, but to the short run in the first difference model. As the institutional impact is expected to appear in the intermediate or long run, the level variant seems to be more appropriate. Results for the first difference specification serve as a robustness check and are provided in the annex.

To summarise the main ideas of this chapter, in order to gain some insights into the behaviour of wages, employment, unemployment and output, we set up VAR and structural equation models for each of the 15 EU member states, for the Euro area and the EU15 as entire regions, and for the US, using annual data from 1970 to 2003. Various approximations to the concept of labour market flexibility are obtained based on the estimation of these models and we then treat these measures as endogenous in linear regression models where different institutional characteristics are introduced as explanatory variables. The results of this analysis will provide interesting conclusions in order to assess the most appropriate structural reforms in the labour market.

8. Analysis of real wages response to unemployment and productivity shocks

In this chapter, we present the results of the empirical analysis of real wages' response to unemployment and productivity and its link to the different institutional variables that could influence this relationship.

Most empirical studies have concluded that there is an insufficient response of real wages to shocks in both the EU countries and in the US. In particular, a great deal of literature has focused on the estimation of wage equations using macroeconomic data. In general, these studies have found a low elasticity of wages to unemployment, specifically for the Euro area countries (Grubb *et al.*, 1983; Bean *et al.*, 1986; Chang-Lee *et al.*, 1987; Alogoskoufis and Manning, 1988; Andersen, 1989; OECD, 1989, Kawasaki *et al.* 1990; Layard *et al.*, 1991; Eichengreen, 1992; McMorrow, 1996). Similarly, estimates of the elasticity of wages to regional unemployment are also low for EU countries (Abraham, 1996), but not much different to other countries if individual data from surveys are used (Blanchflower and Oswald, 1994 for twelve countries; Nicolaisen and Tranaes, 1996, for Denmark; Sanromá and Ramos, 2003 for Spain; or Dessy (2002) for 12 European countries during the 1994-96 time-period using ECHP data).

In this context, the objective of this chapter is twofold:

- Firstly, to identify the explanatory factors for the different results in the empirical literature about adjustment through wages and prices in the labour market, with the aim of obtaining some guidelines for our empirical research related to the contribution of wages to labour market performance and the role of labour market institutions.

- Secondly, and in accordance with sections 6 and 7 above, VAR models and structural equations models will be specified and estimated in order to obtain quantitative estimates of the response of real wages to unemployment and to

productivity. These estimates will then be related to institutional data in order to analyse the influence of institutions in the adjustment process.

Taking this into account, this chapter will be organised into four sections and 5 appendices. Meta-analytical techniques are applied in the first section. Meta-analysis is a research methodology that is used to bring together findings from previous research on a given issue or topic, undertaken by different researchers in a succinct and systematic way. The main aim of meta-analysis is thus to offer an analytical framework for research synthesis, usually based on comparative case studies. Meta-analysis refers to the statistical analysis of a large collection of results from individual studies for the purpose of integrating the findings. The studies used in the meta analysis are quoted in annex 8.1. It is worth mentioning that meta-analysis can be seen as a rigorous alternative to the usual narrative literature review.

Secondly, a VAR analysis is performed in order to analyse real wage dynamics. Based on standard specifications outlined in chapters 6 and 7, we assume that real wages are homogeneous in prices, i.e. the elasticity of nominal wages to prices is 1, and the model consists of the real wage, labour productivity and unemployment. While real wages are positively associated with productivity, the correlation with unemployment should be negative. The analysis of accumulated impulse-responses will give a quantitative measure of the reaction of real wages to unemployment and productivity shocks. While the graphical presentation of accumulated impulse responses is done in the main text, the numerical results are given for the individual countries in annex 8.2. The evidence provided by the variance decomposition is included in annex 8.3.

Thirdly, structural equation models are estimated in order to obtain fixed and time-varying estimates of the effect on real wages of changes in unemployment and on productivity in the various countries.

Finally, in the fourth section, the different measures of the responsiveness of real wages to unemployment and productivity are taken as endogenous in linear regression models where different institutional characteristics are introduced as explanatory variables. Re-

sults for the variance decomposition is reported in annex 8.4. In case of the structural approaches, the institutional impact is discussed for the constant and time varying parameter variant. Annex 8.5 holds additional evidence for the sensitivity of the results to the use of alternative data sets.

8.1. A meta-analysis of real wage flexibility

8.1.1. Design of the meta-analysis

The first step in the meta-analysis consists of identifying the variable of interest of the analysis. We focus our attention on real wage flexibility, as it can be understood as an indicator of adjustment to shocks throughout the labour market in the various economies. In particular, we think it is an appropriate summary of the interactions between wages and employment/unemployment. In order to set up the required database, real wage flexibility will be defined as the estimates of the elasticity of real wages to unemployment.

The second step in the meta-analysis consists of identifying and compiling the various studies providing estimates of real wage flexibility. This step involves several decisions:

i. A first decision regarding the selection of these studies is related to the fact that we decided to focus only on works using a macroeconomic approach. The reason for this is related to one of our objectives in carrying out the meta-analysis - to provide a guideline for our empirical research. As we will follow this kind of approach, we excluded all works using microdata from the analysis. Moreover, the recent work by Nijkamp and Poot (2005), already provides a meta-analysis of this literature.

   The idea is therefore that we will select all studies when an estimate of the elasticity of real wages to unemployment is provided. It is worth mentioning that this elasticity can be defined as a short-run or long-run elasticity. These two dif-

ferent definitions will be controlled later in our analysis. Whenever possible, we will also collect information about the precision of these estimates (i.e. the standard error of the estimate or the t-student statistic to derive it).

ii. In order to look up the studies with these characteristics, we used Econlit as our primary bibliographical source. However, we complemented it using secondary sources (references in the different studies given) and web searches.

iii. It is worth mentioning that we selected published and unpublished works (i.e. working papers or communications to conferences) in order to avoid the potential effects of "publication bias" in our analysis.

iv. As far as the time span is concerned, we considered studies published from 1960 to the present. However, the earliest study in our database was published in 1983 and the most recent one in 2003.

v. With regard to the geographical area considered in the study, we limited our analysis to those works considering one or more OECD countries.

vi. A final issue to consider is whether we will include single or multiple values of the elasticity for each study. In our context, we chose to include all the estimates available in each study as the objective is merely to explain the differences in the previous results and to provide guidelines for our empirical research.

In the end, our database comprised 27 studies (2 books, 14 journal articles and 11 working papers) with 608 estimates of real wage elasticity or real wage rigidity. For 362 of these estimates, the standard error or the t-student was also provided. Table 11 summarises the elasticities obtained from each study and the number of citations received by each of these studies is also provided. By far the most frequently cited study is the one by Layard *et al.* (1991), with the picture provided by their estimates being that of consensus among researchers. It is also worth mentioning that the study by Payne (1995)

has provided a high number of estimates (150) due to the consideration of the state-level dimension for the US.

Table 11: Summary of the different studies included in the meta-analysis

Study	Number of estimates	Number of citations*
Alogoskoufis and Manning (1988)	16	46
Anderton and Barrell (1995)	10	5
Anderton *et al.* (1992)	6	1
Baddeley *et al.* (2000)	22	4
Bean *et al.* (1986)	28	99
Bentolila and Jimeno (1995)	1	2
Berthold *et al.* (1999)	32	0
Cadiou *et al.* (1999)	8	1
Elmeskov and MacFarlan (1993)	27	13
Elmeskov and Pichelmann (1993)	76	2
European Commission (2003)	30	0
Fabiani and Rodríguez-Palenzuela (2001)	14	0
Goubert and Omey (1996)	7	0
Grubb *et al.* (1983)	21	73
HM Treasury (2003)	6	0
Hyclack and Johnes (1989)	31	10
Hyclak and Johnes (1992)	10	15
Layard *et al.* (1991)	18	689
McMorrow and Roeger (2000)	11	1
Nymoen and Rodseth (2003)	4	0
OECD (1999)	15	9
Payne (1995)	150	3
Prasad and Thomas (1997)	2	11
Roeger and in't Veld (1997)	16	3
Turner *et al.* (1996)	7	3
Tyrväinen (1995)	10	8
Viñals and Jimeno (1998)	30	0

Source: Own elaboration.
* The number of citations has been obtained from ISI Web of Knowledge.

These estimates are related to 23 countries, 71 regions and 4 supranational entities. Table 12 summarises the distribution of these estimates, taking into account whether they are flexible or rigid and nominal or real, together with the territory considered. It is also worth mentioning that the 200 regional estimates were collected from only 3 studies, considering only three countries - Germany (11 regions), the UK (10 regions) and the

US (50 states). The 7 supranational estimates were collected from 4 studies and involve 4 different definitions - OECD countries, the EU, the Euro area and five EU countries (Germany, France, Italy, Netherlands and the UK)

Table 12: Summary of the data set for the meta-analysis

Estimates	Country	Region	Supranational	Total
Real Flexibility	310	192	1	503
Real Rigidity	91	8	6	105
Total	401	200	7	608

Source: Own elaboration.

The third step in the meta-analysis consists of identifying and compiling the set of explanatory variables of wages. In the meta-analysis literature, this set of variables is usually divided into three blocks - the control variables, the variables related with the design of the study and the moderator variables.

As regards the first set of variables, control variables are usually related to aspects such as the publication year, the type of publication (journal article, book chapter, report, etc.), the number of pages of each study or the number of citations received (which can be obtained from the ISI Web of Science only when the study has been published in a journal included in the Social Science Citation Index). With the sole exception of the year of publication (which could be an indicator of the state of the empirical technology when the work was done), they can be interpreted as indicators of quality of the study.

The second set of variables included some characteristics related to the design and the implementation of the empirical study that can explain the differences in the results by different authors. In our context, this list includes the following:

i. The territory considered and the sample used

The first aspect to take into account is the considered territory and the sample used. We defined a dummy variable for each territory considered (in the case of regions we also assigned each region to the country to which they belong in a different dummy variable), while with the sample, we recorded the first and the

last year of the sample. The dimension of the territory (supranational, national and regional) was also considered.

ii. The econometric specification

As Broersma and Den Butter (2002) point out, traditional empirical studies on wage formation consider different variables (inflation, unemployment, productivity) to explain the determinants of the change in the wage rate (Phillips curve specification) or to explain the wage level (wage curve specification). As mentioned above, while the Phillips curve specification is based on the theoretical model of Phelps (1968), where wages are set by firms, in the wage curve approach, wages are the outcome of a bargaining process between firms and unions. From a theoretical perspective, there is nowadays some preference among economists for using a wage curve specification rather than the Phillips curve. However, some recent works such as Hsing (2001) or European Commission (2003) prefer to use a Phillips curve specification. In any event, it is important to stress that the results are quite similar when taking the different countries and time periods considered into account. From an econometric point of view, these two specifications can be described as follows:

- The macroeconomic wage curve specification: In the general static specification of the aggregate wage equation, the wage level of country *i* at time *t* is explained using the following expression:

$$\log(W)_{i,t} = c_0 + c_1 \cdot \log(P^e_{i,t}) + c_2 \cdot \log(PR_{i,t}) + c_3 \cdot \log(U_{i,t}) + + u_{i,t}\,, \qquad (8)$$

where $W_{i,t}$ is the level of nominal wages, $P^e_{i,t}$ the expected price level[1], $PR_{i,t}$ productivity and $U_{i,t}$ the unemployment rate in country *i* at time *t*, and, $u_{i,t}$ is a random error term which is supposed to follow a normal distribution. The variables enter the relationship in logs. In the Phillips curve specification, the variables are

[1] The lagged level of prices could be used to proxy the expected level of prices as in many other studies (see, Hsing, 2001, for example).

similar to those in the wage curve specification, but both are included in differences instead of in levels. It is worth mentioning that some authors do not include productivity or prices as explanatory variables while others also include lagged values of wages in order to take the effects of wage persistence into account in the analysis.

In equation (8), the estimates of c_2 would approximate the effect of wage changes on productivity, also taking into account the evolution of other economic factors in the various countries. The coefficient c_3 provides information about the reaction of wages to an increase in unemployment.

Variations of the basic specification include the possibility of working with error correction mechanisms where the growth rate of wages is explained using lagged values of the growth rate of wages and the growth rate of unemployment as well as the long-run relationship between the two variables (in levels). Another alternative consists of obtaining a measure of rigidity instead of flexibility, using the inverse of the unemployment rate as an explanatory variable. This should also be controlled.

For this reason, we defined the following dummy variables, trying to reflect all these possibilities:

- Rigidity / Flexibility
- Growth rate / level of wages
- Growth rate / level of the unemployment rate
- Control variables in wage equation (productivity, inflation, wage persistence)

iii. Econometric methods and techniques

Apart from differences in the econometric specification, the various authors may use different estimation methods and techniques. We defined two particular

variables that reflect the differences in terms of the econometric methods and techniques applied. The first one is related to the consideration of a single territory or a pool of territories, while the second is related to the estimation technique applied (OLS, IV, SURE, etc). Both aspects are of course clearly interrelated.

iv. The data set

The data set used can also be a potential source of differences between studies. We considered the following information:

- The data source
- The frequency of the data
- The exact definition of wages
- The exact definition of the unemployment rate

The last set of variables in the meta-analysis data set is called moderator variables, and it is related to other characteristics that have not been controlled until now, such as example, the size of the different territories (in terms of population, GDP, etc.) or other factors such as their institutional characteristics. This set of variables is also usually replaced by the introduction of fixed effects that would include all observable and non-observable differences.

8.1.2. Meta analysis results

Before showing the results of our analysis, one aspect that should be highlighted is that as we understand it, it seems that observations for real wage rigidity and real wage flexibility should not be mixed. Three alternatives arise. Firstly, to use them in separate analyses; secondly, to redefine observations for rigidity as the inverse of flexibility; or thirdly, to exclude them from the analysis as they account for 17% (105/608). The three alternatives were considered and we decided not to include them in the analysis. Our study will thus be limited to estimates of real wage flexibility.

Table 13 provides some descriptive statistics of the estimates of real wage flexibility in our database. According to this table, the most flexible countries are Sweden, Norway, Turkey, Japan and Switzerland. There is an intermediate group formed by the Netherlands, France, Australia, Germany, Portugal, Belgium, Ireland, Italy, Luxembourg, Finland, Greece and Austria, while the less flexible ones are New Zealand, the US, the UK, Denmark, Canada, and Spain.

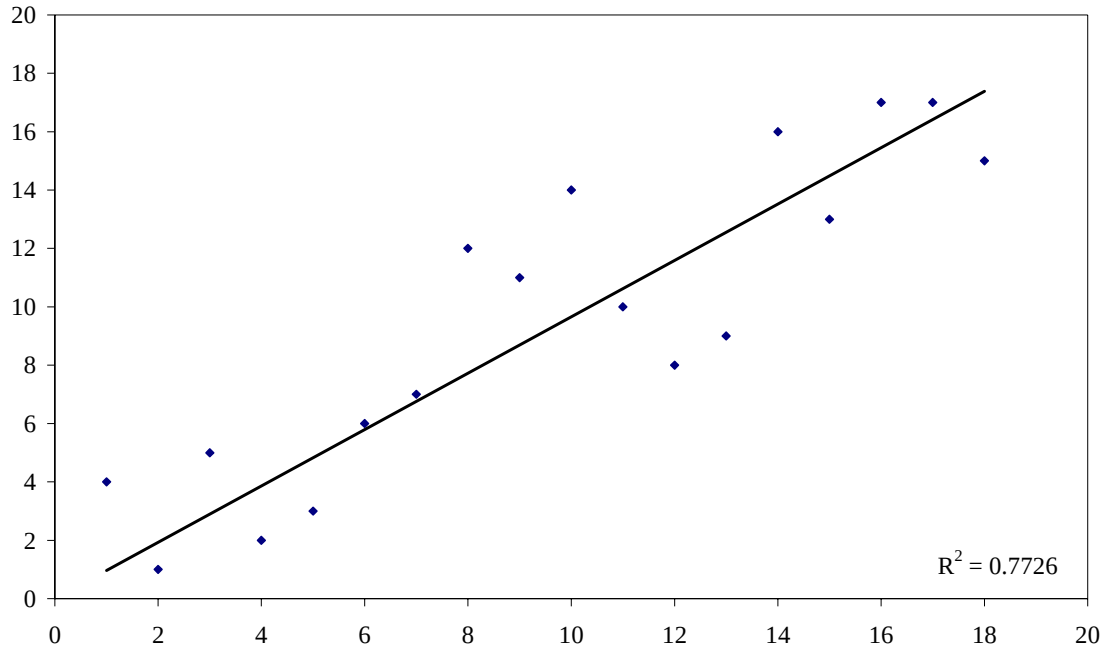
If we compare these results with the only work we know that has carried out a quantitative summary of previous work, that by Heylen (1993), we can see that there are some similarities but also some differences.

Heylen (1993) calculates an average of real wage flexibility for different countries using information from a considerably lower number of empirical works. In Graph 25, the relative position of the 23 countries considered by Heylen (1993) in terms of real wage rigidity are compared with the ranking obtained from the average of estimates of real wage flexibility in these countries from our database.

Table 13: Descriptive statistics of the real wage flexibility estimates

Real wage flexibility	Observations	Average	Standard deviation	Coefficient of variation	Ranking	Heylen (1993)
Australia	9	-0.99	1.54	154.96%	9	8.51 (9)
Austria	16	-2.17	2.46	113.22%	18	14.56 (16)
Belgium	16	-1.07	0.81	75.69%	12	7.96 (8)
Canada	13	-0.59	0.58	97.11%	5	7.36 (6)
Denmark	17	-0.38	0.46	123.15%	4	3.83 (1)
Finland	11	-1.41	2.02	142.58%	16	10.44 (13)
France	22	-0.94	0.99	105.71%	8	9.73 (11)
Germany	23	-1.04	1.10	106.44%	10	7.23 (5)
Greece	4	-1.62	2.00	123.28%	17	
Ireland	9	-1.11	0.95	85.28%	13	7.77 (5)
Italy	22	-1.12	1.25	111.97%	14	9.86 (12)
Japan	15	-7.44	11.45	153.93%	22	17.41 (18)
Luxembourg	2	-1.13	0.13	11.94%	15	
Netherlands	15	-0.74	1.01	137.12%	7	9.01 (10)
New Zealand	7	-0.17	0.33	191.10%	1	
Norway	10	-2.68	3.33	124.20%	20	12.73 (14)
Portugal	9	-1.06	0.89	84.08%	11	
Spain	14	-0.61	0.77	126.62%	6	4.35 (3)
Sweden	16	-2.67	3.18	119.19%	19	15.99 (17)
Switzerland	9	-7.50	10.19	135.96%	23	14.10 (15)
Turkey	5	-6.75	5.44	80.62%	21	
UK	26	-0.37	0.51	138.75%	3	3.83 (1)
US	20	-0.36	0.31	86.43%	2	5.61 (4)

Graph 25: Comparison of the estimates of real wage flexibility by country with the summary analysis by Heylen (1993)

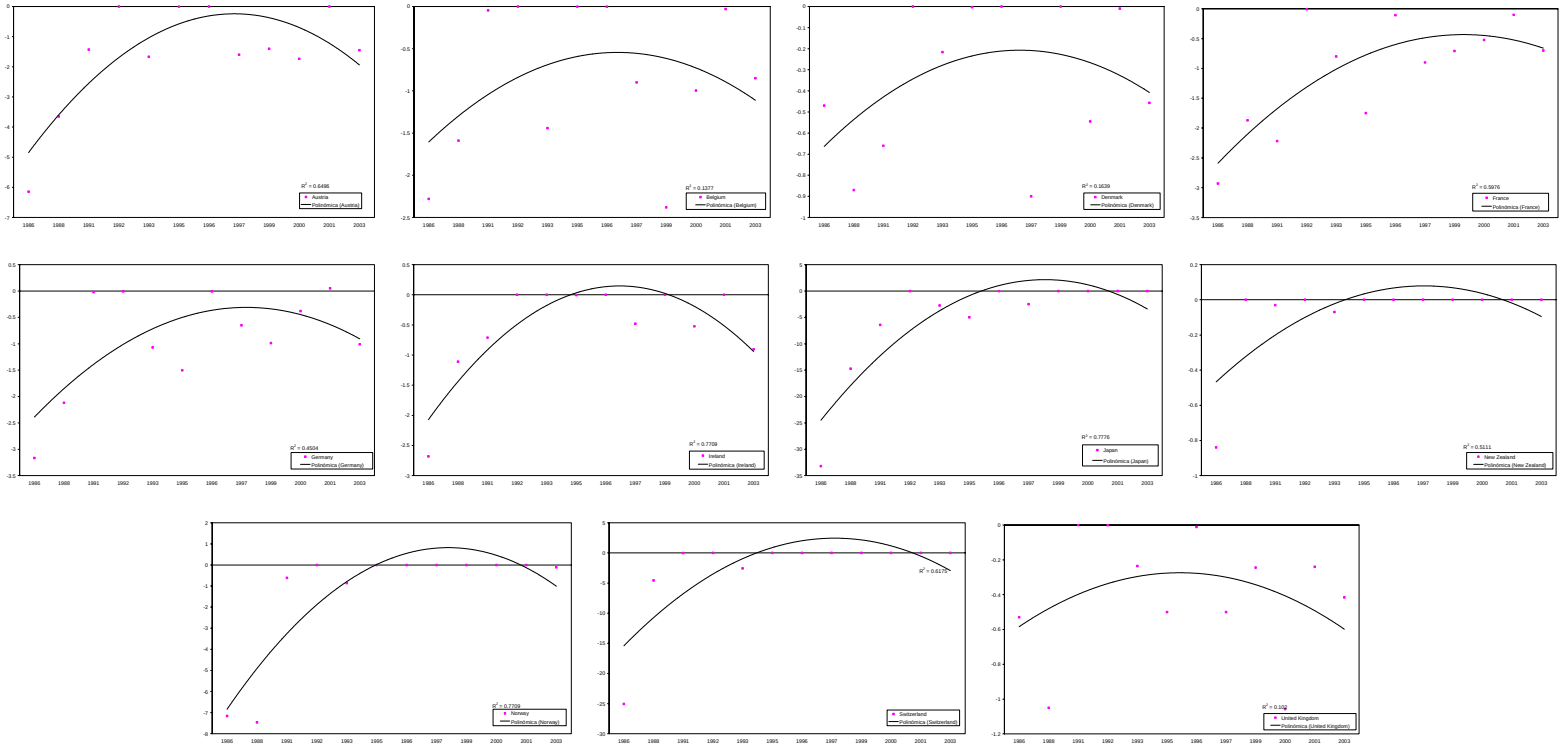


Although there is a positive and significant relationship between the two rankings (after transforming them adequately, as one is related to flexibility and the other to rigidity), changes for some of the countries considered are important. This is true of Ireland, France, Germany and the Netherlands. Why are these results so different? Has the situation changed in these countries? It this result related to the fact that we included more recent studies in our database? We will now try to answers these questions using different quantitative approaches.

As regards the previous point, it is worth mentioning that if we calculate the average for each country of the real wage flexibility by the publication year of the study (as an indicator of the sample included in the study), we can clearly identify three different groups of countries, taking into account the time evolution of the estimates of wage flexibility (see Graph 26). However, it is worth mentioning that the results that should be taking with cautions due to the short number of observations available for some countries.

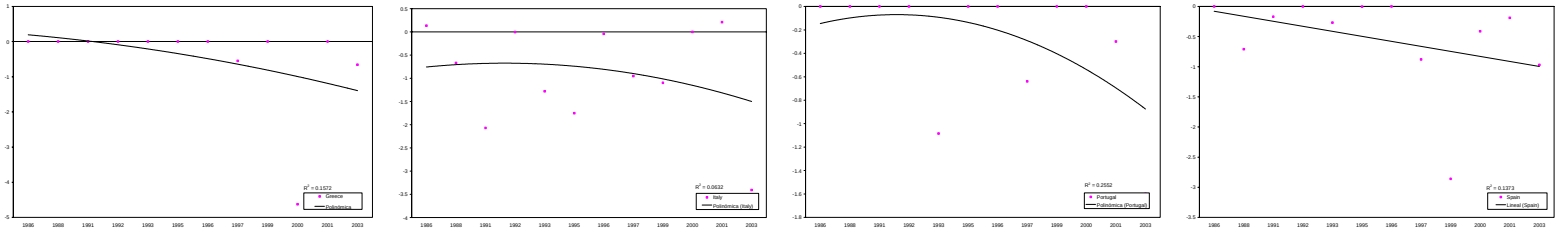
Graph 26: Time evolution of the real wage flexibility by publication year of the study in selected countries (1/2)

First group: Austria, Belgium, Denmark, France, Germany, Ireland, Japan, New Zealand, Norway, Switzerland, UK

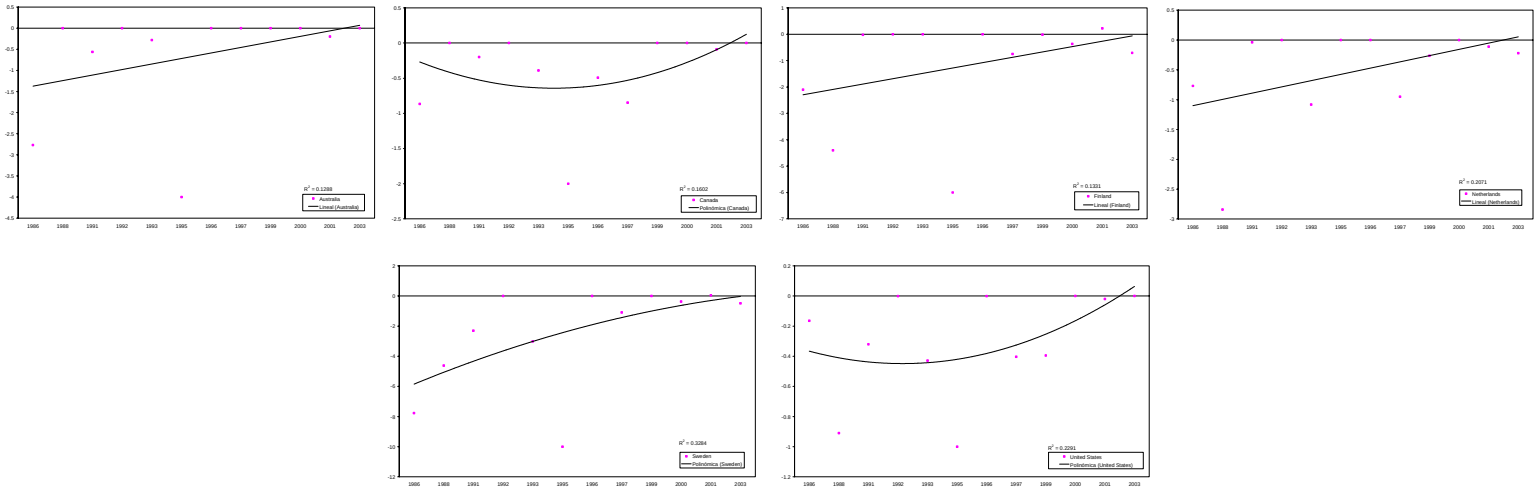


Graph 26: Time evolution of the real wage flexibility by publication year of the study in selected countries (2/2)

Second group: Greece, Italy, Portugal, Spain



Third group: Australia, Canada, Finland, Netherlands, Sweden, US



In particular, in a first group of countries, formed by Austria, Belgium, Denmark, France, Germany, Ireland, Japan, New Zealand, Norway, Switzerland and the UK, real wage flexibility decreased during the eighties but increased at the end of the period.

In a second group of countries, Greece, Italy, Portugal and Spain, the value of real wage flexibility continuously increased during the whole period under consideration.

In the third group of countries, Australia, Canada, Finland, Netherlands, Sweden and the US, the situation was the opposite. Real wage flexibility estimates decreased continuously between the eighties and nineties.

These results have two important implications for our study:

- Firstly, they cast doubts on the possibility of using all available data for our econometric exercise as there seems to be several structural changes. An extension will consist of using time-varying coefficient models.

- Secondly, are these results related to labour market institutions? Have labour market reforms affected the response of real wages to unemployment? Can more sophisticated econometric techniques or better databases explain the differences between the results published in the 1980s and more recent ones? The following analysis will try to provide answers to some of these questions.

Another interesting result is the high and significant value of the (rank) correlation coefficient between some of the characteristics of the different studies[2]. The following are worth mentioning:

- There are high correlations between the database used (OECD, Eurostat or National sources) and other characteristics of the analysis, such as the level of territorial detail considered, the frequency of the data or the definition of wages and unemployment. For example, most studies using the OECD database focus on

[2] As a result of its size, the full correlation matrix is not shown here. However, it is available from the authors on request.

single (0.61) country analysis (0.69) using half yearly data (0.26) and approximating the evolution of wages using compensation of employees (0.54). In a similar way, and because of data availability, most studies using the Eurostat databases only consider more recent periods covering the last decade (0.27).

Most studies focusing on regional analysis use national sources (0.92), and the regional detail is used as a way to improve the robustness of the results from an econometric point of view. When regional data are used, the different regions are treated as a pool (0.83) and usually estimated as a SURE (0.82).

- The high correlation between using regional data and the possibility of using more detailed information on wages such as wages by hour (0.78) is also significant. However, the regional dimension usually implies the impossibility of controlling for the evolution of productivity (-0.79).

  In fact, there is a positive relationship between the number of observations included in the analysis and the possibility of introducing this kind of control, such as the evolution of productivity (0.27) or wage persistence (0.32).

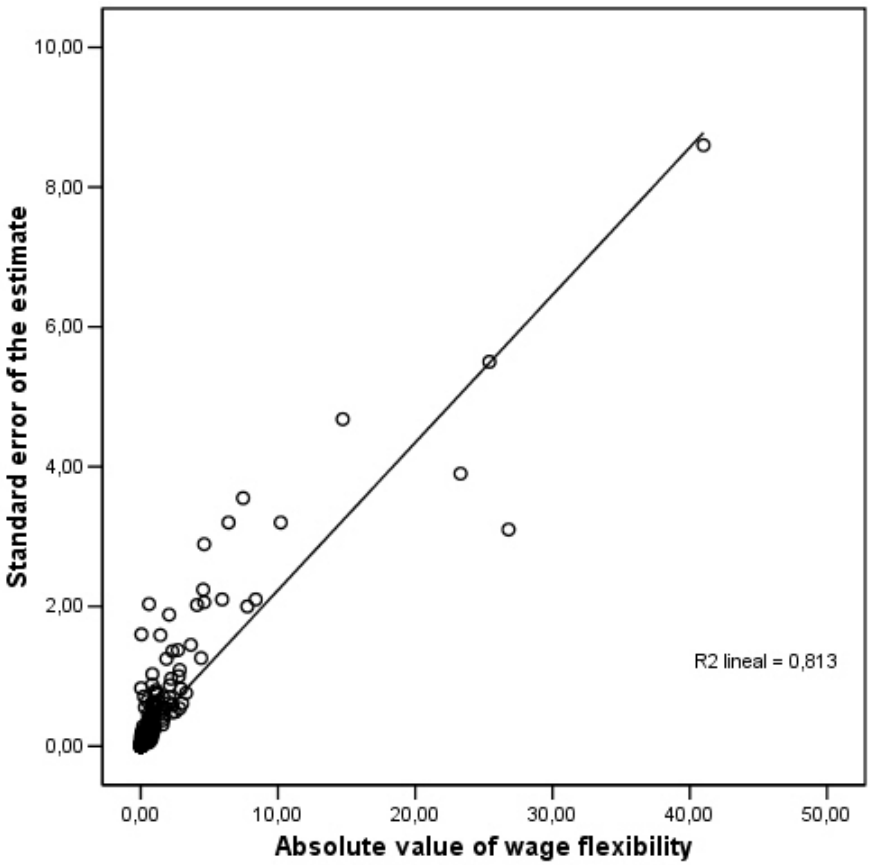
- In terms of the quantitative analysis that will be carried out next, in the context of a regression analysis where these variables were included, results will be affected by the presence of collinearity.

An important methodological problem in meta-analysis is the possibility of "publication bias". This occurs if only statistically significant results with the "correct" sign are being published. One reason might be that the editors of journals prefer to publish these "correct" results. This is one of the reasons why we tried to include not only published, but also unpublished studies (i.e. working papers). However, this does not guarantee that this problem is not present in our sample. In fact, authors may be reluctant even to circulate work if they have certain results which are not in line with previous research. With the aim of analysing the existence of publication bias in our sample, we applied a standard tool called "funnel plots". This consists of plotting the value of the variable of interest (in this case, wage flexibility estimates) against its standard error (Graph 27). The idea is to search for asymmetries in these figures. Asymmetry will indicate that

studies with equal precision disproportionately find either small or large results. In fact, without any publication bias, a symmetric funnel shape would emerge with a vertical line of symmetry at the location of the true parameter.

Looking at the scatter plot in Graph 27 and the estimated regression line, it seems clear that there is a positive relationship between the standard error and the estimated value of wage flexibility. In the absence of any selective reporting, this line should be horizontal, as the estimated elasticity should not vary in proportion to its standard error. However, if there is a tendency only to report results where the t-ratio is around 2 or greater, the reported estimated elasticity will increase as the standard error increases in order to maintain a t-ratio at or above 2.

Graph 27: Relationship between the absolute value of wage flexibility and the standard error of the estimates



The evidence of publication bias should be taken into account when looking at the various studies on this topic. The predominance of results indicating a certain reaction of

wages to unemployment is clear as the results predicted by economic theory. However, results indicating a non-significant relationship between wages and unemployment are certainly worrying from a policy-making point of view. Our empirical research should try to shed light on this issue.

We now present the results of meta-regressions, i.e. we estimate various regression models where the endogenous variable is the absolute value of wage flexibility and the explanatory variables are a set of variables (usually dummy ones) that reflect various study characteristics. The results of these regression models will help to identify the explanatory factors in the different results in the empirical literature on adjustment through wages and prices in the labour market. This is in order to obtain some guidelines for our empirical research.

An important issue regarding meta-regressions concerns the weight that should be given to the different publications. The quality of the various studies is not the same and, for that reason, one would like to make adjustments for quality differences. However, it is very difficult to do this without introducing subjective judgement. For this reason, we decided to use the inverse of the standard error of the estimates as weights, although this will imply that only 341 observations will be available as some studies do not report these values.

Another issue that needs to be highlighted is the existence of collinearity. As mentioned above, the correlations between several potential explanatory variables are quite high and, as a consequence, the number of explanatory variables in the different models will of necessity be reduced to avoid problems derived from collinearity.

Before showing the results of the meta regressions, it is worth mentioning that when using all the observations available for real wage flexibility:

- The inclusion of fixed effects for each of the considered studies explains 26% of the variance of the absolute value of wage flexibility.

- The inclusion of country-fixed effects explains 34% of the variance of the absolute value of wage flexibility.

- If we combine both sets of variables, they explain 48% of the variance of the endogenous variable.

The results of six different explanatory models of the absolute value of wage flexibility are shown in Table 14. All the estimates were obtained by applying weighted least squares using the inverse of the standard error of the estimates as weights. Taking this into account, the number of available observations is 341. It is worth mentioning that models 1, 2 and 3 are identical to models 4, 5 and 6 with the only difference that in the latter, country-fixed effects were included as explanatory variables.

When looking at this table, the following results should be emphasised:

- The dummy variable related to the fact that the study is a journal article is positive and significant at the usual levels in models 2, 3 and 4. This result is in line with previous evidence and reinforces the existence of publication bias in our data set.

- The dummy variable related to territory (region) show negative values in the models where it is introduced. This result implies that when working with more disaggregated models, the value of real wage flexibility will be lower than at country level. However, when this variable is replaced by the variable related to the consideration of a single or a pool territory, this new variable is not significant.

- As the choice of the database is clearly related to the level of territorial detail considered, we replaced the variables associated to territory in models 2 and 5 with those associated with the various databases. In both models, the use of national sources instead of using OECD data provides significantly different values of wage flexibility.

Table 14: Results of the meta-regression

Absolute value of the estimates of wage flexibility	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
WLS - Weights: Inverse of the standard error of the estimates	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value
Intercept	-0.57	0.02	2.37	0.00	0.76	0.15						
Journal article (WP, Book)	0.02	0.73	0.92	0.00	0.20	0.08	0.01	0.86	0.98	0.00	0.15	0.22
Region (Country)	-1.26	0.00			-1.49	0.00	-1.27	0.00			-1.44	0.00
Single territory (Pool)			0.23	0.24					0.11	0.65		
National sources (OECD)			-0.80	0.01					-0.84	0.02		
Eurostat data (OECD)			1.18	0.00					1.16	0.00		
Annual data (Quarterly)	0.43	0.00	-0.69	0.04	-0.14	0.62	0.37	0.01	-0.75	0.05	-0.17	0.57
Half-year data (Quarterly)	0.03	0.60	-0.76	0.02	0.22	0.06	0.05	0.50	-0.76	0.04	0.19	0.15
Hourly wage (Annual wage)	1.15	0.00			1.39	0.00	1.21	0.00			1.43	0.00
Growth rate of wages (level)			0.06	0.43					0.06	0.51		
Growth rate of unemployment (level)			0.06	0.60					0.01	0.91		
Wages as compensation of employees (other)			-1.88	0.00					-1.94	0.00		
Standardised unemployment (other)			0.16	0.66					0.19	0.62		
Ordinary least squares (other)	0.31	0.01	0.07	0.40	-0.29	0.28	0.25	0.06	0.07	0.42	-0.29	0.29
Restricted least squares (other)	1.01	0.04	1.31	0.01	0.53	0.29	1.00	0.05	1.22	0.02	0.56	0.28
Control for inflation (no control)	0.27	0.06			-0.28	0.29	0.21	0.17			-0.29	0.29
Control for wage persistence (no control)	0.28	0.04			-0.24	0.36	0.24	0.11			-0.21	0.45
Control for productivity (no control)	0.03	0.72			-0.01	0.91	0.03	0.74			-0.01	0.92
Number of observations	0.00	0.37	0.00	0.63			0.00	0.43	0.00	0.65		
60s included in the analysis					-0.02	0.47					-0.01	0.51
70s included in the analysis					-0.40	0.00					-0.36	0.01
80s included in the analysis					0.19	0.00					0.19	0.01
90s included in the analysis					-0.21	0.00					-0.21	0.00
00s included in the analysis					0.58	0.00					1.11	0.03
Un-weighted R^2	0.16		0.16		0.17		0.28		0.29		0.28	
Weighted R^2	0.24		0.21		0.28		0.26		0.23		0.29	
Country Fixed effects	No		No		No		Yes		Yes		Yes	

- The evidence regarding the use of annual data or half-year instead of quarterly data does not provide any robust conclusion, as in some models the associated dummy variables are not significant and there are even some sign changes. However, the opposite happens when using hourly wages instead of annual or weekly wages. The value of the elasticity increases. This fact is in line with the results in the wage curve literature as highlighted by Card (1995).

- The specification of levels or growth rates for wages and unemployment do not provide significantly different results after controlling for other variables.

- While the use of standardised unemployment does not seem to affect the results, the use of information concerning employees' compensation instead of wages is statistically significant.

- As expected, the use of ordinary least squares (OLS) or restricted least squares instead of other more complex and appropriate techniques significantly affects the estimates, although in some models this variable is not statistically significant.

- The introduction of control variables for inflation and wage persistence only seems to be relevant when the time period analysed is not controlled.

- Finally, we prepared a set of dummy variables related to the fact that information from the 60s, 70s, 80s, 90s, and 00s is included in the sample. As we can see from the table, the dummy variables for the 70s, 90s and 00s are significant. While the sign of the coefficients are negative for the first two variables, the sign for the third is positive.

In short, we ascertained that choosing a particular database with a certain frequency and definition of variables and a given level of territorial detail, using a certain econometric technique or including some control variables, can have significant effects on empirical results.

8.1.3. Identifying the role of institutions: preliminary evidence

In this section, we provide preliminary evidence on the role of institutions in explaining cross-country variations in the reaction of wages to unemployment. The idea is that the value of elasticity of wages to unemployment can be explained by the institutional setting. Two different measures are therefore going to be used:

- Firstly, we will consider the effects of the different institutional variables introduced in chapter 5 (employment protection legislation, trade union density, bargaining coverage, bargaining co-ordination, bargaining centralisation, benefit replacement rate, active labour market policy and tax wedge) on the average value of the elasticity of wages to unemployment in the various studies (see Table 13) within the framework of a multiple linear regression model.

- Secondly, we will carry out a similar analysis, but this time controlling for the different characteristics of the studies that have been identified as relevant when applying a two stage procedure in the previous section. Firstly, we recover the value of the country's various dummy variables in model 6 (which included fixed effects) and we then specify a linear regression model with these coefficients as endogenous variables and the institutional features as explanatory variables.

In both cases, the institutional variables have been measured as means over the whole period. The results of estimating these two models by Ordinary Least Squares are shown in Table 15. It is worth mentioning that although nineteen countries have been included in the analysis, the number of observations in each of this regression is 15 due to gaps in the institutional database.

Table 15: Elasticity of real wages to unemployment and labour market institutions

	Real wage flexibility	Real wage flexibility (after controlling for study characteristics)
Constant	2.02	0.01
	(2.15)	(0.08)
BRR		
DEN	-0.83	-0.88
	(1.58)	(2.19)
COV		
COO		0.31
		(2.65)
CEN	-0.35	-0.28
	(2.09)	(1.97)
EPL		-0.35
		(2.25)
EPL_T		
TAX	-3.79	
	(2.54)	
ALMP		
ALMP_1	2.37	2.25
	(1.52)	(2.09)
ALMP_2	0.35	0.55
	(2.09)	(1.99)
R-Squared	0.46	0.70

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Both sets of results show the relevance of institutions in explaining the different responses of real wages to changes in unemployment. After eliminating the distorting effect of study characteristics, the model's goodness of fit clearly improves, reaching a value of 0.70. As far as the effects of different institutions are concerned, a higher presence of trade unions (union density) and employment protection legislation have a nega-

tive impact on the response of real wages to a change in unemployment. The co-ordination variable enters the equation with the opposite sign implying that a higher level of co-ordination will improve the response of real wages to labour market conditions. Centralisation in collective bargaining has the expected negative effect in both models, while employment protection legislation is only significant (also with a negative sign) in the second. The tax wedge is also significant with a negative sign in the first model, which implies that higher values of this variable reduce the wage response to unemployment changes, while more active labour market policies (measured as training programs) seem to extend the reaction. However, the share of public employment services has a negative effect on both models. Other variables such as the benefit replacement rate or the bargaining coverage do not have any significant effect.

However, although interesting, the analysis in this section focuses only on the size of the response of wages to a change in unemployment. The following section will provide evidence for differences in adjustments, considering not only the reaction of real wages to unemployment, but also to productivity.

8.1.4. Conclusions from the meta analysis

The meta-analysis in this section has enabled us to identify some guidelines for our empirical work in the following sections, which can be summarised as follows:

- First of all, the prevailing view about differences in the reaction of wages to unemployment has been strongly influenced by the seminal contribution of Layard *et al.* (1991). However, the picture provided when other studies are considered is slightly different.

- The results when looking at the time variation of the estimates of real wage flexibility cast doubts on the possibility of using all available data for our econometric exercise, as there seems to be several structural changes. An extension that will be considered in the next sections is the use of time-varying coefficient models.

- As regards the characteristics of the different previous studies, the territory considered, the database used, the frequency of the data, the definition of some variables and the use of certain econometric techniques and methods are clearly interrelated. This fact should be taken into account when designing our empirical analysis.

- As mentioned above, evidence of publication bias should be taken into account when looking at the different studies on this topic. The preference for results indicating a certain reaction of wages to unemployment is clear, as are results predicted by economic theory. However, results indicating a non-significant relationship between wages and unemployment are certainly worrying from a policy-making point of view. Our empirical research should try to shed light on this issue.

- The results of the meta-regressions permits us to state that choosing a particular database with a certain frequency and definition of variables and a given level of territorial detail, using a certain econometric technique or including some control variables, can have significant effects on empirical results. It is therefore important to take all this into account in order to design our empirical exercise properly and to check the robustness of the results with different specifications and data sets.

- Finally, preliminary evidence on the role of institutions in explaining wage responses to labour market conditions show that a higher presence of trade unions (union density) and employment protection legislation implies a lower response. Other significant variables include bargaining co-ordination, active labour market policies, the degree of centralisation and the tax wedge, while other variables such as the benefit replacement rate or bargaining coverage do not seem to have significant effects. This kind of analysis will be considered further in the following sections, in order to consider the way the different labour markets react to shocks in more detail.

8.2. Empirical results of the VAR approach

In this section, a VAR analysis is performed to analyse real wage dynamics using AMECO annual data for each of the 15 EU member states, for the EU15 and the Euro area as entire regions and for the US from 1970 to 2003.

Based on standard specifications outlined in previous parts of the report, real wages are related to labour productivity and unemployment. While real wages are positively associated with productivity, the correlation with unemployment should be negative.

Having selected the variables of interest, the next step is to determine the lag length of the VAR model. As mentioned in section 7.2, several criteria are available, which are asymptotically equivalent. However, it has become common practice in applied work to use the Schwarz (SIC) criterion because the finite sample properties are somewhat better than the proper-ties of the Hannan-Quinn criterion or the Akaike information Criterion (AIC), for example. In this study we therefore restrict ourselves to the SIC. In fact, we proceeded by fixing a maximum lag length of 5 years and calculated the SIC for all the possible lag orders between 1 and 5. Finally, we selected the lag length where the SIC was minimised.

VAR models are estimated both in levels and differences as evidence for co-integration between these variables is not conclusive (section 7.1).

For each of these model variants, we allowed a lag length varying between 1 and 5. As it turned out, a lag length of either 1 or 2 is sufficient to describe the data. Table 16 shows the models selected following this procedure.

Table 16: Specification of the VAR models for real wages (1970-2003)

Real wages	Level		Differences	
	Exogenous	Lag order	Exogenous	Lag order
Austria	c, t	1	c, t	1
Belgium	c, t	1	c, t	1
Denmark	c	1	c	1
Finland	c, o, t	2	c, o	1
France	c	1	c, t	1
Germany	c	1	c	1
Greece	c, o	1	c	2
Ireland	c, t	1	c, o, t	1
Italy	c	1	c	1
Luxembourg	c, o	1	c	2
Netherlands	c	1	c	1
Portugal	c, o	1	c, o	1
Spain	c	1	c, t	2
Sweden	c, o, t	1	c, o, t	1
UK	c, o, t	1	c	1
EU15	c, t	1	c	1
EU12	c, t	1	c, t	1
US	c, t	1	c	2

c: constant; o: oil price; t: linear trend.

Having specified the VAR model for each country, we look at the dynamic responses of the real wage using the generalized impulse-response representation of the underlying system. Different sources of shocks (impulses to certain variables) are distinguished. The impulse-responses are usually presented graphically for a chosen period for the duration of the shocks. The response of a variable to an impulse in the same or another variable of the system can be analysed in two ways: We can either look at the behaviour of the response variable at each period, or we can look at the accumulated responses over time.

The responses in Graph 28 show the behaviour of real wages for the Euro area when the system is hit by shocks in real wages (LRW_EU12), labour productivity (LEPRO_EU12), and unemployment (LU_EU12)[3]. A positive one standard deviation shock in real wages thus raises real wages immediately, but the impact will decrease

[3] All variables are measured in logs, the graphs display the period-by-period responses to the different shocks, and the dotted lines are 95-% confidence intervals.

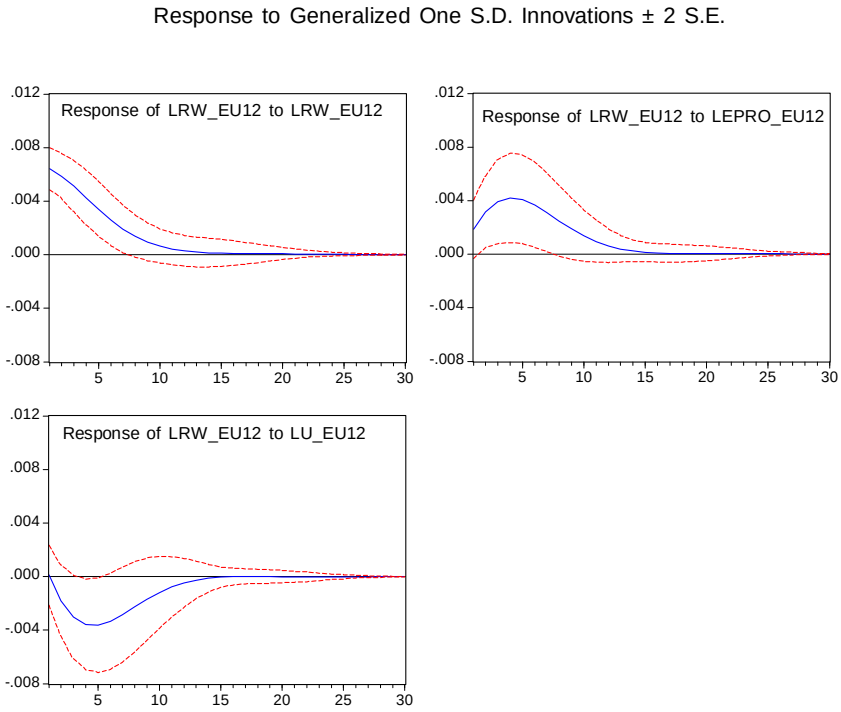
over time. After 7 years, the response of real wages to a shock in the real wage variable is no longer statistically significant. As far as a positive labour productivity shock is concerned, a positive response of real wages can be seen in the middle panel of the figure. As expected, real wages increase due to the shock to labour productivity. Real wages start to rise in the first 5 years. Afterwards, the raise weakens somewhat, and the impact is not statistically significant for the remainder of the periods considered. The lower panel shows the responses of real wages to an unemployment shock. During the first years, real wages will decrease when unemployment tends to increase. Thereafter, the response of real wages to a positive unemployment shock becomes statistically insignificant after 6 years.

The accumulated responses of real wages are shown in Graph 29. Starting with the accumulated responses for the whole period, the impact of a positive real wage shock and a positive labour productivity shock on real wages will be permanent, but will be more important during the first 10 years. On the other hand, the accumulated response of real wages to an unemployment shock is negative for all periods.

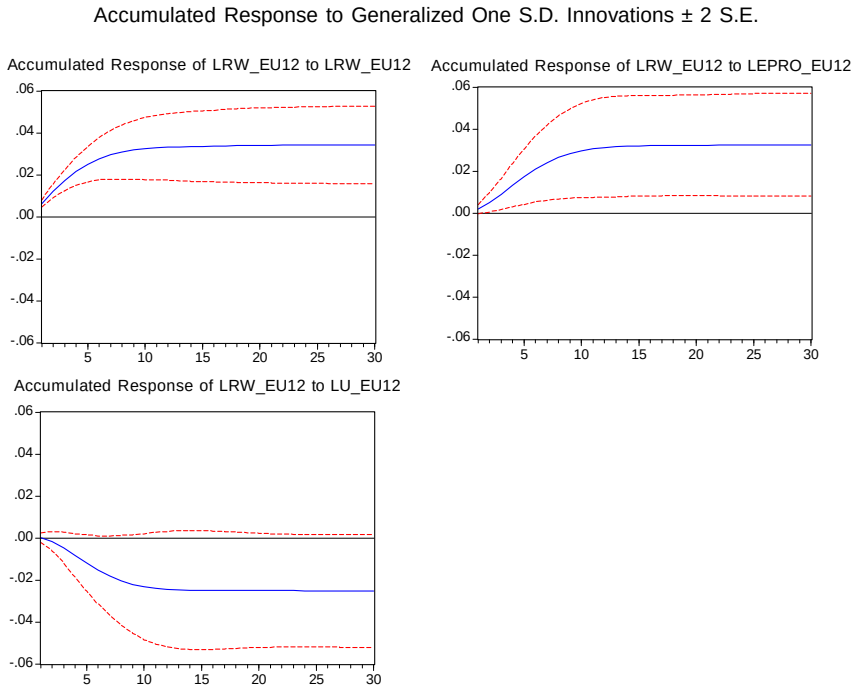
We next present selected results from the accumulated impulse-responses for all EU countries, the EU15 and the US. Here we only report the accumulated responses 2, 5 and 10 years after the shock. Tables A8.1 and A8.2 in annex 8.2 show the results for a shock in unemployment and for a shock in productivity for the level specification and for the differences specification respectively. In most cases the accumulated response of real wages to a positive shock in unemployment and to a positive shock in productivity is, as expected, negative for all points in time considered for the first shock and positive for the second shock. According to Table A8.1, the short-term (2 years) responses of real wages to an unemployment shock are lowest in absolute value for Greece and highest for Portugal, followed by Finland and Luxembourg. After 10 periods, the reaction is highest as an absolute value in Finland, the Netherlands, and Sweden. The lowest responses are found for the US. On the other hand, the short-run reaction of real wages to a productivity shock is highest for Portugal, and the lowest responses are reported for Belgium and Spain. In the long run, (10 years) Portugal and Greece show the largest reaction while Spain and Sweden show the lowest.

These figures will be treated as endogenous variables in a cross section regression model with institutional features as explanatory variables (see section 8.4).

Graph 28: Evolution of real wage in response to various shocks: Level specification



Graph 29: Accumulated evolution of real wage in response to various shocks: Level specification



8.3. Empirical results of the structural approach

Instead of looking at the accumulated impulse-responses, the primary interest in this section lies in the estimated elasticities, i.e., the elasticities of real wages with regard to unemployment and productivity. These elasticities are initially assumed to be constant over time, while we subsequently allow for varying structural elasticities (which enables a panel fixed effects analysis).

Moreover, taking the results of the meta-analysis into account, two additional robustness checks are carried out. Firstly, as unemployment and productivity cannot be considered strictly exogenous, the estimation by ordinary least squares turns out to be inadequate and in this case, two stage least squares estimates will be most appropriate. Taking this into account, real wage structural equations will be estimated by ordinary least squares (OLS), and also by two stage least squares (TSLS) using as instruments the first and second lag of the explanatory variabels. Secondly, the influence of the cho-

sen database (AMECO) on the results will be tested using macroeconomic information for the same time period from the OECD Economic Outlook database. The results of this second exercise are shown in annex 8.5. The correlation between the OLS estimates and the TSLS of the elasticities of real wages to unemployment is 0.99 in levels and 0.76 in differences, while the respective values are 0.96 and 0.47 for the elasticities of real wages to productivity.

The country-by-country OLS and TSLS elasticities are shown in Tables 17 and 18. As a rule, the elasticities are well-behaved - unemployment has a negative impact on real wages, whereas productivity enters with a positive sign. For the Euro area, the OLS estimates of the elasticities of real wages to unemployment range between -0.023 (level model), and -0.025 (difference model). If TSLS is used instead, these values are -0.025 (level) and -0.018 (difference specification).

With regard to the value of the elasticity of real wages to productivity for the EU12, the OLS and TSLS estimates are 0.045 and 0.047 in levels, while these values are 0.196 and 0.657 when working in differences.

In the next step, the elasticities obtained in this section are explained by the variables reflecting the institutional set-up in labour markets. In this analysis, we consider both constant and time-varying parameter approaches[4].

[4] The results of the estimates of the time-varying parameter models are not included in the report, but are available from the authors on request.

Table 17: Constant structural elasticities for real wages: OLS estimates

Real wages	Level		Differences	
	Unemployment	Productivity	Unemployment	Productivity
Austria	-0.015 (1.90)	1.883 (1.61)	-0.015 (3.68)	0.319 (2.13)
Belgium	-0.010 (1.60)	1.207 (8.59)	-0.023 (5.54)	0.810 (6.47)
Denmark	-0.002 (1.22)	0.683 (2.93)	-0.012 (3.65)	0.132 (1.81)
Finland	-0.051 (2.66)	0.786 (2.44)	-0.024 (4.65)	0.041 (1.28)
France	-0.008 (1.28)	0.192 (5.33)	-0.009 (1.83)	0.113 (1.83)
Germany	-0.008 (1.52)	1.111 (1.54)	-0.012 (6.80)	0.249 (4.30)
Greece	-0.022 (2.76)	0.313 (4.31)	-0.012 (1.59)	0.757 (6.16)
Ireland	-0.003 (1.17)	0.222 (1.95)	-0.010 (1.30)	0.172 (1.06)
Italy	-0.370 (3.41)	2.656 (6.22)	-0.050 (5.52)	0.121 (1.01)
Luxembourg	-0.001 (1.49)	0.053 (1.77)	-0.002 (2.63)	0.118 (1.85)
Netherlands	-0.013 (1.56)	0.920 (2.92)	-0.019 (3.79)	0.243 (2.08)
Portugal	-0.068 (6.67)	0.157 (3.67)	-0.052 (4.64)	0.339 (2.12)
Spain	-0.010 (1.27)	0.727 (1.97)	-0.011 (3.86)	0.429 (2.21)
Sweden	-0.027 (2.33)	1.384 (7.64)	-0.007 (1.29)	0.430 (1.83)
UK	-0.011 (2.51)	0.263 (3.82)	-0.018 (3.89)	0.246 (1.86)
EU12	-0.023 (4.86)	0.045 (1.75)	-0.025 (1.46)	0.196 (2.51)
EU15	-0.002 (1.26)	0.715 (2.93)	-0.019 (8.30)	0.235 (2.87)
US	-0.021 (2.06)	0.839 (4.88)	-0.013 (1.76)	0.439 (3.45)

Absolute t-values in parenthesis.

Table 18: Constant structural elasticities for real wages: TSLS estimates

Real wages	Level		Differences	
	Unemployment	Productivity	Unemployment	Productivity
Austria	-0.044 (1.55)	2.396 (5.81)	-0.002 (1.29)	0.310 (1.49)
Belgium	-0.059 (1.86)	1.557 (5.41)	-0.014 (1.10)	1.554 (2.58)
Denmark	-0.021 (1.86)	0.693 (2.63)	-0.015 (1.33)	0.094 (1.06)
Finland	-0.066 (4.47)	0.808 (2.46)	-0.008 (1.76)	0.292 (1.66)
France	-0.011 (1.53)	0.179 (4.82)	-0.021 (3.56)	0.058 (1.26)
Germany	-0.036 (1.57)	1.284 (8.15)	-0.013 (5.55)	0.110 (1.08)
Greece	-0.025 (1.87)	0.323 (2.57)	-0.014 (1.25)	0.951 (1.27)
Ireland	-0.004 (1.21)	0.018 (1.14)	-0.003 (1.34)	0.674 (1.60)
Italy	-0.794 (2.76)	4.161 (3.64)	-0.030 (1.29)	0.705 (1.70)
Luxembourg	-0.002 (1.69)	0.012 (1.27)	-0.001 (1.59)	1.540 (1.17)
Netherlands	-0.019 (1.86)	0.929 (1.97)	-0.022 (3.22)	0.307 (1.67)
Portugal	-0.063 (5.31)	0.164 (3.69)	-0.045 (2.24)	0.236 (1.33)
Spain	-0.013 (1.10)	0.734 (1.52)	-0.011 (1.97)	2.163 (1.21)
Sweden	-0.053 (3.50)	1.520 (7.01)	-0.006 (1.20)	0.339 (1.19)
UK	-0.010 (2.31)	0.244 (2.98)	-0.021 (3.90)	0.064 (1.15)
EU12	-0.025 (4.87)	0.047 (1.78)	-0.018 (1.81)	0.657 (1.94)
EU15	-0.024 (5.98)	0.067 (2.35)	-0.011 (1.21)	0.627 (1.18)
US	-0.034 (2.11)	0.824 (3.58)	-0.025 (1.21)	1.602 (1.08)

Absolute t-values in parenthesis.

8.4. The role of institutions to explain real wage responses to unemployment and productivity shocks

In this section, the accumulated impulse-responses estimated in section 8.2 are taken as endogenous in linear regression models where different institutional characteristics are introduced as explanatory variables. A similar analysis is carried out in annex 8.4 for the variance decomposition.

The idea is that institutions might have, for example, an impact on the size and duration of the responses of shocks. To improve the robustness of the results, several specifications are used. Based on the estimation period, accumulated impulse-responses are considered for 2, 5 and 10 years after the shock. Using these data, the institutional impact is investigated by a cross section model, with individual countries as the cross sections. The institutional variables are measured as means over the whole period.

The high correlation of the institutional variables and the small number of observations implies imprecise parameter estimates. Hence, the large models hide the relevant forces at work, and they need to be simplified successively. Simplification starts from different points to get a robust picture. The preferred equations for the accumulated responses over the entire period are shown in tables 19 to 22. In particular, we present the results for the response of real wages to unemployment and productivity shocks.

Tables 19 to 22 show the results of estimating linear regression models by OLS for the accumulated response of real wage to an unemployment shock and to a productivity shock. Accumulated responses are derived from either the level model (tables 19 and 20) or the difference model (tables 21 and 22). Similar tables are reported for the variance decomposition (tables A8.5 to A8.8 in annex 8.4).

Table 19: Cross section analysis of accumulated impulse-responses : Level specification. Response of real wages to an unemployment shock

Years	2	5	10
Constant	0.002 (1.32)	0.009 (0.93)	-0.004 (0.19)
EPL			
EPL_T			
DEN			0.083 (1.58)
COV			
COO			
CEN	-0.001 (2.04)	-0.007 (1.61)	-0.015 (1.67)
BRR			
ALMP_1			
ALMP_2			
TAX			
R-Squared	0.14	0.06	0.12

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 20: Cross section analysis of accumulated impulse-responses : Level specification. Response of real wages to a productivity shock

Years	2	5	10
Constant	0.000 (0.50)	0.023 (2.66)	0.015 (1.27)
EPL			
EPL_T			
DEN	0.005 (4.60)		
COV		-0.015 (1.81)	
COO			0.006 (1.23)
CEN			
BRR			
ALMP_1			
ALMP_2		0.031 (2.31)	
TAX			
R-Squared	0.22	0.12	0.04

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 21: Cross section analysis of accumulated impulse-responses : Differences specification. Response of real wages to an unemployment shock

Years	2	5	10
Constant	0.004 (2.46)	0.003 (1.48)	0.003 (1.39)
EPL			
EPL_T			
DEN	-0.007 (1.95)		
COV			
COO			
CEN	-0.001 (2.08)	-0.002 (3.75)	-0.002 (3.33)
BRR			
ALMP_1			
ALMP_2			
TAX			
R-Squared	0.38	0.16	0.13

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 22: Cross section analysis of accumulated impulse-responses : Differences specification. Response of real wages to a productivity shock

Years	2	5	10
Constant	0.002 (1.45)	0.006 (3.36)	0.006 (3.49)
EPL			
EPL_T	-0.001 (1.17)	-0.002 (1.72)	-0.002 (1.80)
DEN			
COV			
COO			
CEN			
BRR			
ALMP_1			
ALMP_2			
TAX			
R-Squared	0.03	0.05	0.06

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Looking at the results, it is worth mentioning that in general the impact of institutions does not increase with the time elapsed after the shock. As we will see in chapter 9, this result is the opposite of the one found for employment. More general, if we compare

these results with those obtained for employment, institutions seem to be more important than real wages in the response of employment to certain shocks. In other words, institutions have significant effects on the responses of both employment and real wages, but these effects are more relevant for employment. Eventually, the degree of wage adjustment might not be driven by single institutions. Instead, interactions between different institutions might be more relevant here. These findings are in line with the common view of labour market adjustment processes in the EU opposed to the US. According to this argument, wages are rather sticky in the downward direction, and the burden of adjustment lies mainly on employment.

Taken this comment into account, a stronger bargaining centralisation tends to reduce the real wage response to an unemployment shock, while union density has a positive effect on this reaction (Table 19). The wage response to the productivity shock will be widened in countries with high union density, although this effect is limited to the short run (Table 20). Also, active labour market policies-training have a positive effect, while coverage seems to reduce the reaction. In the long run (10 years), stronger bargaining co-ordination improves the response of real wages to a productivity shock. A result that should be highlighted is that employment protection legislation for temporary working contracts is statistically significant on the 10 percent level and has a negative sign. However, the effect is somewhat fragile, as it is limited to the difference specification.

As a supplement to the VAR analysis, we also analysed the impact of institutions based on structural models. In order to perform the appropriate tests, we first set up a cross-section analysis including the EU-member states and the US. Because of a lack of institutional data, Luxembourg and Greece have been excluded, leaving 14 countries to constitute the sample.

In a first exercise, the elasticities of real wages compared to unemployment and productivity are assumed to be constant over time. They are explained by the institutional framework, where the means of the institutions are considered. The results of this cross section analysis are shown in Tables 23 and 24 for the level and difference model, respectively. The results obtained from OLS and TSLS estimation are very similar. There are some differences between the level and the first difference specification. As a guid-

ance, the level specification might be better suited to capture the effects, as the institutional impact will materialize in the intermediate and long term.

Table 23: Cross section analysis of constant structural elasticities: Level specification. OLS (left) or TSLS (right)

	Productivity	Unemployment	Productivity	Unemployment
Constant	-2.314	0.211	-4.069	0.005
	(3.23)	(1.59)	(13.51)	(1.11)
EPL		-0.173		
		(2.42)		
EPL_T	0.322		0.623	-0.119
	(4.02)		(18.16)	(4.57)
DEN		-0.224	1.454	
		(2.27)	(3.68)	
COV	-3.533	0.354	-5.016	0.843
	(2.77)	(1.79)	(5.38)	(2.37)
COO	0.665		1.436	
	(3.56)		(9.35)	
CEN			-0.843	-0.061
			(7.51)	(1.61)
BRR	-1.167			0.698
	(1.96)			(1.95)
ALMP_1				
ALMP_2	-3.186	0.468	-5.794	0.578
	(4.04)	(2.48)	(2.23)	(1.45)
TAX	7.889	-0.625	11.03	-1.348
	(5.57)	(1.84)	(9.34)	(2.34)
R-Squared	0.89	0.75	0.99	0.88

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 24: Cross section analysis of constant structural elasticities: Difference specification. OLS (left) or TSLS (right)

	Productivity	Unemployment	Productivity	Unemployment
Constant	0.244	-0.003	-0.123	-0.041
	(1.33)	(0.56)	(0.31)	(3.07)
EPL		-0.014		-0.012
		(2.84)		(1.98)
EPL_T	0.071		0.167	
	(1.51)		(1.38)	
DEN		-0.036		
		(2.57)		
COV				
COO			0.169	
			(1.39)	
CEN				0.006
				(3.34)
BRR				
ALMP_1	0.929			
	(1.39)			
ALMP_2		0.062	-1.383	
		(3.38)	(1.78)	
TAX	-0.594			0.036
	(1.58)			(1.31)
R-Squared	0.32	0.62	0.32	0.42

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Starting with the elasticities of real wages to unemployment, the effect of active labour market policies-training is positive, while stronger union power, the tax wedge and higher employment protection legislation limits the effect of unemployment on real wages. For bargaining coverage, the results are inconclusive. As far as the elasticities of real wages to productivity are concerned, the effect of the tax wedge, bargaining co-ordination and employment protection legislation for temporary work contracts are

positive, but a higher use of active labour market policies - training and bargaining coverage - limits the positive effect of productivity on real wages.

In a further step, we allow for time varying structural elasticities, and perform a panel fixed effects analysis. Due to the fixed effects, the institutional impact can be separated from other country individual characteristics. Also, interactions between different types of institutions can be investigated in a panel, as there is a clear increase of degrees of freedom compared to the cross-section approach. The analysis of interactions can provide evidence for possible nonlinearities in the influence of institutions. The results of this exercise are given in Tables 25 and 26.

The coefficients of determination are remarkably higher in the flexible coefficient approach than those obtained for the constant elasticities model. This is due to the inclusion of country-specific fixed effects and also holds for the level and difference specification. There are two striking differences from the constant parameter approach. Firstly, the co-ordination variable is now significant and with the expected positive sign. Secondly, the variable proxying active labour market policies (measured as public employment services and administration) now shows a negative sign instead of the positive one found in the previous model. One possible explanation for this result is related to the time dimension of the considered approach. In particular, an increased demand for labour due to a productivity shock could lead to temporary pressure on the labour market, because people engaged in active labour market programmes are not at the disposal of private 1firms when the output change takes place and, as part of this pressure, real wages can increase.

In addition, interactions are highly important. Especially, the combination of the tax wedge with certain institutional variables such as benefit replacement rates or co-ordination produces significant results. This can be interpreted as evidence that the role of the tax wedge is not only relevant *per se*, but also through other indirect mechanisms. The combination of bargaining institutions (union density, centralisation, co-ordination, coverage) also reinforces the role of unions for the response of real wages to shocks. In this respect, the results are similar to the ones found by Belot and van Ours (2001).

Table 25: Panel fixed effects analysis of varying structural elasticities for the wage equation: Level specification: OLS (left) or TSLS (right)

	Productivity	Unemployment	Productivity	Unemployment
EPL	-0.333	-0.041	-0.491	0.057
	(6.84)	(2.11)	(7.88)	(1.32)
EPL_T				
DEN	-2.187	0.989	1.112	
	(4.94)	(8.51)	(2.35)	
COV	0.414	-0.037	0.187	
	(3.21)	(1.66)	(1.34)	
COO			-0.111	-0.006
			(2.79)	(1.60)
CEN		-0.011	0.324	
		(1.98)	(3.98)	
BRR	-0.394			0.266
	(1.53)			(2.85)
ALMP_1	1.041		1.044	
	(4.53)		(3.69)	
ALMP_2		-0.035		-0.051
		(3.47)		(2.52)
TAX	-1.05	0.725		
	(2.21)	(7.55)		
DEN*TAX		-1.857		
		(8.11)		
COO*TAX	-0.397	0.019		
	(3.36)	(1.93)		
BRR*EPL		0.041		
		(0.03)		
CEN*DEN	-0.063		-0.421	
	(1.51)		(3.70)	
DEN*COO	0.291			
	(2.69)			
BRR*TAX			-2.322	
			(4.59)	
EPL*TAX				-0.142
				(2.29)
CEN*COV				-0.024
				(1.86)
R-Squared	0.82	0.89	0.82	0.89

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 26: Panel fixed effects analysis of varying structural elasticities for the wage equation: Differences specification: OLS (left) or TSLS (right)

	Productivity	Unemployment	Productivity	Unemployment
EPL	0.345	0.018	4.975	0.391
	(6.41)	(7.16)	(1.39)	(1.28)
EPL_T				
DEN	-0.759			
	(6.10)			
COV				
COO				0.667
				(1.31)
CEN	-0.047			
	(2.06)			
BRR			2.12	
			(1.22)	
ALMP_1		0.079	1.674	
		(5.37)	(1.95)	
ALMP_2		-0.013		
		(3.92)		
TAX		-0.067		
		(3.93)		
COV*COO	0.057	-0.009		
	(2.06)	(3.19)		
TAX*BRR	-0.223			-0.055
	(1.55)			(1.35)
EPLT*BRR		-0.044		
		(9.86)		
COO*BRR		0.024		
		(6.64)		
CEN*DEN		0.006	-0.040	0.025
		(2.69)	(1.27)	(3.32)
COV*CEN			0.051	
			(1.73)	
DEN*COV				-0.010
				(2.51)
R-Squared	0.91	0.93	0.09	0.13

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Finally, we analyse the influence of the chosen database (one of the results found in the meta-analysis) on the obtained results. In particular, we reproduced the analysis using the OECD Economic Outlook. The results of this exercise are shown in annex 8.5 and confirm the main conclusions obtained with the AMECO database. However, there are some differences in the specifications and the results that are in line with the conclusions obtained from the meta-analysis. In this sense, if we compare the statistical information obtained from both sources, the most striking differences are related to the evolution of real wages. We have calculated the correlation coefficient between unemployment rates and the annual growth of rates of real wages and productivity for each country from the two sources. While the average correlation coefficient for unemployment is 1.00 (which indicates that the two data sets are identical) and for productivity growth is 0.94 (being the minimum value 0.78 for the Netherlands), the average value for real wage inflation is 0.76 (with a minimum of 0.56 for Spain and the maximum 0.93 for Portugal). The different coverage and definitions from the two sources could explain these differences. An additional aspect that should be highlighted is that differences do not concentrate in the first years of the sample.

Annex 8.1. List of studies included in the meta-analysis

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Annex 8.2. Accumulated impulse-responses for real wages from VAR analysis

Table A8.1: Accumulated Impulse-response for real wages: Level specification

	Unemployment shock			Productivity shock		
	Years			Years		
Country	2	5	10	2	5	10
Austria	0.0016	0.0162	0.0341	0.0026	0.0102	0.0154
Belgium	-0.0019	-0.0135	-0.0162	0.0002	0.0083	0.0194
Denmark	-0.0015	-0.0097	-0.0119	0.0032	0.0344	0.0817
Finland	-0.0065	-0.0437	-0.0654	0.0039	0.0310	0.0315
France	-0.0018	-0.0175	-0.0292	0.0012	0.0147	0.0355
Germany	-0.0016	-0.0180	-0.0400	0.0004	0.0099	0.0283
Greece	-0.0002	-0.0016	-0.0018	0.0034	0.0337	0.0834
Ireland	0.0005	0.0028	0.0049	0.0033	0.0152	0.0220
Italy	-0.0007	-0.0021	0.0046	0.0004	0.0057	0.0137
Luxembourg	-0.0044	-0.0217	-0.0234	0.0038	0.0318	0.0669
Netherlands	-0.0027	-0.0278	-0.0632	0.0019	0.0271	0.0776
Portugal	-0.0114	-0.0613	-0.0273	0.0063	0.0640	0.1174
Spain	-0.0010	-0.0089	-0.0184	0.0003	0.0036	0.0090
Sweden	-0.0011	0.0150	0.0498	0.0046	0.0223	0.0091
UK	-0.0010	-0.0053	-0.0056	0.0017	0.0129	0.0167
EU15	-0.0010	-0.0073	-0.0094	0.0020	0.0169	0.0243
EU12	-0.0013	-0.0099	-0.0148	0.0015	0.0134	0.0220
US	-0.0005	-0.0007	0.0012	0.0025	0.0185	0.0303

Table A8.2: Accumulated Impulse-response for real wages:

Difference specification

	Unemployment shock			Productivity shock		
	Years			Years		
Country	2	5	10	2	5	10
Austria	-0.0005	-0.0010	-0.0011	0.0011	0.0018	0.0018
Belgium	-0.0040	-0.0079	-0.0078	-0.0091	-0.0027	-0.0031
Denmark	-0.0049	-0.0049	-0.0049	-0.0005	0.0003	0.0003
Finland	-0.0074	-0.0075	-0.0085	0.0022	0.0114	0.0110
France	-0.0015	-0.0023	-0.0023	0.0013	0.0041	0.0042
Germany	-0.0001	-0.0028	-0.0029	-0.0037	-0.0054	-0.0053
Greece	-0.0028	-0.0039	-0.0040	-0.0114	-0.0117	-0.0118
Ireland	-0.0087	-0.0121	-0.0123	-0.0008	0.0020	0.0019
Italy	-0.0012	-0.0009	-0.0009	0.0006	0.0011	0.0011
Luxembourg	-0.0020	-0.0075	-0.0090	0.0067	0.0245	0.0293
Netherlands	0.0013	0.0072	0.0097	0.0013	0.0044	0.0054
Portugal	-0.0071	-0.0077	-0.0080	0.0050	0.0120	0.0121
Spain	-0.0003	-0.0036	-0.0032	-0.0044	-0.0145	-0.0133
Sweden	-0.0029	-0.0036	-0.0035	0.0023	0.0055	0.0050
UK	-0.0026	-0.0033	-0.0038	0.0013	0.0047	0.0048
EU15	-0.0011	-0.0060	-0.0066	-0.0001	0.0042	0.0049
EU12	-0.0018	-0.0051	-0.0053	-0.0015	0.0004	0.0005
US	0.0024	0.0021	0.0023	0.0025	0.0036	0.0032

Annex 8.3. Variance decomposition from VAR analysis for real wages

Table A8.3: Variance decomposition for real wages: Level specification

	Unemployment shock			Productivity shock		
	Years			Years		
Country	2	5	10	2	5	10
Austria	2.0667	19.6803	30.8116	4.9850	7.5155	6.9295
Belgium	0.7220	3.5622	3.5940	0.0082	1.7375	3.8740
Denmark	0.9189	3.4897	2.1560	4.3311	46.9818	70.4787
Finland	8.8555	35.4728	37.5046	3.2205	21.7488	18.7760
France	3.0265	21.0341	22.7440	1.3681	15.7666	30.6594
Germany	0.8987	6.9908	10.1381	0.0513	2.4802	5.5717
Greece	0.0022	0.0114	0.0100	0.4471	5.3494	11.9896
Ireland	0.0241	0.0988	0.1342	1.1598	2.8849	3.1072
Italy	0.1897	0.3811	2.1803	0.0795	1.6998	4.0117
Luxembourg	3.8511	10.4943	8.5937	2.9109	22.6126	38.3532
Netherlands	2.9603	22.2072	26.9414	1.4719	22.8914	43.8704
Portugal	6.5192	19.1497	21.1407	1.9837	20.6523	27.8682
Spain	0.2671	2.1071	3.4425	0.0300	0.3625	0.8449
Sweden	0.2860	11.0186	24.5570	4.8829	13.2175	10.8346
UK	0.3627	1.5379	1.5486	1.0918	9.0526	10.0644
EU15	1.6383	6.4148	6.5505	6.5977	34.7946	38.9700
EU12	2.0481	10.4002	11.5868	2.8233	19.3772	24.3281
US	0.1522	0.1735	0.3128	3.1764	19.3515	23.3241

Table A8.4: Variance decomposition for real wages: Difference specification

	Unemployment shock			Productivity shock		
	Years			Years		
Country	2	5	10	2	5	10
Austria	0.2699	0.3442	0.3444	1.1274	1.2393	1.2397
Belgium	4.3869	7.9477	7.9563	22.4025	23.8821	23.8985
Denmark	12.5934	12.6863	12.6868	0.1130	0.4825	0.4825
Finland	10.2212	11.8728	11.9049	0.9080	13.8531	14.3711
France	2.4469	2.5428	2.5428	1.7742	5.0464	5.0487
Germany	0.0019	0.9583	0.9625	6.5284	6.5634	6.5661
Greece	0.3994	0.6368	0.6383	6.6237	8.4935	8.4985
Ireland	13.3796	15.6615	15.6551	0.1129	0.8713	0.8766
Italy	0.4921	0.4961	0.4961	0.1312	0.1687	0.1687
Luxembourg	0.8929	2.2591	2.3335	10.0626	24.2266	25.0274
Netherlands	0.7799	4.2321	4.6240	0.7729	1.6816	1.7208
Portugal	2.8827	3.1734	3.1758	1.4137	3.3260	3.3267
Spain	0.0367	1.2651	1.2689	9.9654	20.2583	20.2706
Sweden	2.0642	2.4646	2.4770	1.2871	2.8006	2.8380
UK	2.7397	4.9836	5.0901	0.6554	5.0000	5.1861
EU15	1.4990	6.5949	6.5876	0.0042	3.8820	3.9309
EU12	3.9677	8.6473	8.6531	2.9200	3.7666	3.7665
US	4.2779	6.2224	6.3374	4.5255	4.9098	4.9779

Annex 8.4. Institutional impact on the variance decomposition of real wages

Table A8.5:. Cross section analysis of variance decomposition: Level specification Response of real wages; unemployment shock.

Years	2	5	10
Constant	-2.074 (1.10)	-17.947 (0.94)	-46.181 (4.01)
EPL			
EPL_T		-4.508 (2.10)	-4.757 (3.17)
DEN			-32.740 (1.84)
COV		55.641 (2.12)	
COO			
CEN	1.342 (1.79)		12.814 (4.55)
BRR			
ALMP_1			
ALMP_2			-25.599 (2.40)
TAX			106.623 (3.82)
R-Squared	0.22	0.36	0.54

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A8.6: Cross section analysis of variance decomposition: Level specification

Response of real wages; productivity shock.

Years	2	5	10
Constant	-3.384 (2.41)	5.234 (0.69)	-6.847 (0.58)
EPL		-8.724 (1.50)	
EPL_T	-0.670 (2.40)		
DEN	3.888 (2.75)		
COV			
COO			
CEN			
BRR	5.222 (3.69)	40.112 (1.92)	55.561 (1.69)
ALMP_1	-8.092 (2.37)		
ALMP_2			
TAX	8.031 (2.22)		
R-Squared	0.68	0.13	0.13

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A8.7: Cross section analysis of variance decomposition: Difference specification Response of real wages; unemployment shock.

Years	2	5	10
Constant	4.413 (1.84)	4.723 (3.18)	4.849 (3.28)
EPL	-7.294 (3.94)	-7.883 (4.54)	-7.908 (4.62)
EPL_T			
DEN			
COV			
COO			
CEN	3.450 (4.11)	3.310 (4.21)	3.293 (4.25)
BRR			
ALMP_1	-13.285 (1.75)		
ALMP_2			
TAX			
R-Squared	0.55	0.59	0.59

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A8.8: Cross section analysis of variance decomposition: Difference specification Response of real wages; productivity shock.

Years	2	5	10
Constant	-1.540 (0.79)	2.075 (0.60)	2.000 (0.56)
EPL			
EPL_T	1.938 (1.52)		
DEN		-15.062 (1.76)	-14.895 (1.73)
COV			
COO			
CEN		3.676 (2.08)	3.698 (2.05)
BRR			
ALMP_1			
ALMP_2			
TAX			
R-Squared	0.17	0.07	0.07

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Annex 8.5. Alternative results for structural equations for real wages using OECD data

Table A8.9:Constant OLS elasticities for the real wage (OECD data)

Real wages	Level		Differences	
	Unemployment	Productivity	Unemployment	Productivity
Austria	-0.010 (1.47)	1.099 (1.76)	-0.021 (4.80)	0.346 (1.64)
Belgium	-0.088 (3.56)	1.093 (1.81)	-0.029 (6.36)	0.361 (2.14)
Denmark	-0.005 (1.10)	0.444 (4.67)	-0.012 (2.33)	0.321 (1.33)
Finland	-0.134 (5.47)	0.953 (1.58)	-0.017 (2.65)	0.437 (1.78)
France	-0.079 (4.42)	1.186 (2.95)	-0.027 (6.96)	0.066 (1.42)
Germany	-0.042 (4.76)	0.174 (3.65)	-0.025 (4.54)	0.096 (1.80)
Greece	-0.023 (1.45)	0.560 (4.66)	-0.017 (1.96)	0.518 (3.25)
Ireland	-0.140 (1.10)	1.104 (5.16)	-0.043 (3.73)	0.377 (1.43)
Italy	-0.031 (2.05)	0.197 (3.94)	-0.021 (2.73)	0.264 (2.03)
Luxembourg	-0.043 (2.07)	1.226 (2.41)	-0.015 (2.59)	0.364 (1.57)
Netherlands	-0.128 (1.41)	1.753 (3.71)	-0.009 (1.93)	0.359 (1.67)
Portugal	-0.066 (1.10)	1.469 (1.40)	-0.058 (3.51)	0.473 (3.18)
Spain	-0.256 (1.56)	1.643 (3.71)	-0.023 (3.02)	0.182 (1.60)
Sweden	-0.092 (7.86)	1.007 (2.43)	-0.013 (1.80)	1.214 (4.23)
UK	-0.115 (1.09)	1.082 (4.04)	-0.017 (2.57)	0.314 (1.48)
EU12	-0.120 (6.56)	1.504 (2.52)	-0.024 (4.56)	0.002 (1.01)
EU15	-0.114 (7.85)	1.428 (3.45)	-0.013 (2.62)	0.192 (1.51)
US	-0.086 (2.59)	2.046 (3.39)	-0.035 (2.42)	0.437 (1.91)

Absolute t-values in parenthesis.

Table A8.10: Cross section analysis of constant structural elasticities for real wages: Level specification (left) and difference specification (right)

	Productivity	Unemployment	Productivity	Unemployment
Constant	1.284	-0.057	0.178	-0.068
	(3.64)	(1.09)	(0.83)	(3.10)
EPL				
EPL_T	-0.151	0.012		
	(2.09)	1.86		
DEN	-1.487		0.919	
	(2.56)		(2.17)	
COV			-0.471	-0.036
			(1.71)	(1.83)
COO		0.052		0.005
		(1.76)		(2.19)
CEN	0.261	-0.065		
	(2.65)	(1.95)		
BRR		-0.276		
		(2.47)		
ALMP_1			0.914	
			(1.22)	
ALMP_2		0.288		
		(2.17)		
TAX				0.098
				(2.13)
R-Squared	0.41	0.65	0.55	0.48

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

9. Analysis of employment response to output and real wages shocks

In this chapter, we present the results of the empirical analysis of the employment response measured in persons and working hours to output and real wages and its link to the different institutional variables that could influence this relationship.

For this task, the chapter will be organised into 3 sections and 3 appendices. First, a VAR analysis is performed in order to analyse employment dynamics. According to standard labour specifications outlined in chapters 6 and 7, employment depends on output and the real wage. While employment reacts positively to output, the relationship to the real wage should be negative. The analysis of accumulated impulse-responses will give a quantitative measure of the reaction of employment to output and real wage shocks. While the graphical presentation of accumulated impulse responses is done in the main text, the numerical results are given for the individual countries in annex 9.1. The evidence provided by the variance decomposition is included in annex 9.2.

Secondly, structural equation models are estimated in order to obtain fixed and time-varying estimates of the effect changes in output and the real wage on employment in the various countries.

Finally, in the third section, the different measures of the responsiveness of employment to output and real wages are taken as endogenous in linear regression models where different institutional characteristics are introduced as explanatory variables. Results for the variance decomposition is reported in annex 9.3. In case of the structural approaches, the institutional impact is discussed for the constant and time varying parameter models.

9.1. Impulse-responses of employment

In this section, a VAR analysis is performed to analyse employment dynamics using AMECO annual data for each of the 15 EU member states, for the EU15 and the Euro area as entire regions and for the US from 1970 to 2003. Due to data availability, Greece and Luxembourg are excluded from the analysis. Employment is measured either in persons and hours to constitute a further robustness check. All variables enter the analysis in logs. Moreover, the VAR models have been estimated with variables in levels and first differences. As a rule, the level specification will be better suited to capture the institutional impact, as the latter is expected to have an effect on the responses mainly in the intermediate and long run.

As it turned out, a lag length of either 1 or 2 was sufficient to describe the data. Tables 27 and 28 show the detailed VAR models selected from this procedure. Table 27 shows the specifications for the level, and Table 28 those for the difference version.

The responses in Graph 30 show the behaviour of employment among people in the Euro area when the system is hit by shocks in employment (LE_EU12), output (LY_EU12), and real wages (LRW_EU12). A positive one standard deviation shock in employment therefore raises employment immediately, but its impact will decrease over time. After four years, the response of employment to a shock in the employment variable is no longer statistically significant. The response of employment to a positive output shock is shown in the middle panel of the figure. As expected, employment increases due to the shock in economic activity, especially in the first five years. Afterwards, the rate of increase is somewhat weaker, but the impact remains significant for the whole period considered. The lower panel provides the responses to a real wage shock. During the first few years, a labour demand interpretation is appropriate, as employment will decrease when wages tend to increase. Labour supply is therefore also important, and because of the mixture of both effects, the response of employment to a positive wage shock becomes statistically insignificant after 10 years.

Table 27: Specification of the VAR models for employment in persons (left) or hours (right): Level specification

	Exogenous	Lag order	Exogenous	Lag order
Austria	C	1	c	1
Belgium	c, o	2	c, o	2
Denmark	C	1	c	2
Finland	c, d	1	c, d	1
France	c, o	1	c,o	1
Germany	c, o, d	1	c, o, d	1
Greece	C	1	c	1
Ireland	C	1	c	1
Italy	c, o	2	c, o	1
Luxembourg	c, t	1	c	1
Netherlands	C	1	c	1
Portugal	C	1	c	1
Spain	C	1	c	1
Sweden	c, o, t	1	c, o, t	1
UK	C	1	c	1
EU15	c, o	1		
EU12				
US	C	2	c	2

c: constant; o: oil price; t: linear trend; d: step (level) or impulse (difference) dummy variable, included for Finland and Germany to account for the unification (Germany) and for the recession in the early 1990s (Finland).

Instead of looking at the period-by-period responses of employment to different shocks, it may be more informative to look at the accumulated responses of employment over time (see Graph 31).

The impact of an employment shock on employment is only temporary. The accumulated response is significant over the first 7 years. The total effect then vanishes, at least from a statistical point of view. The behaviour of a positive GDP shock on employment is quite the opposite. Here, the accumulated response indicates that the effect will be permanent, thus leading to an improved employment performance in the Euro area. Finally, the accumulated response of employment to a real wage shock is negative for roughly two-thirds of the period, and statistically significant for the first 9 years. Similar results are obtained when employment is measured in hours.

Table 28: Specification of the VAR models for employment in persons (left) or hours (right): Differences specification

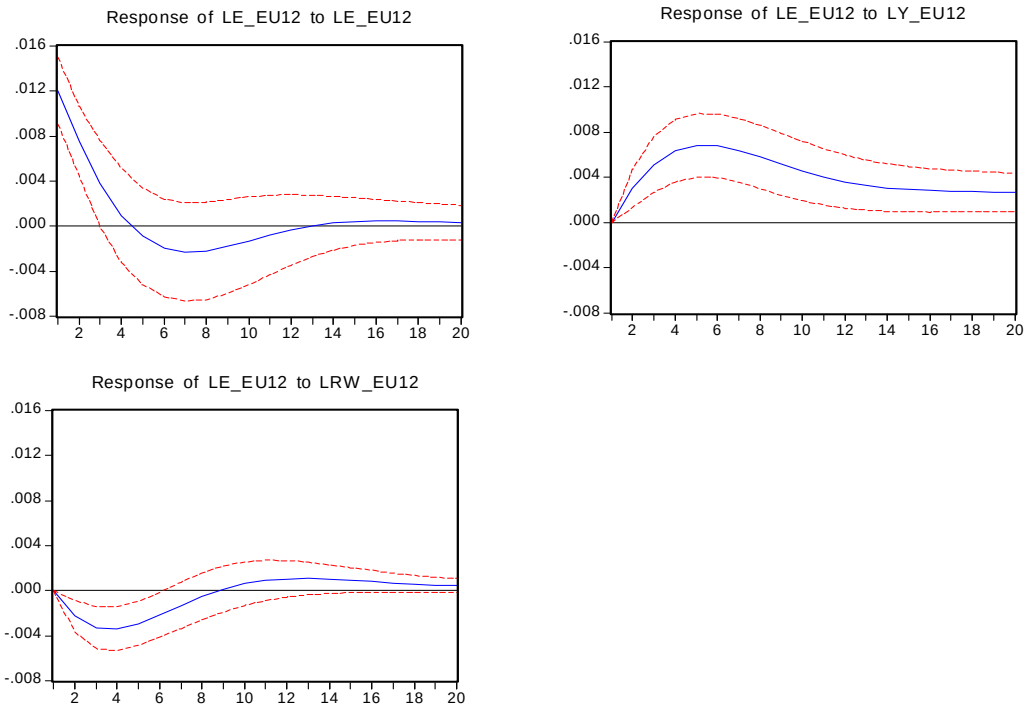
	Exogenous	Lag order	Exogenous	Lag order
Austria	c, o	1	c, o	1
Belgium	C	2	c	1
Denmark	C	1	c	1
Finland	c, d	1	c, d	1
France	c	1	c	1
Germany	c, d	1	c, d	1
Greece	c	1	c	1
Ireland	c	1	c	1
Italy	c	1	c	1
Luxembourg	c	1	c	1
Netherlands	c	1	c	1
Portugal	c	1	c	1
Spain	c	1	c	1
Sweden	c, o	1	c, o	1
UK	c	1	c	1
EU15	c, d	1		
EU12	c, d	1		
US	c	1	c	1

c: constant; o: oil price; t: linear trend; d: step (level) or impulse (difference) dummy variable, included for Finland and Germany to account for the unification (Germany) and for the recession in the early 1990s (Finland).

We next present results from the accumulated impulse-responses for all EU countries and the US. We report here on the accumulated responses of employment and the real wage 2, 5, and 10 years after the shock. Tables A9.1 to A9.4 in Annex 9.1 show the response of employment (in people and hours) to a shock in output and to a shock in the real wage. As the impact of shocks diminishes rather quickly in the difference model, the accumulated impulse-responses after 5 and 10 periods are very similar.

As the results are roughly comparable across the different models, the discussion can be limited to level specification for employment in people. The accumulated response of employment to a positive shock in GDP is usually positive for all periods considered. The short-run responses are lowest for France and highest for the US, followed by Ireland, the Netherlands and Belgium. After 10 periods, the employment effects are largest (relative to the size of the initial shock) in Ireland, the Netherlands, and Spain. The lowest responses are again found for France.

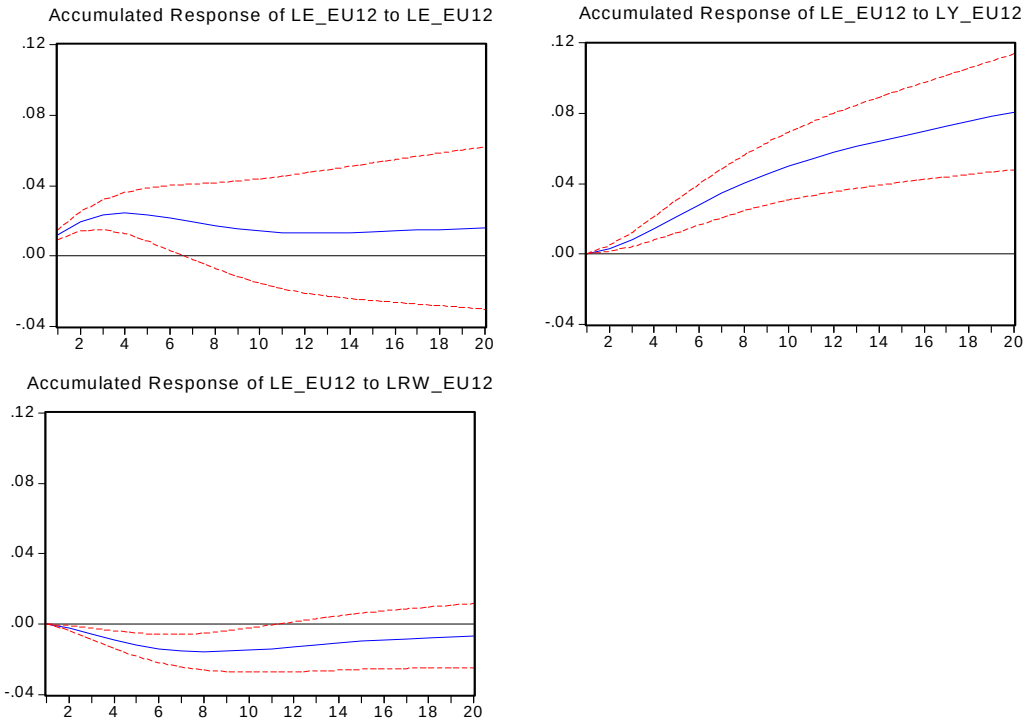
Graph 30: Evolution of employment in response to various shocks



The interim multipliers of employment to a real wage shock are usually negative. The short-run reaction of employment among people to a real wage shock is highest in absolute value in Ireland, Spain and Belgium, and lowest in France, Greece and Italy. In the long run (10 years), Spain and Ireland present the largest reaction.

The results for variance decomposition can be found in Tables A9.5 to A9.8 of Annex 9.2. The picture they show is roughly similar to that explained above.

Graph 31: Aggregated evolution of employment in response to various shocks



9.2. Structural employment equations

GDP and real wage elasticities of employment are obtained by a structural equation for employment. The country-by country OLS elasticities are shown in Tables 29 and 30. As a rule, the elasticities are well-behaved, especially in the level model. GDP has a positive impact on employment, whereas real wages enter with a negative sign. The elasticities for the EU15 are approximately 0.59 for output and –0.53 for real wages in the level model, respectively. Compared with the corresponding US figures (0.88 for output and –0.83 for the real wage), European labour markets seem to be less flexible to economic conditions. In the next step, these elasticities are explained by the variables reflecting the institutional set-up in labour markets. In this analysis, we consider constant and varying parameter approaches.

Table 29: Estimation of labour demand, levels
employment in persons (left) and hours (right)

	Output	Real wage	Output	Real wage
Austria	0.191 (4.28)	-0.070 (1.18)	-0.113 (1.22)	-0.062 (0.50)
Belgium	0.536 (10.60)	-0.464 (8.04)	0.367 (6.75)	-0.574 (9.24)
Denmark	0.321 (4.96)	-0.217 (2.01)	0.064 (0.28)	-0.558 (1.45)
Finland	0.526 (4.33)	-0.680 (4.54)	0.457 (3.98)	-0.813 (5.74)
France	0.316 (5.92)	-0.199 (2.73)	0.191 (3.37)	-0.530 (6.84)
Germany	1.059 (16.53)	-1.026 (7.70)	0.851 (10.50)	-1.223 (7.25)
Ireland	0.606 (22.09)	-0.679 (12.21)	0.462 (20.39)	-0.704 (15.32)
Italy	0.201 (4.73)	0.087 (1.060)	0.108 (2.36)	-0.092 (1.03)
Netherlands	0.975 (16.27)	-0.880 (7.16)	0.766 (8.51)	-1.195 (6.47)
Portugal	0.092 (1.35)	-0.025 (0.32)	-0.091 (1.27)	-0.038 (0.46)
Spain	0.750 (16.61)	-0.838 (12.49)	0.682 (8.10)	-1.082 (8.65)
Sweden	0.447 (4.66)	-0.494 (3.84)	0.276 (3.95)	-0.256 (2.73)
UK	0.469 (4.07)	-0.388 (2.51)	0.666 (3.48)	-0.946 (3.69)
EU15	0.590 (12.89)	-0.527 (6.64)		
EU12	0.609 (15.19)	-0.561 (7.35)		
US	0.878 (17.10)	-0.831 (6.00)	0.667 (11.16)	-0.280 (1.74)

Absolute t-values in parenthesis.

9.3. Institutional impact on employment

The high correlation level of the institutional variables and the small number of observations implies imprecise parameter estimates. The large models thus hide the relevant forces at work, and they need to be simplified successively. To obtain a robust picture, simplification should start from various points. The preferred equations for the accumulated responses over the period as a whole are shown in this section. In particular, we present the results for the response of employment to output and real wage shocks.

Table 30: Estimation of labour demand, differences
employment in persons (left) and hours (right)

	Output	Real wage	Output	Real wage
Austria	0.241 (3.89)	0.057 (0.79)	0.391 (2.37)	-0.114 (0.59)
Belgium	0.523 (5.54)	-0.340 (4.85)	0.601 (3.43)	-0.488 (3.77)
Denmark	0.497 (9.13)	0.002 (0.02)	0.559 (3.09)	0.110 (0.44)
Finland	0.706 (8.10)	-0.030 (0.30)	0.729 (7.85)	-0.161 (1.54)
France	0.426 (5.56)	-0.131 (1.65)	0.407 (3.01)	-0.429 (3.06)
Germany	1.518 (11.85)	-0.761 (3.32)	1.508 (12.35)	-0.776 (3.55)
Ireland	0.600 (5.76)	-0.127 (1.07)	0.541 (5.72)	-0.174 (1.62)
Italy	0.274 (2.71)	-0.039 (0.39)	0.311 (2.18)	-0.229 (1.63)
Netherlands	0.840 (3.71)	-0.392 (1.94)	0.839 (3.22)	-0.551 (2.38)
Portugal	0.242 (2.91)	0.011 (0.18)	0.269 (2.90)	0.022 (0.33)
Spain	0.902 (8.52)	-0.551 (5.99)	1.083 (7.35)	-0.571 (4.46)
Sweden	0.654 (5.06)	-0.052 (0.45)	0.735 (5.94)	-0.034 (0.31)
UK	0.532 (4.59)	-0.052 (0.35)	0.818 (6.53)	-0.127 (0.80)
EU15	0.652 (5.15)	-0.291 (2.06)		
EU12	0.769 (5.42)	-0.374 (2.47)		
US	0.669 (7.55)	-0.345 (2.14)	0.822 (7.39)	-0.436 (2.15)

Absolute t-values in parenthesis.

Tables 31 to 34 show the results of estimating linear regression models by OLS for the accumulated response of employment to a GDP and to a real wage shock. Accumulated responses are derived from either the level (Tables 31 and 32) or the difference (Tables 33 and 34) model. In each Table, results for the GDP shock are shown in the upper part, and those for a real wage shock in the lower. Similar Tables are given for the variance decomposition in Annex 9.3 (Tables A9.9 to A9.12).

Table 31: Cross section analysis of accumulated impulse-responses: Level specification. Response of employment in persons (left) or hours (right) to an output shock

	Years					
	2	5	10	2	5	10
Constant	0.005 (3.68)	0.029 (4.45)	0.078 (4.82)	0.007 (3.61)	0.046 (4.36)	0.110 (4.12)
EPL						
EPL_T						
DEN		-0.014 (1.66)	-0.104 (5.08)			-0.082 (2.06)
COV	-0.006 (3.09)	-0.044 (3.58)	-0.133 (4.44)	-0.009 (3.15)	-0.054 (3.63)	-0.140 (2.77)
COO		0.004 (2.01)	0.025 (4.53)			0.013 (1.38)
CEN						
BRR						
ALMP_1	0.011 (2.70)	0.074 (3.77)	0.190 (3.95)	0.007 (2.26)		
ALMP_2					0.031 (2.02)	0.070 (1.52)
TAX						
R-Squared	0.50	0.67	0.82	0.44	0.50	0.46

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 32: Cross section analysis of accumulated impulse-responses: Level specification. Response of employment in persons (left) or hours (right) to a real wage shock

	Years					
	2	5	10	2	5	10
Constant						
EPL	0.003 (2.34)	0.014 (1.88)	0.041 (1.77)			
EPL_T						
DEN			0.104 (1.51)			
COV					0.013 (1.14)	0.048 (1.51)
COO						
CEN	-0.001 (1.98)	-0.008 (1.81)	-0.037 (2.20)			
BRR	-0.008 (2.11)	-0.059 (2.26)	-0.127 (1.49)	-0.006 (4.94)	-0.052 (2.92)	-0.226 (3.72)
ALMP_1						
ALMP_2	0.006 (1.60)	0.056 (2.09)	0.121 (1.29)			0.132 (2.18)
TAX						
R-Squared	0.33	0.29	0.36	0.24	0.31	0.45

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 33: Cross section analysis of accumulated impulse-responses: Difference specification. Response of employment in persons (left) or hours (right) to an output shock

	Years					
	2	5	10	2	5	10
Constant	0.003 (1.58)	0.017 (2.20)	0.018 (1.77)	0.005 (4.02)	0.006 (1.17)	
EPL						
EPL_T	-0.001 (1.80)	-0.002 (1.82)	-0.002 (1.86)	-0.001 (3.57)	-0.002 (2.48)	-0.003 (2.22)
DEN				0.003 (1.49)		0.010 (1.06)
COV		-0.008 (2.16)	-0.009 (1.74)			
COO		0.001 (2.41)	0.002 (2.09)			
CEN					0.002 (1.26)	0.002 (1.26)
BRR						
ALMP_1	0.012 (1.66)	0.031 (1.87)	0.028 (1.26)			
ALMP_2						
TAX						
R-Squared	0.35	0.49	0.40	0.57	0.30	0.35

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 34: Cross section analysis of accumulated impulse-responses: Differences specification. Response of employment in persons (left) or hours (right) to a real wage shock

	Years					
	2	5	10	2	5	10
Constant						
EPL			0.009 (2.15)			
EPL_T						
DEN	0.004 (1.19)	0.022 (2.19)	0.042 (3.50)	0.005 (1.36)	0.031 (3.40)	0.045 (4.00)
COV						
COO						
CEN	-0.001 (1.47)	-0.003 (2.02)	-0.010 (3.35)	-0.001 (1.31)	-0.004 (2.65)	-0.006 (3.32)
BRR						
ALMP_1	-0.010 (1.29)	-0.045 (2.19)	-0.058 (2.55)	-0.016 (2.05)	-0.061 (3.26)	-0.068 (2.96)
ALMP_2						
TAX						
R-Squared	0.13	0.40	0.57	0.26	0.59	0.62

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Looking at these results, the impact of institutions usually increases with the time elapsed after the shock. A stronger presence of trade unions (union density, bargaining coverage) generally tends to reduce the response of employment to an output shock, while the effect is compensated for by a higher degree of co-ordination and centralisa-

tion. The response of employment to an output shock thus tends to be larger in more coordinated systems. Active labour market policies enter with a positive sign, whether they are measured by public employment services or training measures. It is important to note that a positive GDP shock will lower the relative expenditures on these policies. Their shares of GDP are falling, implying that the response of employment is limited. Private activities may be crowded out by an extensive use of public employment services, and labour market training measures might not meet the demand really needed by firms. Compared to the analysis in chapter 8, the single institutions have a more direct impact on employment than on wages.

These results are more or less confirmed when accumulated impulse-responses taken from first difference models are considered. As a new finding, employment protection legislation for temporary working contracts is expected to reduce the reaction of employment to the output shock. It is important to note that the evidence is limited to the difference model, in which the accumulated responses of the employment fluctuations are explained.

As regards the effects on employment of the real wage shock, an increase in wages usually leads to a decline in employment. A positive sign of a regressor therefore means that employment losses are smaller. An increase in the strength of trade unions and stronger employment protection legislation will therefore limit employment losses. Similarly, they limit the employment gains in case of a negative real wage shock. Firms in countries with higher employment protection are expected to hoard labour to a greater extent. Furthermore, active labour market policies reduce the response pf employment. By contrast, the economic situation is more important if bargaining is centralized. Finally, higher benefit replacement rates tend to make the reaction of employment more wide-ranging. This effect only occurs in the level specification, where the existence of a long-run relationship between employment, GDP and real wages is assumed. In this context, the result can be justified as follows - after a real wage increase, employment will decline. In general, higher unemployment has a negative impact on future wage demands. However, this correction is lower in countries with more generous un-

employment benefits, implying that net employment losses in response to a real wage shock are larger.

As a supplement to the above VAR analysis, we also analyse the impact of institutions based on a structural model. Instead of looking at the accumulated impulse-responses, the primary interest lies in the estimated elasticities, i.e., the elasticities of employment with respect to output and real wages. In a first exercise, these elasticities are assumed to be constant over time. They are explained by the institutional framework, where the means of the institutions are considered. The results of this cross-section analysis are shown in Tables 35 and 36. In a further step, we allow for varying structural elasticities, and perform a panel fixed effects analysis. The results of the latter exercise are given in Tables A9.13 and A9.14 in Annex 9.3.

According to the coefficient of determination, a model for employment in people performs better than the one for hours worked, at least in the level variant. About 60% of the variance is explained by institutional factors for employment in people, considerably less than in the alternative. Nevertheless, all specifications listed in Table 35 show the expected signs for the explanatory variables, and, in most cases, the estimated coefficients are significant at the 5% level. The least satisfactory equation relates to the hours specification in the real wage equation. Only two of the explanatory variables are significant at the usual levels.

Employment protection variables proved to be insignificant in all the equations in Table 36. A higher presence of trade unions (density and coverage) limits the positive effect of output on employment. As in the case of accumulated impulse-responses, there is some evidence for a compensating effect from higher co-ordination and centralisation. The two measures of active labour market policies worsen the employment performance. Here, the impact of public employment services exceeds the labour market training effect. This is what would be expected, given that the former is a direct policy measure with respect to employment, whereas training works more indirectly, by improving the skills of the participants. Higher unemployment benefits are expected to lower the em-

ployment response. The tax wedge measure does not exert any impact on the elasticities, for either output or the real wage.

The relevance of trade unions in explaining output and real wage elasticities suggests that unions are more interested in keeping the real wage level constant than in increasing employment. This result would be in line with the insider-outsider-approach in the process of wage determination.

A closer look at active labour market policies and their coefficients may support the following interpretation: As both variables are measured as their share of GDP expenditure, an increase in output leads to a decline in active labour market policies. Employment growth due to a positive change in output is thus smaller than it may have been without these policies. A possible explanation might be that people embedded in the active labour market programmes are not at the disposal of private firms when the output change takes place. Although this explanation might not be totally convincing, it is in line with the reaction indicated in the real wage equation. An increased demand for labour due to a rise in output leads to temporary pressure in the labour market and, as part of this pressure, to higher real wages.

It may be suggestive to interpret the hours specification as a specification which is better suited to show short-term effects because hours are usually more volatile than people are. In this regard, the results in Table 35 indicate that the impact of institutions on the output elasticity and the real wage elasticity works mainly in the medium term.

The results presented in Table 36 are quite robust with respect to the explanatory variables as well as with respect to the size and significance levels of the coefficients. Even the coefficients of determination do not decline in the first difference specifications compared to the level versions.

Table 35: Cross section analysis of constant structural elasticities: Level specification. Employment in persons (left) or hours (right)

	Output	Real wage	Output	Real wage
Constant	1.297 (4.40)	-1.233 (3.41)	1.212 (3.27)	-0.389 (1.06)
EPL				0.242 (1.06)
EPL_T				
DEN	-1.440 (3.17)	1.579 (2.83)	-1.234 (2.16)	1.101 (1.95)
COV	-1.091 (2.93)	1.454 (3.18)	-1.182 (2.52)	
COO				-0.176 (1.33)
CEN	0.227 (2.47)	-0.339 (3.01)	0.210 (1.82)	
BRR	-1.629 (2.37)	1.791 (2.12)	-1.563 (1.81)	
ALMP_1	2.794 (3.54)	-3.108 (3.20)	3.008 (3.03)	-2.427 (1.99)
ALMP_2	1.104 (1.88)	-1.120 (1.66)	0.749 (1.01)	
TAX				
R-Squared	0.63	0.59	0.48	0.26

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 36: Cross section analysis of constant structural elasticities: Differences specification. Employment in persons (left) or hours (right)

	Output	Real wage	Output	Real wage
Constant	1.427 (5.06)	-0.743 (2.61)	1.571 (4.06)	-0.409 (2.53)
EPL				
EPL_T				
DEN	-2.055 (4.73)	1.499 (3.42)	-1.726 (2.90)	1.064 (4.38)
COV	-0.940 (2.64)	0.490 (1.36)	-1.109 (2.27)	
COO				-0.051 (1.07)
CEN	0.335 (3.81)	-0.183 (2.06)	0.306 (2.54)	
BRR	-2.688 (4.09)	1.254 (1.89)	-2.404 (2.67)	
ALMP_1	2.847 (3.77)	-1.595 (2.09)	2.789 (2.69)	-1.082 (1.94)
ALMP_2	2.153 (3.83)	-0.963 (1.70)	1.716 (2.23)	
TAX				
R-Squared	0.72	0.48	0.47	0.60

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

As an alternative to constant parameters, time-varying elasticities are considered. Due to the fixed effects, the institutional impact can be separated from other country individual characteristics. Also, interactions between different types of institutions can be investigated in a panel, as there is a clear increase of degrees of freedom compared to the cross-section approach. They are used as an instrument for controlling for possible nonlinearities in the influence of institutions. The results of this exercise are shown in Tables 37 and 38.

As in the case of real wages, the coefficients of determination are remarkably higher in the flexible coefficient approach than those obtained for the constant elasticities model. This is due to the inclusion of country-specific fixed effects and also holds for the level and difference specification.

In our opinion, the most striking difference compared to the constant parameter approach is the occurrence of employment protection legislation in the varying elasticity model and its high level of significance. According to the empirical t-values, this variable is most important in both specifications (levels and first differences). There are good reasons for considering employment protection as a measure which behaves asymmetrically over the business cycle. It is less important during booms, but becomes more important during recessions, when firms try to reduce their number of employees. In the constant elasticity approach, it is implicitly assumed that the relevant elasticities are constant over the various phases of the business cycle. In the varying parameter approach, the elasticities are allowed to change over time and this behaviour may be more adequate for reflecting the behaviour of firms during the different phases of the business cycle.

In addition to single regressors, interactions between different types of institutions have been taken into account. The level specification is considered as the guideline for deciding on the relevance of these terms. In specific terms, we applied the following rule - the most important institutional variable was selected and reasonable interactions with other measures of the institutional setting were analysed. Interaction terms which are signifi-

cant in the level specification were also used for the difference model. Here, no additional interaction terms were allowed to enter for ease of comparison between the different models.

The negative impacts of union densities and benefit replacement ratios on output elasticity are weakened in countries where both measures are high. Interactions between union densities and the tax wedge lead to a lower output elasticity. As the tax wedge is not relevant as a single variable, the latter result indicates that taxes seem to operate in an indirect way. For wage elasticities, the results based on interactions are less robust than for output elasticities.

As a summary, if we compare the explanatory variables in both types of models (fixed and time-varying elasticities), four major conclusions can be drawn. Firstly, in the varying elasticities model employment protection legislation is highly significant with the expected signs, whereas in the constant elasticity approach this variable made no contribution at all. Secondly, active labour market policies exert a much lower impact on employment than in the constant parameter case. Training programs are now more important than public employment services. Third, the tax wedge becomes a significant variable, but only in the first difference specification for the hours/real wage equations. Finally, interaction terms are significant, and this points to the existence of nonlinear effects. However, they are less important for employment when compared to the real wage analysis.

Table 37: Panel fixed effects analysis of varying structural elasticities: Level specification: employment in persons (left) or hours (right)

	Output	Real wage	Output	Real wage
Constant	2.204 (8.75)	-1.245 (5.15)	2.681 (7.40)	-1.689 (4.92)
EPL	-0.462 (7.02)	0.426 (2.51)	-0.430 (4.55)	0.467 (4.53)
EPL_T				
DEN	-2.910 (4.46)		-3.715 (3.96)	0.962 (2.70)
COV		0.281 (1.69)		
COO				
CEN	0.103 (3.40)	-0.102 (2.65)	0.115 (2.65)	-0.102 (2.15)
BRR	-2.673 (5.89)	0.673 (2.03)	-3.700 (5.67)	1.538 (3.71)
ALMP_1	0.330 (1.17)	-1.404 (4.21)	0.494 (1.22)	-0.759 (1.67)
ALMP_2	0.140 (1.91)		0.565 (5.36)	-0.569 (4.86)
TAX				
EPL*TAX		0.510 (2.11)		
DEN*TAX	-0.886 (1.14)		-2.139 (1.92)	
DEN*BRR	5.162 (5.31)		6.591 (4.72)	
R-Squared	0.88	0.89	0.80	0.77

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table 38: Panel fixed effects analysis of varying structural elasticities: Differences specification: employment in persons (left) or hours (right)

	Output	Real wage	Output	Real wage
Constant	2.354 (8.22)	-0.756 (5.64)	2.279 (11.67)	-0.611 (4.59)
EPL	-0.428 (5.82)	0.274 (7.06)	-0.387 (7.34)	0.164 (4.25)
EPL_T				
DEN	-2.609 (4.21)	0.358 (2.88)	-2.490 (5.86)	0.244 (1.98)
COV				
COO				
CEN				
BRR	-2.331 (4.39)	0.849 (5.44)	-2.265 (6.20)	1.124 (7.25)
ALMP_1	0.757 (2.43)	-0.213 (1.33)	0.949 (4.41)	-0.251 (1.58)
ALMP_2		0.067 (1.63)	0.164 (2.97)	-0.042 (1.03)
TAX		-0.538 (2.74)		-0.874 (4.47)
EPL*TAX				
DEN*TAX				
DEN*BRR	3.922 (3.48)		3.707 (4.82)	
R-Squared	0.82	0.93	0.93	0.94

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Annex 9.1. Accumulated impulse-response for employment from VAR analysis

Table A9.1: Accumulated impulse-responses for employment: Level specification GDP shock. Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	0.0013	0.0092	0.0244	0.0000	-0.0008	-0.0051
Belgium	0.0046	0.0180	0.0412	0.0034	0.0158	0.0251
Denmark	0.0012	0.0092	0.0219	0.0043	0.0229	0.0343
Finland	0.0013	0.0087	0.0227	-0.0001	-0.0009	-0.0023
France	0.0004	0.0031	0.0106	0.0014	0.0070	0.0099
Germany	0.0024	0.0233	0.0879	0.0008	0.0078	0.0299
Greece	0.0036	0.0235	0.0602	0.0028	0.0159	0.0401
Ireland	0.0051	0.0389	0.1248	0.0030	0.0214	0.0660
Italy	0.0014	0.0115	0.0272	0.0010	0.0059	0.0123
Luxembourg	0.0026	0.0191	0.0493	0.0031	0.0254	0.0834
Netherlands	0.0047	0.0366	0.1124	0.0027	0.0222	0.0711
Portugal	0.0013	0.0103	0.0324	0.0008	0.0049	0.0086
Spain	0.0032	0.0286	0.0999	0.0030	0.0272	0.0953
Sweden	0.0042	0.0236	0.0277	0.0069	0.0334	0.0426
UK	0.0030	0.0195	0.0404	0.0015	0.0097	0.0204
EU15	0.0027	0.0181	0.0394			
EU12	0.0030	0.0214	0.0501			
US	0.0055	0.0270	0.0608	0.0071	0.0415	0.0797

Table A9.2: Accumulated impulse-responses for employment: Level specification

Real wage shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	-0.0007	-0.0048	-0.0098	-0.0008	-0.0044	-0.0086
Belgium	-0.0045	-0.0232	-0.0463	-0.0037	-0.0235	-0.0316
Denmark	-0.0027	-0.0119	-0.0084	-0.0060	-0.0230	-0.0376
Finland	-0.0024	-0.0148	-0.0324	0.0002	0.0015	0.0036
France	-0.0004	-0.0024	-0.0065	-0.0014	-0.0075	-0.0122
Germany	-0.0017	-0.0112	-0.0267	-0.0008	-0.0059	-0.0168
Greece	-0.0006	-0.0055	-0.0201	-0.0034	-0.0181	-0.0410
Ireland	-0.0062	-0.0436	-0.1223	-0.0056	-0.0352	-0.0904
Italy	0.0010	-0.0023	-0.0067	-0.0014	-0.0067	-0.0086
Luxembourg	-0.0027	-0.0207	-0.0580	-0.0029	-0.0222	-0.0613
Netherlands	-0.0032	-0.0228	-0.0633	-0.0028	-0.0215	-0.0620
Portugal	-0.0014	-0.0103	-0.0281	-0.0016	-0.0108	-0.0253
Spain	-0.0061	-0.0521	-0.1630	-0.0057	-0.0487	-0.1566
Sweden	-0.0018	-0.0155	-0.0336	-0.0038	-0.0171	-0.0178
UK	-0.0035	-0.0173	-0.0185	-0.0034	-0.0203	-0.0378
EU15	-0.0018	-0.0092	-0.0099			
EU12	-0.0022	-0.0118	-0.0149			
US	-0.0006	-0.0114	-0.0273	0.0021	-0.0026	-0.0043

Table A9.3: Accumulated impulse-responses for employment: Difference Specification. GDP shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	0.0016	0.0020	0.0020	0.0068	0.0047	0.0049
Belgium	0.0028	0.0006	0.0004	0.0016	0.0001	-0.0001
Denmark	-0.0016	-0.0010	-0.0010	0.0030	0.0022	0.0022
Finland	0.0046	0.0151	0.0189	0.0050	0.0126	0.0164
France	0.0006	0.0011	0.0003	0.0031	0.0011	-0.0018
Germany	0.0013	-0.0012	-0.0047	0.0006	-0.0044	-0.0115
Greece	0.0010	0.0009	0.0009	0.0026	0.0024	0.0024
Ireland	0.0064	0.0150	0.0181	0.0065	0.0131	0.0149
Italy	0.0016	0.0037	0.0040	0.0025	0.0039	0.0040
Luxembourg	0.0028	0.0079	0.0102	0.0020	0.0060	0.0081
Netherlands	0.0049	0.0141	0.0145	0.0054	0.0146	0.0146
Portugal	0.0029	0.0055	0.0058	0.0033	0.0049	0.0047
Spain	0.0018	0.0025	-0.0020	0.0020	0.0042	-0.0002
Sweden	0.0052	0.0119	0.0106	0.0066	0.0110	0.0106
UK	0.0062	0.0107	0.0093	0.0056	0.0090	0.0081
EU15	0.0035	0.0022	0.0011			
EU12	0.0034	0.0022	0.0014			
US	0.0052	0.0059	0.0059	0.0050	0.0077	0.0074

Table A9.4: Accumulated impulse-responses for employment: Difference specification. Real wage shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	-0.0007	-0.0009	-0.0010	0.0017	0.0036	0.0037
Belgium	-0.0038	-0.0072	-0.0071	-0.0065	-0.0111	-0.0116
Denmark	-0.0034	-0.0046	-0.0044	-0.0043	-0.0036	-0.0036
Finland	-0.0021	-0.0071	-0.0090	-0.0007	-0.0016	-0.0020
France	-0.0008	-0.0030	-0.0040	-0.0034	-0.0095	-0.0107
Germany	-0.0032	-0.0147	-0.0182	-0.0057	-0.0207	-0.0210
Greece	0.0022	0.0023	0.0023	0.0010	0.0021	0.0021
Ireland	-0.0086	-0.0252	-0.0315	-0.0069	-0.0182	-0.0214
Italy	0.0010	0.0035	0.0040	0.0012	0.0033	0.0034
Luxembourg	-0.0012	-0.0034	-0.0045	-0.0004	-0.0013	-0.0018
Netherlands	-0.0041	-0.0159	-0.0213	-0.0046	-0.0179	-0.0239
Portugal	-0.0003	-0.0005	-0.0005	-0.0022	-0.0049	-0.0054
Spain	-0.0054	-0.0216	-0.0290	-0.0055	-0.0247	-0.0367
Sweden	0.0005	-0.0041	-0.0040	-0.0013	-0.0049	-0.0048
UK	-0.0013	-0.0050	-0.0046	-0.0027	-0.0078	-0.0073
EU15	-0.0023	-0.0051	-0.0058			
EU12	-0.0027	-0.0051	-0.0059			
US	-0.0001	0.0016	0.0014	0.0020	0.0048	0.0045

Annex 9.2. Variance decomposition from VAR analysis for employment

Table A9.5: Variance decomposition for employment: Level specification
GDP shock. Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	2.1452	15.8378	33.6216	0.0001	0.0666	1.0151
Belgium	8.3815	12.6624	16.0674	2.7939	9.3886	11.1649
Denmark	0.7655	7.0485	14.7259	2.9768	10.7013	11.2065
Finland	0.6133	2.9682	5.8029	0.0052	0.0319	0.0676
France	0.1062	0.6995	1.7567	1.2641	6.0339	7.0189
Germany	4.6191	37.8073	71.5994	0.2381	3.6994	18.5247
Greece	3.0393	18.6096	32.5142	1.3566	7.3637	13.7831
Ireland	3.5962	17.3580	30.7501	1.3080	6.8445	13.9553
Italy	1.1538	11.6351	22.7834	0.3875	3.0393	5.6465
Luxembourg	10.0683	29.3581	33.5389	5.8944	28.3988	48.7354
Netherlands	3.1670	24.7699	49.9422	0.8762	9.2861	26.3395
Portugal	0.3266	2.8221	8.4010	0.1204	0.6584	0.8720
Spain	2.5553	13.2692	22.7398	1.4718	10.0107	19.8967
Sweden	4.1001	13.8467	14.2964	13.3659	40.2396	42.2709
UK	2.5338	15.7650	24.4321	0.3408	1.8324	3.1417
EU15	4.5447	31.1525	47.7323			
EU12	4.2600	32.6824	51.1425			
US	5.7419	14.3267	20.3246	9.3776	40.3257	48.8712

Table A9.6: Variance decomposition for employment: Level specification

Real wage shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	0.7378	4.1241	5.5503	0.1757	1.2236	2.1176
Belgium	8.1162	21.4716	20.8521	3.2571	21.8177	22.2881
Denmark	3.6438	11.2132	11.6585	5.7507	10.6453	12.0329
Finland	2.1535	8.3697	11.7166	0.0164	0.0913	0.1680
France	0.0891	0.4160	0.6188	1.3108	6.9801	9.1039
Germany	2.2022	8.0003	5.8469	0.2270	1.9961	5.2825
Greece	0.0731	1.1326	4.0473	2.0739	9.3382	14.2496
Ireland	5.2908	21.3083	28.3012	4.4240	18.0255	24.9582
Italy	0.5714	1.9235	3.3298	0.8319	3.9003	4.2800
Luxembourg	10.8529	34.9540	46.8088	5.4154	21.1174	25.0852
Netherlands	1.4188	9.3976	15.4197	0.9490	8.5527	19.4105
Portugal	0.3860	2.7427	6.0747	0.4542	3.2545	6.6649
Spain	9.6824	43.0459	58.4416	5.2166	31.5501	52.2450
Sweden	0.7596	6.5079	11.9381	3.9984	10.6063	10.7588
UK	3.2947	11.9475	11.3200	1.6726	7.9610	11.3831
EU15	2.1398	7.7832	6.6631			
EU12	2.3288	9.4003	7.4045			
US	0.0770	3.3968	4.8093	0.7988	2.0740	2.2963

Table A9.7: Variance decomposition for employment: Difference specification. GDP shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	5.4324	5.4405	5.4407	16.1921	19.2767	19.2845
Belgium	5.0866	5.7452	5.7614	0.6360	0.8578	0.8598
Denmark	1.8374	1.8706	1.8708	1.6797	1.7887	1.7887
Finland	7.2252	12.4527	12.8510	7.0992	9.7459	10.0874
France	0.4812	0.7010	0.8547	6.2233	7.5705	8.7323
Germany	1.0527	1.9800	3.2899	0.0716	1.7823	3.8307
Greece	0.3038	0.3142	0.3143	1.2677	1.2746	1.2746
Ireland	9.4063	10.5247	10.5985	9.3667	10.3145	10.3580
Italy	1.9829	3.2401	3.2634	2.7559	3.0920	3.0937
Luxembourg	12.3884	18.2014	18.7505	3.0982	5.3977	5.7095
Netherlands	4.8074	8.6456	8.5835	4.6439	7.9263	7.8419
Portugal	3.0511	4.1107	4.1185	3.1286	3.5123	3.5139
Spain	0.8826	0.8898	1.5792	0.7733	0.9067	1.3191
Sweden	9.7812	15.1662	15.2289	13.7261	16.6573	16.6671
UK	15.5800	20.5290	20.8412	7.5434	9.6547	9.7623
EU15	13.1825	13.9516	14.1922			
EU12	12.4346	12.8470	12.9768			
US	11.3181	12.7819	12.7917	6.8369	8.3082	8.3221

Table A9.8: Variance decomposition for employment: Difference specification. Real wage shock: Employment in persons (left) or hours (right)

	Years					
Country	2	5	10	2	5	10
Austria	1.0514	1.0780	1.0782	1.0553	1.6642	1.6659
Belgium	9.8084	12.9750	12.9694	11.2035	13.4165	13.4329
Denmark	8.4619	9.1594	9.1697	3.3174	3.3688	3.3688
Finland	1.5280	2.7480	2.8461	0.1412	0.1628	0.1658
France	0.8225	2.8822	3.1670	7.8820	15.1532	15.0752
Germany	6.8954	22.8522	23.9631	6.7540	19.3021	19.0811
Greece	1.4158	1.4053	1.4053	0.2037	0.4459	0.4459
Ireland	16.9592	26.9714	27.7349	10.5012	16.7612	17.0915
Italy	0.7384	2.4824	2.5343	0.5884	1.4425	1.4477
Luxembourg	2.3561	3.4666	3.5718	0.1451	0.2645	0.2813
Netherlands	3.3205	9.8592	10.8493	3.4311	10.2233	11.2311
Portugal	0.0429	0.0497	0.0498	1.4016	2.1609	2.1856
Spain	7.9047	21.4637	23.3793	5.6017	18.8935	22.1281
Sweden	0.0832	2.3315	2.3639	0.5125	2.3271	2.3282
UK	0.7195	2.5532	2.5500	1.7364	4.0784	4.0770
EU15	5.5687	8.5058	8.5766			
EU12	7.9473	10.1779	10.2894			
US	0.0061	0.6104	0.6274	1.0910	2.2264	2.2322

Annex 9.3. Institutional impact on the variance decomposition of employment

Table A9.9: Cross section analysis of variance decomposition: level specification. Employment in persons (left) or hours (right); output shock

	Years					
	2	5	10	2	5	10
Constant	3.805 (1.39)	9.123 (1.44)	18.851 (1.50)	7.713 (1.87)	36.127 (2.80)	47.270 (3.36)
EPL						
EPL_T						
DEN		-13.131 (1.20)	-29.062 (1.34)			
COV	-3.752 (1.04)			-10.961 (1.90)	-46.469 (2.58)	-55.686 (2.75)
COO						
CEN						
BRR						
ALMP_1	11.239 (1.37)	64.930 (2.36)	113.870 (2.08)			
ALMP_2				10.655 (1.78)	30.977 (1.65)	32.050 (1.52)
TAX						
R-Squared	0.04	0.24	0.20	0.21	0.31	0.33

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A9.10: Cross section analysis of variance decomposition: level specification. Employment in persons (left) or hours (right); real wage shock

	Years					
	2	5	10	2	5	10
Constant						
EPL			-10.309 (1.26)			
EPL_T						
DEN			-24.366 (1.01)			
COV						-13.436 (1.27)
COO						
CEN			9.573 (1.61)			
BRR	5.930 (3.68)	39.678 (2.90)	41.292 (1.38)	4.727 (4.82)	32.470 (3.13)	73.850 (3.69)
ALMP_1						
ALMP_2		-25.616 (1.25)	-38.012 (1.15)		-19.153 (1.24)	-42.986 (2.14)
TAX						
R-Squared	0.08	0.16	0.23	0.23	0.25	0.46

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A9.11: Cross section analysis of variance decomposition: Difference specification Employment in persons (left) or hours (right); output shock.

	Years					
	2	5	10	2	5	10
Constant	6.972 (2.35)	20.555 (2.49)	20.552 (2.52)	7.645 (1.85)	10.436 (3.38)	10.513 (3.44)
EPL						
EPL_T	-1.926 (3.10)	-1.992 (1.97)	-1.960 (1.96)	-1.850 (2.14)	-1.495 (1.42)	-1.411 (1.35)
DEN	7.296 (1.69)			6.953 (1.10)		
COV						
COO		-6.744 (1.68)	-6.733 (1.70)			
CEN		0.995 (1.50)	1.000 (1.53)			
BRR						
ALMP_1		24.425 (1.38)	24.733 (1.42)			
ALMP_2						
TAX						
R-Squared	0.52	0.39	0.39	0.29	0.07	0.06

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Table A9.12: Cross section analysis of variance decomposition: Difference specification Employment in persons (left) or hours (right); real wage shock.

	Years					
	2	5	10	2	5	10
Constant						
EPL						
EPL_T						
DEN		-19.183	-21.644		-24.374	-27.510
		(1.50)	(1.63)		(2.80)	(3.10)
COV						
COO						
CEN	1.378	3.683	4.049		3.642	4.193
	(3.31)	(1.69)	(1.80)		(2.47)	(2.78)
BRR						
ALMP_1		36.665	38.919	22.113	45.614	45.798
		(1.40)	(1.44)	(4.26)	(2.58)	(2.53)
ALMP_2						
TAX						
R-Squared	0.07	0.15	0.18	0.14	0.38	0.42

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. R-squared: Adjusted R-Squared. Absolute t-values in parenthesis.

Fourth part. Conclusions and policy implications

10. Conclusions

This section briefly summarizes the main conclusions obtained in the different chapters of the report.

The objective of the project is to examine the contribution of wage developments to labour market performance in the EU. The analysis is splitted into different parts, which are concerned with a wage and employment analysis. Both variables are explained using standard models. According to the wage curve literature, the real wage is linked to unemployment rates and labour productivity. Employment is modelled within a labour demand framework, with output and the real wage being the most important variables. We consider both time series and structural models. By means of the two approaches, the adjustment behaviour of labour markets either due to shocks or changes in the explanatory variables is analyzed.

In the context of the time series models, accumulated impulse responses as well as variance decompositions serve as endogenous variables in a cross country regression to investigate the impact of labour market institutions. In the structural variant, which is justified from the economic point of view, real wage and employment elasticities are considered instead. Similar to the time series approach, the estimated elasticities are explained by the institutional variables using cross section and panel fixed effects techniques. The institutions comprise measures regarding employment protection legislation, the structure of the wage bargaining process (union density, bargaining coverage, co-ordination and centralization), unemployment benefit, the tax wedge and active labour market policies.

Our main findings are as follows: regarding the wage and employment equations, the explanatory variables show the expected signs, and dynamic adjustment behaviour is in line with economic reasoning. There is a positive impact of productivity on the real

wage, whereas unemployment has a negative effect. Employment depends positively on output and negatively on the real wage. Because the signs are as expected, the results can be used to perform the further step of the analysis by regressing adjustment parameters on the institutional variables.

Annex 10.1 provides a detailed summary of the different estimates obtained with the structural approach with constant coefficient.[1] Looking at these results, we can see how the estimates for the Euro area and the EU-15 indicate a similar degree of labour flexibility than the one observed for the US except for the response of real wages to unemployment. It is worth mentioning that country rankings are quite different when looking at the different indicators of flexibility that have been considered: the response of real wages to unemployment[2] and to productivity and the response of employment to real wages and to productivity. For example, Spain is one of the less flexible countries when looking at the reaction of wages to unemployment, but one of the most flexible when looking at the response of employment to productivity. These results can be understood as evidence that focusing on the relationship between wages and unemployment to assess labour market flexibility will be extremely simplistic. More complex indicators integrating the different aspects should be investigated in further research.

Regarding the institutional impact, higher union power tends to reduce the real wage response to an unemployment shock. Bargaining centralisation, employment protection legislation and benefit replacement rates dampen the wage response to a productivity shock. Moreover, stronger trade unions and employment protection legislation will limit employment losses. With regard to the reaction of employment to an output shock, the impact of institutions usually increases with the time elapsed. A stronger presence of unions generally tends to reduce the response of employment to an output shock, while the effect is compensated for by a higher degree of co-ordination and centralisation in

[1] We have chosen the estimates of the structural approach with constant coefficients in order to provide a summary because it has been the most standard approach in the litera-ture and also permits to compare the obtained results with the ones from the meta-analysis.

[2] In relation to this indicator, it is worth mentioning that the differences found between the results obtained with the meta-analysis in chapter 8 and the ones by Heylen (1993) for Ireland, France, Germany and the Netherlands are confirmed only for Ireland and France.

the bargaining process. A complete listing of the institutional results of the different models is provided in annex 10.2.

An additional aspect that should be stressed is that institutions seem to be more important in the employment response to certain shocks than in the case of real wages. In other words, institutions have significant effects on the responses of both employment and real wages, but these effects are more significant for employment. While interactions seem not to be very important for the employment adjustment, they gain momentum for the wage analysis. Especially the tax wedge is not only relevant *per se* but also through interaction terms with other institutional measures.

A further aspect is the stability of the optimal institutional design over time. In particular, the best performing institutions over a certain period may change. Also, institutions might have different effects on labour market behaviour depending on the state of the business cycle. As a consequence, even a long-run effect can occur. Analyzing separately recession and boom phases given sufficient data can lead to an improved understanding of the working of institutions and their importance.

To sum up, adjustment processes to shocks in EU labour markets are clearly influenced by the institutional setting. In more deregulated labour markets with a lower presence of unions, the response of real wages and employment to shocks is particularly faster and larger. However, the policy implications from the results are not straightforward: It is important to analyze why labour market institutions are as they are and whether there are other reasons which keep them as they are (European Commission, 2004). In fact, the central question is how labour market institutions should be designed in order to secure benefits, while as far as possible avoiding the distortions that provide little benefit in terms of social protection. This question has not been adressed in the study. It should be a topic of further research of the institutional impact on labour market behaviour.

This study is at least one of the first to analyze the impacts of institutions on wages and employment on the EU level. Therefore, the main focus is to find out whether statistical

significant relationships exist and in which direction these interactions operate. Thus, we do not put much emphasis on the size of the coefficients of certain institutions, but more on their signs. In this sense, the direction of the impacts should have economic meaningful interpretations. Hence, the study is somewhat preliminary and important questions are left unanswered. They are dedicated for further research.

Annex 10.1. Overview of the empirical evidence regarding labour market flexibility in the European Union

Table A10.1: Estimates for the different indicators of labour market flexibility

Average estimates	Response of real wages to unemployment*		Response of real wages to productivity*		Response of employment to real wages**		Response of employment to output**	
	Levels	Differences	Levels	Differences	Levels	Differences	Levels	Differences
Austria	-0.03	-0.01	2.14	0.31	-0.07	-0.03	0.04	0.32
Belgium	-0.03	-0.02	1.38	1.18	-0.52	-0.41	0.45	0.56
Denmark	-0.01	-0.01	0.69	0.11	-0.39	0.06	0.19	0.53
Finland	-0.06	-0.02	0.80	0.17	-0.75	-0.10	0.49	0.72
France	-0.01	-0.01	0.19	0.09	-0.36	-0.28	0.25	0.42
Germany	-0.02	-0.01	1.20	0.18	-1.12	-0.77	0.96	1.51
Greece	-0.02	-0.01	0.32	0.85				
Ireland	0.00	-0.01	0.12	0.42	-0.69	-0.15	0.53	0.57
Italy	-0.58	-0.04	3.41	0.41	0.00	-0.13	0.15	0.29
Luxembourg	0.00	0.00	0.03	0.83				
Netherlands	-0.02	-0.02	0.92	0.27	-1.04	-0.47	0.87	0.84
Portugal	-0.07	-0.05	0.16	0.29	-0.03	0.02	0.00	0.26
Spain	-0.01	-0.01	0.73	1.30	-0.96	-0.56	0.72	0.99
Sweden	-0.04	-0.01	1.45	0.38	-0.38	-0.04	0.36	0.69
United Kingdom	-0.01	-0.02	0.25	0.16	-0.67	-0.09	0.57	0.68
Euro area 12	-0.02	-0.02	0.05	0.43	-0.56	-0.37	0.61	0.77
European Union 15	-0.01	-0.02	0.39	0.43	-0.53	-0.29	0.59	0.65
United States	-0.03	-0.02	0.83	1.02	-0.56	-0.39	0.77	0.75

* Average values for OLS and TSLS estimates using AMECO annual data.

** Average values for estimates using AMECO annual data with employment defined as persons and hours.

Annex 10.2. Overview of the institutional impact on labour market variables

Table A10.2: Overview of the institutional impact on labour market variables (continues next page)

				EPL	EPL_T	DEN	COV	COO	CEN	BRR	ALMP_1	ALMP_2	TAX
Response of real wages to unemployment	VAR: Accumulated impulse-response	Levels	2						-				
			5						-				
			10			+			-				
		Diff.	2			-			-				
			5						-				
			10						-				
	VAR: Variance decomposition	Levels	2						+				
			5		-		+						
			10		-	-			+			-	+
		Diff.	2	-					+		-		
			5	-					+				
			10	-					+				
	Structural equation models	FC	Levels	-/0	0/-	-/0	+/+		0/-	0/+		+/+	-/-
			Diff.	-/-		-/0			0/+			+/0	0/+
		TVC	Levels	-/-		+/0	-/0	0/+	-/0	0/-		-/-	+/0
			Diff.	0/+	-/0			0/+			+/0	-/0	-/0
Response of real wages to productivity	VAR: Accumulated impulse-response	Levels	2			+							
			5				-				+		
			10					+					
		Diff.	2		-								
			5		-								
			10		-								
	VAR: Variance decomposition	Levels	2			-	+			+	-		+
			5	-						+			
			10							+			
		Diff.	2		+								
			5			-				+			
			10			-				+			
	Structural equation models	FC	Levels		+/+	0/+	-/-	+/+	0/-	-/0		-/-	+/+
			Diff.		+/+			0/+			+/0	0/-	-/0
		TVC	Levels	-/-		-/-	+/+	0/-	0/-	0/-	-/0	+/+	-/-
			Diff.	+/+		-/0			-/0	0/+	0/+		

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. The information on the left side of the slash refers to the analysis for OLS estimates while the information on the right side refers to TSLS estimates. The sign shows the direction of the impact, and 0 means that the null of no effect cannot be rejected even on the 0.1 level of significance.

Table A10.2: Overview of the institutional impact on labour market variables (continuation)

				EPL	EPL_T	DEN	COV	COO	CEN	BRR	ALMP_1	ALMP_2	TAX
Response of employment to productivity	VAR: Accumulated impulse-response	Levels	2	+/0					-/0	-/-		+/0	
			5	+/0					-/0	-/-		+/0	
			10	+/0					-/0	-/-		0/+	
		Diff.	2								0/-		
			5			+/+			-/-		-/-		
			10			+/+			-/-		-/-		
	VAR: Variance decomposition	Levels	2							+/+			
			5							+/+			
			10						+/0	+/+		0/-	
		Diff.	2						+/0		0/+		
			5			0/-			+/+		0/+		
			10			-/-			+/+		0/+		
	Structural equation models	FC	Levels			+/+	+/0		-/0	+/0	-/-	-/0	
			Diff.			+/+			-/0	+/0	-/-	-/0	
		TVC	Levels	+/+		0/+	+/0		-/-	+/+	-/-	0/-	
			Diff.	+/+		+/+				+/+		+/0	-/-
Response of employment to real wages	VAR: Accumulated impulse-response	Levels	2	+/0					-/0	-/-		+/0	
			5	+/0					-/0	-/-		+/0	
			10	+/0					-/0	-/-		0/+	
		Diff.	2								0/-		
			5			+/+			-/-		-/-		
			10			+/+			-/-		-/-		
	VAR: Variance decomposition	Levels	2							+/+			
			5							+/+			
			10						+/0	+/+		0/-	
		Diff.	2						+/0		0/+		
			5			0/-			+/+		0/+		
			10			-/-			+/+		0/+		
	Structural equation models	FC	Levels			+/+	+/0		-/0	+/0	-/-	-/0	
			Diff.			+/+			-/0	+/0	-/-	-/0	
		TVC	Levels	+/+		0/+	+/0		-/-	+/+	-/-	0/-	
			Diff.	+/+		+/+				+/+		+/0	-/-

EPL: Employment Protection Legislation, EPL_T=EPL for temporary working contracts, DEN: Trade Union Density, COV: Bargaining Coverage, COO: Bargaining Coordination, CEN: Bargaining Centralisation, BRR: Benefit Replacement Rate, ALMP: Active Labour Market Policy, Public employment services (_1), Labour market training (_2), TAX: Tax Wedge. The information on the left side of the slash refers to the analysis of employment in persons while the information on the right side refers to hours. The sign shows the direction of the impact, and 0 means that the null of no effect cannot be rejected even on the 0.1 level of significance.

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