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**OCCASIONAL PAPER SERIES**

**NO 138 / OCTOBER 2012**

**EURO AREA LABOUR MARKETS  
AND THE CRISIS**

Task Force of the  
Monetary Policy Committee  
of the European System  
of Central Banks





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# EURO AREA LABOUR MARKETS AND THE CRISIS

Task Force of the Monetary Policy Committee  
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**Address**

Kaiserstrasse 29  
60311 Frankfurt am Main  
Germany

**Postal address**

Postfach 16 03 19  
60066 Frankfurt am Main  
Germany

**Telephone**

+49 69 1344 0

**Website**

<http://www.ecb.europa.eu>

**Fax**

+49 69 1344 6000

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## ABBREVIATIONS AND GLOSSARY

### COUNTRIES

BE	Belgium	LU	Luxembourg
DE	Germany	MT	Malta
EE	Estonia	NL	Netherlands
IE	Ireland	AT	Austria
GR	Greece	PT	Portugal
ES	Spain	SI	Slovenia
FR	France	SK	Slovakia
IT	Italy	FI	Finland
CY	Cyprus	US	United States

### GROUPS OF COUNTRIES

EA(17): euro area

EA10: Estonia, Ireland, Greece, Spain, France, Italy, Austria, Slovenia, Slovakia, Finland

EA12: Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland

EA13: Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Malta, Netherlands, Austria, Slovenia, Slovakia, Finland

EU15: Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Sweden and the United Kingdom.

NMS12: Bulgaria, the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovakia.

NMS10: the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia.

NMS3: the Czech Republic, Hungary and Poland

NMS2: Bulgaria and Romania.

### OTHER

AIAS	Amsterdam Institute for Advanced Labour Studies
ALMP	Active Labour Market Policies
BLS	Bureau of Labour Statistics
COLA	cost of living adjustment
CPI	Consumer Price Index
CRI	crisis period
DG ECFIN	Directorate General for Economic and Financial Affairs of the European Commission
EC	European Commission
ECB	European Central Bank
EMU	Economic and Monetary Union

EPL	employment protection legislation
ESCB	European System of Central Banks
EU	European Union
EU LFS	European Union Labour Force Survey
FINBUS	financial intermediation, real estate and business services
GDP	gross domestic product
GSOEP	German Socioeconomic Panel
HICP	Harmonised Index of Consumer Prices
ICTWSS	Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts
ILO	International Labour Organisation
IMF	International Monetary Fund
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
LCI	labour cost index
LFS	labour force survey
LS	labour shortages
LTU	long-term unemployment
NA	national accounts
NACE	statistical classification of economic activities in the European Union
NAIRU	non-accelerating inflation rate of unemployment
NCB	national central bank
NONMKT	non-market services
OECD	Organisation for Economic Co-operation and Development
OLS	ordinary least squares
pp	percentage points
SIR	Structural Issues Report
SMI	skill mismatch index
STW	short-time working
TRADTRAN	retail and wholesale trade and transportation services
UB	unemployment benefits
ULC	unit labour costs
WB	wage bargaining
WDN	Wage Dynamics Network

## TASK FORCE OF THE MONETARY POLICY COMMITTEE OF THE EUROPEAN SYSTEM OF CENTRAL BANKS

This report was drafted by an ad hoc task force of the Monetary Policy Committee of the European System of Central Banks. The task force was chaired by Robert Anderton (ECB). Mario Izquierdo (Banco de España) acted as Secretary to the task force.

The full list of members of the task force is as follows:

<b>European Central Bank</b>	Robert Anderton (Chairman); Mario Izquierdo (Secretary); Ted Aranki, Boele Bonthuis, Katarzyna Budnik, Claire Childs (Administrative Assistance), Ramón Gómez-Salvador, Valerie Jarvis, Nicole Kuttner (Administrative Assistance) Ana Lamo, Aidan Meyler; Daphne Momferatou, Roberta Serafini, Magdalena Spooner
<b>Nationale Bank van België/ Banque Nationale de Belgique</b>	Martine Druant, Jan De Mulder
<b>Deutsche Bundesbank</b>	Katja Sonderhof, Daniel Radowski
<b>Eesti Pank/ Bank of Estonia</b>	Orsolya Soosaar, Natalja Viilmann
<b>Central Bank of Ireland</b>	Suzanne Linehan
<b>Bank of Greece</b>	Daphne Nicolitsas
<b>Banco de España</b>	Sergio Puente, Cristina Fernandez <sup>1</sup>
<b>Banque de France</b>	Gregory Verdugo, Matteo Mogliani, Henri Fraise
<b>Banca d'Italia</b>	Roberta Zizza
<b>Central Bank of Cyprus</b>	Michalis Ktoris
<b>Banque centrale du Luxembourg</b>	Cindy Veiga Nunes, Muriel Bouchet
<b>Central Bank of Malta</b>	Sandra Zerafa, Ian Sapiano
<b>De Nederlandsche Bank</b>	Marco Hoeberichts, Jante Parlevliet
<b>Oesterreichische Nationalbank</b>	Alfred Stiglbauer, Paul Ramskogler
<b>Banco de Portugal</b>	José R. Maria, Cláudia Duarte
<b>Banka Slovenije</b>	Manca Jesenko
<b>Národná banka Slovenska</b>	Helena Solcanska, Pavel Gertler
<b>Suomen Pankki– Finlands Bank</b>	Vanhala Juuso, Heidi Schauman

<sup>1</sup> With the support of José Manuel Montero.

## EXECUTIVE SUMMARY

Between the start of the economic and financial crisis in 2008, and early 2010, almost four million jobs were lost in the euro area. Employment began to rise again in the first half of 2011, but declined once more at the end of that year and remains at around three million workers below the pre-crisis level. However, in comparison with the severity of the fall in GDP, employment adjustment has been relatively muted at the aggregate euro area level, mostly due to significant labour hoarding in several euro area countries. While the crisis has, so far, had a more limited or shorter-lived impact in some euro area countries, in others dramatic changes in employment and unemployment rates have been observed and, indeed, more recent data tend to show the effects of a re-intensification of the crisis. The main objectives of this report are: (a) to understand the notable heterogeneity in the adjustment observed across euro area labour markets, ascertaining the role of the various shocks, labour market institutions and policy responses in shaping countries' labour market reactions; and (b) to analyse the medium-term consequences of these labour market developments.

With these objectives in mind, the SIR Task Force has carried out several specific exercises (e.g. it has conducted a questionnaire among euro area National Central Bank (NCB) experts on main policy measures adopted since the start of the crisis; it has updated a previous Wage Dynamics Network (WDN) questionnaire on wage bargaining institutions in euro area countries; and it has computed worker flows series from Labour Force Survey (LFS) microdata available at most euro area NCBs).

### MAIN DEVELOPMENTS IN EURO AREA LABOUR MARKETS SINCE THE START OF THE CRISIS

The first chapter of the report focuses on the main developments in euro area labour markets since the start of the crisis. Despite the relatively muted employment response to the intense fall in activity, the euro area unemployment rate had, by July 2012, increased by 4.0 pp, to 11.3%,

its highest level since 1999. The labour market impact of the crisis varied substantially across euro area countries with total employment losses from peak to trough ranging from -16% to -0.4% across euro area countries. Differences in the severity of the crisis provide only a partial explanation of these developments; the heterogeneity of responses also reflects the nature of the shocks hitting euro area economies and the presence of imbalances (such as previous booms in the construction sector or accumulated competitiveness losses) in the run-up to the crisis. Countries in which the downturn was driven by international trade experienced a relatively more benign rate of employment destruction. In some cases this was largely explained by working time flexibility which was, in turn, supported by the temporary nature of the global trade downturn. Other country-specific factors also had an impact on the extent of unemployment adjustment during the crisis. Finally, labour markets characterised by higher shares of temporary contracts in advance of the crisis exhibit disproportionately higher employment losses and increases in unemployment.

Large divergences were also observed across worker groups in euro area countries. Partly as a result of the sectoral composition of employment losses (which were heavily concentrated in manufacturing and construction), low-skilled and young workers were the hardest hit, with the youth unemployment rate (i.e. 16-24 years old) exceeding 20% by the end of 2011 in the euro area as a whole. By contrast, participation and employment rates of older workers rose during the crisis, partly reflecting past institutional reforms (such as reforms to pension entitlements and increases in statutory retirement ages). Regarding the extent of labour market slack, the report also computes measures that complement the official unemployment rate by taking into account the increase in the incidence of discouraged workers which has been particularly evident in some euro area countries as a result of the crisis. The characterisation of these discouraged workers shows a large share of low-skilled workers among those individuals without a job and not actively seeking a new one.



Labour supply also reacted to the downturn, but in a relatively muted fashion compared with previous cyclical adjustments, although cross-country heterogeneity was again significant. Participation rates for females and older workers evolved more favourably, probably reflecting added-worker effects resulting from the negative income and wealth effects of the crisis as well as reduced opportunities for early retirement, although the reasons behind the different response of different age groups could not be fully identified. Evidence also shows a reaction of migration flows to the current crisis in some of the euro area countries more affected by the crisis. This is consistent with model results which show that the negative response of GDP to the recession may have been amplified in countries with a large share of temporary migrants in the labour force before the crisis.

The report also provides a detailed analysis of the dynamic adjustment of euro area labour markets using LFS microdata (and administrative data sources where LFS data are not available) to compute quarterly individual labour market transitions between employment, unemployment and inactivity. Very large differences in the size of worker flows in individual euro area labour markets are evident, indicating substantially different adjustment dynamics to shocks across the euro area countries. Some labour market institutions, including employment protection and wage bargaining institutions, seem to be associated with the observed cross-country differences.

With respect to developments since the start of the crisis, the increase in job destruction rates is found to be responsible for the bulk of the increase in unemployment, particularly in the initial phase of the crisis, although a lower job creation rate also contributed. Exit rates from unemployment also declined, leading to a notable increase in the mean duration of unemployment in euro area countries and in the share of long-term unemployment (to around 46%, which is 12 pp higher than before the crisis). The analysis

of exit rates by duration of unemployment shows, however, a somewhat limited impact of the crisis on exit rates of long-term unemployed, although a larger impact cannot yet be excluded, since for those countries where more up-to-date worker flows are available, some additional decrease in unemployment exit rates tends to be found. Across worker groups, older workers exhibit an increased exit rate from unemployment to employment during the crisis in a number of countries, while unemployed youths generally experience a decrease in exit rates.

Relatively limited wage adjustment has been observed in euro area countries despite the severity of the recession. At the beginning of the crisis, the relatively high incidence of multi-year wage contracts in euro area countries prior to the crisis could partly account for an initial delay in this adjustment. Public sector wages reacted to the crisis earlier than private sector wages as a result of the ongoing fiscal consolidation in some euro area countries. The downward rigidity of wages in the presence of a negative shock was documented by different studies in the context of the WDN. The report builds on this previous work and has updated a WDN questionnaire on the wage bargaining institutions in euro area countries. Although changes in these institutions are not very frequent, recent changes have tended to move towards a greater degree of decentralization of wage bargaining and a somewhat lower incidence of price indexation in some euro area countries in response to the crisis.

Finally, using information from microdata for a selected sample of euro area countries, the report shows that when the aggregated wage evolution is computed net of the marked changes observed in employment composition (particularly the decline in the employment share of less-skilled/low-wage workers), the downward adjustment of wages during the crisis is estimated to be somewhat higher. Some interesting differences are also observed in this cyclical pattern along the wage distribution.

### THE IMPACT OF THE CRISIS ON SOME STRUCTURAL FEATURES OF EURO AREA LABOUR MARKETS

The second chapter of the report assesses the long-term consequences of the crisis, taking into account the large degree of heterogeneity observed in the labour market adjustment across countries. The issue of increasing mismatch in euro area economies is perhaps one of the biggest challenges facing some euro area labour markets after the crisis, given the marked increase in long-term unemployment and the persistent downsizing of specific sectors. Indeed, the report points to increasing signs of a growing mismatch between worker attributes and job requirements across a number of euro area countries. In terms of Beveridge curve analysis, the onset of the crisis seems to have heralded a significant outward shift in the aggregate euro area Beveridge curve – i.e. a higher level of unemployment is associated with a given level of vacancies. However, significant cross-country differences exist in part as a consequence of the differences in the shocks affecting euro area economies and in the institutional features of national labour markets. The persistent downsizing of some industries in a number of euro area countries, together with the skill composition of the workforce, also seems to have played a crucial role in explaining the observed outward shifts in the Beveridge curve in some euro area countries.

In addition, the report provides quantitative estimates of the magnitude of the skill mismatch by constructing a skill mismatch index for euro area countries, measuring the degree of disparity between the labour skills demanded and the skills supplied. Various alternative measures are computed which show robust evidence of a significant increase in skill mismatch since the start of the crisis in the euro area as a whole, and especially in those euro area countries more affected by the crisis. In addition, results point to a structural nature of the growth in mismatch with a relatively smaller potential role for labour mobility in alleviating mismatch.

As regards the impact of the crisis on structural unemployment, available estimates from international institutions such as the EC, OECD and IMF show a marked upward trend in structural unemployment in euro area countries with, moreover, increasing divergences across countries. Evidence of possible hysteresis effects is found, highlighting the challenge of rapidly reversing the increases in unemployment. Skill mismatch indicators appear to be associated with differences in the structural component of unemployment across euro area countries while the rising gap between the youth unemployment rate and that of the rest of the labour force also plays a role.

Finally, wage equations have been estimated with the objective of improving our understanding of the effect of rising unemployment on the evolution of aggregate wages over the crisis period. Panel estimates, which pool data across euro area countries, provide some tentative evidence of downward wage rigidities in the euro area (i.e. a lower responsiveness of wages to unemployment during downturns), although this result applies to all downturns in the sample period and not just to this crisis period.

### MAIN POLICY CONCLUSIONS

Downward wage rigidities are an impediment to restoring competitiveness (and thus employment), particularly in those euro area countries that had accumulated external imbalances before the crisis. In the presence of high unemployment, a flexible response of wages to labour market conditions should be a key priority, so as to facilitate the necessary sectoral reallocation underpinning employment creation and reductions in unemployment. In this respect, short-time working (STW) schemes, although successful in mitigating employment losses in some euro area countries in the current crisis, might hinder the reallocation of the labour force from declining sectors towards growing ones if they are maintained for too long. Also, in a context of growing mismatch in the labour market, higher wage differentiation across

different types of workers and jobs is needed to contribute to a proper matching between labour supply and demand and would particularly benefit some of the groups hardest hit by the crisis.

Given the abrupt impact of the crisis on some specific groups of workers and the increase in the structural component of unemployment, the main aim of active labour market policies (ALMP) should be to limit, as far as possible, the risk that the increase in unemployment will have significant hysteresis effects, especially when almost half of the unemployed have been out of work for more than a year. In this respect, ALMPs should be designed to facilitate the return to work of young and less-skilled individuals in particular, by including appropriate training policies to close the gap between the labour skills supplied and demanded, especially in those countries most affected by the possibly permanent downsizing of certain sectors. Such policies would also help to increase the downward pressure on wages exerted by the unemployed and to limit the decrease in potential output growth associated with higher structural unemployment.

Labour market segmentation tends to amplify employment adjustment in response to negative shocks and gives rise to a disproportionate burden of the adjustment process being placed on specific groups of workers (such as those with temporary contracts and young and low-skilled workers). The longer these groups are out of work, the greater the danger that their skills will deteriorate, making it harder for them to find work in the future and possibly leading to higher structural unemployment. The regulation of labour contracts should avoid significant differentiation across different types of worker and focus on lowering average employment adjustment costs across the whole economy. Meanwhile, labour market institutions that are conducive to higher internal flexibility (eg. in terms of hours and wages) can

help firms to accommodate negative shocks at a lower employment cost.

The lessons of the crisis apply not only to labour market policies, as the ongoing correction of previous macroeconomic imbalances has amplified the negative consequences of the downturn in some euro area countries. Major labour market reforms in euro area countries are essential to foster job creation, bring down unemployment and restore competitiveness, while also lowering the risks of a permanent decrease in potential output growth. A comprehensive reform strategy to increase labour market flexibility is a key ingredient for a solid economic recovery in euro area economies with additional positive spillovers on the correction and prevention of macroeconomic imbalances, fiscal consolidation and financial stability. In a monetary union such as the euro area a flexible and well-functioning labour market provides an economic environment that greatly facilitates the price stability-oriented monetary policy of the ECB. Reforms which deliver greater flexibility in employment and wages would reduce adjustment costs associated with idiosyncratic shocks and enhance the efficiency and effectiveness of the monetary policy transmission mechanism.

The Hartz reforms introduced in the early 2000s have been successful in Germany and may provide a useful example, although it is crucial to take into account country specifics in order to design successful labour market reforms. More recently, the ongoing labour market reforms in countries such as Greece, Ireland, Portugal, Spain and Italy include some important measures to increase wage bargaining flexibility and reduce excessive employment protection, and constitute appropriate first steps to improve labour market and competitiveness performance in these countries and in the euro area as a whole. However, in order to fully reap the benefits of labour market reforms, they must also be accompanied by wide-ranging product market reforms.

INTRODUCTION<sup>2,3</sup>

Since the start of the economic and financial crisis in 2008,<sup>4</sup> the situation in euro area labour markets has worsened dramatically, with a loss of almost 4 million jobs and a concomitant sizeable increase in the unemployment rate, which reached 11.3% in July 2012. Substantial cross-country heterogeneity has emerged: some countries have experienced dramatic changes in employment and unemployment rates, while the crisis has had a relatively more limited impact in others. Differences in recent labour market developments can only be partially explained by differences in the extent of the slowdown in economic activity across countries. Understanding the role of different factors in shaping countries' labour market reactions, as well as their implications for future labour market developments, is currently at the core of the policy debate. Accordingly, the main objectives of this report are: (a) to understand the notable heterogeneity across euro area labour markets; and (b) to analyse the medium-term consequences of these labour market developments, along with their policy implications.

In Chapter 1, we document recent labour market developments by analysing heterogeneity across countries and identifying those worker groups more heavily affected by the crisis. The impact of the crisis on the labour force and particularly on participation rates is also examined. Finally, the degree of wage adjustment in response to the weakening of the labour market, and how it varies across indicators and sectors, is explored. In the second chapter, we analyse the possible impact of these developments on the structural functioning of euro area labour markets, focusing on key elements which may have medium-term consequences. We analyse structural unemployment developments in more detail by investigating the possible increase in mismatch between labour demand and supply as a result of the crisis. Finally, we try to assess the impact of wage setting in euro area labour markets against the background of these structural developments.

The impact of the crisis on employment and unemployment developments – with a focus on the striking differences across euro area countries, industries and worker groups – is analysed in Section 1.1.1. In addition, how factors such as pre-crisis macroeconomic conditions, accumulated competitiveness losses and policy measures may help to explain these developments is explored. This section includes two boxes: the first investigates the role of GDP composition and structural factors in explaining differences in Okun's law coefficients, while the second compares euro area and US labour market developments during the crisis. After this analysis of the changes in the *stocks* of employment and unemployment, Section 1.1.2 investigates worker *flows* between employment, unemployment and inactivity, appraising whether these flows have behaved differently in the current crisis.

Section 1.2 describes the adjustment of labour supply in the euro area during the crisis and the response of participation rates since the start of the crisis, investigating possible recent changes in their cyclical sensitivity. The description of labour supply adjustment in response to the crisis is complemented by a box which analyses recent migration developments in euro area countries and assesses whether and how the macroeconomic reaction to the crisis may be affected by the presence of a large number of temporary migrants in individual euro area countries. Box 4 computes various measures of labour market slack that differ from the standard ILO unemployment definition. These measures include discouraged workers and employees working less hours than usual, possibly as the result of the activation of some short-time working schemes.

2 Prepared by Mario Izquierdo.

3 The data available for this report generally cover the period up to the end of 2011, although LFS flows data do not cover the whole of 2011 and EU LFS annual data and microdata are only available up to 2010.

4 The 2008 SIR "Labour supply and employment in the euro area countries" documented the significant progress made by euro area labour markets over the period 1996-2007 (Occasional Paper Series, No 87, ECB, 2008). For other work on the impact of the crisis on labour markets see, among others, OECD (2010), IMF (2010) and ECB (2010).

Section 1.3 provides an analysis of wage adjustment in response to the crisis in euro area countries looking at various indicators. Special attention is given to identifying changes in wage bargaining institutions and their potential impact on the reaction of wages to the crisis. Wage composition effects are analysed in Box 6 which uses data for five euro area countries to reveal the underlying change in aggregate wages during the crisis after allowing for changes in the composition of employment.

The main purpose of the second chapter of the report is to assess the long-term consequences of the current crisis for euro area labour markets. A Beveridge curve analysis in Section 2.1 assesses the extent of divergence between the labour skills supplied and demanded and how sectoral reallocation needs may lead to a substantial and increasing mismatch in the labour market. In addition, Section 2.2 computes mismatch indices to measure the disparity in skill distribution between labour demand and labour supply using EU LFS microdata. Section 2.3 looks at the evolution of structural unemployment based on available estimates of the NAIRU (from OECD, EU Commission and IMF), focusing on the increase in their dispersion across the euro area countries observed since the start of the crisis and how different factors may explain developments in structural unemployment. Finally, wage equation estimates are provided in Section 2.4, to try to assess the impact of the crisis on wage determination.

The report used traditional macro datasets for labour market variables (national accounts and labour force surveys) while also making extensive use of EU LFS microdata to assess the impact of the crisis, relying on different measures of labour market slack in euro area countries and computing a wide set of skill mismatch indices. LFS microdata were used, in the context of a decentralised NCB exercise, to compute changes in individuals' activity status (employed, unemployed or inactive). Thirteen euro area NCBs computed and provided these worker flows series and administrative data

sources were used in the remaining four countries where these data were not available. On data issues, a questionnaire was also sent to the NCBs about the role of country specific policy measures and labour market reforms before and during the crisis. Finally, a specific questionnaire was conducted on wage institutions, updating previous WDN work, to identify changes in the main wage-setting institutions in euro area countries during the crisis.



## I LABOUR MARKET DEVELOPMENTS SINCE THE START OF THE CRISIS

This Chapter provides an overview of the main developments since the start of the economic crisis in euro area labour markets with a special focus on the observed heterogeneity across individual euro area countries. The first section looks at employment and unemployment developments using both a traditional stock analysis and a flows approach to describe them. The second section analyses the reaction of labour supply to the crisis. The third one describes the main elements of wage adjustment since the start of the crisis.

### I.1 EMPLOYMENT AND UNEMPLOYMENT DEVELOPMENTS

#### I.1.1 EMPLOYMENT AND UNEMPLOYMENT IN EURO AREA COUNTRIES SINCE THE START OF THE CRISIS<sup>5</sup>

*Euro area employment and unemployment have been considerably affected since the start of the crisis, although relative to the fall in activity, a more muted impact on the labour market was observed on average in the euro area in comparison with previous recession episodes. However, a substantial degree of heterogeneity is found across individual euro area countries, resulting, among other factors, from sectoral developments, the nature of the shocks and differences in the use of labour hoarding practices. Low-skilled and young workers were severely hit by the recession. Euro area countries have adopted a broad spectrum of policy measures to counteract the consequences of the crisis, aiming to have an impact on either labour supply or demand.*

#### LABOUR MARKET ADJUSTMENT

After the start of the financial crisis in 2008, almost 4 million jobs were initially lost in euro area labour markets, with employment decreasing by 2.5% from its peak, in the first quarter of 2008, to its trough, in the first quarter of 2010. Subsequently, job creation resumed, from mid 2010, but the intensification of the crisis in the second half of 2011, especially in some euro area

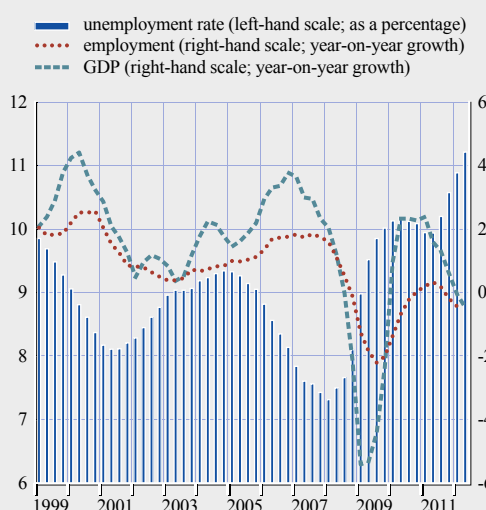
countries, led to further falls in employment in the second half of last year (see Chart 1). At the end of 2011 the total number of employed persons was still over 3 million lower than before the crisis, while the employment rate (defined as total employment divided by working age population) had fallen by 1.6 pp, to 64.2% in the third quarter of 2011. However, considering the intensity of the current crisis, which entailed a fall in euro area GDP of 5.5% between the first quarter of 2008 and the second quarter of 2009,<sup>6</sup> employment adjustment has been relatively muted. The unemployment rate increased from 7.3% in the first quarter of 2008 (its lowest level since the start of the euro) to about 10% at the end of 2009 and, subsequently, to 11.3% in July 2012, with around 18 million people unemployed in euro area countries.

The impact of the crisis on the labour market differed substantially across euro area countries (see Chart 2). From peak to trough the *number of jobs* declined by less than 1% in Germany,

5 Prepared by Boele Bonthuis, Jan De Mulder, Jante Parlevliet and Mario Izquierdo

6 This has been the strongest recession experienced in euro area economies since the Second World War.

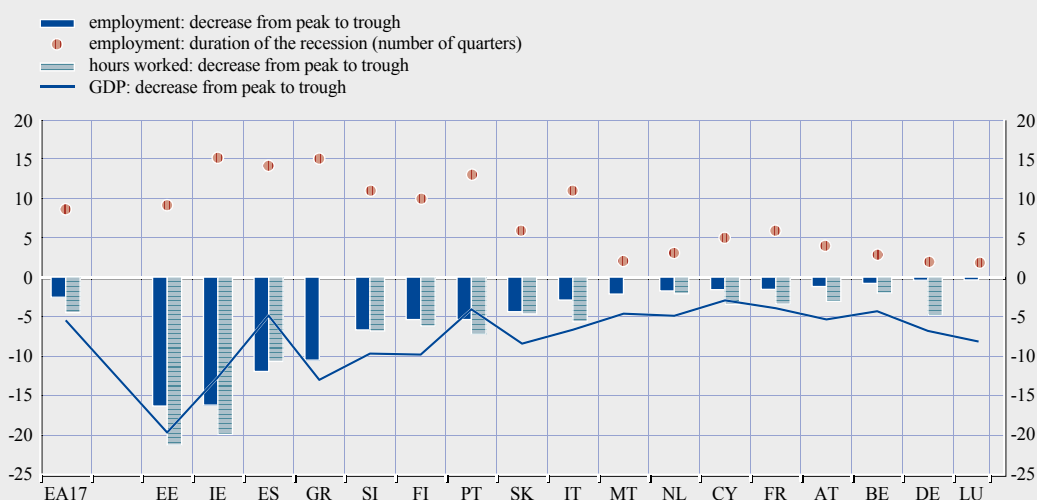
Chart 1 GDP, employment and unemployment



Source: EC (national accounts for GDP and employment, and LFS for unemployment).

**Chart 2 Employment adjustment to the crisis**

(percentage changes from peak to trough)



Sources: EC (national accounts) and own calculations.

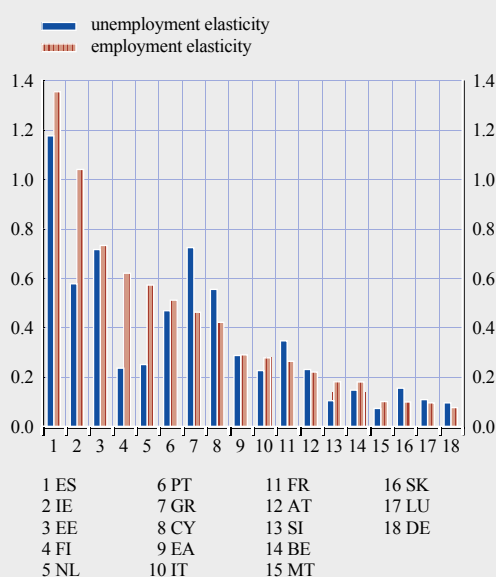
Notes: No quarterly national accounts data are available for total hours worked in Greece, Malta or Luxembourg. Nationale Bank van België/Banque Nationale de Belgique-estimate for Belgium. Country-specific peaks and troughs are considered in the period 2007 Q1-2011 Q4.

Luxembourg and Belgium, despite a GDP fall similar to the euro area average. By contrast, it fell by more than 15% in Estonia and Ireland and by more than 10% in Greece and Spain. These differences seem to be related to the duration of the recession. Employment declined during two quarters in Germany, Luxembourg and Malta, while in Ireland, Spain, Greece, Slovenia and Portugal employment was still decreasing in the third quarter of 2011. These divergences are reflected in the employment and unemployment rates, with significant deteriorations observed in Italy, Spain, Greece, Slovakia, Estonia and Portugal, while the impact remained limited in countries like Germany, Austria and Belgium (see top left-hand panels of Charts A1 and A2 in the Appendix).

These large divergences in labour market adjustment only partially reflect differences in the severity of the crisis and its impact on GDP (see Chart 3). The elasticity to GDP of employment and unemployment differed remarkably across the euro area countries during the crisis. In particular, the reaction of employment to the change in economic

**Chart 3 Elasticity of employment and unemployment to output**

(change in employment or unemployment divided by change in output)



Sources: EC (national accounts), LFS and own calculations.

Notes: Euro area elasticities are computed using country-specific peak-to-trough data and annualised growth rates. Peaks are chosen in the period 2007 Q1-2009 Q1 and troughs in the period 2009 Q1-2011 Q4. The unemployment elasticities are absolute values.

activity was mild in Luxembourg, Germany and Slovakia, while in countries like Estonia, Ireland and especially Spain, very high employment elasticities are observed. Similarly, the unemployment reaction was very strong in Spain, while it was limited in countries like Malta, Slovenia and Luxembourg. The role of different factors in explaining cross-country differences in the elasticity of unemployment to GDP is analysed in Box 1.

Box 1

**THE ROLE OF GDP COMPOSITION AND INSTITUTIONS IN EXPLAINING CROSS-COUNTRY DIFFERENCES IN OKUN'S COEFFICIENT<sup>1</sup>**

The uneven impact of the crisis on the labour markets of different countries is clearly demonstrated in Chart A below, which shows the elasticity of unemployment with respect to output during the crisis. This Box uses Okun's law<sup>2</sup> (which relates changes in unemployment to changes in output) as a framework for investigating the contribution of structural features in explaining these cross-country differences. The focus is on two such features: first, the composition of output; and second, labour market institutions.

Investigations of cross-country differences and changes over time in Okun's coefficient have already been the subject of other analyses.<sup>3</sup> The results suggest that differences are due to the extent to which active labour market policies are used, the prevailing labour market institutions, the degree of wage moderation, the amount of financial stress and financial leverage, etc. The results presented below suggest there is also a role for the composition of demand (domestic versus external demand) in explaining cross-country differences in labour market responses to the crisis. Furthermore, there may be a role for expectations, the skill composition of the workforce and the potential for a consensus between negotiating parties in explaining the cross-country variation in the labour market consequences of the current crisis.

**Composition of GDP and cross-country variation in Okun's coefficient**

To study the relative importance of the components of GDP for unemployment, we estimate the typical Okun relationship while decomposing GDP into its components:<sup>4</sup>

$$\Delta u_{it} = \alpha + \sum_g \beta_g \lambda_g \Delta \ln(GDP_{g,it}) + \varepsilon_{it} \quad (1)$$

where  $\Delta u_{it}$  is the *annual* change in the unemployment rate for country  $i$  in quarter  $t$ ; the  $GDP_g$  components consist of private consumption (*con*), government spending (*gov*), investment (*inv*), exports (*exp*) and imports (*imp*); and  $\lambda_g$  denotes the moving shares of the weights of each component  $GDP_g / \sum_g GDP_g$ . Separate coefficients,  $\beta_g$ , for each component of GDP are estimated, providing estimates of the differential effects of the individual components of aggregate demand on

1 Prepared by R. Anderton, T. Aranki, B. Bonthuis, V. Jarvis and D. Nicolitsas.

2 Okun, A. (1962).

3 OECD (2010), Chapter 1; IMF (2010), Chapter 3; Burda, M. C. and J. Hunt (2011)

4 Anderton and Tewolde (2011) use a similar technique to study the role of expenditure components in explaining trade movements during and after the global financial crisis.

### Estimates of Okun's coefficient and elasticities by GDP component for the euro area

	(1) Okun's coefficient – aggregate output	(2) Okun's coefficient – GDP components	(3) Weight ( $\lambda_g$ )	(4) Elasticity ( $\beta_g \lambda_g$ )
$\Delta \ln \text{GDP}$	-0.29*** (0.02)			
$\lambda \Delta \ln \text{con}$		-0.36*** (0.03)	0.56	-0.20
$\lambda \Delta \ln \text{gov}$		-0.28*** (0.06)	0.20	-0.06
$\lambda \Delta \ln \text{inv}$		-0.21*** (0.02)	0.22	-0.05
$\lambda \Delta \ln \text{exp}$		-0.07*** (0.01)	0.56	-0.04
$\lambda \Delta \ln \text{imp}$		0.07*** (0.02)	0.54	0.04
Adjusted R-squared	0.4958	0.5737		
Number of observations	957	950		

Notes: Own calculations. Panel results based on a sample of all euro area countries for the period 1996 Q1-2011 Q3. Regression results include a constant or fixed effects which are not reported. Weights are calculated as averages for the period 1996 Q1-2011 Q3.

unemployment. In the steady state, the unemployment-output semi-elasticity is obtained by taking the sum of the estimated coefficients multiplied by the corresponding moving share ( $\sum_g \beta_g \lambda_g$ ).

The table shows panel estimates of the aggregate Okun coefficient (col. 1) and the estimates for the separate components of GDP (col. 2) based on panel estimates pooling the individual euro area country data for the period 1996 Q1-2011 Q3. An estimated aggregate Okun coefficient of around -0.3% suggests that a one percentage point fall in GDP growth is, on average, associated with a contemporaneous 0.3 percentage point increase in the unemployment rate. The unweighted coefficients of the components show that movements in unemployment differ according to the component that is driving GDP (column 2 of the table). The results show that, in general, unemployment is most sensitive to the consumption component of output, while foreign trade has the lowest impact on unemployment – a finding in line with Walterskirchen (1999). The Okun coefficient for the domestic demand component is three to six times as high as that for exports. Thus a given decrease in labour-intensive domestic demand will have a considerably larger negative effect on employment than an equivalent decrease in capital-intensive exports. In other words, the unemployment or employment content of domestic expenditure is much higher than that of exports.

In terms of elasticities (col. 4 of the table), which take into account the weight of the expenditure component in GDP, the results show that a percentage increase in the consumption component (*con*) will, on average, lower unemployment by 0.2%. The relatively small trade-component elasticity seems to help explain why the unemployment rate in some countries did not increase in response to the downturn during the intensification of the global financial crisis by as much as the typical Okun relationship would imply. For example, the downturn in economic activity in countries such as Germany was driven by a decline in exports as a result of the sharp drop in global trade during the crisis. Although other factors may primarily explain the muted response of unemployment to the downturn, such as short-time working schemes, the relatively smaller unemployment elasticity of exports also seems to be part of the story for countries such as Germany.

**Cross-country divergences in the responsiveness of unemployment to changes in output: expectations, labour market consensus and skill composition**

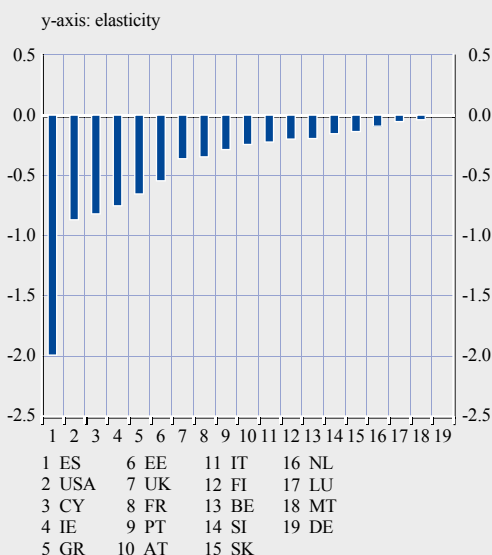
Turning to the recent crisis episode, the absolute average value of the elasticity of unemployment with respect to output fluctuations during the crisis was just below 0.3. However, this elasticity exceeded 0.6 for five countries (Spain, United States, Cyprus, Ireland and Greece), with Spain exhibiting an elasticity of close to 2, while for three countries (Malta, Luxembourg and Germany) the absolute value of the elasticity was below 0.1 (see Chart A).

*Expectations* about the length of the crisis might have influenced the extent to which firms in some countries shed (or hoarded) labour during the crisis. Using investment expectations as a proxy for the perceived length of the crisis, Charts B and C show the

Autumn 2009 European Commission investment forecasts for 2010 against the output elasticity and change in unemployment rate respectively.<sup>5</sup> Positive investment expectations are associated with a more limited reaction of unemployment to output losses and with a more moderate change in unemployment. An institutional feature that could explain cross-country divergence of the

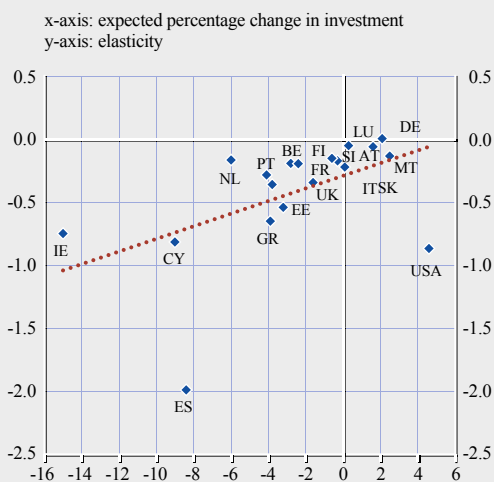
5 European Economic Forecast, European Commission, Autumn 2009.

**Chart A Elasticity of unemployment with respect to output during the crisis**



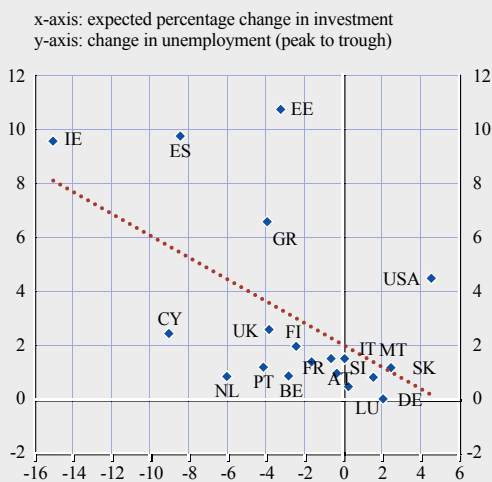
Sources: Eurostat and own calculations.  
Note: The country-specific peaks and troughs of GDP (and the corresponding levels of unemployment on those dates) are used.

**Chart B Expected change in investment and elasticity of unemployment with respect to output**



Sources: Eurostat and own calculations.

**Chart C Expected change in investment and change in unemployment**

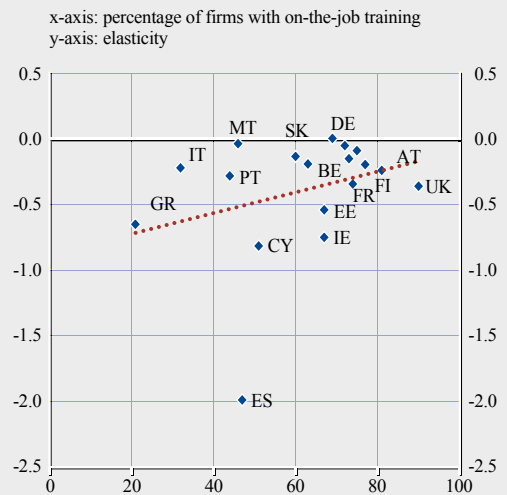


Sources: Eurostat and own calculations.



labour market impact of the current shock is a country's tradition for dialogue between unions, employees and employers. A proxy for such a tradition is the presence or otherwise of an institutionalised tripartite council.<sup>6</sup> Finally, another relevant factor in mitigating the unemployment impact of the output fall may be the skill composition of the workforce.<sup>7</sup> The hypothesis is that firms are more likely to hoard labour if workers are qualified and possess sectoral or firm-specific skills. Due to the lack of data on the skill composition of the workforce, indirect evidence on the firm-specificity of the workforce, namely the percentage of firms engaging in continuous vocational training, is used. Chart D illustrates the negative association between the labour market impact of the loss of output and the percentage of firms pursuing continuous vocational training.

**Chart D On-the-job training and elasticity of unemployment with respect to output**



Sources: Eurostat and own calculations.

Regressing the elasticity of unemployment to output during the present crisis on the variables mentioned provides some evidence that positive investment expectations, the existence of a tripartite council and the extent to which firms engage in “on-the-job training” may mitigate the impact of the crisis on unemployment. Using a longer term perspective and regressing the Okun coefficients in each of two sub-periods (1995-2003, 2004-2011) on a number of institutional variables suggests that Okun's coefficient tends to be more negative the higher the proportion of employees on fixed-term contracts and where a tripartite council does not exist. However, no statistically significant link with the extent of on-the-job training is found.

6 The information is collected from the Visser database on the institutional characteristics of trade unions, wage setting, state intervention and social pacts, 1960-2010 (ICTWSS).

7 The OECD (2010) *Employment Outlook* reports results using firm-level data; the skill intensity of a firm is positively associated with labour hoarding.

## Box 2

### UNEMPLOYMENT DEVELOPMENTS IN THE EURO AREA AND THE UNITED STATES<sup>1</sup>

Between the start of the recession and the end of 2011, total employment decreased by almost 6 million in the United States (i.e. around 4.5% of the total prior to the recession), while euro area employment contracted by around 4 million (i.e. 2.6%).<sup>2</sup> At the same time, the contraction in economic activity was of a similar magnitude in the two economies, with peak-to-trough declines in real GDP of around 5% in both cases. There are a number of reasons which may help to explain the lower employment losses observed thus far in the euro area relative to the United States.

1 Prepared by Ramón Gómez Salvador (ECB) and Valerie Jarvis (ECB).

2 For important methodological differences in the compilation of employment data in the euro area and the United States, see the article entitled “Comparability of statistics for the euro area, the United States and Japan” in the April 2005 issue of the ECB's Monthly Bulletin.

These include a rather lower overall exposure of the euro area economy to sectoral shocks in the construction, real estate and financial sectors. In addition, the greater reliance on short-time working schemes in many euro area countries helped cushion job losses.<sup>3</sup>

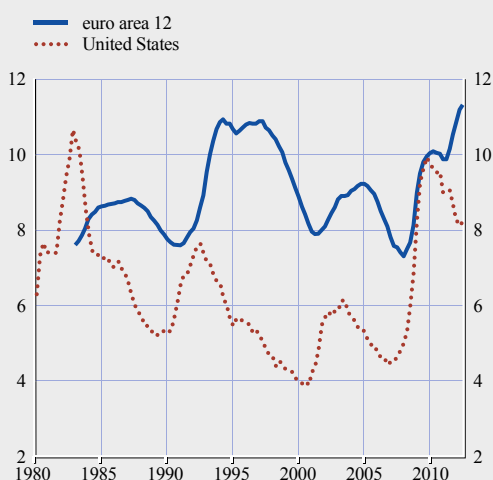
In addition to different labour demand dynamics, both economies experienced considerable labour supply effects, which – although adverse in nature – helped to contain the rise in unemployment. In the euro area, the virtual stagnation in the rate of labour force growth following the onset of the recessions can be attributed almost equally to a slowing in population and participation growth. In the United States, by contrast, the observed 0.5% contraction in the labour force is almost entirely due to a strong decline in participation rates (of around 2.3 percentage points from the pre-crisis peak), while US population growth moderated only slightly. Moreover, while the decline in US participation rates was broadly based across labour market sub-groups, the euro area stagnation masks some considerable differences across sub-groups. Two groups, in particular, show a marked divergence from the overall trend: older workers (aged 55-64), whose labour market participation continues to grow at rates similar to those of the pre-crisis years; and women, with female participation rates continuing to increase, albeit at more moderate rates than earlier in the decade (see Section 1.2.1).

These different labour market dynamics have led to a somewhat slower increase in unemployment in the euro area – albeit from a higher initial level (see Chart A). Overall, since the beginning of the crisis, the aggregate euro area unemployment rate has risen by around 4.0 percentage points. Meanwhile, the US unemployment rate more than doubled – from 4.8% in February 2008 to a

<sup>3</sup> The use of short-time working programmes in many euro area countries increased sharply during the recession (applying, at its peak, to around 4% of employees in Germany and Italy), whereas similar schemes applied to only around 0.5% of the US labour force. See IMF, *World Economic Outlook*, Chapter 3, “Unemployment Dynamics during Recessions and Recoveries: Okun’s Law and Beyond”, 2010.

Chart A The evolution of unemployment in the euro area and the United States

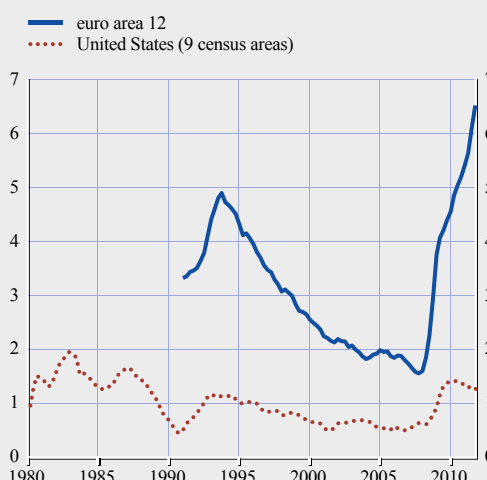
(percentage of civilian labour force)



Sources: Eurostat, BLS and own calculations.  
Note: Euro area data to 1995 computed on the basis of developments in the EA12. Latest observations: 2012 Q2.

Chart B Dispersion in unemployment rates

(weighted standard deviations)



Sources: Eurostat, Bureau of Labor Statistics and own calculations.  
Notes: Standard deviations, weighted by shares in labour force, for EA12 and US 9, respectively. Latest observations: 2011 Q4.

peak of 10.1% in October 2009. By early 2010, both economies recorded unemployment rates of around 10%, but since then, developments have been rather different. While the US unemployment rate has been slowly declining (to 8.7% in the final quarter of 2011), euro area unemployment continues to exceed 11%. Chart B shows that the dispersion of cross-country unemployment rates in the euro area is also rather larger than across US census areas.

A more immediate concern is the rise in the duration of unemployment. Longer unemployment spells may lead to a strong deterioration in human capital and/or labour market attachment and, consequently, harm the long-run growth potential of an economy. Chart C shows the marked increases in the proportions of total unemployment accounted for by persons without work for at least six months.

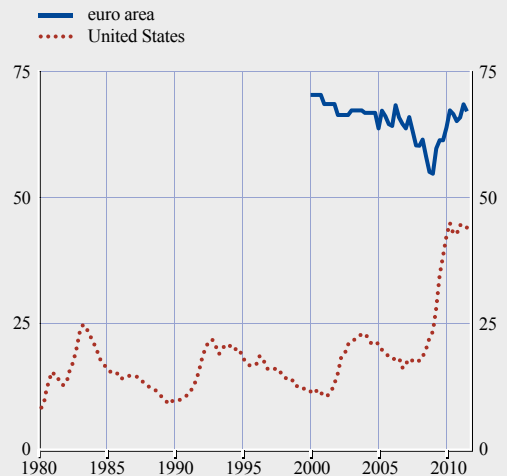
Typically, US unemployment rates tend to reflect a far higher degree of so-called “frictional unemployment”, while the share of longer-term unemployment (those out work for six months or more as a percentage of total unemployment) is generally much lower than in the euro area, peaking at around 25% in the aftermath of past recessions. By contrast, the latest recession has resulted in a considerable increase in longer-term unemployment in the US. This rise is undoubtedly due, in part, to the severity of the recession and the lack of new employment possibilities in a still depressed labour market; but part is also likely due to the 2008 extension of unemployment benefits from 26 to 99 weeks, which helped raise the incentive to register as unemployed beyond the six month horizon.<sup>4</sup>

All in all, the impact of the crisis was deep in both economies, with a marked increase in unemployment rates, which raises some concerns about a possible increase in unemployment persistence due to the current crisis in both the euro area and the United States.

4 Daly, Hobijn and Valletta (2011) conclude that the almost two-fold extension of US unemployment insurance is likely to have contributed only modestly to the increased unemployment durations; of far greater importance are the sectoral declines in employment and the resultant mismatch in worker attributes versus openings.

**Chart C Unemployment duration in the euro area and the United States**

(percentage of total unemployment corresponding to persons out of work for at least six months)



Sources: Eurostat, BLS and own calculations.  
Notes: Euro area data from 2000 Q1. Latest observations: 2011 Q3.

### FACTORS EXPLAINING THE HETEROGENEOUS EVOLUTION OF EMPLOYMENT

Several factors may lie behind the observed cross-country differences in labour market reactions to the crisis: the labour hoarding practices adopted in a number of countries; sectoral specialisation, as some sectors were more affected by the crisis than others; the nature of the shock affecting euro area countries;

the conditions influencing the willingness and the ability of firms to retain workers; and the policy and institutional environment may also have been important factors.

### LABOUR HOARDING

The fall in total hours worked in the euro area (-4.5%) was considerably larger than the decline in headcount employment (see Chart 2). Labour

hoarding in euro area labour markets during this crisis therefore contributed to mitigate employment (in terms of persons) adjustment, in some of those countries less affected by the crisis (e.g. Germany and Austria). Indeed, faced by the weakening of activity, firms have shown a widespread preference for forms of internal flexibility, such as cutting overtime and making use of short-time working (STW) schemes.<sup>7</sup>

### SECTORAL EMPLOYMENT DEVELOPMENTS

Employment losses were heavily concentrated in industry and construction (see Chart 4). The employment adjustment in construction is especially significant in some countries (Estonia, Ireland and Spain),<sup>8</sup> in part reflecting a correction to the previous boom in the housing sector. Industry accounted for the bulk of the employment decline in Slovakia, Slovenia and Italy, although the number of jobs in this sector also decreased markedly in Estonia and Spain. Employment in market services also contributed to the total employment decline in several euro area countries. Only in non-market services

(largely consisting of the public sector) did employment keep rising.<sup>9</sup>

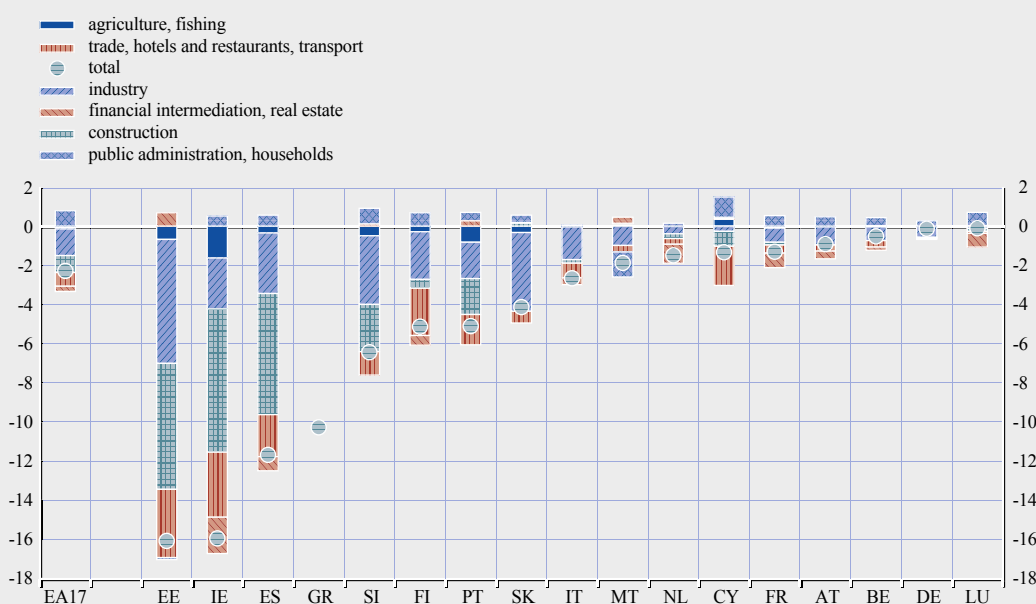
### THE NATURE OF THE SHOCKS

The nature of the shock may be a crucial factor influencing the transmission of the decline in GDP to the labour market. For example, the external shock (i.e. the collapse in world trade and exports during the initial quarters of the crisis) turned out to be temporary and firms may have expected the output loss to be transitory and hence retained

- 7 The use of STW is discussed further in the policy measures subsection and in Box 1.4 on labour market underutilisation.
- 8 In Ireland and Spain the construction sector accounts for around 50% of the overall employment contraction.
- 9 Total job losses, expressed as a percentage change, have also been influenced by the *employment structure* in the different countries. This was for instance the case in countries like Estonia, Ireland, Spain and Slovenia, where employment was more concentrated in heavily affected branches of activity (industry and/or construction). After correcting for the sectoral employment structure, intra-euro area dispersion remains large but is clearly reduced. This picture changes slightly when we look at *job losses relative to the sectoral fall in activity*. For the euro area as a whole, the elasticity of employment with respect to output was largest in “finance and business”. In construction, the elasticity was around unity, it was lower in industry and “trade and transport”.

Chart 4 Employment reaction to the crisis by sector

(percentage changes from peak to trough, and contributions of the branches of activity in percentage points)



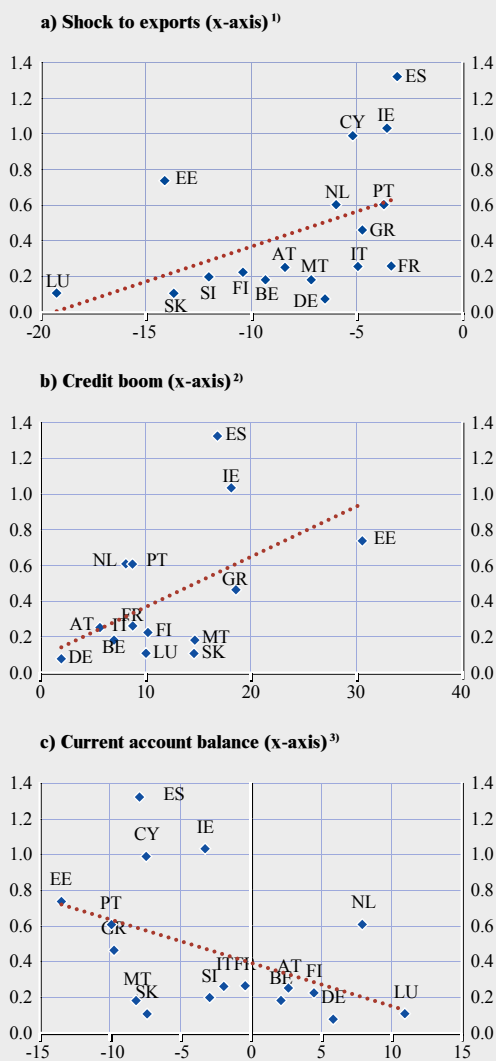
Sources: EC, ECB and own calculations.

Notes: For Greece, no sectoral subdivision of employment is available. Peaks and troughs are country-specific in the period 2007 Q1-2011 Q4.

workers in anticipation of the trade recovery.<sup>10</sup> On the other hand, a bursting property bubble (implying more permanent restructuring) or a credit crunch may lead to further domestic shocks and uncertainty, so that firms are more reluctant and less able to retain staff.

**Chart 5 Elasticity of employment to GDP: explanatory factors**

(elasticities on y-axis)



Sources: a) ECB, Eurostat and own calculations, b) national sources for Estonia, c) Slovakia and Malta.

1) The export shock is measured as the percentage point change of exports from 2008-2009 relative to 2008 GDP (chain-linked volumes).

2) Data for Greece are provisional.

3) Measured as the average annual credit growth 2000-08 except for Slovakia (2002-08) and Malta (2005-08).

In this respect, panel (a) of Chart 5 suggests that there is a positive (significant at the 5% level) association between the relative size of the change in exports (in percentage points of GDP) and the observed employment elasticity. That is to say, in those countries where the recession was more closely associated with a decline in exports, and may have been perceived as a temporary shock, the total elasticity of employment to GDP was significantly lower than in other euro area countries. By contrast, panels (b) and (c) of Chart 5 show, respectively, that strong pre-crisis credit growth and current account deficits were associated with a higher employment elasticity (correlation is significant at the 5% level).

#### BREAKDOWNS OF EMPLOYMENT AND UNEMPLOYMENT DEVELOPMENTS

Detailed breakdowns of EU LFS employment and unemployment data show that low-skilled, temporary and young workers were those most affected by the recession in euro area countries. For instance, the sensitivity of worker groups to the crisis varied strongly according to their *level of education* (see Charts 6 and A2).<sup>11</sup>

Low-skilled workers were more severely hit as their employment decreased strongly and their unemployment rate increased relatively more (starting from an already higher level). By contrast, high-skilled employment continued to grow over the whole period, albeit at a slower pace. Firms tend to retain high-skilled personnel since they have specific knowledge and skills and are less easily replaced, while low skilled people can be exchanged more easily. The divergent evolution of unemployment rates according to educational attainment is more pronounced in some of those countries more affected by the crisis (e.g. Estonia, Ireland and Spain).

10 Box 1 on Okun's law contains a possible alternative interpretation relating to the (un)employment intensity of exports.

11 These charts are not directly comparable to previous ones (see Charts 2 to 4), in which country specific dating of the crisis was used.



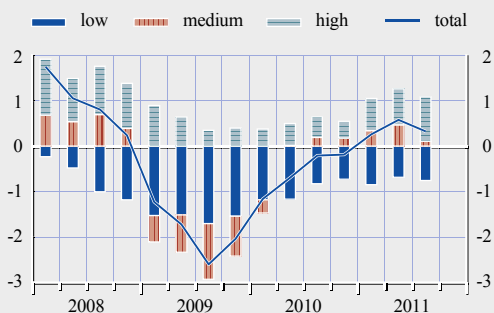
Chart 6 Employment and unemployment developments in the euro area

(breakdown by various categories)

**Euro area**

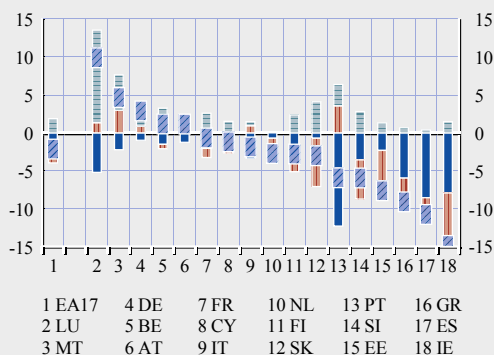
(annual percentage changes)

**a) employment breakdown by educational level**

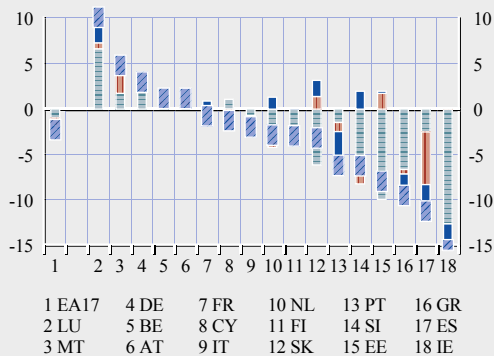


**Euro area countries**

(2011 Q1-Q3 with respect to 2008 Q1-Q3, contributions in percentage points change)



**b) employment breakdown by professional status and type of contract**



**c) employment breakdown by age group**

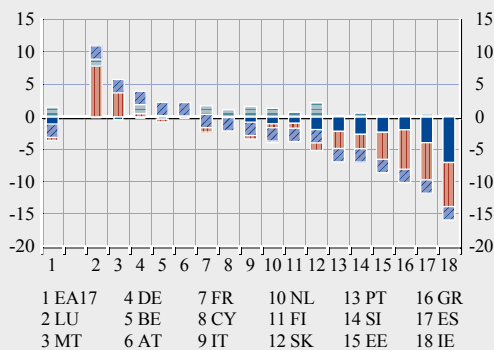
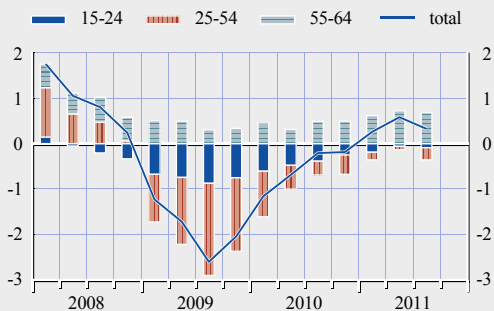
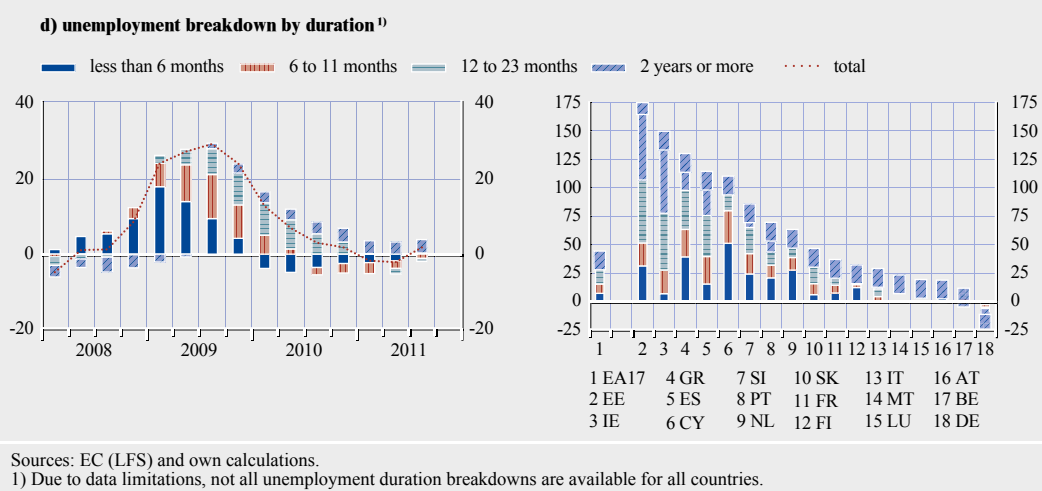


Chart 6 Employment and unemployment developments in the euro area (cont'd)



In terms of *professional status and type of contract*, temporary workers whose contracts are coming to an end are usually made redundant first when firms need to lay off staff. This makes them more vulnerable than permanent workers in the initial phase of a recession. But when the economy starts to pick up, employers may be uncertain about the magnitude and the duration of the recovery and may often first recruit workers by offering them a temporary contract. Thus, temporary employment is most sensitive to the business cycle during slowdowns and upturns. As a result of the economic upturn in several countries from mid-2009 onwards, the number of temporary workers has recently returned to (or exceeded) its pre-crisis level. Non-employees (mainly autonomous workers) were also strongly affected by the crisis (see Chart 6). However, large differences are observed at the country level, which probably partly reflect the different positions in the business cycle, national practices, etc. For example, in Ireland and Estonia the number of permanent employees dropped considerably, while in Spain, for a similar drop in total employment, a larger fall in temporary employment is observed.<sup>12</sup>

*Young persons* are more vulnerable to redundancy and may sometimes be less attractive to potential employers, partly reflecting the

fact that they often do not have permanent jobs and/or relevant professional experience or skills. Already in 2008, the employment of 15 to 24 years old was affected by the crisis and in 2011 it was still decreasing. By contrast, employment of older workers (55-64 years old) showed a clear rise over the whole period.<sup>13</sup> In particular, the employment rate of females aged between 55 and 64 increased (see Chart A1 in the Appendix).<sup>14</sup>

The more favourable evolution of employment of older workers was widespread across the euro area: even in the countries more severely affected by the crisis, where a decline of the employment rate of older workers is found, it was more limited than the decrease observed for the prime-age group. This may reflect the impact of several recent reforms introduced in

12 The fall of temporary employment in Spain accounts for the bulk of the downward correction of temporary employment in the euro area.  
13 The increase in employment of older workers was mainly due to a widespread rise among those aged 55 to 59 years, but the employment rate for those aged 60 to 64 years old also rose considerably.  
14 Nevertheless, the employment rate of older workers in the euro area remains below the rate for prime-age workers and, for instance, below the rate for older workers in the United States. Further investigation would be needed to analyse the role of several labour market and pension reforms introduced in euro area countries in previous years that were intended to increase the labour market participation of this specific group of workers.

a number of countries in previous years that were intended to increase the labour market participation of this specific group of workers, but also changes in employment composition by branch of activity might play a role.

Unemployment developments mirror these employment trends. On average, the unemployment rate in the euro area of those aged 15-24 reached 20.6% in the first half year of 2011, which is almost 6 pp higher than before the crisis. By contrast, over the same period the rate increased by only 1.4 pp for older workers. The youth unemployment rate exceeded 20% in around half of the euro area countries and it was above 40% in Spain and Greece. The increase over the last three years has been largest in the euro area countries where the crisis was more intense, but notable rises are also evident in other countries. Only in Slovenia and the Netherlands (where the increase in unemployment was uniform across age groups) and Germany (where a decrease has taken place) was youth unemployment not disproportionately more affected. Furthermore, a sizeable proportion of young workers affected by the crisis seem to have entered further education instead of unemployment.

Turning to *gender*, men were in general hit harder by the recession than women, most probably because male workers are relatively more active in the branches of activity that were most sensitive to the recession (industry, construction), while women tend to work more in sectors that were less affected such as non-market services. As a result, the gap between the male and female unemployment rates narrowed. This was a common feature across euro area countries, although the relative increase in the male unemployment rate was higher in Spain, Portugal, Slovenia, Finland and Slovakia (see Chart A2). The higher unemployment increase among males was common to all age groups, although it was generally greater among young workers (with some exceptions, including Belgium, Italy and Greece).

Over the whole period considered, the number of *part-time workers* in the euro area kept growing

and in all euro area countries the number of part-time jobs was higher at the beginning of 2011 than before the crisis. Some full-time jobs may have been converted into part-time ones, due to the application of short-time working schemes or as people have chosen to work part-time in order not to lose their job. Another reason could be that (part-time) workers enter the labour force in order to compensate at the household level for income losses suffered by the principal earner.

The breakdown of *unemployment by duration* clearly shows the impact of the crisis (see Chart 6). The initial increase in unemployment was due to the newly unemployed who had lost their job. Hence, short-term unemployment increased rapidly between 2008 and 2009. As the crisis continued and the unemployed still faced difficulties in finding a job, long-term unemployment (LTU; defined as unemployment spells lasting longer than one year) started to increase at the beginning of 2009.

As a percentage of total unemployment, LTU in the euro area reached 45.3% in the second quarter of 2011, more than 4 pp higher than in 2008 (see Chart A3). Again, remarkable disparities can be observed across countries. In terms of developments since 2008, larger increases are observed in Ireland, Spain and Estonia. These cross-country differences and, in particular, their relevance for the structural functioning of euro area labour markets are analysed more deeply in the second chapter of the report.

#### LABOUR MARKET REFORMS AND POLICY MEASURES ADOPTED IN EURO AREA COUNTRIES SINCE THE START OF THE CRISIS

The favourable developments in euro area labour markets over the decade prior to the global financial crisis partly reflect previous structural reforms. Tax wedges were reduced in the majority of euro area countries while unemployment benefit administration was reformed in some euro area countries by tightening work availability or eligibility conditions and/or shortening the duration of

benefits. Several reforms aimed to reduce early retirement, with increases in the statutory retirement age and lowering of the financial incentives to retire earlier. On average, these measures seem to have stimulated labour supply, particularly for older workers.

The labour market reforms introduced in Germany in the early 2000s (the Hartz reforms) appear to constitute a good example of successful reforms contributing to a better labour market performance in the current crisis. The reform strategy included improving employment services and redesigning active labour market policy measures, so as to activate the unemployed, reduce unemployment benefit duration and stimulate labour demand by deregulating segments of the labour market and promoting low paid part time employment (“mini jobs”). As part of the reforms to unemployment benefits, eligibility criteria became stricter and sanctions for refusing a job offer were increased. The follow-on unemployment assistance programme, which provided means tested benefits, potentially indefinitely, was merged with

the less generous social welfare programme. As a result, the reservation wage fell and the search intensity of the unemployed increased. Moreover, some institutional restrictions concerning temporary employment agencies and temporary work contracts were loosened. Finally, the reforms also helped to improve the matching of unemployed and vacancies thereby contributing to a reduction in unemployment.<sup>15</sup>

Following the start of the crisis in 2008 policy measures focused on supporting aggregate demand and boosted employment in the euro area. To mitigate the impact of the crisis on employment, measures encouraging flexible working time arrangements were also taken, although remarkable differences are observed across euro area countries, see Table 1.<sup>16</sup> In order to increase

15 See, for instance, Jacovi and Kluve (2006) who find positive impacts on the functioning of public employment services and training programmes. Klinger and Rothe (2009) and Fahr and Sunde (2006) show these reforms increased matching efficiency, with larger effects for the long-term unemployed.

16 In addition, some euro area countries adjusted their unemployment benefits schemes.

Table 1 Measures taken to combat the crisis

Country	Supply side				Demand side			
	Training	In-work benefits	Job search assistance	Extension unemployment benefits <sup>1)</sup>	Short-time working	Subsidy incentive to hire workers	Reduction in non-wage labour cost <sup>2)</sup>	Public work and investment programmes
AT	X	X			X		X	X
BE	X	X	X	X	X	X	X	
CY	X		X			X		
DE	X		X		X		X	
EE	X		X	X		X	<sup>3)</sup>	X
ES	X		X		X	X	X	X
FI	X		X	X	X		X	
FR	X		X		X		X	X
GR	X			<sup>4)</sup>		X	<sup>3)</sup>	
IE	X						X	
IT	X	X		X	X	X		
LU	X			X	X	X		
MT	X							
NL	X		X		X			
PT <sup>5)</sup>								
SI				X	X			
SK	X				X	X	X	

Source: NCBS' replies to SIR questionnaire on policy measures taken to combat the crisis.

1) Either higher benefits or loosening of eligibility criteria.

2) Mostly decrease in social security contribution.

3) Estonia and Greece are the only two countries that increased the non-wage labour cost by increasing the unemployment contributions of employers (and employees).

4) In Greece unemployment eligibility criteria became stricter.

5) All the crisis measures taken in Portugal have been suspended since April 2011.

the chances of unemployed persons to find a job, countries adopted various policies to improve the supply side of the labour market. Measures are mainly aimed at improving the matching process between the unemployed and job vacancies, either by improving the skills of the unemployed or by helping them in their search for jobs. Almost all countries adopted some sort of training programme for the unemployed.<sup>17</sup> The opportunity to continue or return to regular education was offered in Austria, Germany, Ireland and the Netherlands. Incentives for firms to hire workers and train them on the job were provided in Austria, Cyprus and Italy. Job-search assistance for the unemployed is another widely used policy.

Such assistance ranged from increasing the staff and budget of public employment agencies to requiring employers who lay off workers to provide outplacement services (Belgium and Estonia). Finally, some countries provide in-work benefits. This was for instance the case in Austria (wage subsidy programmes for the young and long-term unemployed) and Belgium (in-work benefits targeted at older workers).

On the demand side, STW schemes, under which working hours per employee are reduced, were widely used. While these schemes have advantages, they can put a heavy burden on public finances. In addition, in the longer run they might hinder the re-orientation of the labour force away from declining enterprises and sectors towards developing ones. In cases of extreme demand decline, it is possible in many countries to temporarily suspend the employment relationship. STW schemes were widely regarded as one of the most important measures to counter the crisis. However, for some countries it is uncertain whether it was the STW scheme which preserved jobs or actually labour hoarding due to tight pre-crisis labour markets. In order to make it more profitable for employers to hire workers, some countries introduced hiring subsidies or reduced non-wage costs. Often the subsidies are targeted at specific groups (young workers, older workers or long-term unemployed). Non-wage costs were reduced in a number of countries, most of the time by lowering social security contributions,

especially for specific types of workers.<sup>18</sup> Some countries directly targeted weak labour market conditions by introducing public work and investment programmes. Finally, in addition to measures that preserve or create jobs, over one third of the euro area countries adjusted their unemployment benefits eligibility criteria, or increased benefits, to soften the impact of the economic crisis on the newly unemployed.<sup>19</sup> However, most of the unemployment benefit measures were temporary.

The relevance of ongoing labour market reforms is particularly important in Greece, Ireland and Portugal, which are all currently under international financial assistance programmes. These reforms can be very comprehensive and include pension and welfare reforms, public sector reforms and privatisation programmes. In the case of labour market institutions, several relevant modifications have been implemented, partly as a way to boost growth and contribute to the strengthening of public budgets. In particular, in Greece these reforms included a reduction in the level of the minimum wage, a shift away from sectoral level collective agreements to firm-level collective agreements, and the relaxation of severance pay. In Ireland, sectoral wage agreements are being reformed to ensure that they are more flexible and responsive to economic conditions while labour market activation and training policies have also been strengthened. In Portugal, a significant reduction of severance payments was implemented, together with an increase in the flexibility of working time and a larger scope for collective bargaining at the firm level. In addition, the unemployment insurance system has been revised by reducing benefit replacement rates and the maximum duration of benefits.

Other European countries, such as Spain, have also recently implemented labour market reforms. The main aims of these reforms were to increase

17 With the exception of Greece, Portugal and Slovenia.

18 In Spain, firms can also apply for deferral of social security contributions. Estonia and Greece are the only two countries which actually increased social security contributions.

19 Greece made the criteria stricter.

the internal flexibility of firms, paving the way for companies to be able to modify certain aspects of their working conditions relative to the provisions of sectoral-level collective bargaining agreements, and to reduce employment volatility by increasing the incentives for permanent contracts. The collective bargaining system was also modified to allow firm-level collective agreements to prevail over upstream ones and, more recently, in February 2012, a new labour market reform has been passed with additional measures to significantly increase wage bargaining decentralisation and reduce EPL for permanent workers. Finally, in Italy a new labour market reform has been designed by the Government to reduce dualism and promote employment creation. To this end, insurance schemes covering short-time work and dismissal are extended and harmonised and individual dismissal laws are softened by abolishing the right to reinstatement in the case of unfair dismissal for economic reasons. Other targeted measures have been included in the reform, for specific groups such as women and old and young workers.

### 1.1.2 FLOWS DESCRIPTION OF THE IMPACT OF THE CRISIS ON EURO AREA LABOUR MARKETS<sup>20</sup>

*This section complements previous analysis of the main developments in employment and unemployment stocks by looking at the recent behaviour of worker flows series in euro area countries. Remarkable differences in the size of worker flows between employment, unemployment and inactivity are observed across euro area countries, while the increase in unemployment since the start of the crisis, in particular in its initial phase, was mainly due to a large increase in employment exit rates. Again large heterogeneity across countries is found and exit rates from unemployment also decreased significantly in some euro area countries. This section also explores the role of personal and job-related characteristics as well as labour market institutions as determinants of worker flows.*

A detailed analysis of the recent evolution of gross worker flows in euro area countries is

critical in gaining insight into labour market dynamics since it may uncover differences in the dynamic properties of euro area labour markets and their capacity to adjust to different shocks with associated policy implications. For instance, the employment adjustment observed since the start of the crisis may be due to a decrease in job creation or to an increase of job destruction or a combination of both with different policy implications in each case. Furthermore, an increase in unemployment inflows may prescribe measures to foster labour hoarding while a decrease in unemployment outflows may call for active labour market policies to increase the probability of exit from unemployment.

In order to carry out this analysis, we use LFS microdata available at 13 euro area NCBs.<sup>21</sup> These data allow changes in the labour market status of individuals to be tracked over the consecutive quarters during which they remain in the LFS sample<sup>22</sup> and changes in the activity status of individuals (movements between employment, unemployment and inactivity) between two consecutive quarters to be computed.<sup>23</sup> One of the main advantages of LFS microdata is that they are fully comparable across countries and, in particular,

20 Prepared by Marco Hoeberichts, Ana Lamo and Mario Izquierdo

21 LFS microdata are available for this analysis for EE, IE, GR, ES, FR, IT, CY, MT, NL, AT, SI SK and FI.); these data are not available for BE, DE or LU, while certain methodological problems precluded their use in the case of PT. Box 1.4 provides a detailed description of the recent evolution of worker flows in these four countries using alternative administrative data sources. LFS microdata with individual identifiers allow for the computation of worker flows, which are not generally available for research purposes and, in particular, are not provided by Eurostat due largely to confidentiality restrictions. However, in the case of the 13 euro area countries for which microdata are available at the NCBs, in general, these data could not be shared within the task force. Therefore, a decentralised exercise was carried out at the respective NCBs to compute these worker flows for this analysis. Given the smallness of the sample size, data for MT are largely under-represented and should therefore be treated with caution. In NL, national rather than Eurostat definitions have been used in relation to job and age categories.

22 The rotating scheme employed is not standardised across euro area countries but most individuals are interviewed in the LFS for six consecutive quarters.

23 In order to compare the relative size of these flows, we will examine their size as a percentage of the labour force in the corresponding country. When these flows series are considered in terms of probabilities, we compute them as the percentage of the origin group.



the labour force states of employment, unemployment and inactivity are defined in a homogenous manner using Eurostat definitions. Furthermore, in contrast to other data sources, a large set of information available in the LFS data on worker characteristics (sex, age, educational attainment and unemployment duration) and job characteristics (industry and type of contract) can be used to analyse the main determinants of these worker flows.

### LABOUR MARKET FLOWS INTO AND OUT OF EMPLOYMENT

Looking at status changes into and out of employment, we first compare the average size of these flows over the pre-crisis period (2004 Q1-2008 Q2) and over the period since the start of the crisis (2008 Q3-2010 Q3)<sup>24</sup>. The relative size of worker flows entering and exiting employment for the EA13 as a whole<sup>25</sup> and for individual euro area countries are displayed in Charts 7 and 8, respectively. For the EA13 as a whole, workers representing around 4% of the total labour force have on average moved out of employment in each quarter since 2004. Quite large differences across euro area countries in terms of the relative size of these employment outflows are however observed.

These flows are five times higher in countries such as FI and ES than in SK and GR. Worker flows exiting from employment are also larger than the EA13 average in SI, IT and AT, while they are smaller in FR, IE, NL, CY, EE and MT.<sup>26</sup> As can be seen in Chart 8, a similar country ranking is observed among euro area countries in worker flows entering into employment.<sup>27</sup> Focusing solely upon the period since 2008, as expected, the fall in activity led to an increase in the job destruction rate and a decrease in the job creation rate. However, a larger increase was observed in the job destruction rate, with flows out of employment increasing from 4.2% to 4.7% of the labour force for the euro area 13 as a whole.

24 It is possible to use country-specific timings for the crisis in individual euro area countries, although, in principle, the results do not change qualitatively for the euro area average. However, if the analysis were to be carried forward into 2011-12 it is likely that in some countries in which the crisis intensified after 2010 the differences with respect to the period prior to 2008 could be more marked.

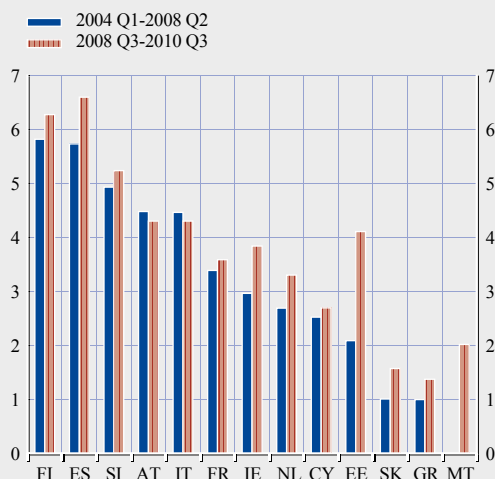
25 Euro area aggregates are computed using labour force weights for each country.

26 Although for this latter country flows series only cover the crisis period, starting in 2009 Q1.

27 The cross-country correlation in the size of worker flows in and out of employment is close to unity.

Chart 7 Exits from employment

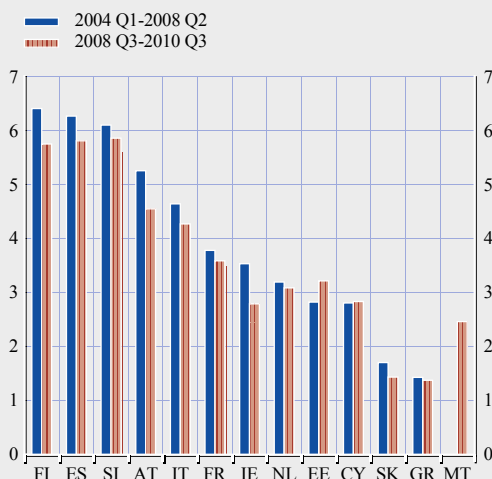
(as a percentage of the labour force)



Sources: LFS microdata and own calculations.

Chart 8 Entries into employment

(as a percentage of the labour force)



Sources: LFS microdata and own calculations.

The differences across countries in terms of the impact of the crisis on employment inflows and outflows were also considerable. Employment outflows increased markedly in countries, like EE, IE and ES, that were more heavily affected by the crisis. The increase in exit flows from employment since the start of the crisis is significantly associated with the severity of the GDP fall.<sup>28</sup> While flows into employment since the start of the crisis have generally decreased, they do not display a clear link to the severity of the GDP decline. Flows into employment decreased in some of those countries where the GDP fall has been relatively larger (IE and ES), but a marked decline also occurred in others, such as FI, FR and IT. In particular, although the general pattern is that the crisis raised employment destruction more than it lowered job creation, in some euro area countries (FI, FR, IT and AT) the opposite is true.

An update of the worker flows series covering the first half of 2011 has been possible for seven euro area countries and introduces some qualifications to previous results. According to these more recent data, the higher impact of the crisis on employment outflows was a feature of the initial phase of the crisis, with a subsequent slowdown in most euro area countries observed in the more recent period, as can be seen in Chart A4 in the Appendix. This is particularly true in some of those euro area countries more severely affected by the crisis (ES, EE, IE), where the exit rate from employment is slowly returning to the pre-crisis level. The re-intensification of the crisis in the second half of 2011 is resulting in further increases in job destruction rates in some euro area countries.<sup>29</sup>

Movements from employment to inactivity are very frequent in several euro area countries and, at least over the pre-crisis period, appear to have been more frequent than employment to unemployment flows (especially in countries such as FI, IT, AT and SI, see Chart A5). Employment to inactivity movements are however not closely linked to the business cycle. In contrast to employment to unemployment flows which have increased markedly across most euro area countries since the start of the

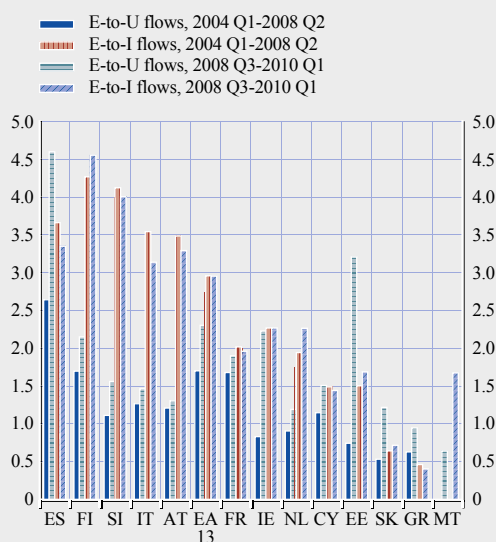
crisis, an increase in employment to inactivity flows of similar magnitude is not observed for the EA13 aggregate, which remained broadly stable at 2.8% of employment (see Chart 9).

Flows to inactivity are basically a-cyclical in most countries while flows to unemployment exhibit a clear counter-cyclical behaviour (see Chart 9 and Table A1 in the appendix) so that the employment adjustment during recessions is associated to a greater extent with an increase in job destruction rates than with a decrease in job creation rates.<sup>30</sup>

- 28 The correlation coefficient is 0.7. Other factors also may have played a role. For instance, labour hoarding was commonly implemented in IT and AT and, possibly in combination with other factors, contributed to a decrease in job exit rates in these countries. The increase in employment exit flows was also quite muted in countries such as CY and FR.
- 29 This can be seen in the flows series for ES, for instance, which is available up to 2011 Q4.
- 30 Recent evidence in Elsby et al. (2010) highlights a marked increase in job destruction rates during the current recession. In euro area countries, however, differences in the cyclical pattern of employment exit flows across euro area countries are remarkable. In ES, EE and IE unemployment inflows show a marked counter-cyclical pattern while this pattern is more muted in general in the rest of the euro area countries.

**Chart 9 Employment outflows**

(as a percentage of employment)



Sources: LFS microdata and own calculations.  
Note: "E" denotes employment, "U" unemployment and "I" inactivity.

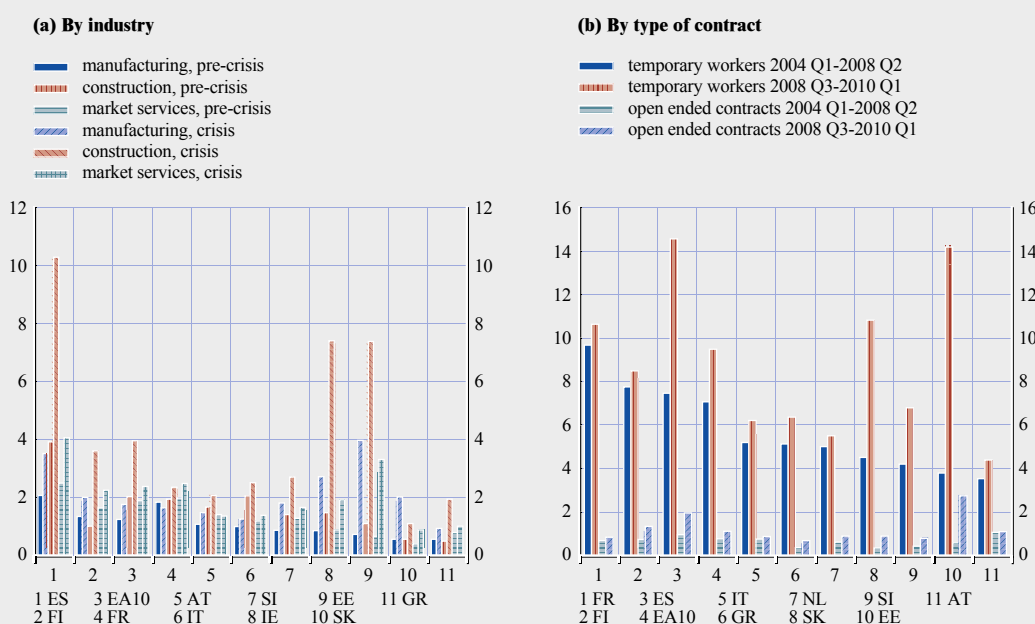
Turning now to the impact of the sectoral structure on recent employment flows in euro area countries, we consider the relative probabilities of exiting from employment to unemployment in the manufacturing, construction and market services sectors in ten euro area countries both before and during the period following the start of the current crisis (see Chart 10). In general, the construction sector tended to show higher exit rates from employment to unemployment, in particular in ES, EE and IE. However, in FI, GR and FR, those employed in the market services sector faced a higher probability of losing their job. By contrast, manufacturing tends to be associated with higher job stability probably reflecting a lower share of seasonal activities in this sector. Regarding the impact of the crisis, although there is a common upward trend in exit rate probabilities, the scale of the employment adjustment in the construction sector led to a much more pronounced increase in employment outflows within this sector. Also,

as we mentioned in the previous section, the limited impact of the crisis on manufacturing employment was remarkable. Differences across countries are again large, with a sharp increase in job destruction rates in the construction sector in countries such as ES, IE and EE.

Another key factor in explaining the probability of losing a job is the type of contract held by employees. EPL is much higher in some euro area countries for workers with an open-ended contract than for temporary workers, therefore the probability of such individuals losing their jobs is much lower. In Chart 10 we observe that, even in the period prior to the crisis, temporary workers faced quite a large probability of employment exit in each quarter. On average for the EA10 as a whole, the exit rate probability for temporary workers was around 7% between 2004 and 2008, as opposed to around 1% for workers with open-ended contracts. Although this general pattern holds for individual euro

Chart 10 Employment to unemployment

(percentage of origin group)



Sources: LFS microdata and own calculations.  
Pre-crisis: 2004 Q1-2008 Q2. Crisis: 2008 Q3-2010 Q1.

area countries, temporary workers in FR, ES and FI faced a much higher probability of losing their job than in other countries. Since the crisis began in 2008, it is clear that the exit rates of temporary employees reacted strongly in ES, EE, SK while, despite the generally low level of EPL for these workers, they only increased moderately in the rest of the countries. The intensity of the crisis, together with the possible different nature of the shock may also be behind these country differences. Also in the case of open-ended contract workers, although they had a much lower probability of losing their jobs during the crisis, this probability increased, especially in ES and EE.

In order to fully characterise the impact of the crisis on euro area worker flows, tables A2 and A3 in the appendix show the results of a multivariate analysis of exit rate probabilities using individual LFS microdata. In Table A2 in the appendix the individual probability for a worker to change her labour market activity status is associated with personal characteristics (sex, age and education) and job characteristics (sector and type of contract). The main results show that there is a clear inverse relationship between age and the probability of losing a job, with young workers facing higher probabilities, even when controlling for the varying incidence of non-regular contracts and the sectoral composition of employment. Remarkable differences are also evident in the relative probability of losing a job according to skill level. In particular, there is a clear inverse correlation between educational level and the probability of exiting from employment. As regards job characteristics, the employment adjustment is concentrated amongst those on fixed-term contracts, especially in some euro area countries (FR, ES, FI), while the differences between the self-employed and workers with open-ended contracts tend not to be significant.

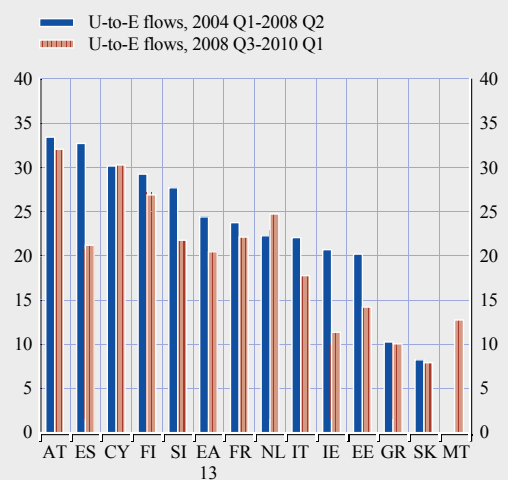
### LABOUR MARKET FLOWS OUT OF UNEMPLOYMENT<sup>31</sup>

As in the case of employment outflows, large differences are observed in the relative probabilities of exiting from unemployment in euro area countries, reflecting remarkable differences in the mean duration of unemployment across countries. Once an individual enters unemployment, the average quarterly unemployment exit rate probability is relatively high (around 30%) in AT, FI, ES and CY, while unemployment lasts longer, on average, in GR and SK, where this probability is around 10% or less (see Chart 11). As expected, these unemployment exit probabilities generally decreased in euro area countries during the crisis, albeit to varying degrees. Despite a high exit rate probability prior to the crisis, the decrease in ES during the crisis has been the most pronounced amongst

31 We focus in this section on unemployment outflows as unemployment inflows are analysed in the previous section.

Chart 11 Exits from unemployment to employment

(as a percentage of unemployment)



Sources: LFS microdata and own calculations.  
Note: "E" stands for employment and "U" for unemployment.

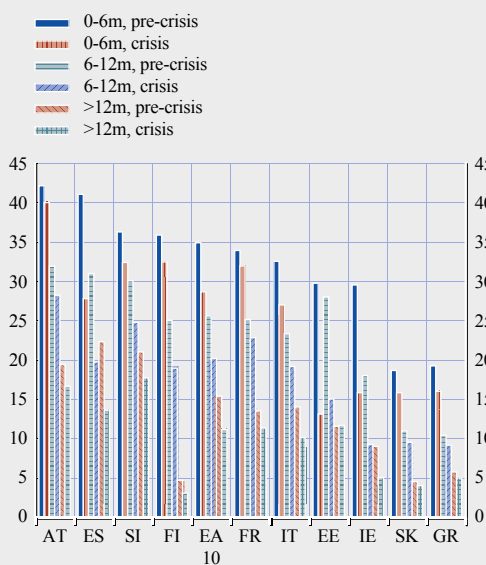
euro area countries and is now broadly in line with the euro area average. In other countries, such as EE, IT, IE and SI (as well for the euro area average), a decrease in unemployment exit rate probabilities has also been observed.

While the update to the most recent data suggests (see Chart A6 in the Appendix) that some additional decline in unemployment exit rates occurred over this period in ES and IE, the unemployment exit rate probabilities remained broadly unchanged. A modest recovery is observed in FI and EE over the more recent period yet, unlike employment exit rates, unemployment exit rates have failed to recover to the levels observed in the period before the crisis (with the exception of NL and to a lesser extent, FI). Movements between unemployment and inactivity are also quite common in euro area countries, with the average probability of an unemployed individual moving to a non-employment situation<sup>32</sup> of around 23% in the period prior to the crisis. Differences across euro area countries are however considerable, with larger movements to inactivity evident in IT, NL and FI. As regards the impact of the crisis, Chart A7 does not indicate any large increase in the number of unemployed persons becoming inactive as a result of the deterioration in labour market conditions. Indeed, flows to inactivity appear to decline in euro area labour markets during the crisis, especially in some of the countries most sharply affected by the fall in activity (ES, EE).<sup>33</sup>

Turning to the risks of hysteresis effects (leading to high persistence of the recent increases in unemployment across euro area countries) a key issue to examine is the duration of unemployment and specifically how the exit rate from unemployment has evolved by unemployment duration. Chart 12 shows exit rate probabilities from unemployment to employment by unemployment duration. Chart 12 shows exit rate probabilities from unemployment to employment by unemployment duration. A marked negative relationship is observed between the exit rate probability and the duration of unemployment, suggesting that unemployment is clearly duration dependent.

Chart 12 Unemployment to employment flows by duration

(percentage of origin group)



Sources: LFS microdata and own calculations.

In particular, the unemployment exit rate probability of the short-term unemployed is more than twice as large as the exit rate probability of the long-term unemployed. Although this is the general pattern observed across euro area countries, particularly low exit rate probabilities for the long-term unemployed are observed in FI, SK and GR.

However, as regards the impact of the crisis, short-term unemployment spells seem to have been more directly affected by the crisis. This is illustrated in Chart A8, which shows the change in exit rate probabilities between the periods before and after the start of the crisis in euro area countries. In particular, a noticeably sharp reduction is evident in the case of the short-term unemployed. Furthermore, the differences

32 Education, retirement and discouraged individuals not actively seeking a new job, etc. Education, retirement and discouraged individuals not actively seeking a new job, etc.

33 This effect may have had a positive impact on participation rates in these countries, but it may also have contributed to a large increase in the unemployment rate. See Section 2.1 on labour supply adjustment in response to the crisis in euro area labour markets.

observed across countries are correlated with the intensity of the GDP fall since the start of the crisis. In those countries most severely affected, short-term unemployment has increased rapidly and, given low job creation rates, the probability of finding a new job has decreased markedly. However, at least up to the end of 2010, the decrease in the probability of finding a new job for the long-term unemployed has been smaller relative to other duration categories. Also, in the case of long-term unemployment, differences across euro area countries are not linked to the varying intensity of the recession, reflecting the potential impact of other factors.

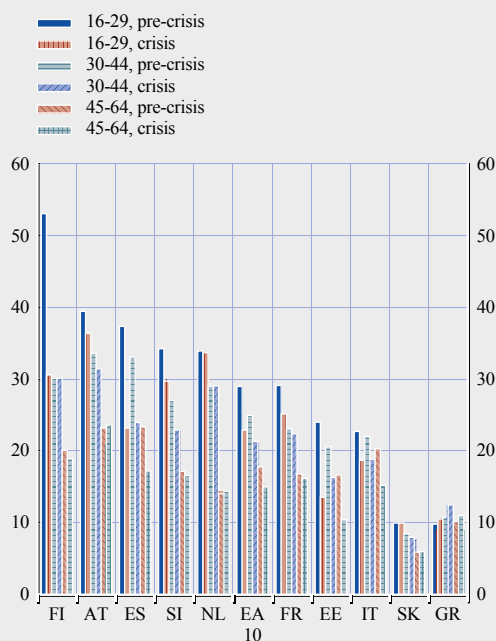
To conclude this analysis of unemployment outflows in euro area countries, it is of interest to analyse differences in unemployment exit rates by the personal characteristics of the unemployed individuals. As regards age, young workers exhibited a higher exit rate probability from unemployment despite suffering higher unemployment rates (see Chart 13). The impact of the crisis has however been greater for young workers, with a larger decrease in their exit rate probabilities relative to prime age and older workers. A similar result was found for employment exits, with a larger increase amongst the younger age cohorts, which may be related to the higher incidence of non-regular contracts among such workers. As was also the case in respect of employment outflows, the impact of the crisis has been less intense for older workers relative to those of prime-age. In this respect, it is noteworthy that in the case of AT, NL, GR and FR the exit rate from unemployment for older workers has actually increased since the start of the crisis.

#### CAN DIFFERENCES IN LABOUR MARKET INSTITUTIONS EXPLAIN THE VARIATION IN WORKER TURNOVER ACROSS EURO AREA COUNTRIES?

We now explore whether there is any association between the cross-country heterogeneity in the size of worker flows, both in terms of employment and unemployment flows, and differences in labour market

**Chart 13 Exit rate from unemployment to employment**

(by age group)



Sources: LFS microdata and own calculations.

institutions across euro area countries.<sup>34</sup> Notwithstanding the fact that EU countries exhibit significant differences in the extent of self-employment – a factor which must contribute to employment dynamics – one of the single most important factors considered to explain differences in labour market flows across euro area countries is the degree of employment protection legislation (EPL) as there is a clear theoretical prediction regarding the negative impact of EPL on employment inflows and outflows.

<sup>34</sup> In this exercise we consider cross-country differences in the average size (over the available sample period, see footnote 36) of worker flows in individual euro area countries and how some labour market institutions may be linked to them. Further investigation would be needed in order to assess the causal relationship between worker turnover and institutions or their role in explaining the reaction to the crisis. See Boeri and Garibaldi (2009), for instance, for some analysis on the role of labour market institutions in explaining the evolution of worker flows in some euro area countries.



Table 2 Correlation coefficients between worker flows and labour market institutions

	Employment inflows	Employment outflows	Unemployment inflows	Unemployment outflows
EPL – Overall indicator	0.00	-0.06	0.17	0.12
EPL – Regular employment	-0.27	-0.39	-0.22	-0.25
Initial net replacement rate of U benefits	0.38	0.28	0.33	0.31
Long-term net replacement rate of U benefits	0.42	0.47	0.13	0.09
Coverage of collective bargaining	0.65	0.66	0.47	0.41
Bargaining level	0.52	0.56	0.40	0.35

Sources: LFS flows data, OECD for EPL and unemployment benefit indicators and ICTWSS for collective bargaining indicators.

However, in practice, it is not always easy to identify a strong link between worker turnover and EPL.<sup>35</sup> Despite suffering from a number of shortcomings, OECD EPL indicators provide useful disaggregation of the different/various components of EPL. As shown in Table 2, a link between the overall OECD EPL indicator and the size of worker flows in euro area countries is not found. This may reflect the fact that effective EPL is better captured by the EPL indicator covering only regular workers. In this second case, a negative link between EPL and the size of employment and unemployment flows is found.<sup>36</sup> As regards other aspects of labour market institutions, a positive association between UB replacement rates and the size of unemployment outflows is observed.<sup>37</sup> Finally, the role of wage bargaining institutions in explaining large differences in worker reallocation across euro area countries is considered. A positive link between the size of worker turnover and the two main characteristics of WB systems, namely, the level of wage bargaining and the coverage of collective bargaining systems, is observed. This result would also be consistent with other studies<sup>38</sup> which have found higher employment flows in the presence of high coverage of collective wage agreements. As regards the level of wage bargaining, worker flows are observed

to be higher in those euro area countries with a more centralised WB mechanism.

Previous results tend to show some promising results on the role of some key labour market institutions in explaining large differences in the size of worker flows across euro area countries. It should be noted, however, that analysis of an optimal level of worker flows in euro area countries and which institutions may influence it is well beyond the scope of this analysis.

35 Part of these difficulties in the past have related to the lack of comparable data on worker flows across countries. Therefore, the flows series from the EU LFS may prove useful as they are computed in a homogeneous way across euro area countries. Furthermore, the legal and institutional particularities of EPL across countries are not always easy to summarise in a single quantitative indicator. For instance, the enforcement of legal provisions may result in large differences in the effective EPL across countries, which cannot be measured by the usual indices.

36 Although not shown, p-values show a statistically significant association. In addition, this sub-indicator is closely associated with the relative incidence of temporary contracts across euro area countries, which is positively linked to the size of worker flows.

37 The main channel through which unemployment benefits can affect unemployment flows is via their impact upon job-search incentives and, in this respect, greater generosity might be expected to lead to lower unemployment outflows. However, other factors may also be playing a role. For instance, as suggested by the OECD (2010), higher UB replacement rates are also found to increase employment outflows.

38 See Bertola et al. (2008)

### WORKER FLOWS DURING THE CRISIS IN GERMANY, LUXEMBOURG, PORTUGAL AND BELGIUM<sup>1</sup>

This box summarises the evolution of worker flows since the start of the crisis in those euro area countries for which LFS microdata are not available to carry out the corresponding analysis. To this end it explores monthly administrative data on inflows and outflows from unemployment for Germany and Luxembourg, while quarterly and annual data on employment flows in firms derived from social security records are used for Portugal and Belgium, respectively. It is important to note that comparing the results for Germany, Luxembourg, Portugal and Belgium with each other, or the results for these countries with those for euro area countries for which the LFS data could be used, is not straightforward. Apart from the use of different data sources,<sup>2</sup> the pattern of their productive specialization and the structure of their labour forces vary (e.g. the importance of cross-border workers and migrant labour in Luxembourg).

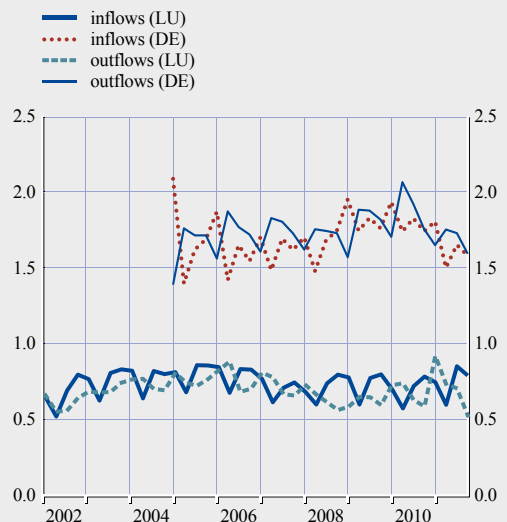
To preview the main results, in Germany and Luxembourg overall worker flows remained more or less unaffected by the crisis.<sup>3</sup> Nevertheless, young and low-skilled workers experienced slightly higher unemployment inflow rates as compared to the pre-crisis period. These developments broadly correspond with those identified in Section 1.1.2 as many other euro area countries experienced an increase in unemployment inflows during the economic and financial crisis, especially in the case of young and low-skilled workers. In Portugal and Belgium job creation fell and job destruction rose significantly during the crisis.

#### Analysis of flows data in Germany and Luxembourg

Unemployment inflows and outflows in Germany and Luxembourg are displayed as a percentage of the labour force in Chart A. The data have a strong seasonal pattern, as most persons enter unemployment in January and in the first month of each quarter. Worker flows in Germany and Luxembourg appear to have been only mildly influenced by the crisis. Between October 2008 and October 2009, inflows to unemployment increased somewhat in Germany, while outflows from unemployment remained constant. Hence, as was the case in other euro area countries, the observed increase in the unemployment rate was driven by higher

Chart A Quarterly averages of monthly unemployment inflows and outflows

(percentage of labour force)



Sources: Germany: Federal Employment Agency. Flows to and from unemployment capture all movements of a person within one month. Luxembourg: ADEM (Agence pour le développement de l'emploi). Own calculations.

Notes: Unemployment outflows between periods  $t$  and  $t+1$  are approximated by the difference between total unemployment in  $t$  and total unemployment in  $t+1$  plus unemployment inflows between  $t$  and  $t+1$ .

1 Prepared by José R. Maria, Jan De Mulder, Cindy Veiga Nunes, and Katja Sonderhof.

2 Indeed, while LFS data are broadly harmonised, this is not the case for administrative data, which are recorded according to national criteria.

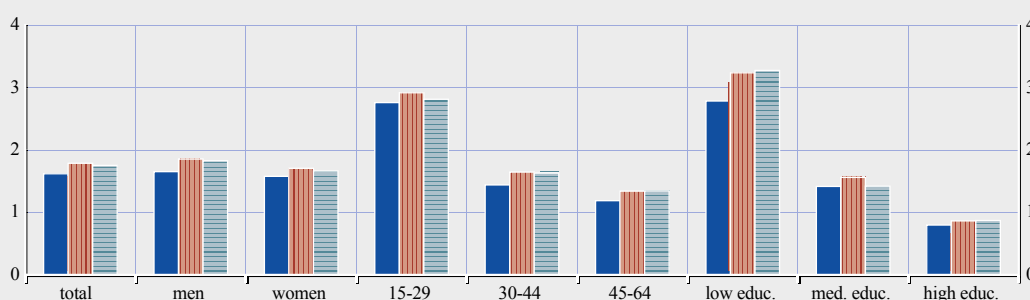
3 This corresponds well with the relatively limited impact of the crisis on economic activity in these countries (see Section 1.1.1).

Chart B Monthly unemployment inflows by various subgroups

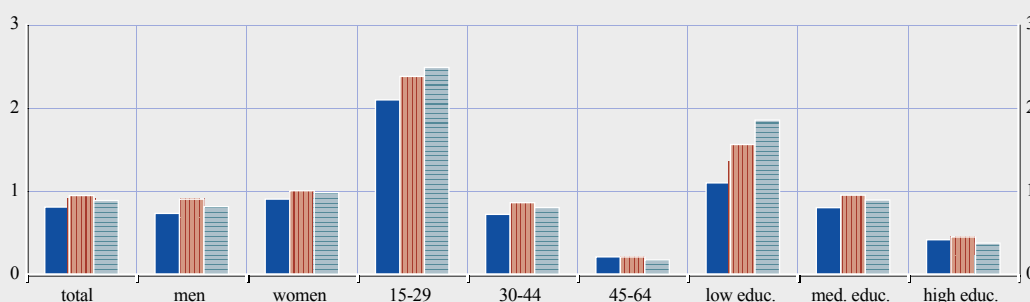
(percentage of labour force)

pre-crisis  
crisis  
recovery phase

Germany



Luxembourg



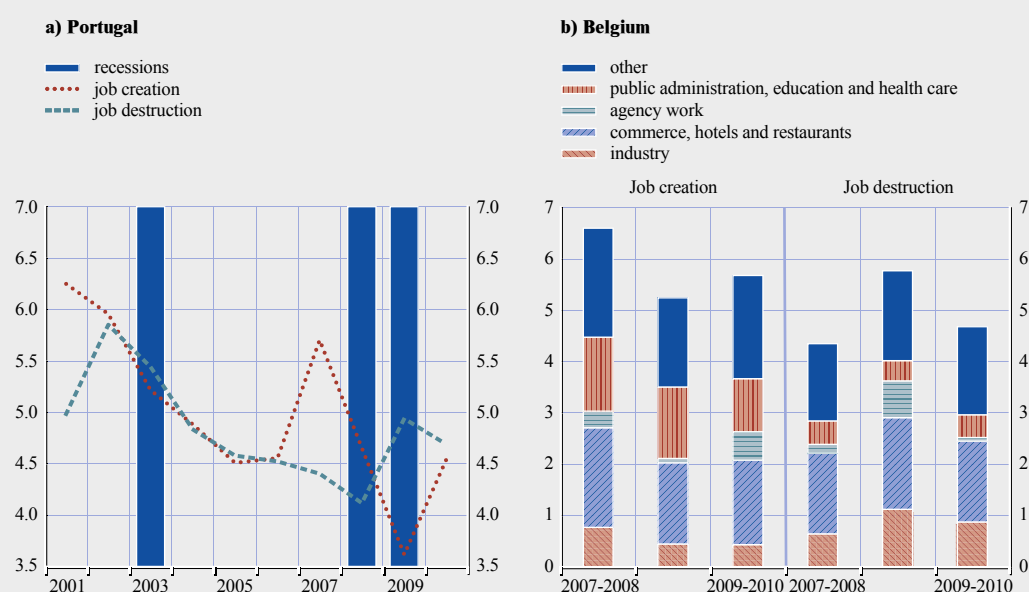
Sources: Germany: Federal Employment Agency. Flows to and from unemployment capture all movements of a person within one month. Luxembourg: ADEM (Agence pour le développement de l'emploi). Own calculations.  
Note: "Pre-crisis" refers to data for 2007, "Crisis" refers to the period between August 2008 and July 2009 in Germany and September 2008 and 2009 in Luxembourg, and "Recovery" refers to all data thereafter up until the end of 2011.<sup>47</sup> Germany: flow rates are averages for full years (from August until July); Luxembourg: flow rates are considered in September each year (when the data on unemployment flows by subgroup are available).

inflows to rather than by lower outflows from unemployment. After 2010 Q1, higher outflows from unemployment combined with moderately lower inflows to unemployment to contribute to a reduction in the unemployment rate. In Luxembourg, the increase in unemployment during the recession was, to a large extent, due to a decline in outflows from rather than an increase in inflows to unemployment.<sup>4</sup> However, in Luxembourg the impact of the crisis on unemployment inflows may be somewhat underestimated. The high share of cross-border workers, who when they lose their jobs are not counted as unemployed in Luxembourg, may have played an important role in keeping unemployment inflows low during the crisis.<sup>5</sup> Both in Germany and Luxembourg labour hoarding and the extensive use of short-time work schemes are likely to have contributed to the limited increase in the unemployment inflow rates during the crisis.

4 Data on employment flows for Luxembourg confirm these results and suggest that while hiring rates have deteriorated during the crisis, the impact of the latter on separation rates has been rather muted. These developments may be partially explained by the fact that job-to-job flows have declined. Lower vacancies may have impelled the employed to postpone job resignations and decreased the probability of finding a new job for the unemployed. In addition, a decline in the share of temporary contracts, starting in late 2008, may also explain the relatively low separation rates during the crisis.

5 Cross-border workers represent around 42% of total employment. At the same time, cross-border workers are over-represented in sectors that were particularly hit by the crisis and they are more likely than other workers to be employed on a temporary basis. Once they lose their job, non-resident workers are counted as the unemployed in their country of residence.

Chart C Job creation and job destruction in Portugal and Belgium



Sources: Portugal: social security and computations as in Centeno, M., C. Machado and A. Novo (2009) "Excess turnover and employment growth: firm and match heterogeneity", IZA Discussion Paper Series No 4586. The average of quarterly flows is reported for each year. Shaded areas correspond to periods when GDP decreased: -1.0% in 2003, -0.1% in 2008 and -2.9% in 2009. Belgium: National Social Security Office and DynaM-belgium.org. Annual flows from midyear t until mid-year t+1 are reported. Own calculations.  
 Note: The job creation/destruction rate in period t is computed as the ratio between net employment gains/losses in expanding/contracting firms in period t and the average employment in periods t and t-1.

Unemployment inflows broken down by period (pre-crisis, crisis and recovery phases) in Germany and Luxembourg are shown in Chart B. An increase in inflows into unemployment during the recession, followed by a decrease thereafter, can be observed for the medium-skilled in both countries, the young in Germany and the medium-aged in Luxembourg. The rise of inflow rates to unemployment during the crisis was comparable across all age groups in Germany, while it was pronouncedly higher for the young than for older persons in Luxembourg. Low-educated workers experienced a much higher increase in inflow rates to unemployment during the crisis than medium or high-skilled persons, both in Germany and Luxembourg.<sup>6</sup>

### Job creation and destruction in Portugal and Belgium

Chart C presents, for Portugal and Belgium, job creation and job destruction rates, which show employment gains (losses) as a proportion of total employment. In Portugal both job creation and destruction rates have exhibited downward trends over the last decade. However, changes in the job creation rate are more strongly and robustly correlated with real GDP growth. In 2009, the job creation rate fell by around 1 pp (which is similar to the fall recorded in the recessionary periods of 2003 and 2008, when the economy stagnated) and the job destruction rate increased sharply (+0.8 pp, which compares with -0.4 pp and -0.3 pp in 2003 and 2004, respectively). In 2010, the job creation rate and job destruction bounced back, against a background of real GDP growth of 1.4%.

<sup>6</sup> In Germany education can only be measured in terms of school education. Typically, three levels of schooling are common: lower and medium level (that qualify for an apprenticeship) and a higher level that qualifies for university studies. For Luxembourg, the education measures also refer to lower (9 years of compulsory school or less), medium (secondary schools, technical or general) and high levels of schooling (post-secondary: university and other).

In Belgium, the job creation rate fell by 1.4 pp between the period mid-2007 to mid-2008 and the period mid-2008 to mid-2009, while job destruction increased by 1.4 pp (see right-hand panel of Chart C). A sectoral breakdown reveals that a reduction in job creation and a rise in job destruction in industry and agency work explain the largest part of the aggregate changes in the job flows over the period. During the subsequent period from mid-2009 to mid-2010, job creation went up again and job destruction went down, although without returning to their pre-crisis levels. The aggregate job dynamics was strongly tied to the dynamics of agency work during this period.

## 1.2 LABOUR SUPPLY REACTION TO THE CRISIS<sup>39</sup>

The euro area labour force increased marginally in 2009 and 2010, as both the working age population and participation rates recorded a deceleration, although quite diverse responses over the crisis period were observed in individual euro area countries. Heterogeneity was also evident across population groups. In particular, the labour force of female and older workers continued to increase in 2009 and 2010. Finally, when relating the euro area participation rate to the business cycle, we find that, the cyclical adjustment of participation rates in the recent recession was somewhat lower than expected given the intensity of the crisis.

This section documents the reaction of labour supply since the start of the crisis. Changes in the labour force come from two factors: changes in the population and changes in the participation rates. While population dynamics tend to be stable and exogenously determined (except for migration flows, which are addressed in Box 5), participation rates are more volatile and partly reflect individuals' decisions in response to the situation in the labour market. This section will therefore examine the latter in more detail.

### LABOUR FORCE AND PARTICIPATION RATE DEVELOPMENTS

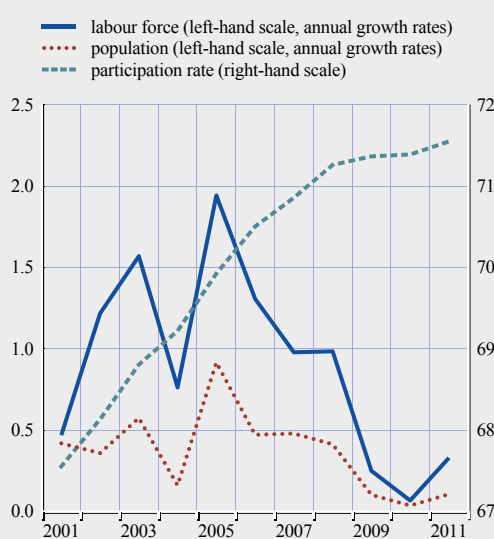
In the years preceding the crisis (2005-08), the euro area labour force was growing at an annual average rate of 1.3%. In 2009 and 2010, labour force growth decelerated to an annual average of 0.2% (see Chart 14). The latest LFS data up to the third quarter of 2011 show a similar picture, with an average growth rate of 0.3% in total

labour supply in the first nine months of the year, although a slight recovery of labour force growth took place in the third quarter of 2011, with a year-on-year growth rate of 0.5%. Regarding the contribution of population and the participation rate to the labour force developments since the start of the crisis, both were close to zero in 2009 and 2010 (see Chart 15), although the deceleration in participation rates was higher than the one observed in population.

Examining the developments in the participation rate in the euro area in more detail, this rate stood at 67.5% in 2000 and increased to 71.3% in 2008, which corresponded to an average increase of 0.5

<sup>39</sup> Prepared by Cristina Fernández, Magdalena Spooner and Michalis Ktoris.

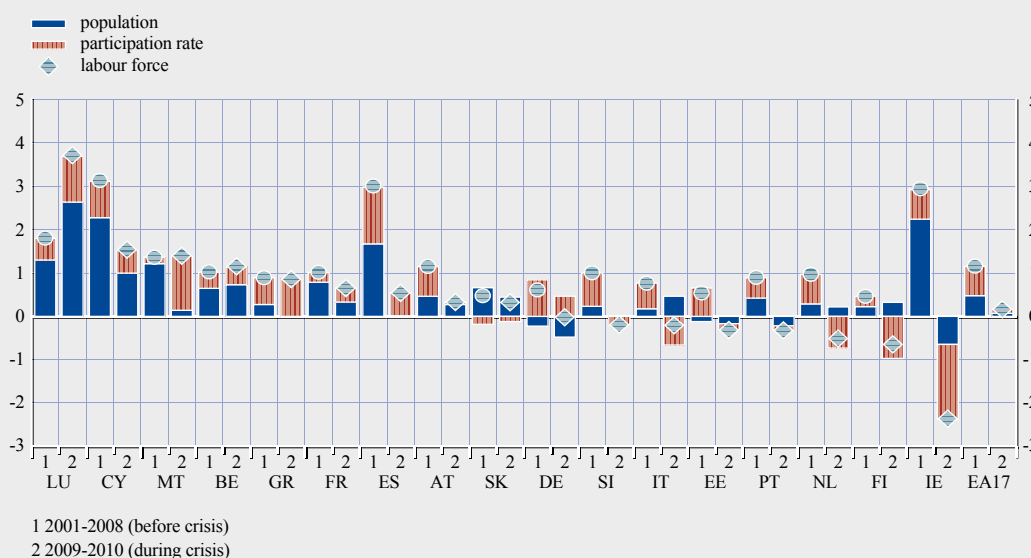
Chart 14 Labour force growth, population growth and participation rate in the euro area



Source: Eurostat.

**Chart 15 Contribution of growth in population and the participation rate to labour force growth in euro area countries**

(percentage changes; annual average growth)



Sources: Eurostat and own calculations.

pp per year. Following this period, the participation rate stagnated and the latest data for the first nine months of 2011 show the rate holding stable at 71.4%. Regarding the participation rates in individual euro area countries, these fell for eight countries while they increased for nine over the 2009–2010 period (see Chart 15). Interestingly, participation rates in four countries (Malta, Greece, Cyprus and Spain) increased in both years, while in another four countries (Ireland, Finland, Italy and Estonia) they decreased in both years, albeit to varying degrees, not showing a clear link with employment developments.

#### BREAKDOWNS BY GENDER AND AGE GROUPS

Despite the fact that the labour force in the euro area remained at similar levels in 2009 and 2010 on an aggregated basis, there was quite some variation across different age and gender groups (see Table 3). The examination of the developments by gender shows that the growth of the female labour force experienced a deceleration while the male labour force actually shrank. At the country level, the picture is similar (see Charts A9 to A11 in Appendix). The female labour force has been growing for

most of the countries (the exceptions being Ireland, the Netherlands, Slovenia and Finland), while the male labour force decreased in all countries except Belgium, France, Cyprus, Luxembourg, Malta and Slovenia.

Participation rate developments by gender largely explain this evolution. In particular, Chart 16 shows that the male participation rate in the euro area decreased sharply in 2009 and further decreased in 2010. The rate stood at 78.2% in 2010, down from 78.7% in 2008, a level last observed in 2005. In contrast, women's participation rates continued to increase, although at significantly lower rates. Across individual countries, female participation rates grew at a higher pace than male ones.

Apart from the heterogeneity observed by gender, diverse developments were also recorded across different age groups (see Chart 17). The labour supply of the older age group (workers between 55 and 64 years of age) continued to grow after the start of the crisis at rates similar to previous years, while the crisis had a severe negative effect on the



Table 3 Growth in euro area labour force, population and participation rates

(annual percentage changes)						
EA17	2006	2007	2008	2009	2010	2009-2010
<b>Labour force</b>	1.3	1.0	1.0	0.2	0.1	0.2
Male	0.9	0.6	0.6	-0.3	-0.3	-0.3
Female	1.8	1.4	1.5	0.9	0.5	0.7
Young (15-24)	-0.6	-0.2	-0.6	-2.9	-3.8	-3.3
Prime age (25-54)	1.2	0.6	0.8	0.0	0.0	0.0
Older (55-64)	4.3	4.7	3.9	4.5	4.0	4.2
<b>Population</b>	0.5	0.5	0.4	0.1	0.0	0.1
Male	0.6	0.5	0.4	0.1	0.0	0.0
Female	0.4	0.5	0.4	0.1	0.1	0.1
Young (15-24)	-0.6	-0.5	-0.7	-1.0	-1.2	-1.1
Prime age (25-54)	0.5	0.4	0.4	0.0	-0.2	-0.1
Older (55-64)	1.6	1.9	1.7	1.5	2.0	1.7
<b>Participation rate</b>	0.8	0.5	0.6	0.1	0.0	0.1
Male	0.3	0.2	0.2	-0.4	-0.3	-0.3
Female	1.4	0.9	1.1	0.8	0.4	0.6
Young (15-24)	0.1	0.3	0.1	-1.9	-2.6	-2.2
Prime age (25-54)	0.7	0.3	0.4	0.0	0.1	0.1
Older (55-64)	2.7	2.7	2.1	2.9	2.0	2.5

Sources: Eurostat and own calculations.  
Note: 2009-2010 represents average annual growth.

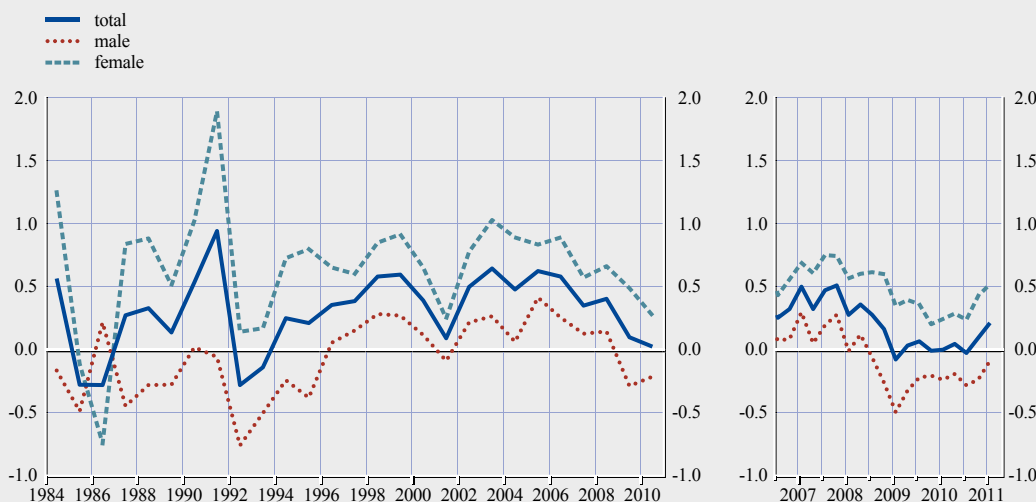
labour force of prime age workers and especially young workers, at both the euro area and country level.<sup>40</sup> The positive growth in the labour supply of older workers may be attributed to several factors that mainly affect the participation rate

of this group. Specifically, pension system reforms in several euro area countries are likely

<sup>40</sup> As described in Section 1.1.1, this was also the case in employment developments.

Chart 16 Euro area participation rate by gender

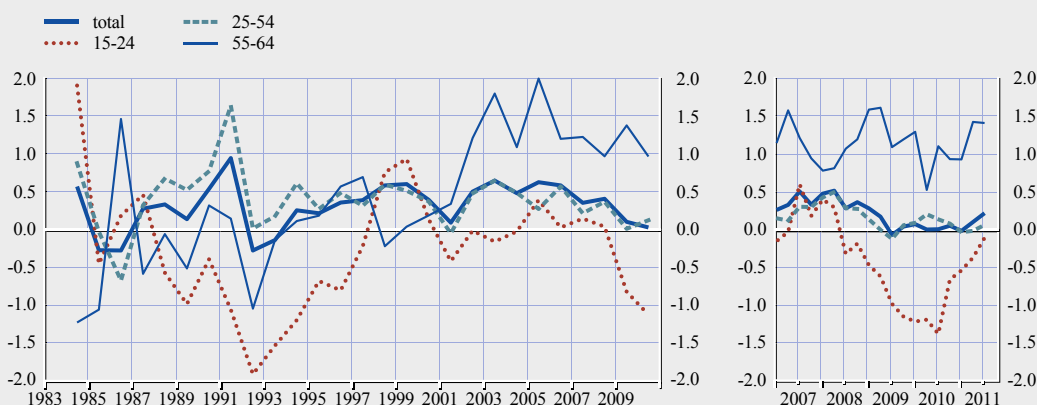
(annual changes; percentage points)



Sources: Eurostat and own calculations.  
Notes: Euro area is calculated as sum of available countries. Labour force age: 15-64. Latest observation: 2011 Q3.

Chart 17 Euro area participation rate by age

(annual changes in labour force as percentage of population; percentage points)



Sources: Eurostat and own calculations.

Notes: Euro area is calculated as sum of available countries. Labour force age: 15-64. Latest observation: Q3 2011.

to have positively affected the participation decisions of this age group. Meanwhile, the labour force of prime age (25-54) workers stagnated after 2008, following a small amount of positive growth in previous years. The labour force of young workers (15-24) declined at faster rates than in the pre-crisis period. Across the euro area countries, the behaviour exhibited by the labour forces of the older and the younger age groups was similar to that at the aggregate euro area level. Specifically, the older-age labour force grew in all euro area countries while the younger-age labour force shrank. Developments in the labour force of prime age was more mixed, however, as it decreased in eight out of the 17 euro area countries.

We find a clear role for participation rates behind these developments. The youth participation rate has fallen by a total of 2.0 pp since 2008, after recording a marginal increase in the two preceding years, to reach its lowest value (42.5%) of the last decade. Meanwhile, growth of the prime age workers' participation rate recorded a slight deceleration, while the participation rate of the older group continued to increase at high rates throughout the crisis. These aggregate euro area developments were generally observed in the individual countries. Older workers' participation rates increased

across virtually all euro area countries (except in Estonia, Ireland and Portugal) while youth participation rates generally decreased (except in Greece and France where they increased in 2009). However, overall, euro area labour force and participation rates were not so strongly affected by the crisis as in previous downturns.

#### CYCLICAL SENSITIVITY OF PARTICIPATION RATES

Participation rates in the euro area have stagnated since 2008 after a period of continuous positive growth. A recession can affect the participation decision in two ways. On the one hand, a discouragement effect may be evident during recessions when individuals without work perceive low opportunities of finding a job and decide not to actively seek one. On the other hand, the added worker effect can emerge, for example, when females in a household enter the labour force in order to replace the lost income when the male of the household loses his job. Overall participation may therefore rise or fall depending on which of these two effects is stronger. In this subsection, we test whether and how the sensitivity of participation rates to the cycle has changed during the crisis.

In order to test for the cyclical sensitivity of participation rates, we recursively regress the

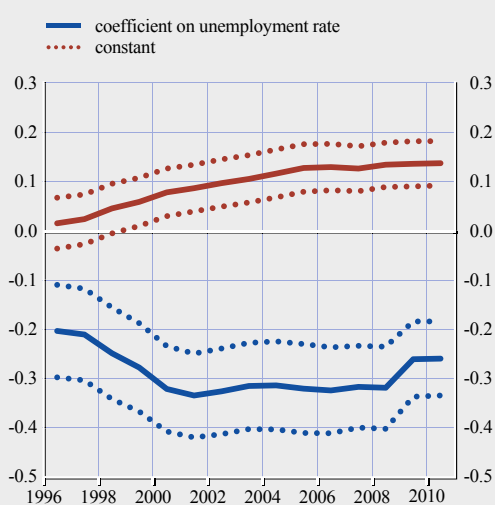
change in participation rates against the change in the unemployment rate.<sup>41</sup> In this specification, the constant captures the medium-term trend of participation rates while the time-varying profile of the unemployment rate coefficient shows how the sensitivity of participation rates to the cycle may have changed during the crisis. Looking at the results, the coefficient of the unemployment rate is negative, indicating that participation rates tend to increase in expansions when better labour market opportunities exist.

Regarding changes in this coefficient, it increases during the 1996–2000 period, remaining roughly stable thereafter, and stands at  $-0.32$  in 2008 (see Chart 18). Subsequently, it drops to  $-0.26$  in 2010,<sup>42</sup> suggesting that participation rates in the euro area were somewhat less sensitive to the cycle during the current crisis. This analysis was also carried out for individual countries and indicated a general trend towards smaller unemployment coefficients, although in most cases the results were not statistically significant.<sup>43</sup> The same analysis by gender<sup>44</sup> shows that women’s participation was less sensitive to the cycle in 2009 than in previous years.<sup>45</sup> Comparing

the coefficients for males and females, one finds that the coefficients for women are substantially lower in absolute value, although still negative, which suggests that women generally exhibit less sensitivity to the cycle compared with men. This may possibly be linked to the added worker effect (i.e. women entering the labour force in order to replace the lost income when the male of the same household loses his job).

Overall, the analysis shows a relative resilience of participation rates to the cycle at the aggregate level during the crisis compared with previous years, although at the individual country level results tend not to be significant. However, the adjustment of participation rates to the crisis may still be ongoing. According to Duval et al. (2011), who examined the effects of previous downturns on participation rates, the negative effect of severe downturns reaches its maximum five years after the cyclical peak, while for very severe downturns it takes between five and eight years.<sup>46</sup> On the other hand, as was also pointed out in the same study, this recession is probably different from previous ones, since pension reforms during the last decade have made it more attractive for older workers to remain in employment.

Chart 18 Recursive estimation of the participation rate on the unemployment rate and a constant



Sources: OECD and own calculations.  
Note: The dotted lines represent the 0.95 confidence interval bands.

- 41 Similar results were obtained using the unemployment and output gaps as proxies for the cycle, although the unemployment gap results were not statistically significant. In the case of the output gap, data for only nine countries were available for a long time period. Due to the uncertainty concerning the measurement of these two variables and the limitation of the coverage, we only report the results using the unemployment rate.
- 42 The 0.06 pp difference between the 2008 and 2010 results is found to be statistically significant at the 0.05 level.
- 43 In particular, a pro-cyclical pattern for the participation rate is found in 11 of the 14 countries for which a sufficient number of observations was available. In nine of the 14 countries, the unemployment parameter was smaller in 2010.
- 44 The weighted average of the OECD data was obtained for the variables of interest for 12 countries (Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal and Finland) over the period 1977–2009. Regarding the results for the total population, they showed a similar drop to the results described above, although they are at a higher level (around 8 pp higher). As before, the results for the individual countries were in most cases not statistically significant.
- 45 Such data were not available by age, so that the same analysis could not be performed by age groups.
- 46 According to AMECO (the annual macro-economic database of the European Commission’s Directorate General for Economic and Financial Affairs) data, the current recession in the EA17 can be described as a severe downturn, and the cyclical peak occurred in 2007, suggesting that a large part of the adjustment may have already happened.

#### Box 4

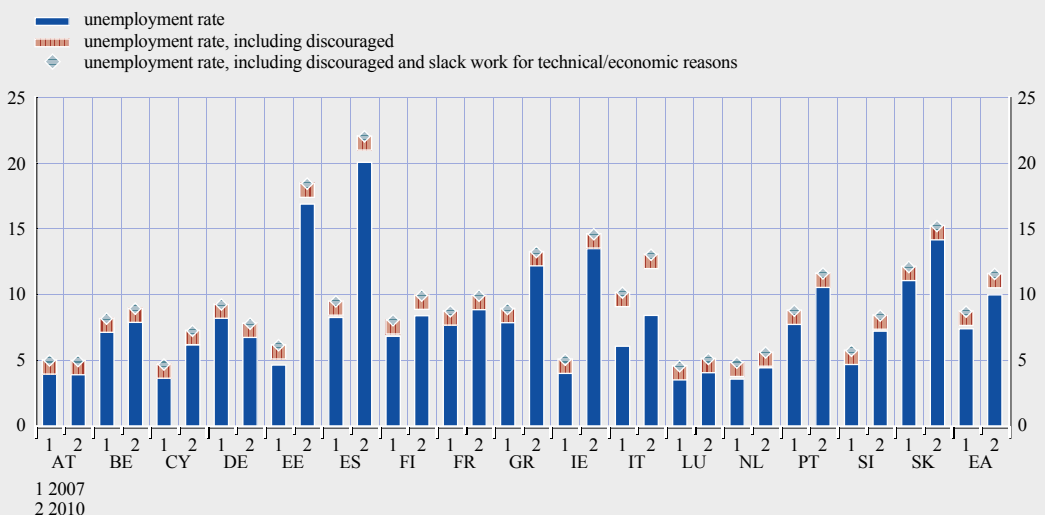
### ALTERNATIVE MEASURES OF LABOUR UNDERUTILISATION FOR EURO AREA COUNTRIES<sup>1</sup>

One issue for policymakers is the extent to which the current crisis calls for a broadened concept of unemployment. The official ILO figures may not measure the full extent of underutilisation of the labour force as they fail to capture two features of labour markets which are particularly relevant in recessions.<sup>2</sup> First, the exacerbation of the discouraged worker effect, whereby people who are available to work immediately are less active in hunting for jobs; second, the hours of work lost by employees on short-time working (henceforth STW) schemes, which have been widely used in some euro area countries to deal with the worsening conditions on the labour market.

Some statistical institutes complement the release of official unemployment figures with enlarged measures including workers at various degrees of attachment to the labour market. Notably, the US Bureau of Labour Statistics (henceforth BLS) produces six alternative measures of labour underutilisation (see Table A4 in the Appendix).<sup>3</sup> Including persons marginally attached to the labour market and/or discouraged workers. In both cases, these definitions include individuals without a job but not actively searching for a new one.<sup>4</sup>

- 1 Prepared by Roberta Serafini and Roberta Zizza.
- 2 According to the criteria established by the ILO the unemployed comprise persons aged 15 to 74 who are without a job but immediately available to work and who were actively searching for a job during the four weeks preceding the interview.
- 3 Two of them (*U-1* and *U-2*) are more narrowly defined than the official unemployment rate (*U-3*), while the remaining three (*U-4*, *U-5* and *U-6*) refer to broader concepts. Similar estimates have also been published by the OECD (2010). More recently the Italian Statistical Institute has started releasing figures on discouraged workers on a regular basis (ISTAT, 2011). Some euro area national central banks have also developed ad hoc methodologies to construct alternative measures (for example Italy and Portugal; see Brandolini, Cipollone and Viviano (2006) and Centeno, Maria and Novo (2010)).
- 4 Persons marginally attached to the labour force are those who declare to be neither working nor looking for work but indicate that they want, and are available for, a job, and that they have looked for work sometime in the past 12 months. Discouraged workers, a subset of the marginally attached, have given a job-market related reason for not currently looking for work. Another alternative definition includes involuntary part-time workers, namely those who want and are available for full-time work but have had to settle for part-time employment.

#### Alternative measures of labour underutilisation



Sources: EU LFS and own calculations.  
Notes: Data for Malta are not available. See Table A5 in the Appendix for 2004-2010.

This box presents new estimates for labour underutilisation in euro area countries for the period 2004-10, which are comparable across countries in terms of both methodology and underlying data (EU LFS, provided by Eurostat).<sup>5</sup> In particular, our underutilisation measure includes inactive people who declared themselves to be available for a job but not seeking employment because they believed that no work was available. This measure is therefore a “broader” version of the BLS’s *U-4*, which considers a further criterion on the period elapsing since the last job search (less than 12 months).<sup>6</sup> In addition, in response to the crisis several euro area countries experienced extensive use of new and/or existing STW schemes, which de facto represent a further source of underutilisation of labour.<sup>7</sup> Unfortunately information on STW schemes is not available in the EU LFS dataset, which instead lists “*Slack work for technical or economic reasons*” as one of the reasons for either not having worked in the reference week despite having a job or for hours actually worked having been lower than usual. The former accounts for those under a zero-hour STW scheme, the latter for those under a partial scheme, who are given a weight equal to the hours not worked as a proportion of those usually worked.<sup>8</sup> On the basis of this information, an additional measure of labour underutilisation can be computed.

### A brief review of the results

In the euro area as a whole, once the discouragement effect is taken into account the size of the deterioration in labour market slack between 2007 and 2010 is roughly the same as the one suggested by the official unemployment rate, although from a higher level (see Chart). At the same time, the indicator for the aggregate masks substantial heterogeneity across countries. While the picture appears broadly stable across indicators in some countries (e.g. Belgium, France, The Netherlands and Portugal), labour market performance is worse in Italy and Spain once the pool of discouraged workers is included. In addition, hours worked lost due to slack work for economic reasons seem to play a major role in Belgium, Estonia, Finland, Italy, the Netherlands and Slovenia. Germany appears to be an exceptional case, since its unemployment rate has actually declined compared with the pre-crisis period (see Chart).

Italy is a clear example of how the official unemployment figures may underestimate the extent of labour underutilisation; the inclusion of discouraged workers would make the Italian unemployment rate the sixth highest in the euro area (at 12.5%, which is 4.1 pp higher than the official unemployment rate).<sup>9</sup>

### Who are the discouraged workers? A probit analysis

Apart from in Italy, the discouragement component also seems to play a role in Estonia, Finland and Spain. We therefore focus on this subset of countries to obtain further insights into the

5 Data refer to the second quarter for all countries (except Austria and France for which the first quarter is used). Comparability across euro area countries may be achieved at the cost of possibly not using the best possible measure, as well as potential inconsistency with measures available at national level.

6 The EU LFS dataset is provided with the duration of search for employment only for those classified as unemployed. The lack of information on the duration of search makes looking at broader measures such as *U-5* and *U-6* not very sensible.

7 For example the Bank of Italy (2011) uses the Italian LFS data to evaluate the impact of such schemes.

8 Hours of work lost due to *slack work for technical or economic reasons* include more than those covered by STW schemes. We tried to fill this gap on the extent of STW schemes by asking national central bank members to provide national data. Unfortunately the picture was extremely heterogeneous: apart from countries that do not operate STW schemes, there are others for which data are scarce or missing. For most countries only information on the workers concerned is available, but not on hours or full-time equivalent units. Consequently, the impact of these schemes may be severely overestimated as many workers are likely to be suspended from work only for some hours/days in a week.

9 The same also holds according to broader measures. According to Eurostat (2011), there is a potential additional labour force of more than 7 million persons in the euro area. Of these, almost 3 million are Italian, accounting for 11.6% of the labour force aged 15-74.

## Results probit regressions

(2004-2010)

		Probability of being discouraged versus being other inactive				Probability of being discouraged versus being (ILO) unemployed			
		Estonia	Spain	Italy	Finland	Estonia	Spain	Italy	Finland
	Female	-	+	-	-		+	+	
	Age	+	+	+	+	+	-	+	-
	Age <sup>2)</sup>	-	-	-	-		+	+	+
<b>Marital status</b>	Married		-	-	-		+	+	
	Widowed, divorced or legally separated		-			-	-	-	
	Number of members employed <sup>a)</sup>	-	+	-	+	-	+		
<b>Household's characteristics</b>	Size		-	+	-	-			
<b>Nationality</b>	Native		-	-	-	+		+	
<b>Time since last work experience</b>	1-5 months		+	+	+	-	-	-	-
	6-11 months		+	+	+	-	-	-	-
	1-4 years	+	+	+	+	-	-	-	-
	4 years and above	+	+	+				-	+
<b>Level of education</b>	Upper secondary	-	-	-	-	-	-	-	-
	Tertiary	-	-	-	-	-	-	-	-

a) Share of number of people in the household.

characteristics of the discouraged workers. Results from probit regressions (summarised in the Table above)<sup>10</sup> would suggest that there are clear similarities among these countries in terms of the individual characteristics of the discouraged workers. In each of these countries they are less educated than both the official unemployed and other inactive people; it also emerges that they have more often had a job than the inactive, while the opposite holds when they are compared with the official unemployed.

Compared with other inactive persons, discouraged workers are more often male in Estonia, Finland and Italy, but not in Spain. The probability of being discouraged increases everywhere with age and, except in Estonia, is higher for immigrants. When compared with the unemployed, discouraged workers are more likely to be female in Italy and Spain. In terms of age groups, discouraged persons tend to be older in Estonia and Italy, but younger in Spain and Finland. In Italy discouraged workers are mainly concentrated in the South and in the islands, probably reflecting the poor labour prospects in those areas.<sup>11</sup>

### Who has worked less for technical or economic reasons?

To evaluate the characteristics of those workers who have worked either not at all or else less than usual in the reference week, for technical or economic reasons (a proxy for workers under STW schemes), a similar probit analysis has been carried out for 2009 (a year that in a number of countries marked a peak in the use of such schemes) in those 16 euro area countries for which LFS data are available.<sup>12</sup> With reference to those countries in which STW schemes have been

10 Regressions are run over the seven-year period from 2004 to 2010 (with the inclusion of annual dummies) and for each year separately, to assess if any change occurred due in particular to the crisis. Results by year are available from the authors.

11 Indeed, most of the gap between the official and the "enlarged" measures of unemployment in Italy is attributable to the southern regions.

12 The dependent variable is equal to 1 if the worker is subject to an STW scheme and zero otherwise. The right-hand side variables includes gender, age and its square, nationality, education, tenure, region, type of occupation, sector, firm size, type of contract (open-ended or temporary) and type of working schedule (part-time or full-time). The full set of results is available from the authors upon request.



used most, namely Belgium, Germany and Italy, we find that the distribution of workers under STW schemes is rather heterogeneous across these three countries, partly reflecting the different institutional features of national STW schemes. In Italy and Belgium, the probability of having been under those schemes is higher for the less skilled. In terms of the sector of employment, in Italy the manufacturing sector seems to be the most affected while the probability is lower in services to firms and to households; in Germany and Belgium the probability of being under an STW scheme appears high also in a number of business and personal services as well as in manufacturing. Finally, Italy emerges as the only case in which the size of the firm matters, as the probability of having been under an STW scheme is higher in larger firms.

#### Box 5

#### INTRA-EUROPEAN MIGRATION IN THE EURO AREA DURING THE CRISIS<sup>1</sup>

The crisis period provides a useful testing ground for the notion that intra-EU labour migration can ease the adjustment of economies to macroeconomic shocks. This box assesses how intra-EU migration, in particular after the EU enlargement between 2004 and 2007, affected the reaction of euro area economies to the crisis. More specifically, it uses a model of the joint dynamics of migration and key macro variables after an adverse macroeconomic shock and contrasts the theoretical results with the EU LFS data on immigration movements to euro area countries.

#### Model based analysis

A structural model, calibrated for two regions (the EU15 and NMS12), is employed to examine how free labour movements between “poorer” and “wealthier” regions can affect the reaction of the latter to a macroeconomic shock. Labour migration between the EU15 and NMS12 is endogenous and occurs in response to differences in wages and employment opportunities between the two regions.<sup>2</sup>

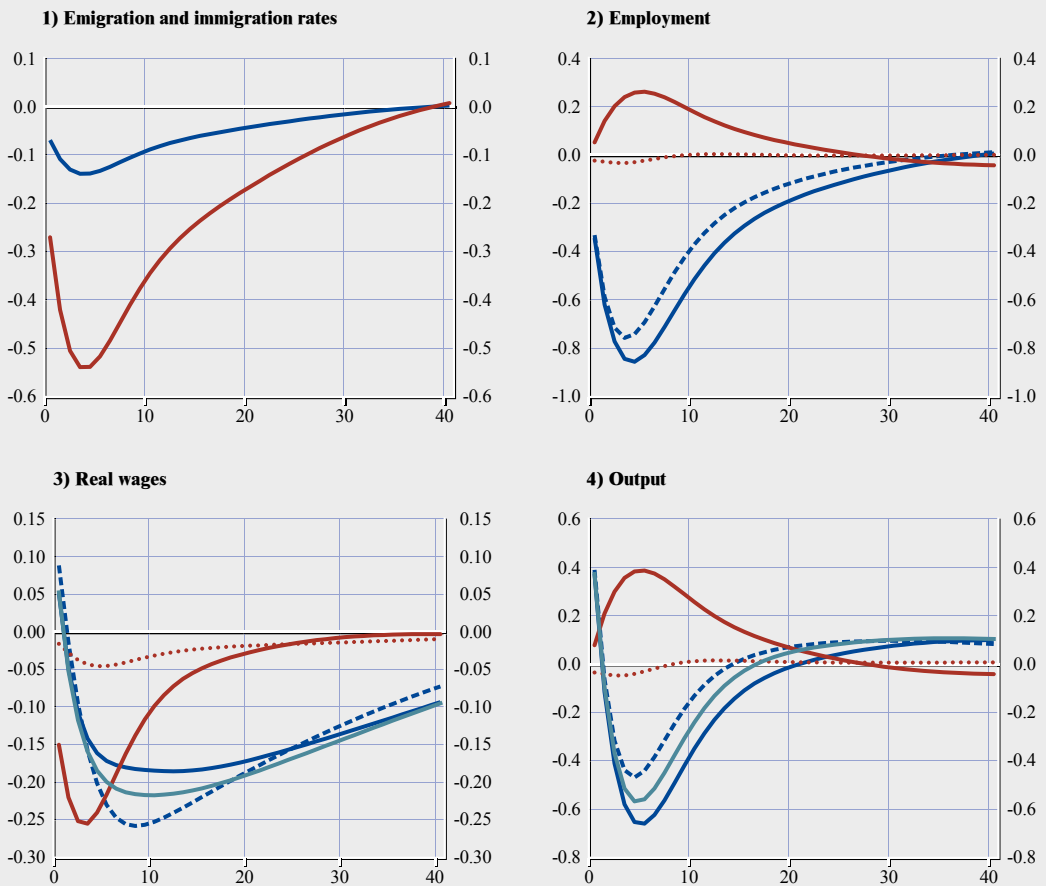
Chart A shows the model responses to a negative productivity shock in the EU15, which is employed as a proxy for the adverse impact of the crisis in these countries. The dotted lines represent the reaction of macro variables when the borders between the two regions are closed, while the solid lines illustrate the reaction when immigrants from the NMS12 initially account for 1.5% of the resident population of the EU15. In both cases, a fall in productivity raises the marginal costs of production. Firms react by increasing prices and cutting employment (Chart A panel 2). As the situation in the labour market worsens, wages contract (Chart A panel 3) and, combined with depressed employment, feed into lower household income. In addition to the negative investment effects, this deepens the initial GDP reduction (Chart A panel 4). Under the open-door immigration regime, the EU15 immigration rate drops (Chart A panel 1) as the fall in labour demand encourages NMS12 workers to terminate their stay abroad (or not to emigrate in the first instance). The lower supply of immigrant workers reduces the productive capacity of the economy and employment and GDP falls below the levels that would have been observed under the closed-borders regime.

1 Prepared by Katarzyna Budnik and Suzanne Linehan. With comments and data from Jante Parlevliet.

2 For a detailed description of the model see Budnik (2011).

**Chart A Simulated responses to a negative productivity shock**

(percentage)



Source: Own calculations.

Notes: ECB blue, solid lines denote the response of the EU15 variables and reddish brown lines of the NMS12 variables to the shock. The impulse response functions of economies running an “open-door policy” are represented by solid lines and those of economies with closed labour markets by dotted lines. Specifically, the Blue solid line in Chart A1 represents the temporary immigration rate in the EU15, and the red line the temporary emigration rate of workers from NMS12. Petrol blue line in Chart A2 and Chart A3 illustrate the responses of employment and wages of EU15 workers under the open-door regime. The periods on the horizontal axis are quarters.

Reflecting the relative scarcity of labour and changes in the composition of employment,<sup>3</sup> average wages contract by less than under the closed-borders regime. Both the employment and real wage levels of EU15 indigenous workers are therefore actually higher than would be the case under the closed-borders regime (see Chart A panels 2 and 3).

### EU enlargement and immigration trends 2004-2010

EU enlargement waves in 2004 and 2007 initiated the gradual elimination of immigration barriers for NMS12 citizens.<sup>4</sup> The timing of their removal varied markedly within the euro area, as illustrated along the horizontal axis of Chart B: Ireland was the first to open its labour

<sup>3</sup> Specifically, the reduced employment share of low-wage immigrant workers.

<sup>4</sup> The NMS12 account for around 25% of the total working age population of the enlarged EU.

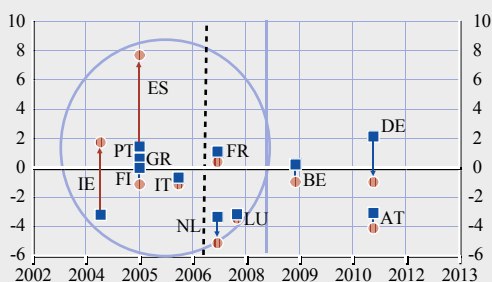
market to NMS10 citizens, while Austria and Germany maintained some immigration restrictions until 2011. While workers from the NMS2 Member States (Romania and Bulgaria) gained easier access to all euro area labour markets following their EU accession in 2007, Finland was the only country to remove all immigration restrictions at that time.

Easier labour market access appears to predominantly motivate work-related immigration. For example, data on the reasons underpinning emigration to the Netherlands indicate that the share of immigrants who entered the country for work reasons jumped immediately following the introduction of an open-door policy for NMS3 and NMS2 citizens (see Chart C).

The number of immigrants aged 15-65<sup>5</sup> generally increased between 2004 and 2010 in all euro area countries, with the exception of Estonia, Germany and the Netherlands (as detailed in Chart A12 in the Appendix). It is noteworthy that even following EU enlargement, the stock of immigrants from outside of the EU continued to exceed intra-EU immigration across most of the euro area countries.

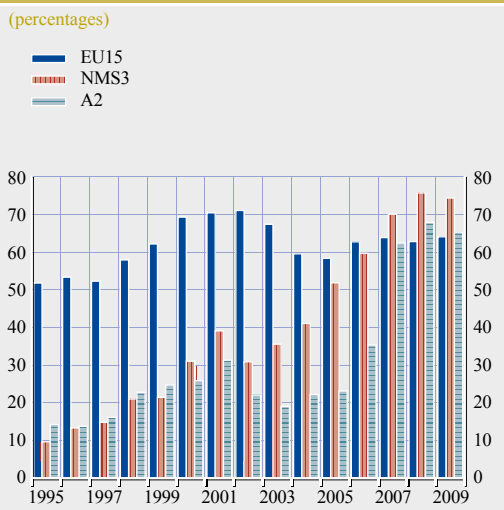
5 The definition of an immigrant in the presented statistics, which are based on the EU LSF data, corresponds to a person born in a country other than that of current residence. As such, the definition differs from the other definition commonly used (including by national statistical offices), which is based upon immigrant nationality.

Chart B Timing of the introduction of open-door policies in the euro area and average unemployment rates 2004- mid-2008 and mid 2008-2009



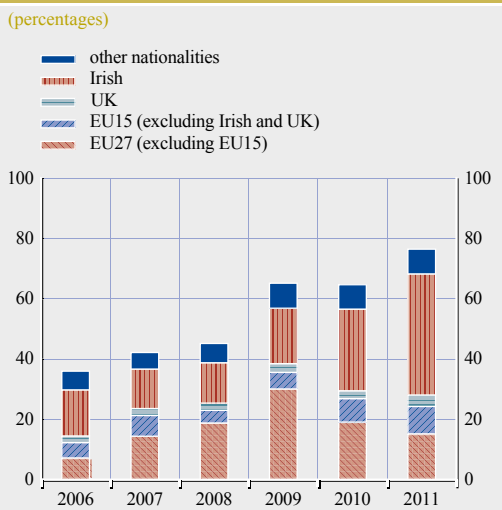
Sources: ECB, Eurostat and own calculations.  
Notes: The horizontal axis indicates the timing of the introduction of an open-door policy for citizens of the NMS10 for individual euro area countries. The vertical axis shows the deviation of the unemployment level in a country from the EU15 average between 2004 and mid-2008 (black squares) and between mid-2008 and 2009 (red dots). Arrows indicate a direction of change in the unemployment rate in a country relative to the shift in the average unemployment rate in the EU15. The dotted vertical line denotes the time of the A2 accession to the EU and the grey vertical line the beginning of the crisis (2008 Q3).

Chart C Share of foreign citizens who came to the Netherlands for work reasons



Sources: ECB, Dutch and Irish Statistical Offices and own calculations.

Chart D Emigration from Ireland by nationality



Sources: ECB, Dutch and Irish Statistical Offices and own calculations.

Moreover, a substantial share of the observed immigration from other EU Member States to euro area countries from 2004 onwards was accounted for by workers originating within the EU15, albeit with inflows of citizens from the NMS10 increasing in magnitude (see Chart E). Interestingly, in a number of euro area countries, namely, Cyprus, Greece, Italy, Portugal and Spain, NMS2 immigration appears to have outpaced that of the more numerous NMS10 citizens. From 2007 increased labour market slack seems to have slowed, but this failed to halt inflows of NMS2 citizens attracted by inherently longer-term incentives, namely, higher earnings potential and the cultural proximity of the Mediterranean countries.

**Chart E Immigration from EU27 to the euro area member states**

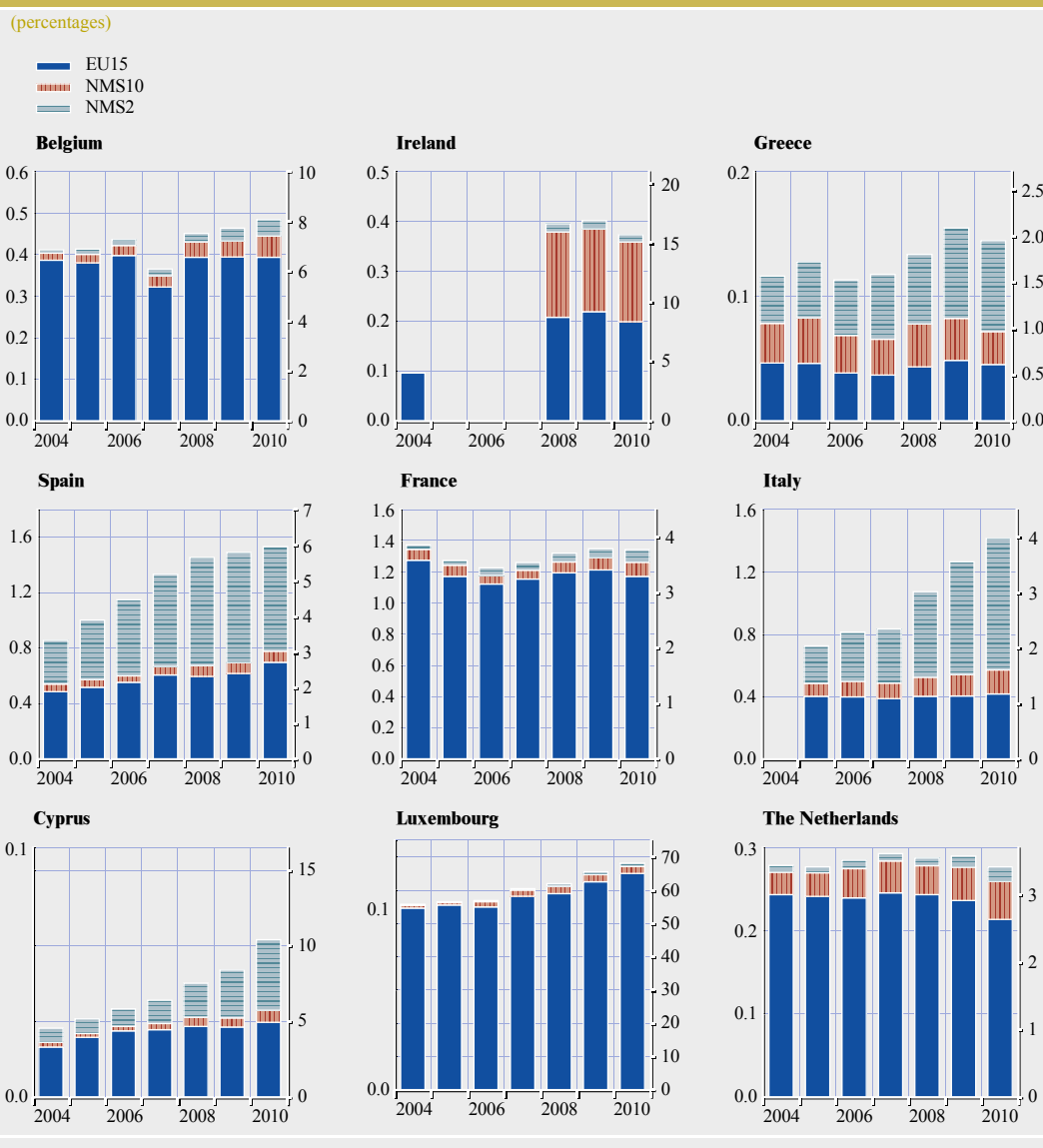
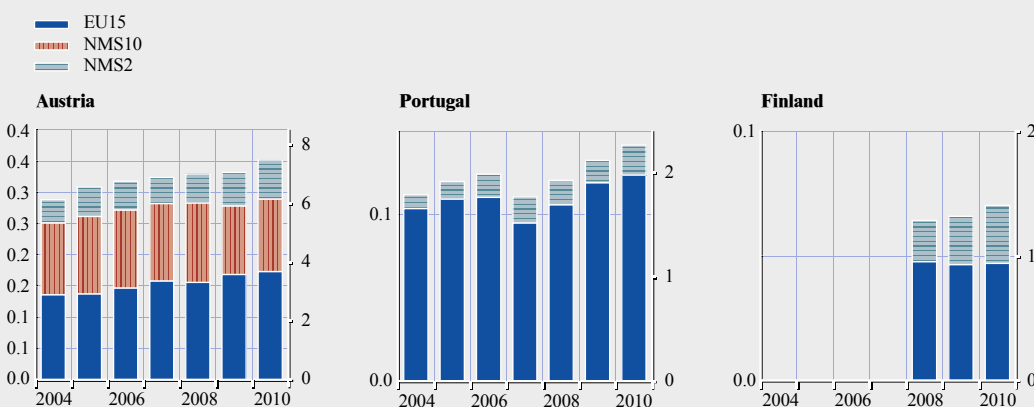


Chart E Immigration from EU27 to the euro area member states (cont'd)

(percentages)



Sources: ECB, EU LFS and own calculations.

Notes: Left-hand scale is in millions of persons. Right-hand scale shows the ratio of immigrants to the native population (persons of working age born in the country) expressed as a percentage. Data for Estonia and Slovakia are not shown as the sample of immigrants was too limited to calculate reliable statistics. For similar reasons, data on NMS10 immigrants to Portugal are not shown. Data on the composition of EU27 immigrants to Slovenia, by country of birth, are not available.

The model analysis suggests that the GDP response to the crisis should have been amplified when a significant share of the labour force is comprised of more mobile foreign workers, in particular from “poorer” regions. This appears likely to have been the case in Ireland. The expansion of the Irish economy before 2007 encouraged strong inward migration, which between 2004 and 2007 was to a significant degree accounted for by NMS10 citizens. In line with the model’s prediction, the deterioration in economic conditions resulted in more pronounced employment adjustment amongst non-Irish nationals: an estimated 11.1% reduction in employment of Irish nationals between the third quarter of 2007 and the corresponding quarter of 2011 contrasts with an estimated 32.8% decline among non-Irish nationals over the same period. Furthermore, non-Irish nationals were the first to react to increased labour market slack, as reflected in the sharp increase in their outward migration during 2008 and 2009 (see Chart D). Emigration of Irish nationals played a somewhat more prominent role only over the subsequent two years.

In contrast, the model indicates that the GDP contraction should have been somewhat moderated by migration trends in the south-western euro area countries, which attracted substantial NMS2 inflows during the crisis.<sup>6</sup> This is also true for countries where the labour market remained relatively healthy post 2008 (e.g. Austria and Finland) and therefore encouraged more NMS10 and EU15 citizens to search for jobs there.

6 To mimic the responses of these economies, a positive immigration shock (tied to a reduction of immigration costs) should be considered jointly with a negative productivity shock. The response of the former shock would be an increase in employment and GDP, and moderation of the average wage. For related simulations, see Budnik (2011).

### 1.3 THE ADJUSTMENT OF WAGES TO THE CRISIS<sup>47</sup>

The extent of wage adjustment since the start of the crisis in euro area countries is investigated by looking at several wage and labour cost indicators. Given the muted impact

of the crisis on compensation per employee, unit labour costs initially increased significantly in the early stages of the crisis, driven by the sharp decline in productivity. Overall, when

47 Prepared by Martine Druant, Daphne Momferatou, Alfred Stiglbauer, Cindy Veiga, Robert Anderton, and Boele Bonthuis.

taking into account the intensity of the crisis, preliminary evidence seems to suggest that the wage response in the euro area has been rather limited. This apparently limited adjustment seems to corroborate evidence from a firm survey about the existence of various obstacles to wage adjustment in European countries. At the same time there is a large degree of cross-country heterogeneity regarding the speed and size of wage adjustment since the crisis. These heterogeneous adjustment patterns may partially reflect cross-country differences in exposure to the recession as well as differences in wage bargaining institutions. As the latter are not always fully captured by the institutional indicators presented in this section, their role in explaining the wage response to the crisis seems limited. However, Box 6 shows that changes in the composition of employment can explain part of the apparently limited wage adjustment.

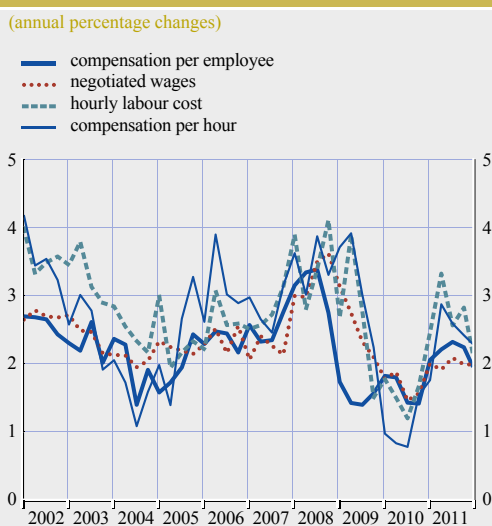
### A CLOSER LOOK AT THE EVOLUTION OF WAGE INDICATORS

At the beginning of the downturn in 2008, all four of the euro area nominal wage indicators presented in Chart 19 continued the upward movement observed in the second half of

2007. As regards compensation per employee and negotiated wages, this mostly reflected stipulations in wage contracts concluded before the crisis, since the average length of wage contracts in the euro area ranges between one and three years (Du Caju et al., 2008). The upward trend started to reverse in the second half of 2008 and a slowdown of the growth rates of compensation per employee and negotiated wages was observed thereafter, which levelled off in 2009/2010 and picked up again in the first half of 2011, although some moderation is observed in the third quarter of that year. As some euro area countries (e.g. Austria, Germany, the Netherlands and Luxembourg) relied heavily on the intensive margin of employment adjustment, it is more informative to focus on hourly labour cost developments.

When hours worked are taken into account, the upward movement in labour costs continued until the beginning of 2009. This merely reflected the large downward adjustment in hours worked observed in some euro area countries and a less than proportional reduction in compensation. When the downward movement of working time stopped, hourly compensation started to slow down, reaching relatively low growth levels in 2010, although it picked up again in 2011.

Chart 19 Euro area wage indicators



Sources: Eurostat and own calculations.

Turning to unit labour costs (ULCs), labour hoarding resulted in a sharp drop in productivity per employee during the recession. As a consequence, unit labour costs increased strongly during the early stages of the recession, and then decelerated in the course of 2009, before falling in 2010 as compensation growth moderated and productivity growth rebounded strongly. Unit labour costs returned to positive growth rates in 2011 (see Chart 20).

Taking into account the intensity of the crisis, the wage response in euro area countries appears to have been rather limited. Chart 21 shows a traditional Phillips curve relationship between changes in compensation per employee and unemployment changes at the country-level both in the period before the crisis (2001-2007) and in the crisis period (2008-2010). In the



Chart 20 Euro area labour cost indicators

(annual percentage changes)



Sources: Eurostat and own calculations.

We now turn to differences in wage developments between the private and public sectors in euro area countries.<sup>48</sup> While the growth rate of private sector hourly compensation continued increasing during the initial phase of the downturn (see Chart 22), public sector compensation growth immediately stabilised, as short-time working schemes are less common in this sector and no sharp reductions in hours worked were observed. In both sectors, hourly labour cost growth had slowed down to 1% by the end of 2009. In the private sector, the trough was reached in the second quarter of 2010, while compensation growth continued to slow down more rapidly in the public sector and actually turned negative in the third quarter of 2010. By the third quarter of 2011 the compensation growth rate in the private sector rebounded to more than 3%, while public sector compensation growth, at around 1%, remained more subdued.

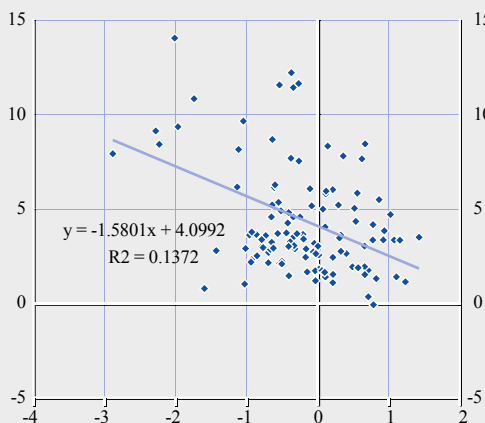
latter period, the estimated response of wages to changes in the unemployment rate seems to have been lower than in former. A more formal analysis of wage determination is presented later in this report (see Section 2.4).

48 The private sector is approximated here by the total economy excluding sections A (agriculture, fishing and forestry) and O to Q (public administration, defence, education, human health and social work activities) of NACE Rev. 2. The public sector is approximated by sections O to Q of NACE Rev. 2.

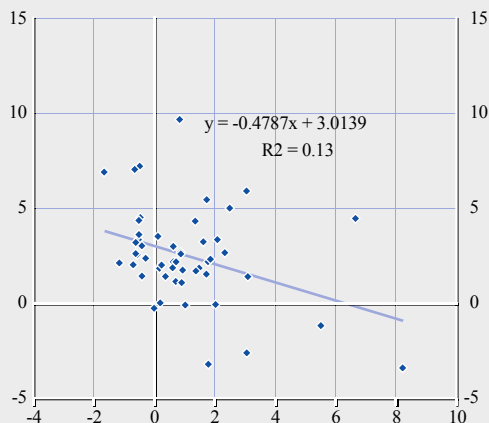
Chart 21 Phillips curve for the euro area

Pre-crisis (2001-2007)

x-axis: change in unemployment  
 y-axis: change in compensation per employee



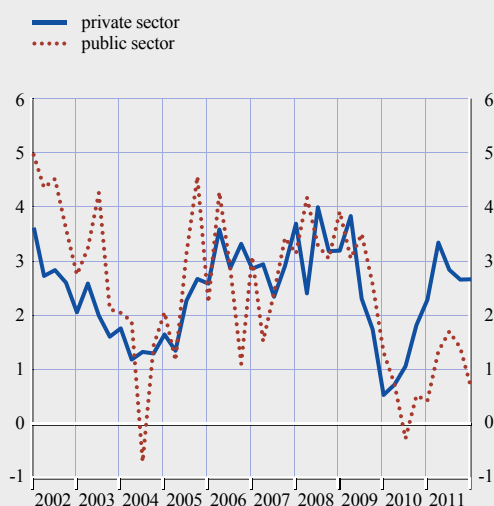
Crisis (2008-2010)



Sources: Eurostat and own calculations.

**Chart 22 Euro area compensation per hour: private and public sectors**

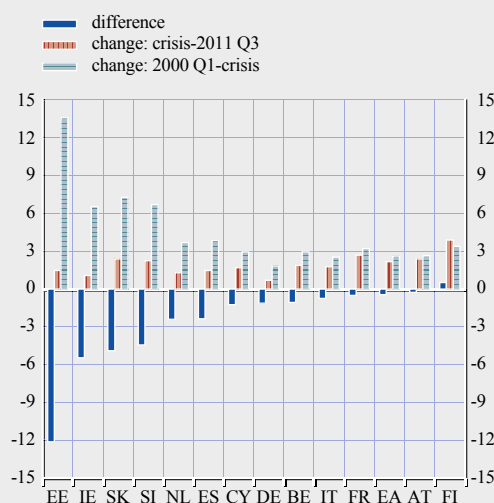
(annual percentage changes)



Sources: Eurostat and own calculations.

**Chart 23 Private sector compensation per hour**

(before and after the start of the crisis; by country; annual percentage changes)



Sources: Eurostat and own calculations.

Notes: No data available for Greece, Luxembourg, Malta or Portugal. Turning points correspond to the peak in employment for each individual country and for the euro area as a whole.

The stronger deceleration in public sector wages reflects government imposed wage cuts and wage freezes in some countries, with a view to reducing their fiscal deficits while also providing appropriate signals to private sector wage setters. Public sector wages have been cut in Estonia, Greece, Spain and Ireland, and frozen in Luxembourg (in 2010 and 2011) and Italy (2011-2014), while wage increases were postponed in Slovenia.<sup>49</sup> Regarding country-specific developments prior to the crisis, compensation per hour tended to grow more slowly in the public sector than in the private sector in Austria, Cyprus, Germany, Estonia, the Netherlands and Slovenia.<sup>50</sup> Since the onset of the recession, average growth in compensation per hour in the public sector has decreased in all countries except for Austria, Germany and Slovakia. Estonia, Ireland, Slovenia and Spain experienced the sharpest decreases in the growth of public sector compensation per hour as a result of the crisis.

Focusing on private sector compensation developments (as public sector wages

during the crisis have been driven by fiscal consolidation concerns), the responsiveness of private sector wages to the downturn is presented in Chart 23, where a distinction is made between compensation per hour before and since the start of the recession.<sup>51</sup> Since the start of the crisis, euro area private sector hourly compensation has risen by 2.6% per year on average, which is almost the same as its pre-crisis average growth rate. This apparent lack of adjustment seems to corroborate evidence from a firm survey about the existence of different obstacles to wage adjustment in euro area countries. However, heterogeneity is observed across large countries, suggesting that calculating a euro area-specific turning point blurs the picture of what happened at the country level at different points in time.

49 According to the replies to the SIR-questionnaire by task force members.

50 Greece, Luxembourg, Malta and Portugal are not taken into account in this comparison because of a lack of sectoral data on hourly compensation.

51 Turning points are calculated for each country, with the end date of the pre-crisis period corresponding to the peak in employment for that specific country.

Some country-level wage adjustment has taken place as compensation growth rates have slowed down in all Member States, except for Austria and Italy. This slowdown has been most remarkable in Estonia, Slovenia, Ireland and Slovakia. Moreover, since the onset of the crisis average hourly compensation has declined in absolute terms in Estonia and Slovenia.

Different degrees of flexibility of wage components may be a reason for the cross-country heterogeneity in wage responses. Wages typically consist of more flexible parts (e.g. performance related pay, such as bonuses) and rather inflexible parts (i.e. base wages which are contractually fixed).<sup>52</sup> A survey among European firms conducted in 2009 in the context of a research network, namely the Wage Dynamics Network (WDN), may shed light on these issues.<sup>53</sup> This survey showed that “not even in the worst crisis since the Great Depression were firms willing to cut base wages in an attempt to protect jobs”. A notable exception was observed among Estonian firms, “which suffered the worst negative shock in our sample of countries and operate in the most flexible wage setting institutional environment.” (Fabiani et al., 2010).

In more detail, the survey results show that: (1) cost-cutting strategies mainly consisted of adjusting labour costs, which in most cases meant reducing the labour input, by reducing permanent or temporary employment, or hours worked per employee. Only a small percentage of firms reported cuts in base wages as their main strategy (except Estonian firms); instead, adjustment through flexible wage components was more important; (2) the (rare) incidence of wage cuts did not increase much during the recession (except again in Estonia<sup>54</sup>). This provides evidence that downward wage rigidity is prevalent in Europe: firms freeze wages instead of cutting them during a sharp economic downturn. Aggregate data on the actual development of wages seem to confirm this pattern. Negotiated wages did indeed react less strongly to the downturn than compensation per employee or per hour, at least in the initial period after the onset of the crisis.<sup>55</sup>

## RECENT CHANGES IN WAGE BARGAINING INSTITUTIONS

Wage bargaining institutions have been singled out as a major source of wage rigidity by the WDN. We now review the recent evolution of these institutions, before discussing their influence on wage developments. Given the different measures taken in several euro area countries in response to the crisis, and the opportunity provided by this report, a WDN questionnaire which was used to gather information on wage bargaining institutions in 1995 and 2006<sup>56</sup> was updated by all euro area NCBs for their respective country to ensure that all the latest information was available. We describe below only the most important changes in institutions that have taken place recently. Table 4 summarises these changes.

The first element to be considered in relation to wage setting institutions refers to the degree of *collectivisation*. This captures the extent to which wage bargaining between employers’ associations and trade unions determines overall wage outcomes. *Union density* refers to the percentage of employees that belong to trade unions. However, the most relevant indicator to assess the effects of such bargaining processes is wage bargaining coverage, as this can in many cases extend to non-members as well. Across the euro area, extension mechanisms are often applied which result in high trade *union coverage* rates, of over 75%, for most euro area countries.

52 However, evidence from the labour cost index (LCI), released by Eurostat, which records total wage costs including and excluding bonuses, shows only minor reactions in the flexible component of wages in euro area countries, i.e. both series tend to move closely together.

53 The WDN, set up in 2006 in the context of the European System of Central Banks, was intended to provide a better understanding of the link between wages and prices at both the micro and macro level. Research results from the WDN yielded ample evidence for the existence of wage rigidities in the euro area.

54 Where wage freezes have become significantly more common: 32% of employees experienced wage freezes, compared to 5% in “normal times”.

55 See Chart 19 in this section; cf. also European Commission (2011b).

56 The results of the original questionnaire are contained in Du Caju et al. (2008).

**Table 4 Main changes in wage setting institutions**

	<i>Collectivisation Wage bargaining coverage</i>	<i>Centralisation Dominant level of bargaining</i>	<i>Level of bargaining for adaptation to cyclical fluctuations</i>	<i>Frequency of deviation from central agreement/possibility of deviation</i>
2006	Medium to high in all countries except EE, IE, SK where it was low	Generally sector dominant IE: national EE, MT: company FR: sectoral/company	n.a.	Rarely used Not possible in IE, CY, LU, SK, FI
2011	Medium to high in all countries except CY, EE, IE, SK where it is low	Generally sector dominant IE: national EE, MT: company FR: sectoral/company	Company and/or sectoral in most countries	Rarely used Not possible in IE, CY, LU, SK, FI
Main changes 2006-11		IE: national level wage bargaining framework not formally terminated, yet structures have been in abeyance and provisions in respect of pay have lapsed ES: prevalence of firm level agreements established by law BE: no wage norm decided for 2009-2010, only limited one-off increases		DE, SI: increased use GR, ES: opt-out now possible by firm-level agreement when in economic difficulty, but not much used In GR PT, IT: easier, but still limited use.

As regards the latest changes during the downturn, in Greece the extension of sectoral collective agreements to all firms in the sector has been suspended for the length of the medium-term fiscal plan.

A related characteristic is *centralisation*, which essentially refers to the level(s) at which bargaining takes place. In most euro area countries wages are negotiated at multiple levels, but the dominant level tends to be the sectoral level, even if broader national level agreements may sometimes also exist. Ireland is the only euro area country where such national level agreements are also the dominant ones.<sup>57</sup> In Belgium (where an indicative wage norm, taking into consideration

wage developments in neighbouring countries, normally establishes a guideline for wage increases), in response to the crisis, no nominal wage norm was decided upon for the period 2009-2010. In Spain, a reform of the collective bargaining system in June 2011 established the prevalence of firm-level collective agreements.<sup>58</sup>

Company level agreements are less dominant across the euro area, with only Estonia and

<sup>57</sup> In this respect, it is noteworthy that the final phase of the most recent National Wage Agreement expired during 2010 and no formal agreement on pay determination is envisaged in the short-term.

<sup>58</sup> Although sectoral agreements at the national or regional level may overturn this prevalence. However, a further reform, in February 2012, has eliminated this possibility)

Coordination	Minimum wages <i>% of employees paid at minimum wage (either national/statutory or in collective agreements)</i>	Minimum wage is basis for other wage increases	Indexation <i>% of employees whose wages are automatically adapted to inflation</i>	Backward looking indexation	Other <i>Is competitiveness taken into account in wage negotiations?</i>
Sectoral in most countries Higher in BE, IE, GR, ES, FR, NL, PT, SI Pattern bargaining in: AT, DE, LU	Generally low Somewhat higher in IT High only in AT and FI	AT, ES, FR, GR, MT, SK NL: linked to social assistance and disability pay	Medium to high in BE, CY, ES, FI, LU, MT	BE, CY, ES, FI, FR, LU	Not in AT, CY, DE, IT, FI, FR, PT, SK
Sectoral in most countries Higher in BE, IE, GR, FR, NL, PT, SI Pattern bargaining in: AT, (DE), LU	Generally low Somewhat higher in IT High only in AT and FI	AT, ES, FI, FR, GR, MT, SK NL: linked to social assistance and disability pay	Medium to high in BE, CY, LU, MT	BE, CY, ES, FR, GR, LU	Not in AT, CY, DE, IT, FI, FR, PT, SK, SI
DE: declining effect of pattern bargaining by IG Metal and chemical sector	GR: minimum wage freezes IE: minimum wage reductions (reversed subsequently, however) SI: large increases and increased coverage as of 2010		LU: postponement of indexation adjustment to end 2011; at most one payout per year until 2014, irrespective of inflation evolution CY: COLA under discussion		PT: Tripartite agreement to promote competitiveness Not strictly related to competitiveness: MT: performance-related pay introduced in some sectors IT: Tighter link to productivity since 2009 framework

Malta reporting them to be the dominant level. With regard to the use of opt-out clauses, firms appear to rarely use this option, which may often need to be accepted by works councils. In terms of more recent developments, the use of such clauses has increased mainly in Germany in recent years, as well as in Slovenia, Greece and Portugal, but it still remains rather limited in the latter two countries. In Greece, individual firms now have the right to opt-out of the sectoral-level agreement by signing a firm-level agreement when in economic difficulty; this possibility was also enhanced by the 2010 and 2012 labour market reforms in Spain. Since the 2009 agreement on wage bargaining, opting-out

has also become easier in Italy but (as in Greece and Portugal) is seldom used.

The *coordination* of wage formation relates to the extent to which the external consequences of wage agreements on the whole economy are taken into account, this being possible even in an environment of decentralised wage bargaining. Pattern bargaining is one way to achieve this. It used to play an important role in Germany, with the metal and chemical industries usually giving a clear signal for other sectors' wage negotiations. In the last few years this tendency seems to have been dissipating and, although it might occasionally be observed in the industrial

sector, it is not observed in the services sector. Finally, public and banking sector agreements used to set the tone for private sector ones in Greece in the mid-1990s, but this has no longer been the case in more recent years.

Some form of a *minimum wage* was found in all euro area countries in 2011, originating in most cases in national legislation or else translated into such legislation after being decided in the context of collective bargaining. Minimum wages are applicable to the whole economy in most countries,<sup>59</sup> while in Austria, Finland and Italy they differ across sectors, as they are determined in sectoral collective agreements. In Belgium and Spain sectoral differentials may also be set, above the national minimum. In Germany and Cyprus minimum wages are only relevant and specific to a rather limited set of professions. Although minimum wages exist across the euro area, the actual proportion of workers paid at that wage tends to be rather limited. However, even so, changes in the minimum wage may indirectly affect a larger proportion of employees. In Greece, Spain, France, Austria and Slovakia the increase in minimum wages influences other negotiations as well, particularly in the cases of wages at the lower pay end. In the context of the crisis and associated austerity measures minimum wages were reduced in Greece and Ireland. (However, this latter reduction was reversed subsequently.) In Slovenia, on the other hand, minimum wages were increased and their coverage extended in 2010.

*Indexation* or, more generally, the extent to which wages are adjusted to price increases appears to have been affected during the recent downturn, with several euro area countries implementing changes to regular pay adjustments of an either temporary or more permanent nature. For example, in Spain the wage agreement for 2010-12 recommended not including annual indexation clauses and a new wage agreement for 2012-14 agreed on the use of euro area inflation as the nominal reference for these clauses if national

inflation were higher.<sup>60</sup> In Luxembourg, a one-off change to the automatic wage indexation scheme was implemented postponing any payout in 2011 to October of that year at the earliest. In addition to this, a bill was approved with a further postponement of payments under the automatic indexation scheme until 2014. Furthermore, in Cyprus and Portugal austerity measures have involved the renegotiation of collective agreements or particular elements of them, with a cost of living adjustment (COLA) reform currently under discussion in Cyprus and a tripartite agreement aimed at promoting competitiveness and reducing unemployment in Portugal. Finally, in Greece a three-year agreement was signed in July 2010, which provided for nominal wage freezes in 2010 and until mid-2011, and increases in wages in July 2011 equal to the average annual rate of euro area HICP inflation in 2010 (i.e. 1.6%) and an analogous wage increase in July 2012. In the event, following legislative initiatives at the beginning of 2012, the minimum wage was cut (by 22% for adults and by 32% for persons aged under 25), seniority increases were suspended until the unemployment rate falls below 10% and the length of collective agreements was restricted to a maximum of three years.

#### CAN WAGE DEVELOPMENTS BE EXPLAINED BY WAGE BARGAINING INSTITUTIONS?

In Chart 23 we observe very different developments in private sector unit labour costs across countries. One possible way of shedding light on the reasons underlying those differences is to examine the role of wage bargaining institutions. Accordingly, the link between unit labour cost developments and wage bargaining institutions has been analysed by means of correlations between average growth in private sector ULCs in the period between 2000 Q1 and the country specific start of the crisis, on the one

59 In Belgium, Spain, France, Greece, Ireland, Luxembourg, the Netherlands, Portugal, Slovenia, Estonia, Malta and Slovakia.

60 Excluding energy price inflation in the event of a positive international oil price shock, defined as an increase of more than 10%.



hand, and institutional indicators in 2006, on the other. The same has been done using the period from the start of the crisis until 2011 Q1 and institutional indicators in 2011.

These indicators are based on the survey results described above and refer to wage bargaining coverage, the level of bargaining, whether the dominant level of wage bargaining allows for the adaptation of bargaining to cyclical fluctuations, coordination of bargaining, the extent of minimum wages and indexation, and whether competitiveness is taken into account in wage negotiations. Additionally, we used institutional variables from the ICTWSS database of the Amsterdam Institute for Advanced Labour Studies (AIAS) to check the robustness of previous results.<sup>61</sup>

Our analyses tend to find only limited explanatory power of bargaining institutions. Both sets of empirical exercises gave some indication that higher bargaining coverage was associated with higher ULC growth since the beginning of the crisis. In interpreting these results, one has to be cautious, because there could be two reasons for this result. On the one hand more “collectivist” (or “corporatist”) countries might tend to exhibit stronger labour hoarding, thus driving up ULCs in the downturn. On the other hand, it could also be the case that the crisis was perceived as “temporary” in more “collectivist” countries, e.g. because, coincidentally, these countries faced an export crisis rather than a “structural” crisis.

Several factors can explain the lack of a strong link between wage bargaining indicators and the recent evolution of wages in euro area countries.<sup>62</sup> First, the measurement of wage bargaining institutions is in general difficult; thus the indicators used tend to be qualitative and may not cover all aspects of bargaining institutions. For instance, in Germany opt-outs from collective agreements are widely used and played an important role in the very moderate unit labour cost developments during and after the crisis. Estonian results must be considered in the context of a labour market in

which collective bargaining is not important. Moreover, even though no fundamental changes were observed in wage bargaining institutions between 2006 and 2011, important reforms have been made in some countries during the crisis. However, these measures could still not be quantified and, hence, were not captured by the institutional indicators, but they may help to explain negative or very moderate ULC growth since the start of the crisis in some of these countries. Also, collective bargaining measures relate only to negotiated wages, while wage indicators also cover other wage components.

Second, diverging economic developments across Member States may, in comparison with institutions be more prominent explanatory factors. In some countries, unit labour cost developments are still influenced by catching-up effects, because the increases in wages in the tradable sector, linked to productivity growth, are transferred to the wages and prices of the non-tradable sector where productivity does not necessarily increase. Also, countries were not hit by the crisis to the same extent and during similar time periods. In severely hit countries (eg, Estonia, Ireland<sup>63</sup> and Slovenia), strong deceleration of unit labour cost growth has been observed since the crisis. On the other hand, in Finland, a country where no decrease in ULC growth has been observed, the drop in GDP was of a very short duration. And finally, wage indicators may be influenced by several other factors, including composition effects associated with changes in employment. These can to some extent explain the limited cyclical sensitivity of wages. For a quantitative analysis of compositional effects for a selected group of countries, see Box 6.

61 The database can be found on the AIAS homepage: <http://www.uva-aias.net/208>.

62 A similar analysis carried out by the European Commission (EC, 2011a) concludes that “wage bargaining institutions have no strong or robust implications for wage levels or growth”.

63 The aggregate unit labour cost improvements in Ireland should be interpreted with care as they partly reflect a shift from low productivity sectors such as construction to high value-added export sectors.

### REAL WAGES AND EMPLOYMENT COMPOSITION EFFECTS DURING THE CRISIS<sup>1</sup>

Many macroeconomic theories formulated to explain labour market mechanisms have had to deal with a cross-country stylised fact: real wages, which are supposed to react to shocks, appear to be uncorrelated – or even perversely correlated – with movements in the business cycle.<sup>2</sup> However, since Bils (1985) and Solon et al. (1994), several papers have argued that cyclical changes in the composition of employment may explain the apparently acyclical evolution of real wages. In practice, the dynamics of the aggregate real wage not only reflect changes in wages at the individual level, but are also influenced by changes in the composition of employment. Composition effects appear to have been particularly important during the crisis recession episode and, in this respect, may also partly explain the apparent lack of wage adjustment observed since the start of the crisis. In this box, we first describe the extent of composition effects in the recent abrupt rise in unemployment and then we investigate their relevance in explaining the moderate changes in real wages before and after the recession in five euro area countries, namely Belgium, Germany, France, Italy and Portugal.<sup>3</sup>

#### Changes in the unemployment rate during the recession of 2008-2009

We first assess how the probability of becoming unemployed differed across workers in order to assess the importance of compositional changes during the last recession (Table A7 in the Appendix).<sup>4</sup> While the overall unemployment rate increased by between 1 and 2.5 pp between the fourth quarter of 2007 and the fourth quarter of 2009 in Belgium, France, Italy and Portugal, the unemployment rate for young males increased by between 5.6 and 7.8 pp, and that for male immigrants by between 3.7 and 8.2 pp. Meanwhile, female workers were less affected, and the unemployment rate for young females increased significantly less than that for young males, except in Belgium. In sum, workers who became unemployed in 2009 were more likely to be young or immigrants. In contrast, in Germany the unemployment rate slightly decreased between 2007 and 2009.

#### Composition effects and changes in the wage distribution during the Recession

All in all, the above evidence suggests that the characteristics of the employed have changed in the aftermath of the crisis, because many workers with low wages, such as young workers, immigrants and construction workers, became unemployed. To investigate the effect of the exit from employment of these workers on the wage structure, we decompose the changes in the distribution of the log real wages during the crisis into changes due to employee characteristics

1 Prepared by Matteo Mogliani and Gregory Verdugo in collaboration with Emmanuel Dhyne, Martine Druant, Cláudia Filipa Duarte, José Francisco Maria, Katja Sonderhof and Roberta Zizza.

2 This puzzling evidence was at the very heart of, for instance, the efficiency wage theory and the insider-outsider theory of employment.

3 Despite the harmonisation effort, some unavoidable data heterogeneity arises from the use of different national sources. For instance, the analysis concerns full-time workers aged between 16 and 65, while for Italy the age class considered is 15-64. Secondly, data are available on a quarterly basis for France and Italy and on a yearly basis for Germany, Belgium and Portugal; there are also differences in the timing of the collection of wage data (mainly between February and April for Germany, October for Belgium and Portugal, throughout the year for the other countries). Finally, reported figures based on survey and administrative data might differ from the official ones released by national statistical and employment agencies.

4 Similar patterns in the composition of the unemployment increase since the start of the crisis are observed in the other euro area countries. See Section 1.1.1 for additional details.

Changes in real wages and composition effects during the crisis

	Observed wage change	Price effect	Composition effects	Observed wage change	Price effect	Composition effects
	Males			Females		
France 2008-2009	1.65	-1.03	2.68	1.22	-0.44	1.66
Germany 2007-2009	0.43	-1.48	1.91	1.58	-3.99	5.57
Italy 2008-2010	-0.62	-2.34	1.72	0.95	-1.88	2.83
Belgium 2007-2009	0.87	-2.92	3.79	6.81	1.23	5.58
Portugal 2007-2009	5.23	2.05	3.18	6.85	3.29	3.55

Notes: Data from LFS in France and Italy, GSOEP for Germany, Structure of Earnings Survey for Belgium and Quadros de Pessoal for Portugal. Only full time workers. Wages are net of taxes, do include bonuses and extra-wage earnings (except for Italy), and are deflated by the HICP.

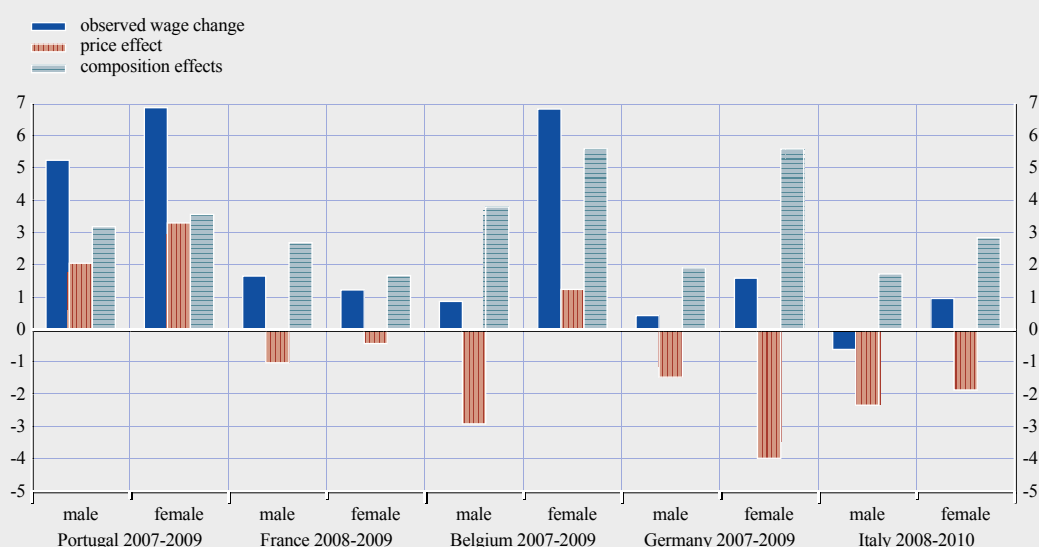
and changes due to wages at constant composition. To do so, we construct a counterfactual wage density, computed *as if* the distribution of the characteristics of individuals had stayed the same as in the initial period (see DiNardo et al., 1996; Chiquiar and Hanson, 2005; Machado and Mata, 2005).<sup>5</sup> We use a flexible approach and control for changes in the distribution of workers across 54 categories of education and experience (proxied by age).<sup>6</sup>

Observed and counterfactual changes in log real wages are shown in accompanying Table and Chart while results at different percentiles of the distributions are reported in Tables A8 and A9 for males and females respectively in the Appendix. The first column for each country displays the observed change in the distribution of wages over the period, while the second column

5 For Italy, the change is from 2008 Q1 to 2010 Q1. We refer the reader to the Appendix for more technical details on the procedure applied in the present study.

6 For each country, we define the categories by interacting nine age groups (under 24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, over 60) with six education levels (five for Italy).

Changes in real wages and composition effects during the crisis



Sources: LFS in France and Italy, GSOEP for Germany, Structure of Earnings Survey for Belgium and Quadros de Pessoal for Portugal. Own calculations.

(price effect) indicates changes which would have occurred if the distribution of education and experience of employees had stayed the same over the period and workers had been paid according to the wage schedule observed in the final period. The third column (composition effects) indicates the increase in the wage which would have resulted from the changes in the composition of workers over the period if wages had stayed at their initial level.

Overall, for each country, the figures for males indicate that real wages across the entire distribution have increased over the crisis period, with some interesting exceptions for Italy at the bottom and the top of the distribution, and Belgium at the bottom of the distribution; for Italy this could be partly due to the inclusion in the definition of wage of the (lower) benefit paid in the case of short-time working schemes. For males, average wages increased, except in Italy where the mean wage declined by -0.6 log points. These figures indicate that real average wages did not adjust to the deterioration of the labour market in the recent crisis, although there were some notable cross-country differences.

However, results from the decomposition in the second and third columns indicate that controlling for changes in the characteristics of workers has an important effect on the figures: indeed, at constant composition, the mean wage of males would have *declined* in the majority of countries: by -1.0 log point in France, -1.5 in Germany, -2.3 in Italy and -2.9 in Belgium. Portugal is an exception: although composition effects are also significantly high, mean wages increased by 2.1 log points. Overall, our results suggest that composition effects account for most of the increase in average real wages over the crisis period and that changes in the composition of the labour force over the crisis raised average real wages by between 1.7 and 3.8 log points across the countries considered.

Changes in wages in other parts of the distribution provide interesting information on how the wages of workers with different levels of skills have changed during the crisis. Overall, the results indicate a large difference at the first decile and the first quartile between France, Germany and Portugal, where observed wages increased, and Italy and Belgium, where wages decreased. Composition effects explain a large share of changes in wages across the distribution in France, Germany and Belgium, while their role is more modest in Italy and Portugal. Institutional differences across countries are likely to explain part of these disparities. According to Card and DiNardo (2002), changes in institutional factors such as increases in the minimum wage are the predominant explanation for changes at the very bottom of the wage distribution in the long run. For France, recent research has shown that changes in the minimum wage explain rather well the evolution of the lowest wages (Verdugo et al., forthcoming). The relatively mild increase in the minimum wage in France over the period might explain why the increases in wages at the bottom of the wage distribution have been moderate during the crisis and are entirely explained by composition effects. On the other hand, the sharp increase in the nominal minimum wage in Portugal (+11.3% over the period 2007-09) may in fact contribute to explain the increase in the mean wage and the positive price effect in the bottom of the distribution. Recent empirical evidence suggests that such increases tend to spillover to other individuals' wages and to compress the wage distribution (Centeno, Duarte and Novo, 2011).

At the top of the distribution, observed increases in wages at the ninth decile appear to be relatively larger than changes in the rest of the distribution in France, Germany and Belgium, but, once again, these changes are also mostly explained by composition effects. As a result, there is no strong evidence that the wages of relatively skilled workers at the top of the distribution

were less affected than the wages of less skilled workers at the median. It is worth noticing that in Germany, wages at the bottom of the distribution have increased slightly more rapidly than wages at the top of the distribution, which might be explained by increases of minimum wages in some sectors during the period under observation.<sup>7</sup> This suggests that the growth in wage inequality in Germany, as documented in the long run by Dustmann et al. (2009), has slowed down during the recent economic downturn.

The results for females, relative to male workers, indicate a moderate role for composition effects in explaining observed wage changes, except in Belgium and Portugal, as well as for the first decile in Germany and Italy (Table A9). Overall, observed wage changes for females are lower than for males in France, Germany and Italy, while they are higher in Belgium and Portugal. However, in the latter two countries, changes in the composition of female workers appear to have largely determined the changes in the distribution of wages over the period. The fact that there is a large degree of heterogeneity in the wage changes for females across countries also reflects in part the large variations of the gender participation gap across countries in our sample.<sup>8</sup> As shown by Olivetti and Petrongolo (2008), national differences in the characteristics of women entering the labour market across cycles (*i.e.* labour market participation for women is often conditional on the employment status or wage of men within the household) may influence the interpretation of wage changes and wage differences across European countries. As a result, dramatic changes in participation rates for low skilled women at the bottom of the wage distribution might explain the relatively large composition effects reported for the first decile in Germany, Italy and Belgium. On the other hand, the relatively mild changes in wages for women observed in France are consistent with the evidence provided in Table A7, which indicates that the increase in the unemployment rate was much lower for females than for males in this country.

Our analysis sheds important light on the issue of wage adjustment during the recent crisis. The evolution of aggregate wages during the crisis appears to be mainly driven by the inflow of young and less skilled workers into the unemployment pool and the resulting increased proportion of higher paid workers among those employed, but also to some extent by some decrease in wages for workers who remained employed. One caveat is that this analysis may not always be computed on the same basis as other results in the Report. For example, wage changes may also reflect changes in working time and, in particular, they may be affected by the reduction in working hours observed in some euro area firms as a response to the crisis.

7 During the period under observation, around one million employees (nearly 3% of all employees) were covered by minimum wages in Germany.

8 According to the OECD, in 2010 the participation rates of women were 66%, 71%, 51%, 62% and 70% in France, Germany, Italy, Belgium and Portugal respectively, versus 75%, 82%, 73%, 73% and 78% for men.

## 2 THE CRISIS AND STRUCTURAL FEATURES OF EURO AREA LABOUR MARKETS

This second chapter aims to provide a better understanding of the medium-term consequences of the current crisis for the structural functioning of euro area labour markets. In the first section, a Beveridge curve analysis is carried out in order to investigate the possibility of increasing mismatch between labour supply and demand in euro area countries. Skill mismatch indices are constructed in the second section to measure the disparity between the labour skills supplied and demanded. The third section documents the recent evolution of structural unemployment, using estimates available from international organisations, and the main factors underlying it. Finally, the fourth section provides wage equation estimates covering the crisis period to enable the changes in wage responsiveness to the recent increase in unemployment to be analysed.

### 2.1 DEVELOPMENTS IN EURO AREA BEVERIDGE CURVES<sup>64</sup>

*This section analyses developments in euro area Beveridge curves before and during the crisis. The focus is on the extent to which the heterogeneous impact of the crisis on euro area labour markets and the heterogeneity in sectoral employment losses reflect growing mismatch across euro area labour markets. An overview of Beveridge curve developments suggests that there has been a shift in the euro area Beveridge curve since the onset of the crisis, albeit with considerable heterogeneity at the country level. A multivariate analysis establishes the statistical significance of these shifts. An examination of factors underlying the observed developments points to the importance of sectoral employment losses as an important determinant of observed Beveridge curve shifts.*

The rise in euro area aggregate unemployment masks large cross-country and sectoral differences in job losses and a major increase in the proportion of long-term unemployed.<sup>65</sup> An increase in unemployment spells is a common feature of deep recessions,<sup>66</sup> but as a consequence of the deep

recession experienced in some euro area countries, some sectors are likely to have been heavily restructured or permanently downsized. Such restructuring is a necessary element of economic renewal, but the course and speed at which this reallocation can proceed depends crucially on the suitability of labour market participants for the new positions on offer. One way of investigating the extent to which labour market developments reflect growing signs of mismatch is to examine developments in unemployment and job vacancies over time, characterised by the Beveridge curve. Typically, this curve shows a negative relationship between unemployment and vacancy rates over the course of a business cycle, tracing the evolution of the economy from expansionary phases to contractions in activity. “Shifts” in the Beveridge curve over time are of particular interest, since they are suggestive of structural changes in the unemployment-vacancy relationship. “Inward” shifts – i.e. towards the origin – are often interpreted as suggesting greater efficiency in the “matching” of the unemployed to vacancies.<sup>67</sup> This section investigates the extent to which recent movements in Beveridge curves provide evidence of increasing mismatch across euro area countries.

### BEVERIDGE CURVE ANALYSIS FOR THE EURO AREA

Chart 24 a) shows developments in the aggregate euro area Beveridge curve since the first quarter of 2006, on the basis of new vacancy data available from Eurostat.<sup>68</sup>

<sup>64</sup> Prepared by Boele Bonthuis, Valerie Jarvis and Juuso Vanhala.

<sup>65</sup> Long-term unemployment has been a long-standing feature of the euro area economies for much of the course of EMU and continues to be considerably higher in the euro area than in many other advanced economies – particularly the United States (see also Box 1.2). See also Section 1.1.1 for sectoral employment developments since the start of the crisis and changes in unemployment composition.

<sup>66</sup> Elsby et al. (2010) summarise the various mechanisms: “The variation in unemployment may occur as a result of variation in the rate at which workers flow into unemployment, variation in the rate at which unemployed workers exit unemployment or a combination of both.”

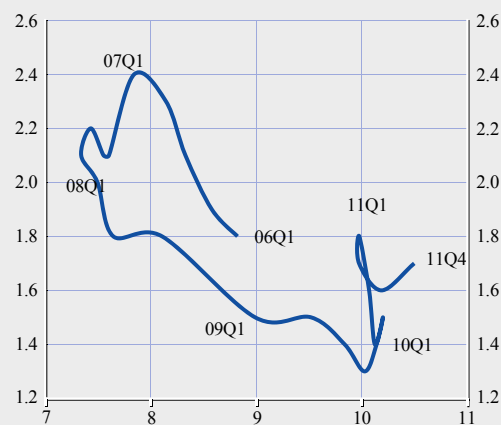
<sup>67</sup> For detailed descriptions, see Blanchard et al. (1989); for theoretical underpinnings, see: Pissarides (1979) or Blanchard et al. (1994).

<sup>68</sup> ECB (2010a). Due to the short nature of the series, data are not seasonally adjusted. More importantly, a number of concerns remain about the cross-country comparability of the data and regarding statistical discrepancies in the compilation of the national series which underlie the euro area aggregate.

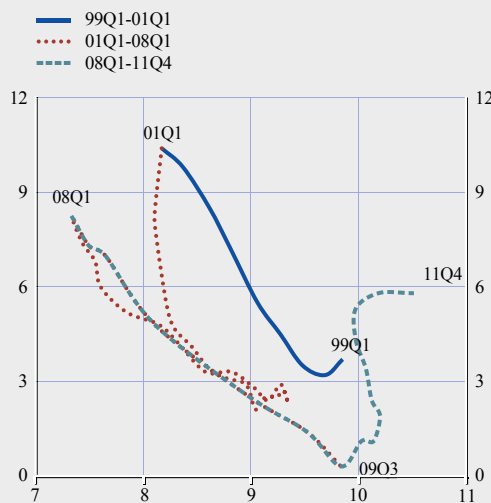


Chart 24 Movements in the euro area beveridge curve

a) Beveridge curve for the euro area, 2006 Q1-2011 Q4



b) Beveridge curve for the euro area, 1999 Q1-2011 Q4 using labour shortages



Sources: Eurostat and own calculations.

Notes: X-axis unemployment rate percentage; y-axis: a) Eurostat vacancy series percentage; b) Labour shortages (diffusion index).

The counter-clockwise movements of the pre-crisis observations trace the typical business cycle pattern of falling unemployment as labour demand and job vacancies increased. As the recession took hold, the vacancy rate fell sharply and unemployment increased strongly, which resulted in a “south-easterly” movement in the Beveridge coordinates.

This outward movement is a typical feature of deep recessions, but one which requires careful monitoring so as to ensure that initial outward *movements* do not in fact disguise more worrying outward *shifts* in the unemployment-vacancy relationship, indicative of a growing structural mismatch. Since the onset of the recovery in economic growth (in the third quarter of 2009), and despite a strong initial (up to 2011 Q1, at least) increase in vacancy rates in many countries, the euro area unemployment rate has remained at around 10% for over six consecutive quarters. This may simply reflect a protracted cyclical pattern of movements towards the extremities of a given Beveridge curve or, more worryingly, a change in the nature of the Beveridge curve relationship,

but the short nature of the vacancy series makes it difficult to evaluate which of the two forces is likely to be the stronger.

Chart 24 b) makes use of a longer time series on labour shortages (used as a proxy for vacancy developments) to trace the evolution of the Beveridge curve over the course of EMU.<sup>69</sup> This suggests that euro area labour markets had shown some signs of structural improvements following the launch of EMU, resulting in an inward shift in the (proxy) Beveridge curve

<sup>69</sup> Data are taken from the European Commission’s Monthly Confidence Surveys, specifically the responses to the question relating to manufacturing employers’ perceptions of labour shortages as limits to business. There is a strong correspondence between the two series (correlation coefficient of around 0.74). For a comparison of the contemporaneous co-movements between the series, see Chart A13 in the Appendix. Moreover, it is intuitively plausible that labour shortages should be a good proxy for vacancy developments: firms, faced with an improvement (decline) in business conditions, first perceive an inadequacy (surfeit) of personnel before posting (reducing) formal vacancies for new employees. The main advantage of the labour shortages series lies in its longer time dimension, which allows for significance testing in the econometric specifications. Comparisons with alternative labour shortage series – including those reported by construction firms and employers in services, as well as combinations of all three series – are given in the forthcoming paper “What’s going on behind the euro area Beveridge curve?” by the current authors.

during the middle years of the 2000s (see red lines in Chart 24 b)). However, the recession hit euro area labour markets hard, causing a sharp rise in unemployment as vacancies plummeted (as illustrated by the grey line, which traces the path of the Beveridge curve since the pre-recession peak in GDP in the first quarter of 2008). In the aftermath of recession, however, there are signs of an outward shift in the aggregate euro area Beveridge curve, suggesting a higher level of unemployment associated with a given level of vacancies.

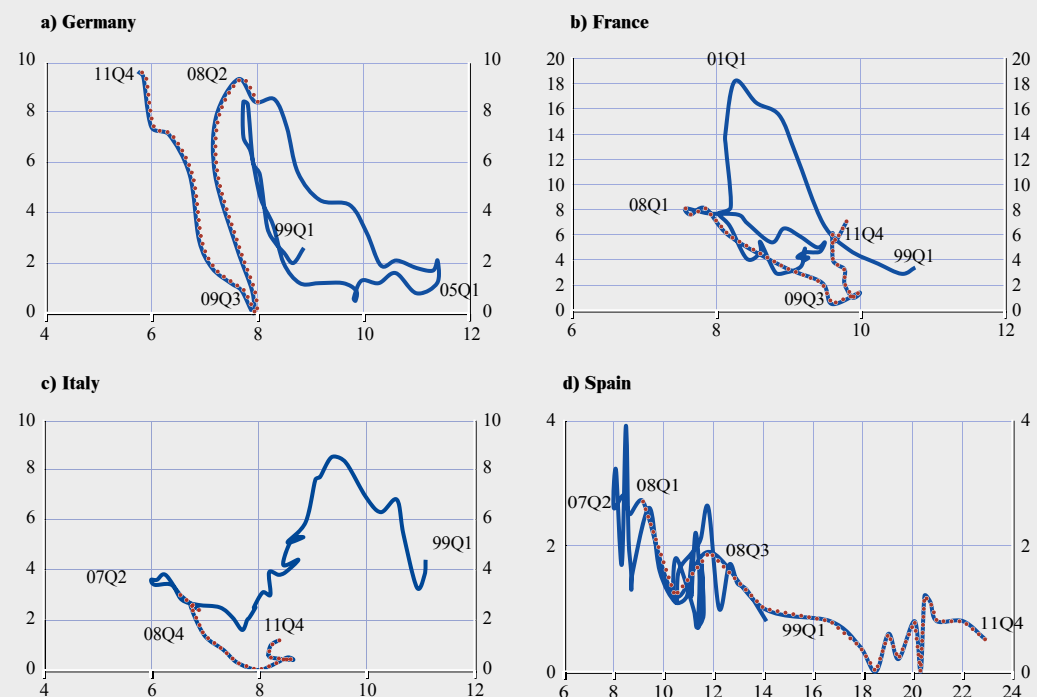
To identify the possible sources of the apparent shift in euro area Beveridge curves, Chart 25 shows Beveridge curve developments for the four largest euro area economies over the course of EMU, again using labour shortages as a proxy for vacancy developments. For Germany, the recession appears to have had a relatively short-lived impact on the labour market. From

2005 the German Beveridge curve seems to have exhibited the typical expansionary pattern of a decline in unemployment and an increase in vacancies, reflecting the tightening phase in the German labour market. The relatively short-lived fall in the vacancy rate following the onset of recession (in the second quarter of 2008) did not lead to an increase in unemployment in Germany, partly due to the relatively low unemployment inflows as a consequence of the private sector's strong reliance on short-time working schemes. Since the start of the recovery, the German labour market has continued to follow a similar path, with both an increase in vacancies and a declining unemployment rate, to the extent that the data suggest a further inward shift in the German Beveridge curve.

Meanwhile in France, the aftermath of the crisis appears to have led to considerable labour market disruption, at least in the short term. Despite

**Chart 25 Longer-term Beveridge curves for euro area countries**

(using employers' perceptions of labour shortages as a proxy for vacancy rates)



Sources: Eurostat and own calculations.  
Notes: x-axis: unemployment rate (% civilian population); y-axis: employers' perceptions of labour shortages (diffusion index). Red line from 08 Q1 onwards.

a notable increase in labour shortages, the unemployment rate remains close to 10%. This contrasts sharply with that country's pre-crisis experience, where signs of an inward shift in the Beveridge curve suggested an improvement in labour market matching. The pattern is similar in Italy, although the traditionally rather sluggish speed at which the Italian labour market appears to adjust (see the rather slow decline in vacancies and unemployment involved in the inward "shift" of Italy's Beveridge curve over the first half of decade), together with and a strong slowing in GDP growth from the first quarter of 2007, makes the full impact of the crisis difficult to assess.

Developments in Spain are clearly less ambiguous, at least during the last year: vacancy rates and reports of labour shortages remain close to their series lows and there has been a clear outward shift in the unemployment rate. This, together with the increase in long-term unemployment, some temporary extension in unemployment subsidies *and* the strong sectoral dimension to the employment losses in that country, following the collapse of the housing sector, are all suggestive of a sharp increase in labour market mismatch in this country.

Table 5 summarises the results of these analyses by "clustering" the various countries into one of four discrete categories following visual inspection of recent Beveridge curve movements.<sup>70</sup> The majority of countries appear to be showing some signs of improvement from the depths of their respective recessions. While some of these countries' labour markets appeared to have been particularly hard hit by the crisis, there are already signs emerging that

the worst effects are over, with unemployment stabilising or starting to decline as vacancies gradually increase and thus few signs of widespread or long-lasting mismatch in these economies. As stated above, it is not yet clear whether France and Italy fall into this category.

From a policy perspective, it is the bottom row of Table 5 which warrants the greatest concern. The first group of countries in this row (Greece, Cyprus and Portugal) are still clearly in the grips of recession, with unemployment rising and vacancy rates close to all-time lows. In the second column of this row, vacancies and labour shortages have started to materialise, but aggregate unemployment (and particularly, long-term unemployment) have continued to rise, which is suggestive of an emerging structural mismatch between worker attributes and labour demand.

#### BEVERIDGE CURVE MOVEMENTS: ECONOMETRIC ANALYSIS

The evidence reviewed thus far would seem to suggest that the recent crisis may have led to considerable structural changes in unemployment developments across a number of euro area countries. Greece, Cyprus, Spain, Portugal, Ireland Slovenia feature prominently in the cluster of countries whose labour markets have been particularly adversely affected by the crisis, with Beveridge curve movements outside

<sup>70</sup> Chart A14 in the Appendix shows the Beveridge curves for the remaining euro area countries. The clustering remains largely unchanged regardless of whether aggregate vacancy rates, as published by Eurostat, or labour shortages are used. The latter are preferred for this analysis, due to the longer duration of the labour shortage series and the lack of seasonal adjustment in the vacancy data, which makes comparison of recent developments less straightforward.

Table 5 Cluster analysis of beveridge curve movements: "eyeball" method

	Vacancy Rates	
	Declining	Stable/rising
Unemployment rate	---	AT, BE, DE, EE, FI, FR, LU, MT, NL, SK
	GR, CY, PT	euro area, ES, IE, SI, IT(?)

Sources: Eurostat and own calculations.

Notes: Vacancy rates approximated by changes in employers' perceptions of labour shortages as a limit to business (taken from the ECFIN Survey of Business Confidence). The clustering is based on movements since the local unemployment peak (where applicable). Data for Ireland inferred on the basis of year-on-year percentage point changes in Eurostat vacancy rates.

the range of developments observed over the course of the past two decades. Others – most notably Germany, Austria, Estonia, Luxembourg and Belgium – appear to have weathered the recession with fewer long-lasting effects and less fear of emerging mismatch.

An econometric analysis has been carried out with three aims: (1) to look explicitly for Beveridge curve shifts over the crisis; (2) to identify the euro area countries where such shifts are most likely to have occurred; and (3) to investigate – to the extent that this is possible in the light of the data available – the institutional features behind the cross-country heterogeneity.

Our starting point was a basic Beveridge curve specification,<sup>71</sup> originally applied to the United States by Valetta (2005), which regressed the unemployment rate on both the vacancy rate and the vacancy rate squared plus a vector of time dummies. As in a European Commission review (European Commission, 2011), our model differs slightly from that of Valetta (2005) in that the vector of time dummies is replaced by a simple time trend; dummy variables were used simply to capture the effect of the crisis on the Beveridge curve relationship (both for the euro area aggregate and for the individual countries), using data on employers' perceptions of labour shortages as a proxy for vacancy rates. Thus our model became:

$$u_{it} = \alpha_i + \beta_{1i} u_{it-1} + \beta_{2i} LS_{it} + \beta_{3i} LS_{it}^2 + \beta_{4i} CRI_i + \beta_{5i} CRI_i * LS_{it} + \varepsilon_{it} \quad (1)$$

where  $u$  is the unemployment rate;  $LS$  is the labour shortages variable representing vacancy developments; and the subscripts  $i$  and  $t$  denote country and time dimensions. The quadratic term  $LS^2$  is designed to ensure the convexity of the Beveridge curve and thus capture non-linearities in the Beveridge relationship.

To test the impact of the crisis on euro area Beveridge curves, the dummy variable  $CRI$  (taking a value of one from the first of at least two consecutive quarters of negative quarter-on-quarter GDP growth *to the end of the series*) was incorporated to identify the start and aftermath

of the crisis.<sup>72</sup> In addition, the dummy variable  $CRI * LS$  represents an interaction term between the crisis dummy and the labour shortages variable and is designed to capture changes in the *slope* of the Beveridge curve, i.e. changes in the efficiency of the matching process. The model was estimated on quarterly data covering the period 1990 Q1 to 2011 Q3.<sup>73</sup>

Table 6 summarises the main results for the euro area and the four largest economies. Overall, this simple model appears to work reasonably well. The results at the aggregate level are broadly in line with those of the European Commission (2011).<sup>74</sup> As expected, labour shortages  $LS_t$  display a negative coefficient, illustrating the negative relationship between unemployment and vacancies which underlies

71 In an early investigation of Beveridge curve relationships in Germany, Börsch-Supan (1991) uses panel estimation techniques to test for structural shifts in unemployment as a consequence of recessions across the German federal states (Länder) from 1963 to 1988. The dependent variable is the unemployment rate. Shift periods are identified by visual inspection of regional Beveridge curves, so as to specify shift dummies, which are then tested for statistical significance. Vacancy data are composed from the official Bureau of Labour vacancy statistic (self-reported), which is corrected by an estimate of the number of unreported vacancies. A variety of functional forms for the vacancy variable ( $v$ ) are explored, including the simple vacancy rate, the vacancy rate squared, a combination of these, as well as a hyperbolic function ( $1/v$ ). Wall and Zoega (2002) build on Börsch-Supan using a two-stage approach – i.e. first identifying shifts in the Beveridge curve, before seeking to explain the shifts by means of a range of institutional variables, but unfortunately not education or skills. In a similar vein, Groenewold (2003) uses a benchmark approach with a standard matching function to examine Beveridge curves and their shifts for Australia. His work suggests coefficients of a similar magnitude to that of Wall and Zoega (2002) and confirms the importance of worker characteristics as a major determinant of increased structural unemployment, despite the very different institutional framework studied. This is the analysis to which we will next turn. Most recently Valetta (2005) estimates the reduced form function  $u_t = \alpha + \beta_1 v_t + \beta_2 v_t^2 + \tau Y + \varepsilon_t$ , where  $u$  is the unemployment rate,  $v$  is a synthetic vacancy rate,  $Y$  represents time effects and the remaining symbols are estimated parameters.

72 In the country regressions all crisis periods are country-specific.

73 In addition to this benchmark specification, several variants of the respective variables were explored, including logarithmic and differenced transformations, which resulted in parameter estimates of a similar magnitude, though less significant. Various transformations and combinations of the vacancy term, and the inclusion of the share of long-term unemployment (LTU) as an explanatory variable, were also tried.

74 European Commission (2011a). The model is the same, but the data used are slightly different. In the European Commission's variant, fitted to the period 1996 Q1 to 2010 Q4, Eurostat vacancy data are used for the second half of the period; for the rest of the period (i.e. up to 2003) the vacancy rates are modelled on the basis of the labour shortages data used directly here.

Table 6 Estimates of euro area beveridge curves

(dependent variable: unemployment rate ( $U_t$ ))								
	UR	LS	LS2	CRI	CRI*LS	Constant	Obs	Adj. R <sup>2</sup>
<b>Euro area</b>	0.828*** [0.0265]	-0.0937** [0.0392]	0.00318 [0.00337]	0.476*** [0.114]	0.00132 [0.0212]	3.265*** [0.496]	66	0.985
<b>Germany</b>	0.886*** [0.0277]	-0.169*** [0.0342]	0.0106*** [0.00379]	-0.437*** [0.156]	0.0192 [0.0193]	1.134*** [0.189]	82	0.985
<b>Spain</b>	0.915*** [0.0165]	-0.790*** [0.182]	0.168*** [0.0508]	1.140*** [0.319]	0.502** [0.239]	3.233*** [0.609]	86	0.991
<b>France</b>	0.863*** [0.0221]	-0.0556*** [0.0104]	0.00114*** [0.000334]	0.263** [0.108]	0.00567 [0.0202]	2.569*** [0.341]	86	0.981
<b>Italy</b>	0.992*** [0.0227]	-0.0491 [0.0589]	0.000989 [0.00648]	0.166 [0.181]	-0.0247 [0.0961]	0.671* [0.402]	85	0.981

Source: Own calculations (see text).

Notes: \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively. For variable definitions: see text; for full country coverage, see table A10 in the appendix.

the Beveridge curve. The convexity condition does not hold statistically for the euro area as a whole. The crisis dummy, *CRI*, is positive and statistically significant, suggesting an outward shift in the aggregate euro area Beveridge curve since the onset of the recession. In this respect, more recent data (see again Chart 24(b)) suggest that, since the trough in activity in the second quarter of 2009, there seems to have been some change in the “slope” of the euro area Beveridge curve, reflecting an overall decline in the responsiveness of unemployment to vacancy developments in the post-recession period, although this is not yet evident statistically at the aggregate level.<sup>75</sup>

Table 6 also includes results for each of the four largest euro area countries. The model performs well for Germany, Spain and France, with the expected signs on all variables. The coefficient on the crisis dummy for Germany is significantly negative, confirming the apparent *inward* shift of the German Beveridge curve since the crisis.<sup>76</sup> In France, the shift is in the opposite direction, suggesting that the recent “outward kick” seen in the graphical representations of the French Beveridge curve is likely to reflect a structural shift in that country’s labour market.<sup>77</sup> Results for Spain suggest that the crisis may have led to both a substantial shift in that country’s unemployment-

vacancy relationship *and* a significant change in the responsiveness of unemployment to movements in job vacancies. The significance of the positively-signed shift dummy *CRI* strongly suggests that the Spanish labour market is likely to have suffered a significant increase in the degree of labour market mismatch since the onset of the crisis.<sup>78</sup> Finally, the model does not perform well for Italy failing to estimate a significant association between unemployment and the vacancy rate.

75 Undoubtedly, part of the ongoing rise in the unemployment rate seen beyond the end of the recession can be attributed to the typical lag that labour market developments display with respect to GDP growth. Part is also likely to be due to the unwinding of previous “crisis measures”, which were widely adopted in many euro area countries precisely in an effort to avoid large-scale job losses and increases in unemployment. It is thus hardly surprising that, following the widespread adoption of short-time working schemes across a number of euro area countries, unemployment responsiveness was likely to fall in the aftermath of the recession, as increases in activity were simply met by increased working hours among the incumbent workforces.

76 The inward shift had in fact already taken place before the crisis.

77 In addition, the estimates appear to suggest that unemployment persistence is rather greater in France, and rather less sensitive to changes in labour demand, compared with Germany, despite relatively similar levels of underlying long-term unemployment.

78 The reader is reminded that the parameter estimates are not strictly comparable across countries, as employers’ perceptions are somewhat “nationally determined”. Hence the markedly “stronger” negative correlation between labour shortages and unemployment in Spain than in the other countries shown in Table 5 is likely to reflect not simply a higher responsiveness of unemployment to vacancy developments, but also a markedly lower average level of labour shortages reported over much of the estimation period.

**Table 7 Cluster analysis of Beveridge curve movements: econometric results**

		Shift parameters	
		No change	Shift*
Slope parameters	No change		euro area(+)***, DE (-)***, FR(+)**, GR <sup>a)</sup> (+)**
	Change in slope (unemployment less responsive post-crisis)	CY (+)**, NL <sup>b)</sup> (+)*	ES: shift (+)***/ slope (+)** LU <sup>c)</sup> : shift (-)* / slope (+)**

Notes: \*\*\*, \*\* and \* denote statistical significance at 1%, 5% and 10% levels, respectively.

a) Model does not work well for GR (lagged depvar >1);

b) No shift in baseline specification, but omission of interaction term suggests significant outward shift;

c) Caution warranted in the interpretation of results for Luxembourg, due to the typically unusually high proportion of foreign workers in that labour market (see also Section 1.2.1).

Shift parameters: Figures in brackets indicate direction of shift, i.e., (+) implies outward shift/greater mismatch; (-) implies inward shift/greater matching efficiency; Slope parameters: (+) change implies decline in responsiveness of unemployment to changes in vacancies after onset of crisis.

Full estimates for all 17 Member States are provided in table A10 in the appendix, with the main results of these estimates summarised in the cluster diagram in Table 7. In order to highlight those countries with the strongest labour market reactions over the course of the crisis, only those with significant shift or slope parameters are shown. Only Germany has managed, over the course of recession, to have experienced a clear favourable “shift” in the structural relationship between labour demand and unemployment. It is then hardly surprising that it is one of the select group of countries which has started to see not only a decline in unemployment rates, but also in the share of long-term unemployment, since the start of the crisis. The model also suggests an inward shift in Luxembourg, though the results are weaker and include a significant adverse slope change, reflecting in part the exceptionally high share of cross-border employment in Luxembourg’s total employment, which means that the exact movement of Luxembourg’s Beveridge curve is ambiguous.<sup>79</sup>

Recalling the countries in the bottom line of the clustering in Table 6, a number of the same countries appear here, though with varying results. In Greece and Cyprus, two Member States still in the depths of recession, the crisis appears to have led to somewhat different labour market reactions (though these results should be treated with caution). In Greece, the crisis appears to have resulted in a significant outward shift in the Beveridge curve. Meanwhile in Cyprus (and,

in some specifications, the Netherlands) it is the degree of responsiveness of unemployment which appears to have changed more significantly – and adversely – since the onset of recession.<sup>80</sup>

The diverse responses of the various euro area countries reflect varied and often ongoing labour

79 For Luxembourg, it is likely that the high degree of labour market volatility seen since the start of the crisis reflects, in part, both small sample sizes and the special nature of the Luxembourg labour market, with its high share of cross-border workers, who usually do not contribute to Luxembourg unemployment counts, but who react promptly to changes in Luxembourg vacancy developments. For this reason, Luxembourg is excluded from the analysis of Beveridge curve shifts.

80 In Greece, the strong growth in unemployment, coupled with an ongoing decline in vacancies, over the crisis renders the lagged dependent variable somewhat unstable. Part of this instability probably results from the relatively small number of observations included prior to the crisis and the very dramatic labour market reaction to its onset, which marked the onset of a clear “vicious circle” with respect to labour market developments. The results for Cyprus are also not without problems. Combining the parameter estimates for the labour shortages variable  $LS$ , with the interaction term  $CRI*LS$ , appears to render the Beveridge curve relationship invalid. Part of the problem lies in the small number of pre-crisis observations; probably more important is the strong labour market reaction in this country since the start of the downturn. Whilst it would be tempting to dismiss the model as a good indicator of labour market developments (at least, in the absence of a longer data series), it is worth remembering that the positive correlation found between unemployment developments and labour demand is itself often a first indication of growing structural mismatch. See: European Commission (2011b). The model is less convincing when suggesting outward shifts for Finland and Malta; both visual inspection and background knowledge of developments in those labour markets suggest that both countries have experienced only modest increases in their unemployment rates since the onset of recession, and they both exhibit a high degree of volatility in their reporting of labour shortages. These features make econometric analysis difficult, as the convexity constraint is not simply rejected, but may be negative. For these reasons, these countries are excluded from Table 7 and the subsequent analysis of shift determinants.



market reallocation of workers in the wake of a deep recession. Therefore, the past accumulation of human capital by the unemployed and its transferability to new occupations will be crucial. In addition to identifying shifts in the Beveridge curve, understanding what is driving such shifts is key for policy responses. From the analyses of the preceding chapter, it would seem that structural change, as a consequence of major sectoral declines, is a prime candidate.

In an attempt to shed light on the extent to which sectoral developments have been a key driver of the observed outward shifts, an alternative specification used the estimated Beveridge curve shifts as dependent variables, which were regressed in a probit model across the nine countries which provided a suitable (i.e. statistically well-defined) Beveridge curve relationship.<sup>81</sup>

$$S_{it} = \alpha + \beta_{1i} X_{it} + \beta_{2i} Z_{it} + \varepsilon_{it}, \quad (2)$$

where  $S_{it}$  is a dummy regressor, taking a value of 1 from the first quarter-on-quarter decline

in GDP for countries which exhibited an outward shift in their Beveridge curve over the course of the recession, and otherwise 0;  $X_{it}$  is the sectoral matrix, expressed as the difference between the annual rate of growth of employment in sector  $j$  and the growth rate of total employment in country  $i$  at time  $t$ . The sectoral matrix distinguished five discrete sectoral groupings, as follows: *IND* – industrial employment, including manufacturing, energy mining and energy generation, but excluding construction, which was included separately (*CONSTRN*); *TRADTRAN* – including retail and wholesale trade and transportation; *FINBUS* – financial intermediation, real estate and business services; *NONMKT* – predominantly non-market services, including education, health care and public sector employment.  $Z_{it}$  is a vector of country and time-specific labour force characteristics

81 In this explanatory work, the sample of countries was restricted, so as to ignore any observations where the Beveridge curve could not be clearly defined as downward-sloping at the 5% level; this resulted in the removal of eight countries: Estonia, Ireland, Italy, Cyprus, Luxembourg, Malta, Austria and Finland.

Table 8 Determinants of euro area Beveridge curve shifts

(dependent variable: probability of outward shift in Beveridge curve)				
	(a)	(b)	(c)	(d)
<i>IND</i> <sup>1)</sup>	24.19 [21.87]	23.62 [20.22]		
<i>CONSTRN</i> <sup>1)</sup>	47.56*** [12.77]	54.20*** [10.35]		
<i>TRADTRAN</i> <sup>1)</sup>	28.37 [27.32]	32.33 [22.70]		
<i>FINBUS</i> <sup>1)</sup>	63.03*** [17.17]	39.95*** [11.79]		
<i>NONMKT</i> <sup>1)</sup>	54.10* [30.94]	51.95** [25.91]		
<i>r_15_24</i> <sup>2)</sup>	-0.523*** [0.166]		-0.409*** [0.141]	
<i>r_55_64</i> <sup>2)</sup>	0.297* [0.166]		0.55]*** [0.115]	
<i>LOW-SK</i> <sup>3)</sup>	0.606* [0.334]			0.160 [0.212]
<i>HIGH-SK</i> <sup>3)</sup>	0.375 [0.381]			-0.176 [0.244]
<b>Constant</b>	-1.499 [3.586]	-2.714*** [0.480]	-7.302*** [2.709]	-1.786*** [0.240]
<b>Obs.</b>	315	333	333	327

Notes:

1) Employment declines in sector  $i$ , relative to rate of employment losses in total economy.

2) Ratio of age-group to total labour force.

3) Percentage point change in ratio of low- and high-skilled to total labour force.

by age, sex and skill level, in particular: the proportion of young workers, aged 15-24, and of 55-64 year-olds in the labour force ( $r_{15\_24}$ ,  $r_{55\_64}$ , respectively); and the proportion of the labour force categorised as high and low-skilled, respectively.<sup>82</sup>

The results for a pooled sample of nine euro area countries – Belgium, Germany, Greece, Spain, France, the Netherlands, Portugal, Slovenia and Slovakia – estimated over the period 2002 Q1-2011 Q4 are shown in Table 8. They confirm the importance of sectoral employment losses as determinants of observed Beveridge curve shifts, with the coefficients attached to the construction (*CONSTRN*) and finance and business (*FINBUS*) sectors strongly significant and robust to changes in the specification (see column (b)) and sample period.<sup>83</sup> Labour force characteristics are a further determinant of the probability of a shift. Specifically, a higher proportion of young workers, aged below 25, reduces the likelihood of an outward shift, while higher proportions of older workers (aged 55-64) tends to raise the probability. In terms of workforce skills, growth in the proportion of low skilled workers in the labour force increases the chances of an outward shift, while the proportion of higher-skilled workers in the labour force is not significant in this specification, although these results are less robust to changes in the specification than the other variables.<sup>84</sup>

## 2.2 THE EVOLUTION OF SKILL MISMATCHES IN THE EURO AREA<sup>85</sup>

*The intense job destruction, and its concentration in certain branches of activity, that has occurred in some countries in the euro area, has increased the mismatch between the skills demanded by the labour market and those supplied by the labour force. This section quantifies the magnitude of the problem, by constructing a skill mismatch index. Since the start of the crisis a strong increase in mismatch is found. A close analysis of the index suggests that the problem is caused by structural imbalances between*

*labour demand and labour supply, rather than by a lack of geographical mobility. Strong differences between countries are unveiled, both in the nature and the magnitude of the problem. Finally, it is found that the skill mismatches have significant effects on the unemployment rate.*

Since the start of the recession, the euro area labour market appears to have been facing increasing structural imbalances. In particular, given the previous unbalanced expansion in some economic activities (construction-related and financial sector activities) in some countries in the euro area it is likely that the existing human capital/skills of the newly unemployed workers may be of limited value for nascent jobs in expanding economic sectors. As such mismatches between labour demand and labour supply can hinder the reallocation of the labour force and therefore hold back potential growth, it is important to have an idea of their magnitude and nature.

82 Early versions of these specifications also included a variable “MALE”, capturing the proportion of the labour force accounted for by men, but this was not significant in any of the regressions and thus has been omitted. Previous analyses have often included LTU as an explanatory variable in Beveridge curve regressions and have found this to be an important causal factor (inclusion of LTU in our specification resulted in considerable instability of the model). But this shortcut seems somewhat unsatisfactory, since both increases in LTU and shifts in Beveridge curves are likely both to be symptoms of a common causal relationship. (We also tried using LTU as the dependent variable in our model in an effort to see whether, as anticipated, LTU would be less responsive to changes in labour demand. As expected, variation in the labour shortages variable yielded no significant effects on LTU, but this is not a very satisfactory – or robust – test for mismatch at the wider level.)

83 Results for the shorter sample period 2006 Q1 to 2011 Q3 confirm the results in Table 8.

84 Further specifications, including institutional variables – including employment protection legislation, in an attempt to capture overall labour market flexibility, and unit labour cost growth – failed to show any expected significance. This is not to say that such variables do not also play an important role in determining the positioning of respective Beveridge curves, but such analyses are empirically challenging, not least as a result of: the long and variable lags by which institutional changes affect labour market behaviour; the lack of variation – even in annual terms and across countries – of such variables over time; and the wide variety of combinations of such variables which would need to be considered to isolate adequately the impact of individual labour market institutions on observed outcomes.

85 Prepared by Sergio Puente, José Manuel Montero and Mario Izquierdo.

Reallocating the large stock of unemployed workers from depressed activities and/or countries to more dynamic ones will be a major challenge for policy-makers. However, the type of measures that can help enhance the speed and efficiency of this reallocation will depend on the correct diagnosis of the underlying problem. In that respect, it is important to know whether euro area countries and regions are confronted with the same kind of mismatches. Indeed, if the skills demanded by firms in expanding sectors can be matched with the human capital supplied by individuals from inside the euro area, then the observed mismatch problems in the European labour market are linked to a lack of mobility.

In other words, due to frictions in the process of search and matching in the euro area or factors hindering the mobility of the labour force we may experience a period of high unemployment that can be partially solved by encouraging labour mobility across different countries or regions within the euro area. Greater mobility can be encouraged by enhancing the flexibility of wages across sectors and regions, so that wages reflect the scarcity of some types of human capital relative to others and thus incentivise workers to move or to invest in appropriate human capital accumulation. It would also help to remove the obstacles associated with housing markets – e.g. by ensuring a well-functioning rental market – and other barriers to movement, such as the provision of public goods in the areas where labour demand is expanding. On the other hand, the euro area economy may be experiencing a more profound “structural” imbalance problem if, for the area as a whole, the skills supplied by the labour force do not match the skills required by nascent economic activities. In such a case, facilitating labour mobility would not solve the underlying problem.<sup>86</sup>

### AN INDEX OF SKILL MISMATCHES

The skill mismatch index (SMI) constructed is inspired by Estevao and Tsounta (2011),<sup>87</sup> who calculate an SMI for the US economy by taking the difference between skill demand and supply at a state level. The EU LFS provides, for the period 1998-2010, six International Standard

Classification of Education (ISCED) levels of education<sup>88</sup> for both employment (as an approximation of labour demand) and the active population (which corresponds to labour supply).<sup>89</sup> The skill mismatch indicator is constructed at different aggregation levels. First an aggregate euro area index of skill mismatches is built, incorporating 16 Member States of the euro area,<sup>90</sup> in order to study the relevance and nature of the existence of skill mismatches in the euro area as a whole. One of the novelties of this analysis is its euro area dimension, since we are dealing with a set of countries whose economic dynamics are tied by a monetary union. In addition, country-specific indices are constructed, as well as, for those countries for which the necessary disaggregated data are available, indices at regional level. Formally, the (baseline) SMI is constructed using the following formula:

$$SMI_{it} = \sum_{j=1}^6 (S_{ijt} - D_{ijt})^2 \quad (1)$$

where  $i$  represents the euro area, the country or the regional level for which the index is calculated,  $j$  is the skill level,  $t$  is the period,  $S_{ijt}$  is the share of the labour force with skill level  $j$  in euro area/country/region  $i$  at time  $t$ , and  $D_{ijt}$  is the share of employed persons with skill level  $j$  in country  $i$  at time  $t$ .

The SMI can be informative in several ways. First, the analysis of each country’s SMI across time should inform us whether skill mismatches

86 Such skill mismatches can also occur in a “favourable” situation in which the economy is evolving towards a more innovative one and labour supply needs time to adapt to the implied upgraded skill demand. But, even in this case, the appearance of a mismatch would, at least temporarily, signal a structural imbalance or even a lack of flexibility in labour markets to adapt to a changing environment.

87 Estevao, M. and E. Tsounta (2011): “Has the Great Recession raised US structural unemployment?”, IMF Working Paper WP/11/105.

88 The levels of education are the following: primary education or less; lower secondary education; upper secondary education; post-secondary, non-tertiary education; first stage of tertiary education; and second stage of tertiary education.

89 Compared with Estevao and Tsounta, the measure used is therefore more accurate, as they used the whole population of working age to approximate labour supply.

90 Malta is left out because of a lack of sufficiently disaggregated data.

have improved or worsened over time and what impact the recession has had. Second, it allows us to identify whether there is either a mobility problem (across countries or regions) or a more structural one. To do this, the SMI using the skill distribution at euro area level can be compared to a weighted average of the various SMIs at a more disaggregated level (country or region). Both indices refer to the same aggregation level (euro area), but the former reports differences in the aggregate skill distributions, whereas the latter reflects disaggregated skill distributions (by country or region). If the type of mismatches is more or less homogeneous across countries, both SMIs will deliver a similar message. But if there is a lack of certain skills in some countries or regions, compensated by an excess in others, then the latter SMI will be higher than the former. Indeed, while in that case the SMI calculated with euro area data will not show a significant mismatch, because the aggregate skill distribution will hide this heterogeneity, the SMI that is a weighted average of the country or regional ones will be higher because mismatches of different types do not cancel each other out. Therefore, the difference between these indices can be interpreted as the size of the mismatch that is caused by a mobility problem.

To check the robustness of the results, alternative SMIs were constructed, by changing some elements of the definition of our baseline SMI. Firstly, instead of the sum of squares the sum of absolute deviations was also used. Secondly, when defining the appropriate measure of labour supply relevant for firms, one may argue that it should be the stock of unemployed workers rather than the whole labour force, since the former are those readily available for work. Thus, we also computed the index by using the distribution of skills of unemployed workers as a proxy for the supply of skills, instead of using the whole labour force. Thirdly, one could also argue that the relevant measure of skill demand should only include recently created employment, not the whole stock of workers, as that would capture the true needs of currently expanding firms. Therefore the SMI was also

calculated taking the distribution of skills of workers hired in the last year as the indicator of skill demand.<sup>91</sup> Finally, using educational attainment as a proxy for skill clearly has some pitfalls.<sup>92</sup> Although skills seem to be reasonably measured in this exercise, as there is an indisputable (though admittedly far from perfect) connection between education and skills and a homogenous measure of educational attainment across countries is used, based on a standard classification (ISCED), two additional indices were computed in order to take into account the branch of activity and occupation of employed workers and the labour force,<sup>93</sup> by considering the distribution of people over nine different education-sector<sup>94</sup> and education-occupation<sup>95</sup> pairs, respectively. The aim was to capture (at least partially) the acquisition of skills during a person's working life, in addition to those obtained from formal education.

Chart 26 shows the SMI for the euro area as a whole computed at three different levels of aggregation. Each SMI shows a strong increase during the crisis period, signalling a substantial intensification of mismatch problems. Moreover, when skill supply is proxied using the stock of unemployed workers (instead of the labour force), the skill mismatch rise may have started earlier (specifically, by the middle of the last decade). Hence, these results point to a skill mismatch problem in the euro area labour market in the recent crisis period, which might have been developing some years earlier.

The recent SMI increase is found at all aggregation levels. This signals that the

91 An even closer measure of skill demand would be the skills demanded for vacancies posted by firms. However, no homogeneous information is available in this respect.

92 For a thorough discussion of these methodological issues, see Borghans, L., F. Green and K. Mayhew (2001): "Skill measurement and economic analysis: an introduction", Oxford Economic Papers 3, pp. 375-384.

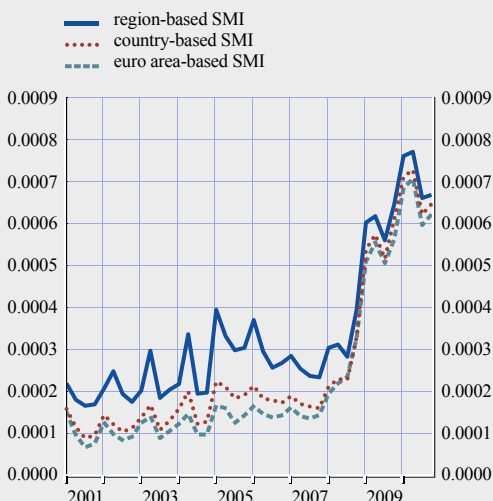
93 In this latter case, for unemployed workers we define occupation and sector according to their last job. Unfortunately, this information is only available for unemployment spells with duration of less than a year.

94 For education: ISCED levels 1-2, 3-4 and 5-6. For sector: construction, services and other.

95 For education: ISCED levels 1-2, 3-4 and 5-6. For occupation: ISCO groups 1-3, 4-6 and 7-9.

Chart 26 Skill mismatch index

(euro area aggregates)



Sources: EC (EU LFS) and own calculations.

Notes: Skill demand proxied by educational attainment of employed and skill supply by educational attainment of the labour force. The "Euro area-based SMI" is constructed by using the aggregate skill distributions of labour demand and supply at euro area level. The "Country-based SMI" is constructed by aggregating 16 SMIs computed using country-level skill distributions. Finally, the "Region-based SMI" is the aggregation of SMIs computed at a regional level.

intensification of the skill mismatch problem is mainly structural, and not particularly related to a mobility problem. Indeed, the proportion of the SMI that could potentially be solved with perfect mobility of workers across countries (captured by the distance between the SMIs computed at the euro area and country levels) has fallen in recent years, suggesting a higher degree of integration between national labour markets, which has, however, not been able to compensate for the structural mismatch increase. Also a comparison of the SMIs based on country and regional data indicates that there is no general mobility problem across the regions within each country, although we will see below that this is not true for all countries.<sup>96</sup>

As a robustness check, Chart A15 (in the Appendix) shows SMIs for the euro area calculated using some alternative definitions. First, we use the distribution of educational levels only for recently created jobs as a proxy

for labour demand. Second, the sum of absolute deviations, instead of the sum of squares is also used. Finally, SMIs are calculated by using the combination of education with either sector or occupation. All these indices indicate that skill mismatches rose during the recent recessionary period. This increase was sharpest according to the SMIs for which skill is combined with sector or occupation, but these two indicators also dropped substantially at the end of the period. All in all, the findings presented above seem to be quite robust to the alternative definitions of the SMI. Chart A16 also reports the SMI, for individual countries over the period 1998-2010 (depending on the availability of individual data), calculated as the baseline specification (equation (1)). There appears to have been a sharp increase in the SMI in the labour markets of those countries severely affected by housing booms, such as Estonia, Ireland and Spain. The SMIs of the other countries varied substantially, but mismatches nevertheless increased in almost all of them in 2009 and 2010. Some of the countries for which regional data are available, such as Belgium, Germany and Portugal, seem to be facing a mobility problem, since their SMI based on the aggregation of regional SMIs is considerably higher than the SMI calculated by using country level data. In the case of Portugal, the gap has widened over recent years.

If the labour supply considered is limited to the unemployed (see Chart A17), the recent mismatch increase is not so widespread across countries. Moreover, for some countries the picture changes substantially. In particular, whereas Spain and Estonia still record historically high mismatch levels, the rise in Ireland is more moderate. Also, from a medium-term perspective, the trend observed in some countries is rather different. For instance, in the case of Germany, Chart A17 shows a steady increase in skill mismatch, in contrast with the inverted U-shape that was found in Chart A16. In the case of Italy, the direction of the trend in regional mismatch changes from

<sup>96</sup> Furthermore, a detailed analysis reveals that a very large proportion of the mismatch stems from a scarcity of highly educated people, including at the regional level.



**Table 9 Pooled OLS estimates between the SMI and proxies for structural unemployment**

Dependent variable	SMI for Labour Force:			
	[1]	[2]	[3]	[4]
Long-term unemployment	0.001 (0.001)			0.000 (0.000)
NAIRU – HP		0.007*** (0.002)		0.007*** (0.002)
Sectoral empl. volatility			0.073*** (0.019)	0.042** (0.017)
Adjusted R-squared	0.21	0.58	0.12	0.61
No observations	601	613	608	584
No countries	16	16	16	16

\* \*\*, \*\*\* denote statistical significance at a 10%, 5% and 1% levels, respectively.  
All equations include year and quarter dummies, not reported. Standard errors adjuster for clustering, being the clusters each country.

one of steady decline, with the first definition (Chart A16), to one of steady increase, with the second (Chart A17). Finally, the upward trend observed in Portugal with the first region-based SMI is not present with the second.

#### WHAT IS THE SMI CAPTURING?

Having built a skill mismatch index, it is important to check whether this index is indeed proxying some factors related to the imbalances between skill demand and skill supply that are relevant for the determination of employment/unemployment in each country. If it is, then the SMI should be highly correlated with some other measures related to structural unemployment, like the incidence of long-term unemployment, the NAIRU or a measure of sectoral employment volatility. Table 9 reports the results from a simple regression exercise in which our baseline measure of the SMI (i.e. using the educational attainment of the labour force as the measure for skills in the labour supply) is regressed on a constant and the above mentioned variables. The coefficients of the NAIRU and the sectoral employment variability appear to be statistically significant and have the expected signs, but this is not the case for the incidence of long-term unemployment. Reassuringly, these results suggest that our measure of skill mismatches captures some factors that are related to the dynamics of structural unemployment.

Next, the relationship between skill mismatches and unemployment at a country level is analysed.

The estimated model relates quarterly changes in the unemployment rate to quarterly output growth rates and to the quarterly percentage change in the skill mismatch index. The estimated specification is a sort of Okun's law and takes the following form:<sup>97</sup>

$$\Delta u_{it} = a_0 + a_1 \Delta y_{it} + a_2 \Delta smi_{it} + a_3 \mu_t + \eta_i + \varepsilon_{it} \quad (3)$$

where  $i$  and  $t$  refer to a country and year, respectively,  $u_{it}$  is the unemployment rate,  $y_{it}$  is the (log of) GDP, and  $smi_{it}$  represents the (log of) the SMI. We also account for quarterly dummies ( $\mu_t$ ) and individual country effects ( $\eta_i$ ), while  $\varepsilon_{it}$  represents the usual error term.<sup>98</sup>

Table 10 shows results from estimating equation (3) using two methods, either the within groups estimator or the pooled OLS estimator. The SMI used comes from the baseline specification, using the labour force to represent labour supply. The results show that country-level unemployment rates are very significantly and positively associated with skill mismatches, even after accounting for country-level business cycles and aggregate shocks. In addition, the estimated coefficient is relatively large, since over a third of movements in skill

97 Different specifications including lags were also tried, yielding similar results.

98 Time dummies control for aggregate, euro area level variables that could affect the behaviour of country-level unemployment, such as those related to monetary policy, while country-specific business cycles would be captured by country-level changes in GDP.



**Table 10** Baseline regression of country-level unemployment rates on GDP and skill mismatch measures

Dep. variable: change in unemployment rate	FE estimator	Pooled OLS
	1	2
Log-change in real GDP	-0.131*** (0.030)	-0.122*** (0.030)
Log-change in skill mismatch index	0.349*** (0.118)	0.359*** (0.121)
Adjusted R-squared	0.450	0.450
No observations	568	568
No countries	16	16

\* \*\*, \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively.  
All equations include time dummies and dummies for each quarter of the year, which are not reported.

mismatches translate into changes in the unemployment rate. Although these results are not directly comparable to those of Estevao and Tsounta (2011) or EC (2011),<sup>99</sup> it is remarkable that these estimated coefficients are around ten times larger than theirs. These results are robust to the estimation method used and to the use of several alternative computations of the SMI (at country level and using the labour force as the measure of skill supply), since significant positive effects are found for all the alternative definitions of the index.

In short, the results of this section point to an intensification of a skill mismatch problem in the euro area labour market in the recent crisis period, which might have been developing some years earlier. The SMI has increased sharply in those labour markets severely affected by housing booms, such as Estonia, Ireland and Spain. Also, in most of the other countries mismatches rose in 2009 and 2010. However, a final remark should be added: although part of the above mentioned mismatches is cyclical, so that it could correct itself with the economic recovery, it is highly likely that a substantial part has a more structural nature. Therefore, it would be advisable for countries to implement policies that improve the matching of unemployed workers to job vacancies and enhance their skills. In other words, policy-makers should make extensive use of active labour market policies, while at the same time ensuring that relative wages (across sectors and occupations) are flexible enough to guarantee a reaction by skills demand and supply to the emergence of possible skill shortages,

although the process of acquisition of new skills will necessarily take time.

### 2.3 DEVELOPMENTS IN STRUCTURAL UNEMPLOYMENT<sup>100</sup>

*This section describes developments in structural unemployment using estimates from a number of different sources (European Commission, OECD and IMF). Most, although not all, countries witnessed an increase in estimated structural unemployment, albeit to differing degrees. These cross-country developments are consistent with the view that the recent period has been characterised by a combination of global, sectoral and country-specific shocks. Notwithstanding uncertainty about the precise level of structural unemployment and the unemployment gap, the evidence of strong labour market mismatches highlights the need for additional structural reforms at the country level.*

Differences in labour market institutions, including unemployment benefit regimes, mismatches (of skills or geographical) and sector and country-specific shocks are all factors that potentially underlie the different developments in structural unemployment across countries, especially to the extent

<sup>99</sup> European Commission (2011): “European Economic Forecast – Autumn 2011”, Box I.2.2, page 68. This study replicates Estevao and Tsounta (2011) on a sample of 27 EU Member States over the period 2001-2010, and attains similar results to theirs in terms of the effect of the SMI on unemployment.

<sup>100</sup> Prepared by Aidan Meyler and José R. Maria.

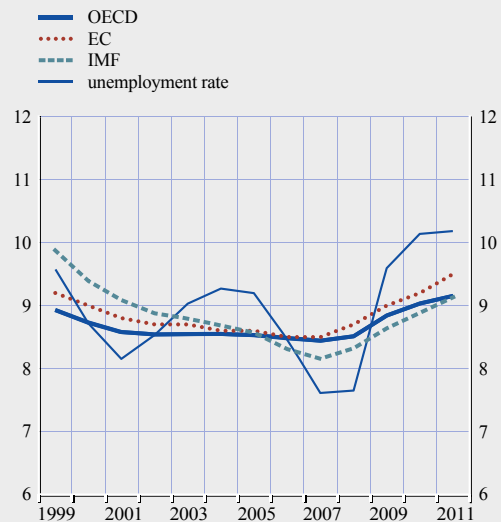
they contribute to increasing the degree and persistence of long-term unemployment and hysteresis in unemployment more generally. Notwithstanding their strong conceptual appeal to policy-makers and relative computational simplicity, structural unemployment rate estimates are subject to a high degree of uncertainty and are sometimes controversial. Theoretical and practical difficulties include the absence of a single or unique model explaining structural unemployment, a high degree of estimation uncertainty for what is ultimately an unobservable variable, as well as the impact of data revisions.

Estimates of structural unemployment from each of the international organisations show a downward trend prior to the beginning of the crisis and a rather abrupt increase over the period 2007-10 (see Chart 27).<sup>101</sup> Movements in the structural unemployment estimates seem to be linked to the lower (medium-to-longer-term) frequency movements of the unemployment rate. Higher (shorter-term) frequency movements do not, however, display a stable link (for the periods 1999-2001 and 2005-10 the correlations were positive on average, but they were negative for the period 2001-05). During this latter period, the actual unemployment rate moved upward, while the estimates of structural unemployment continued to decrease. In contrast, the recent increase in unemployment has been mirrored by increases in estimated structural unemployment, which suggests that some of the increase in unemployment may have been or has become structural.

The aggregate euro area results conceal cross-country heterogeneity (see Chart 28). Specific institutions and idiosyncratic structural features of euro area countries may play a key role, as the recent increase in both the actual and structural unemployment rates of the euro area took place against a background in which the labour market situation exhibited an increasing degree of heterogeneity across countries.<sup>102</sup> After a convergence period before the beginning of the crisis, the dispersion of both the actual and

Chart 27 NAIUR estimates for the euro area

(levels; annual; percentages)



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: The series are an aggregation of the available structural unemployment rates of each international organisation.

structural unemployment rates of euro area countries showed a rapid increase, reaching high levels in 2010.

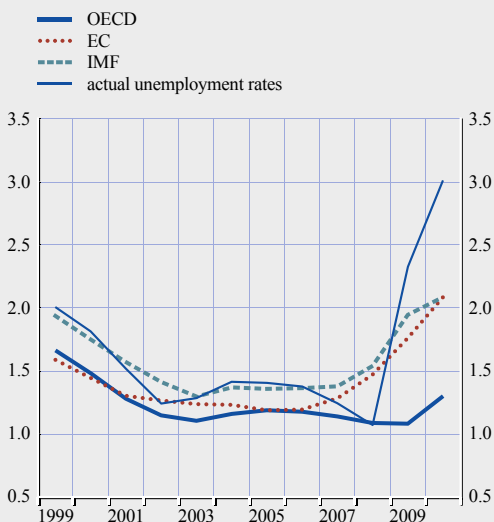
The increase in the dispersion of estimated structural unemployment, particularly according to the IMF and EC estimates, is a worrying feature of recent developments, as it would suggest that recent unemployment divergences across countries cannot be seen simply as a conjunctural outcome and highlights the need for additional structural reforms if labour market performance across the euro area is to be improved. The heterogeneous behaviour across euro area countries can be further highlighted by the analysis of individual euro area

<sup>101</sup> For the euro area estimates, the EC data represent the aggregation of all the Member States, the IMF data exclude Estonia, Malta and Slovakia and the OECD data exclude Cyprus, Malta and Slovenia.

<sup>102</sup> Following Martin (1997), the dispersion indices are computed as the weighted average of absolute deviations between the figures of the countries and of the euro area. The weights are based on labour force data. By construction, these indices give more influence to larger countries. However, a similar pattern emerges when the (unweighted) standard deviations are considered (not shown for space reasons).

**Chart 28 Dispersion between euro area countries**

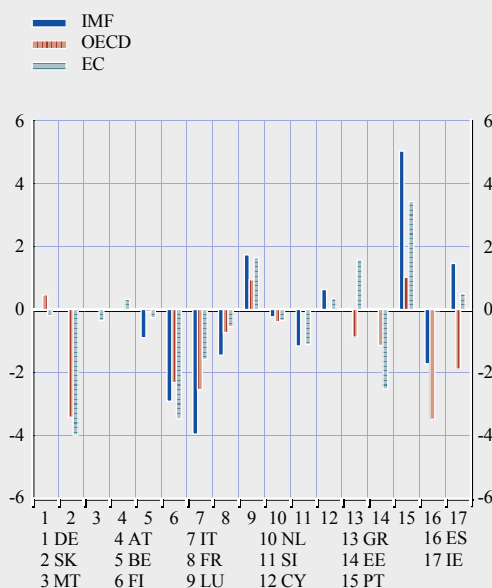
(levels, annual)



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: The series are an aggregation of the available structural unemployment rates of each international organisation. Dispersion indices are computed as in Martin (1997).

**Chart 29 Change in structural unemployment (2000-07)**

(changes, in pp)



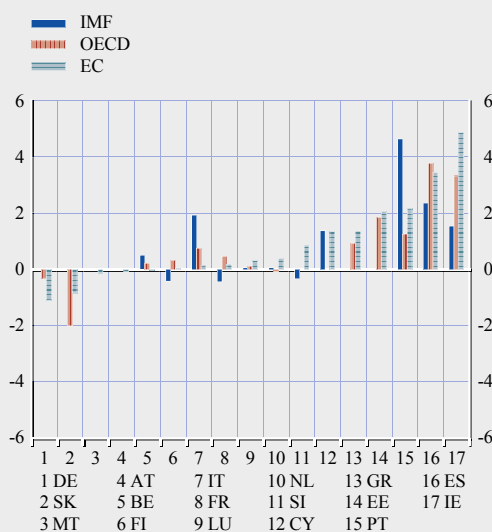
Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: Countries are ordered in Charts 29 and 30 by the changes in structural unemployment over the period 2007-10 according to EC estimates, which cover all countries.

countries. Chart 29 depicts changes in structural unemployment over the period 2000-07, while Chart 30 depicts changes over the period 2007-10. Before the crisis, structural unemployment rate estimates decreased in most countries, most notably in Spain, Italy, Slovakia and Finland, the main exceptions being Luxembourg and Portugal (with the former at a low level). After 2007 however, most countries saw an increase in structural unemployment, although there are some countries with decreasing or relatively stable structural unemployment rate estimates (for instance Germany and Austria). There has also been considerable heterogeneity regarding whether the observed trend prior to the crisis has been reversed, remain unchanged or gained momentum.

The wide range of the level of structural unemployment in 2010 across countries is illustrated in Chart 31. The highest rates are for Spain, while the lowest are for Luxembourg, the Netherlands and Austria. In addition, the

**Chart 30 Change in structural unemployment (2007-10)**

(changes, in pp)



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: Countries are ordered in Charts 29 and 30 by the changes in structural unemployment over the period 2007-10 according to EC estimates, which cover all countries.

vertical distances across the estimates for each country highlight the considerable uncertainty surrounding these estimates. Although relatively modest in some countries, the distances are rather large in others, especially in Ireland, Spain and Portugal.

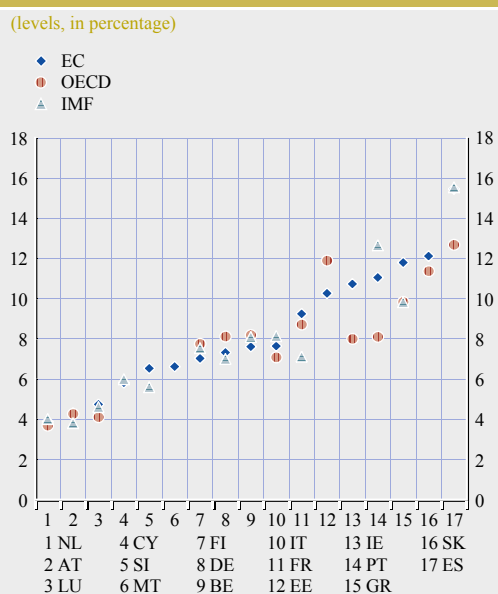
The behaviour of the unemployment gap, defined as the difference between actual and structural unemployment rates, also provides useful information, in particular on the likely impact of the recent economic and financial crises on wage and price pressures in euro area countries. Chart 32 plots the unemployment gap in the euro area over 1999-2010 and includes maximum and minimum levels across countries. All estimates indicate that the unemployment gap increased after 2007. The 2010 levels are positive in all databases and the highest over the past decade in each database, which serves to indicate the severity of the current crisis.

Finally, both the estimates of structural unemployment and unemployment gap developments have high correlation coefficients across the institution estimates in the period 1999-2010, of more than 0.8 and more than 0.9, respectively. This outcome suggests that a similar type of information is being delivered, at least in terms of directions. It should be emphasised however that negative and positive gaps coexist in several years. Indications of excessive labour demand (implying upward inflation pressure) co-existing with indications of demand slack (implying the opposite) implies a non-negligible degree of uncertainty in the analysis in terms of levels.

#### FACTORS DRIVING STRUCTURAL UNEMPLOYMENT

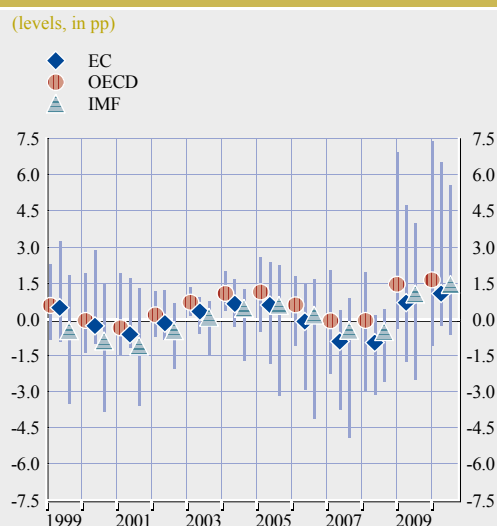
According to Elmeskov and Macfarlan (1993), the structural unemployment rate may depend "...on recent developments in actual unemployment".

**Chart 31 Estimated structural unemployment levels in 2010**



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: In Chart 31 countries are ordered by the 2010 levels of the EC database. In Chart 32 there are three markers for each year, representing the euro area aggregates according to each database; the vertical lines range between the maximum and minimum country levels.

**Chart 32 Unemployment gaps in the euro area**



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: In Chart 31 countries are ordered by the 2010 levels of the EC database. In Chart 32 there are three markers for each year, representing the euro area aggregates according to each database; the vertical lines range between the maximum and minimum country levels.

For example, a temporary negative demand shock that pushes up the actual unemployment rate may produce an increase in structural unemployment, persisting even after demand has recovered. This phenomenon has been labelled as hysteresis (p. 70). Ball (2009) also argues that hysteresis helps to explain the long-run behaviour of unemployment as well as account for why the natural rate of unemployment is influenced by the path of actual unemployment and shifts in aggregate demand.

Hysteresis in unemployment can arise for a number of reasons. One is the loss of human capital or skills that can occur the longer the unemployed are out of work. Another is that longer spells of unemployment may send a negative signal to potential employers, as a result of which it becomes more challenging for the unemployed to find a new job. It may also be the case that the longer unemployment lasts the more discouraged in their job search and more detached from the labour market the unemployed become. An additional factor might be employment protection legislation that disproportionately protects those with jobs (insiders), while hindering those without jobs (outsiders), as companies are more reluctant to hire than would otherwise be the case.

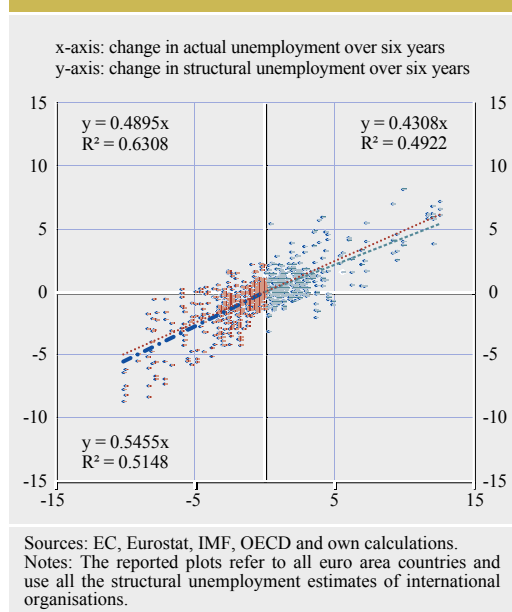
Overall the evidence seems to favour the presence of hysteresis effects in unemployment developments in the euro area. One of the main operating channels is via changes in long-term unemployment, which displays strong and significant correlations with structural unemployment.<sup>103</sup> The link between changes in the actual unemployment rate and changes in estimates of structural unemployment, which appear to exist, regardless of the length of time considered, for all countries and all international organisations' estimates, suggest that cyclical changes in the former seem to feed through into estimates of structural unemployment. Chart 33 considers six-year periods. The correlation over the six-year period appears to vary across the EC, IMF and OECD estimates. In this case, approximately 50% (48.95%) of changes in actual unemployment show up in estimates of

structural unemployment (at one year this is 24% and at ten years 66%).

The empirical evidence reported in Chart 33 is also indicative of a degree of asymmetry, whereby decreases in actual unemployment showed up more in estimates of structural unemployment (54.55%) than increases (43.08%). This may reflect the fact that whilst increases in unemployment (if not prolonged) may have been sometimes purely cyclical, decreases may have been more structural in nature. It might be argued that by 'filtering' actual data, the co-movement between these variables is to some extent tautological. However, this need not be the case as inflation may be non-stationary and other factors such as expectations and supply-side shocks impact on the estimated structural unemployment rate. Furthermore, it should be noted that in addition to being observed ex post, hysteresis in European labour markets is perceived ex ante. Chart 34 documents the link between changes to the short-term outlook for unemployment

103 Not shown for space reasons.

Chart 33 Changes in actual unemployment and estimated structural unemployment



and changes to the longer-term outlook, according to professional macro-economic forecasters (on average, over 50% of changes to the one-year ahead unemployment forecast is expected to remain over a longer term of five years).<sup>104</sup>

Identifying the factors behind the presence of hysteresis poses a challenging task, given the wide range of institutional features across countries. Gianella et al. (2008), using pre-2008 data, estimate NAIRUs for a number of countries and consider as possible driving factors, the tax wedge, the user cost of capital, product market regulation, union density and the unemployment benefit replacement ratio.

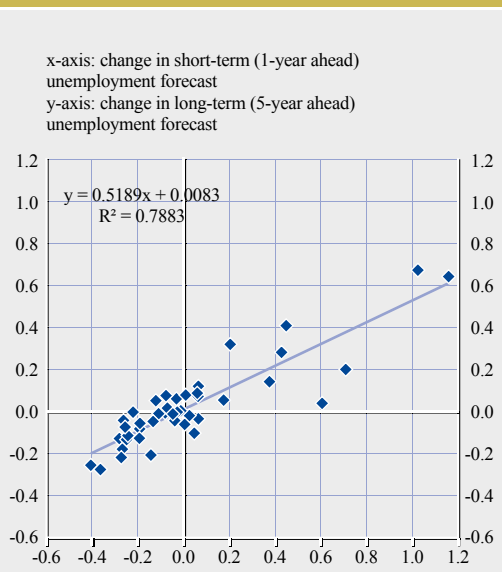
Although they find that such variables do generally play an explanatory role, they note considerable variation in estimates across countries and that their results fit the 2000-07 decline in the NAIRU better than

earlier developments. It should also be borne in mind that the nature of the shock impacting on labour markets may have implications for the degree to which cyclical developments become structurally embedded. For example, since 2007 a number of countries, in particular Ireland and Spain, have had large negative shocks to their construction sectors. Given that the largest shocks have impacted on construction workers, who may have specific non-transferable skills, this may have “endogenous” implications for the degree of hysteresis.

Chart 35 indicates that there is a strong, statistically significant correlation with indicators of skill mismatch (see Section 2.2 for

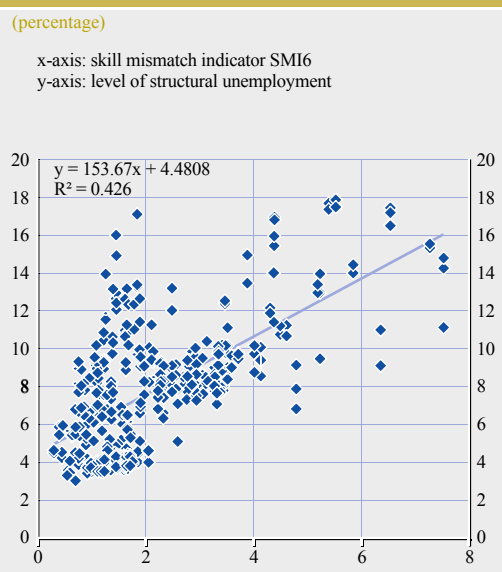
104 This outcome contrasts strongly with equivalent evidence from inflation data. As discussed in detail in Bowles et al. (2009), there is no correlation between changes to short-term inflation forecasts and longer-term expectations in the ECB Survey of Professional Forecasters (SPF), owing to the successful anchoring of longer-term inflation expectations.

**Chart 34 Hysteresis implied in professional forecasters' unemployment forecasts**



Sources: ECB Survey of Professional Forecasters (SPF) and own calculations.

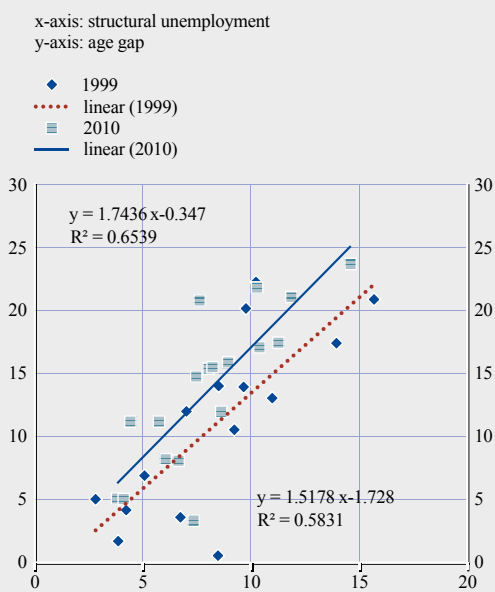
**Chart 35 The mismatch index and structural unemployment**



Sources: EC, Eurostat, IMF, OECD and own calculations.  
Notes: The skill mismatch indicator is presented in Section 2.1.2. The “age gap” is calculated as the absolute gap between the unemployment rate for persons under the age of 25 and that for the over 25s.

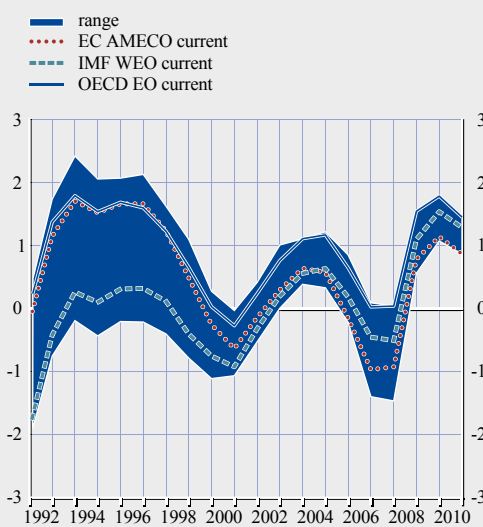


Chart 36 The “Age Gap” and structural unemployment



Sources: EC, Eurostat, IMF, OECD and own calculations.

Chart 37 Range of unemployment gap estimates (current vintages)



Sources: European Commission, Eurostat, OECD, IMF and own calculations.

a detailed discussion of different indicators of skill mismatch in euro area countries). Labour market segmentation (particularly impacting on the young) may also have negative implications for structural unemployment. This may be because the young never get a chance to enter the workforce and quickly lose their education capital. Chart 36 shows a strong and statistically significant positive correlation with the gap between the youth unemployment rate and the unemployment rate for the rest of the labour force.<sup>105</sup>

### UNCERTAINTIES SURROUNDING STRUCTURAL UNEMPLOYMENT ESTIMATES

Whilst the concept of structural unemployment, and especially the NAIRU, is relatively easy to understand, in practice its estimation is subject to a high degree of uncertainty. Quantitatively, uncertainty about estimates of structural unemployment, which is an unobservable variable, stems from a number of sources, in particular data uncertainty and model uncertainty. As model frameworks used to derive structural unemployment estimates vary and may

incorporate varying degrees of judgement, it is difficult to quantify precisely the uncertainty surrounding them. The estimates are generally obtained using unobserved component models, which are ultimately sophisticated statistical filters that suffer from end-of-sample and turning-point problems.<sup>106</sup>

An alternative perspective of uncertainty, particularly in real time, which is not dependent on one specific model or approach, may be gained by focusing on the impact of (i) unemployment rate data uncertainty and (ii) the uncertainty surrounding structural unemployment estimates. Chart 37 above focuses on the combined impact of these two uncertainties, as captured by the

<sup>105</sup> No clear or significant relationship was found for the proportion of the workforce on temporary contracts or the OECD's employment protection legislation (EPL). The inability to find a relationship may reflect the nature of the EPL indicators (which normally take a value from 1 to 6).

<sup>106</sup> For a detailed discussion of NAIRU uncertainties, see Staiger et al. (1997) and McAdam and Mc Morrow (1999). See Guichard and Rusticelli (2011) for a reassessment of OECD estimates. For a discussion of the end-of-sample and turning-point problems surrounding potential output and output gap estimates, see ECB (2005, 2011).

range of implied unemployment gaps. A striking feature of this chart is that for much of the period 1992-2010, the range spans both positive and negative values.<sup>107</sup> Another feature of Chart 37 is that all unemployment gap estimates seem to move in the same direction, regardless of the database considered. This suggests that policy makers should perhaps focus more on changes in estimates of the unemployment gap than on specific levels. However, Chart 37 underestimates the uncertainty for several reasons. First, revisions to the most recent data have yet to be realised. Second, it hides the fact that some links with structural unemployment may not be stable, for instance developments in discouraged workers or part-time employment, which highlights the importance of closely monitoring all indicators instead of relying solely on a single indicator of labour market tightness.

In addition, as noted in Box 1.4, official measures of unemployment may misrepresent the real level of slack in the labour market. Given that structural unemployment estimates are generally generated using official data, developments in broader measures of unemployment may have implications for understanding the effective degree of slack in the labour market. Finally, it should be emphasised that both actual and structural unemployment are subject to non-negligible revisions across data vintages. These revisions are discussed individually in more detail in the technical appendix, as is the link between, on the one hand, structural unemployment and, on the other part-time and discouraged workers.<sup>108</sup>

All in all, notwithstanding caveats regarding estimation uncertainty, the increase in the dispersion of structural unemployment estimates since the beginning of the crisis is consistent with the view that the recent divergences across countries cannot be seen as a simple conjunctural outcome. This underscores the need for additional structural reforms to improve labour market performance. Whilst many labour markets exhibit signs of hysteresis, this hysteresis is not necessarily a given and

can be attenuated by appropriate labour market policies.

## 2.4 WAGE SETTING AND UNEMPLOYMENT ELASTICITIES<sup>109</sup>

*We test for changes in wage responsiveness to unemployment developments using panel estimates which pool the data across the euro area countries. The results suggest some tentative evidence of downward wage rigidities in the euro area (i.e. a lower responsiveness of wages with respect to unemployment during downturns), although this result applies to all downturns and not just to the recent crisis period.*

The objective of this section is to improve our understanding of the effect of rising unemployment on the evolution of wages in crisis periods. Short and long-term unemployment may have different impacts on wage adjustment, and this might be important during the crisis, since the proportion of those defined as long-term unemployed has increased markedly. A rise in structural unemployment, perhaps due to an increase in labour market mismatch, may also reduce the impact on wages of a given change in unemployment. Accordingly, this section investigates whether the sensitivity of wages to movements in unemployment has changed over the crisis period, and during downturns more generally. We define the following dynamic wage specification based on quarterly data:

$$\Delta RW_t = C_c + \sum_{j=1}^4 \alpha_j \Delta RW_{t-j} + \sum_{i=0}^4 \beta_{1,i} U_{t-i} + \sum_{i=0}^4 \beta_{2,i} \Delta Pr od_{t-i} + \left( \sum_{i=0}^4 \beta_{3,i} \Delta CPI_{t-i} \right) + \beta_4 D_t^* U_t + e_t \quad (1)$$

107 The average figure for the euro area across vintages and EC, IMF and OECD estimates was 1.13 pp over the period 1999-2007. This range was relatively large for Spain (4.06 pp), Portugal (3.81 pp), Ireland (2.25 pp) and Germany (2.24 pp).

108 A discussion of unemployment measurement issues and their implications for estimating structural unemployment can be found in Centeno et al. (2010, 2011). Estimating structural unemployment in small open economies may also be particularly challenging. See Meyler (1999) for a discussion of issues in the Irish context, with high trade openness and large migration flows.

109 Prepared by Robert Anderton and Boele Bonthuis

Where:

$\Delta RW_t$  = annual difference in log of real/nominal compensation per person-hour

$U_t$  = unemployment rate

$\Delta Prod_t$  = annual difference in log of real output per person-hour

$\Delta CPI_t$  = annual difference in log of consumer price index

$D_t$  = country-specific dummy for economic downturns

$C_c$  = fixed effect

Because of stationarity issues, all variables are in logarithms and differenced with respect to the corresponding quarter a year previously (except the unemployment rate).<sup>110</sup> The estimates are therefore based on year-on-year percentage changes using quarterly data. The equation is estimated in a panel setting with fixed effects, by pooling the data across 13 euro area countries, with the dependent variable defined as real compensation per person-hour (not available for Greece, Luxembourg and Malta).<sup>111</sup> In addition, we also estimate variants of these specifications by using nominal compensation as the dependent variable and then including the CPI as an explanatory variable. Hence, when real compensation is the dependent variable the CPI is not included in the regressions (we effectively restrict  $\beta_{3,i}$  to unity), while the nominal compensation specification allows  $\beta_{3,i}$  to be freely estimated.<sup>112</sup> The last term is an interaction term designed to capture the possible impact of economic downturns on wage determination, focussing on the possible change in the wage elasticity with respect to the unemployment rate. A country-specific dummy (D) takes the value of 1 if yearly GDP growth is negative: this dummy captures downturns and is interacted with the unemployment rate (D\*U) to see if the responsiveness of wages

to unemployment changes during periods of annual declines in GDP growth. In our sample the longest period of economic downturn is the current crisis.

We expect the sign on the unemployment rate to be negative as a rise in the unemployment rate should put downward pressure on wages. The sign on productivity should be positive, on the assumption that employees' wages incorporate some reward for rises in productivity. The sign on the CPI should also be positive as nominal compensation should rise in accordance with prices as wage setters will attempt to (at least partially) preserve wages in real terms. A coefficient of (close to) unity for the CPI term may reflect strong employee bargaining power or a high degree of wage indexation.<sup>113</sup> The sign for the interaction term (D\*U) will be positive if wages are less responsive to increases in unemployment during downturns.

One reason for the latter phenomenon could be that during downturns a rising share of long-term unemployment puts less downward pressure on wages, because of the relatively lower probability of re-employment of the long-term unemployed, as they become less able to effectively compete for jobs (due to a loss of human capital). It could also be the result of a generally observed downward wage rigidity for many euro area countries due to labour market institutions. Another reason could be a rising mismatch between vacancies and the unemployed, possibly due to the reasons mentioned earlier in the report. Or it could be because the public employment services of countries with rapidly rising unemployment are overloaded with job seekers, decreasing their

<sup>110</sup> We do not difference the unemployment rate as it is frequently found to be stationary in levels. However, we experimented with a specification with the unemployment rate in differences and obtained largely similar results.

<sup>111</sup> Belgium is dropped from the compensation per hour specification too because of lack of data for productivity per hour.

<sup>112</sup> Hence the CPI term in equation (1) is put in parentheses, indicating that its inclusion is a variation of the baseline equation.

<sup>113</sup> In some countries wage indexation is automatic or widespread (i.e. BE, CY, ES, MT and SI).

ability to effectively place people into work. By contrast, non-significant parameters for the interaction term, in combination with significant and correctly signed other coefficients, could simply mean that the effect of unemployment on wages is the same for upturns and downturns. We estimate equation (1) both for the pre-crisis period and the total sample period. The results are reported as long-run parameters, which are calculated as follows:<sup>114</sup>

$$\bar{\beta}_x = \frac{\sum_{i=0}^4 \beta_{x,i}}{1 - \sum_{j=1}^4 \alpha_j} \quad (2)$$

However, given the relatively short sample period (1995Q1-2011Q4), the long-run parameters are not necessarily capturing full equilibrium wage relationships.

Turning to the results (Table 11), they generally confirm previous priors. For all panel estimates the unemployment rate is found to have the expected negative sign, suggesting downward pressure from the unemployed on wages. The downturn interaction term is positive and significant for all equations, indicating a lower

downward responsiveness of wages to higher unemployment during downturns. As mentioned above, this could be capturing the impacts of higher long-term and/or structural unemployment on wage pressures, or it could indicate general downward wage rigidity, possibly because of the difficulty of renegotiating wages downward.

The long-run parameter on productivity ranges from 0.55 to 0.84, indicating that only part of the productivity gains are incorporated into wages. This seems to be consistent with the well-documented decline in the labour share in the euro area.<sup>115</sup> However, we double-checked the robustness of our results by imposing a unity parameter for the productivity term and found that the key equation results, most notably the sign and significance of the downturn interaction term, remain essentially the same (see table A12 in Appendix). Turning back to the main results in Table 11 above, the sign of the parameter on CPI is positive as expected, but again not all of

<sup>114</sup> The significance of the long-run parameter is tested with a non-linear joint F-test. In the Appendix the results of estimating equation 1 are repeated, but this time the sum of the coefficients of the lagged dependent variable is shown, giving an insight into the wage transition speed.

<sup>115</sup> See, for example, Anderton and Hiebert (2011), pp. 48-50.

**Table 11 Wage Equation Panel Estimates**

	Pre-crisis		Whole sample	
	Real	Nominal	Real	Nominal
<b>U</b>	-0.0028 [0.001]	-0.0030 [0.000]	-0.0039 [0.000]	-0.0044 [0.000]
<b>Δ prod. (hour)</b>	0.5517 [0.000]	0.5923 [0.000]	0.6051 [0.000]	0.8424 [0.000]
<b>Δ CPI</b>		0.6205 [0.000]		0.7660 [0.000]
<b>D*U</b>	0.0026 [0.000]	0.0030 [0.000]	0.0015 [0.000]	0.0014 [0.005]
<b>Constant</b>	0.0259 [0.000]	0.0385 [0.000]	0.0331 [0.000]	0.0394 [0.000]
Observations	468	468	667	667
R-squared	0.634	0.681	0.677	0.769
Number of euro area countries	13	13	13	13
SER	0.013	0.012	0.015	0.013
Adj-R-sq	0.61	0.66	0.66	0.76

Notes: P-values in brackets. Maximum data range: 1995Q1-2007Q4 (pre-crisis period); 1995Q1-2011Q4 (whole sample period). Unbalanced panel.

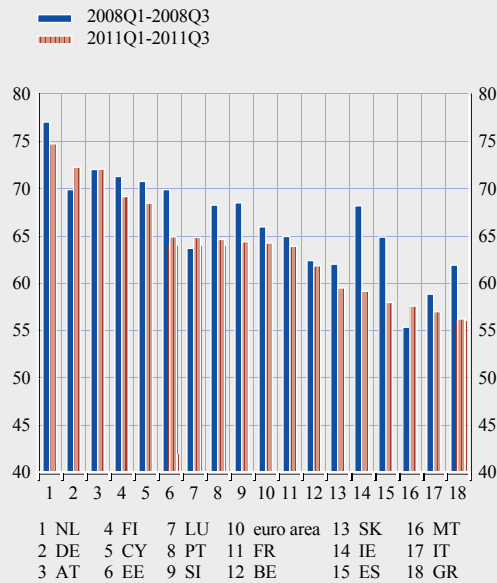
the change in prices is transmitted to wages (only 62% to 77% of the change in prices is passed through to wages).

In summary, panel estimates across the euro area countries suggest a lower responsiveness of wages to rising unemployment during economic downturns, although this result applies equally to all downturns and not just to the crisis period. This may indicate that rising long-term unemployment and/or increasing labour market mismatch reduce the elasticity of wages with respect to unemployment during downturns, or that the euro area is generally characterised by downward wage rigidities due to institutional features.

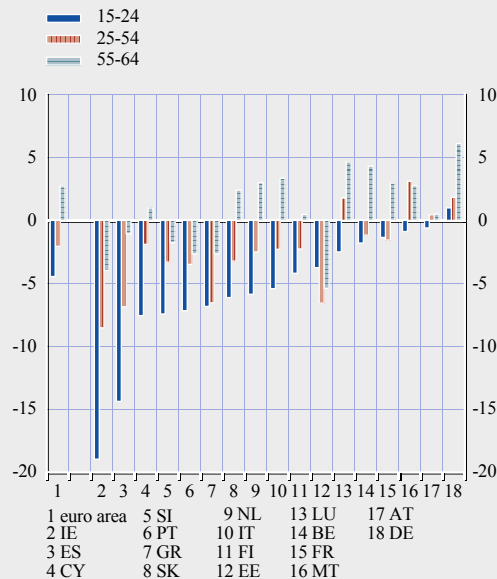
## APPENDIX

### Chart A1

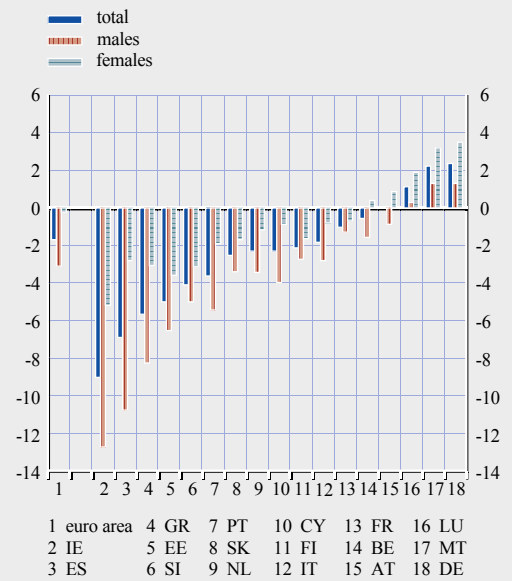
#### Employment rates in euro area countries (as a percentage of working age population)



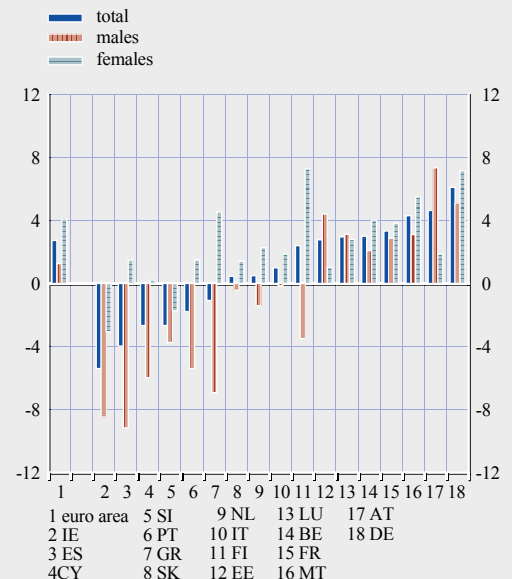
#### Employment rate by age group (percentage change between the first three quarters of 2008-2011)



#### Employment rate by sex (percentage change between the first three quarters of 2008-2011)



#### Employment rates of older workers by sex (percentage change between the first three quarters of 2008-2011)

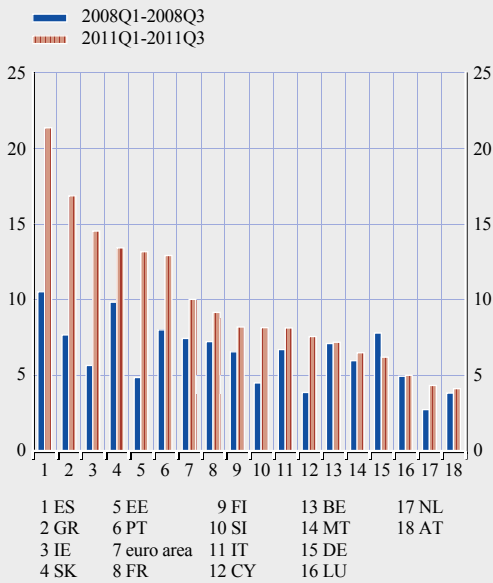


Source: EC (LFS).

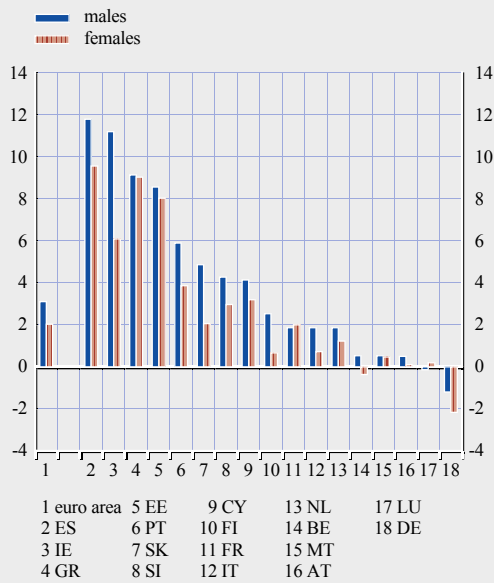


Chart A2

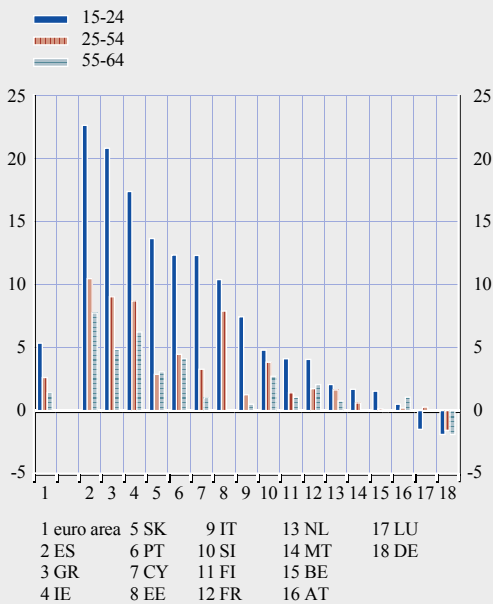
**Unemployment rates in euro area countries**  
(as a percentage of the labour force)



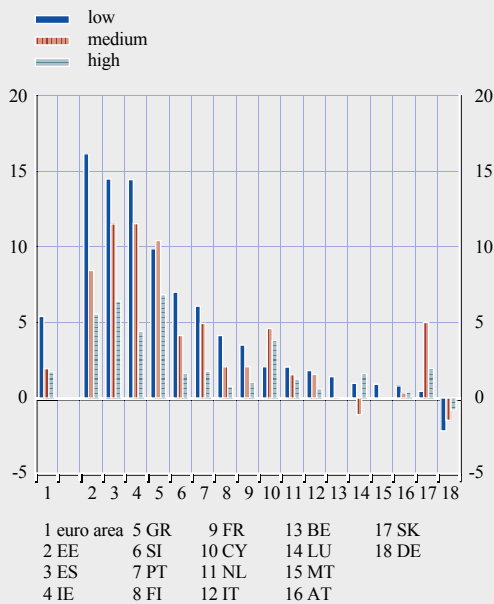
**Unemployment rate by sex**  
(percentage change between the first three quarters of 2008-2011)



**Unemployment rate by age group**  
(percentage change between the first three quarters of 2008-2011)



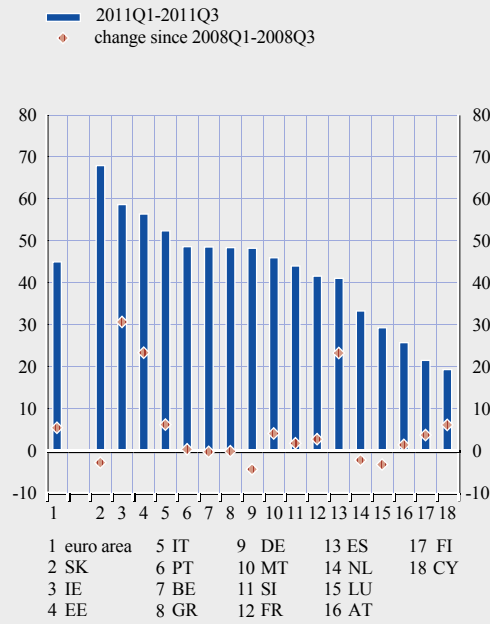
**Unemployment rate by educational attainment**  
(percentage change between the first three quarters of 2008-2011)



Source: EC (LFS).

**Chart A3 Long-term unemployment**

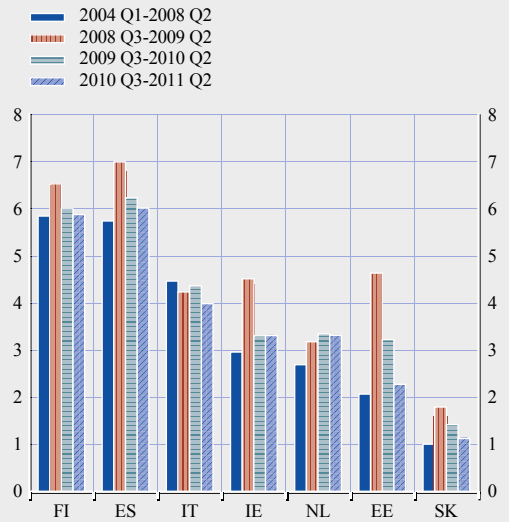
(as a percentage of unemployment)



Source: EC (LFS).  
 Note: Long-term unemployment is defined as unemployment spells of longer than 12 months.

**Chart A4 Exits from unemployment by sub-periods**

(as a percentage of the labour force)

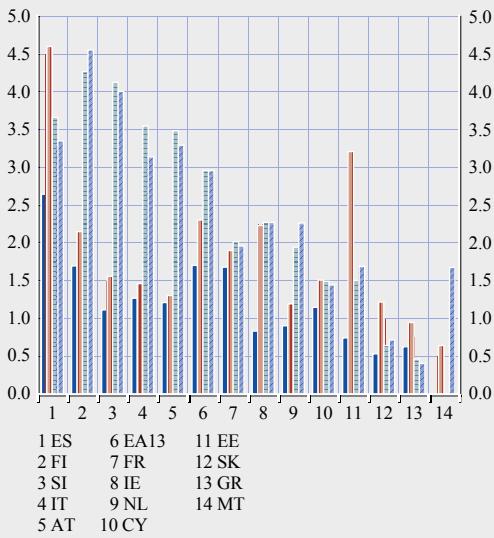


Source: LFS microdata.

**Chart A5 Employment outflows**

(as a percentage of employment)

- E to U: pre-crisis period
- E to U: crisis period
- E to I: pre-crisis period
- E to I: crisis period

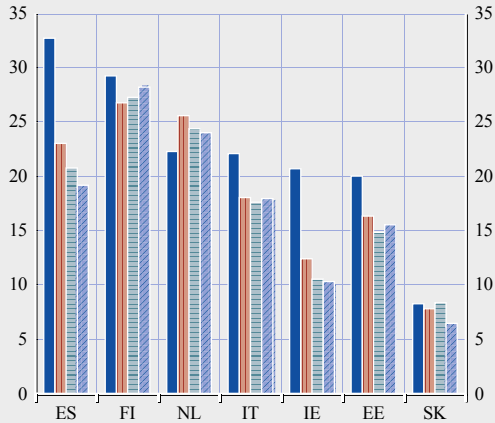


Source: LFS microdata.  
Note: "E" denotes employment, "U" unemployment and "I" inactivity.

**Chart A6 Exit rate from unemployment to employment by sub-periods**

(as a percentage of unemployment)

- 2004 Q1-2008 Q2
- 2008 Q3-2009 Q2
- 2009 Q3-2010 Q2
- 2010 Q3-2011 Q2

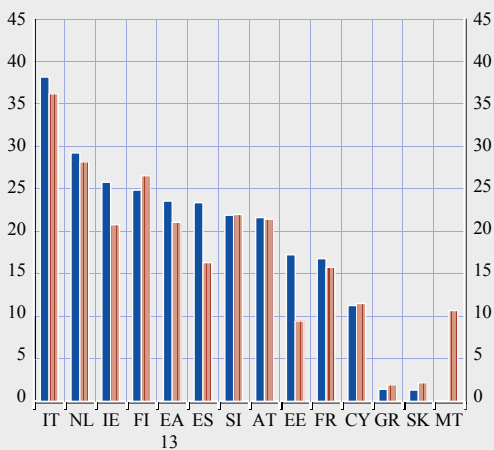


Source: EC (LFS).

**Chart A7 Exit rate from unemployment to inactivity**

(as a percentage of unemployment)

- 2004 Q1-2008 Q2
- 2008 Q3-2010 Q1

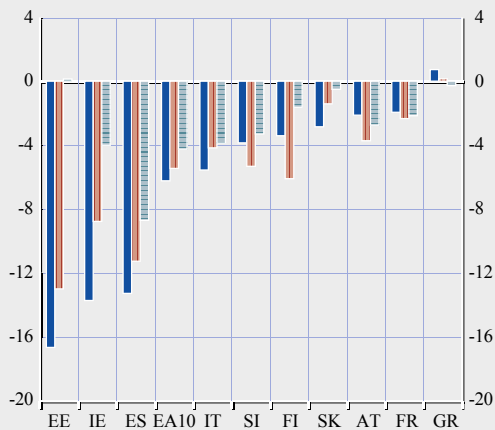


Source: LFS microdata.

**Chart A8 Change in unemployment exit rates by unemployment duration**

(percentage points)

- 0-6m
- 6-12m
- >12m



Source: LFS microdata and own calculations

**Table A1 Cyclical pattern of worker flows in euro area countries (2000-10) correlation with GDP growth**

	ES	EE	IE	SI	NL	FI	SK	CY	GR	AT	IT	FR
Exits from employment	-0.5	-0.8	-0.5	0.1	-0.2	0.0	-0.3	-0.1	-0.2	0.0	0.3	0.0
Exits to unemployment	-0.9	-0.8	-0.6	-0.5	-0.5	-0.4	-0.4	-0.4	-0.3	-0.2	-0.1	0.0
Exits to inactivity	0.1	-0.3	-0.2	0.3	0.0	0.1	0.1	0.2	0.0	0.1	0.4	0.1
	FR	AT	FI	ES	IT	IE	NL	EE	SK	SI	CY	GR
Entries into employment	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.1	0.0	-0.1	-0.2

Source: LFS microdata.

**Table A2 Probit analysis: flows from employment to unemployment**

(main determinants of the individual probability of exiting from employment to unemployment)

Variables	Estonia	Ireland	Greece	Spain	France	Italy	Cyprus	Austria	Slovenia	Finland
Female	0.001	0.003	0.001	0.003	0.001	0.001	0.001	0.001	0.002	-0.002
30-44 years	-0.003	-0.010	0.000	-0.005	-0.003	-0.006	0.033	-0.003	-0.004	-0.001
45-64 years	-0.004	-0.016	-0.001	-0.010	-0.006	-0.010	0.031	-0.006	-0.007	0.000
Medium skilled	-0.004	-0.003	-0.001	-0.004	-0.003	-0.004	-0.002	-0.002	-0.002	0.000
High skilled	-0.006	-0.006	-0.002	-0.010	-0.004	-0.005	-0.004	-0.005	-0.005	-0.007
Manufacturing	0.000	0.017	0.001	-0.009	-0.001	-0.002	0.001	0.004	0.004	-0.001
Construction	0.005	0.059	0.002	-0.003	0.000	0.005	0.005	0.008	0.009	0.004
Market services	-0.001	0.010	0.003	-0.009	0.004	-0.001	0.004	0.005	0.005	-0.001
Non-market services	-0.008	0.001	0.000	-0.014	-0.006	-0.001	-0.006	0.001	0.002	-0.003
Fixed term contracts	0.044	0.000	0.036	0.065	0.080	0.036	0.020	0.016	0.036	0.067
Self employed	-0.003	0.000	-0.004	-0.002	0.006	0.000	-0.007	-0.005	0.016	-0.005
GDP	-0.001	0.000	0.000	-0.008	-0.001	0.000	-0.002	0.000	0.000	-0.001

Notes: Probit regressions also include seasonal dummies (not reported). Reference category is male, 16-29, low education, agriculture, open-ended contract. Bold coefficients denote significance at 5% level.

**Table A3 Probit analysis: flows from unemployment to employment**

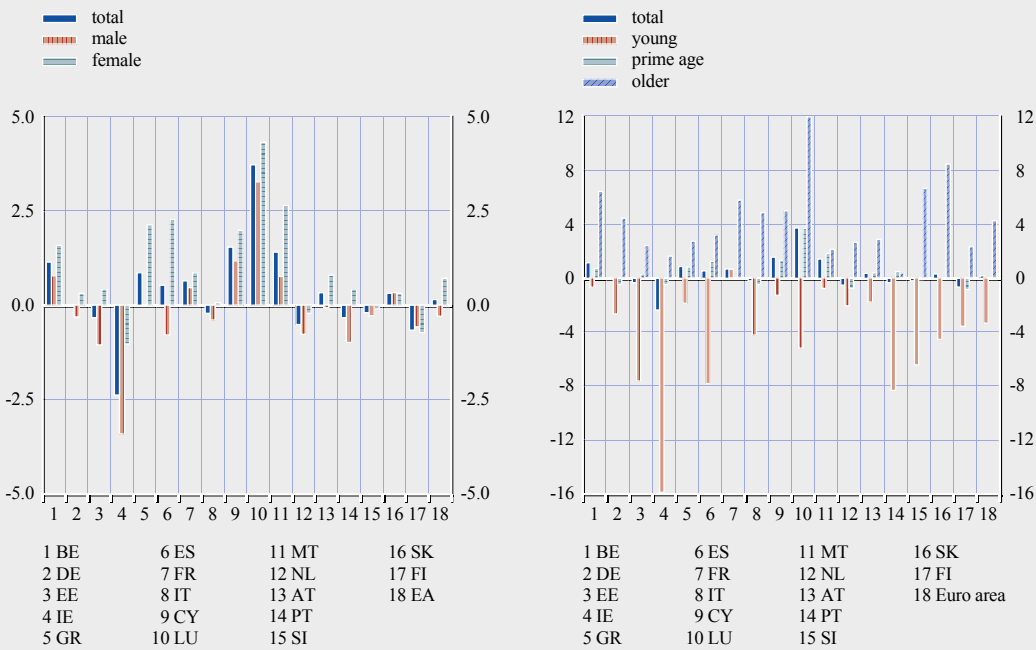
(main determinants of the individual probability of exiting from unemployment to employment)

Variables	Estonia	Ireland	Greece	Spain	France	Italy	Cyprus	Austria	Slovenia	Finland
Female	-0.015	0.008	-0.041	-0.026	-0.009	-0.058	-0.035	-0.024	-0.024	0.037
30-44 years	0.007	0.001	0.020	0.000	-0.014	0.016	-0.013	-0.048	-0.043	-0.545
45-64 years	-0.032	-0.015	0.008	-0.046	-0.084	-0.008	-0.050	-0.118	-0.120	-0.134
Medium skilled	0.021	0.045	-0.017	0.028	0.057	0.021	-0.026	0.074	0.037	-
High skilled	0.030	0.127	0.006	0.077	0.062	0.055	0.004	0.100	0.149	0.006
Duration 7-12m	-0.028	-0.040	-0.053	-0.072	-0.063	-0.072	-0.107	-0.084	-0.047	-0.112
Duration 12-24m	-0.065	-0.067	-0.077	-0.119	-0.125	-0.124	-0.201	-0.161	-0.082	-0.157
Duration >24m	-0.134	-0.094	-0.110	-0.148	-0.168	-0.175	-0.211	-0.224	-0.127	-0.206
GDP	0.008	-0.005	0.005	0.050	0.012	0.011	0.016	0.009	0.004	0.006

Notes: Probit regressions also include seasonal dummies (not reported). Reference category is male, 16-29, low education, less than 6 months in unemployment. Bold coefficients denote significance at 5% level.

Chart A9 Average growth of labour force in 2009 and 2010

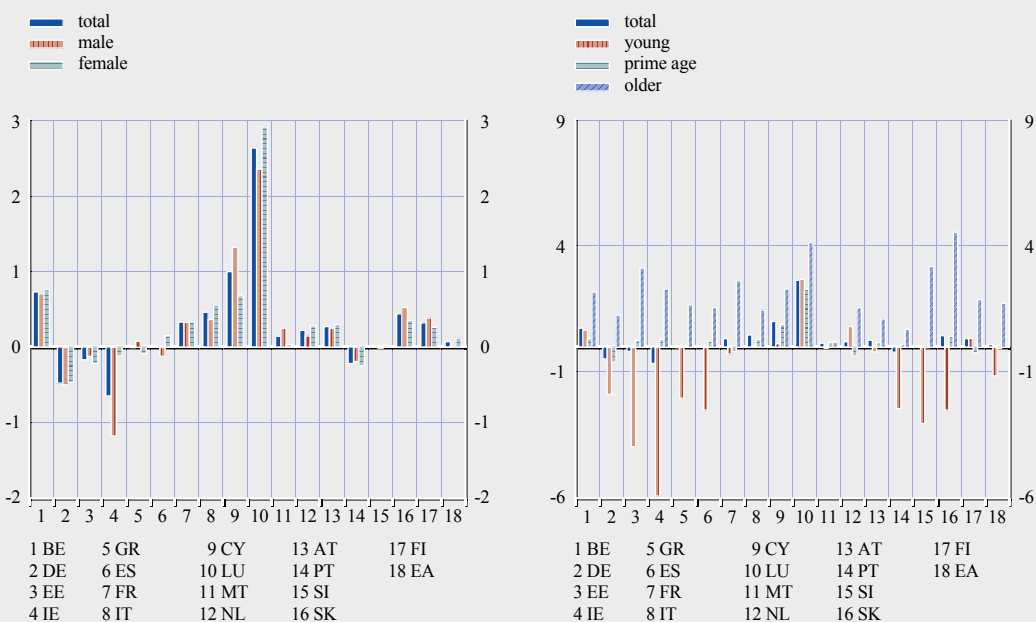
(percentage changes)



Sources: Eurostat (LFS database) and own calculations.

Chart A10 Average growth of working-age population in 2009 and 2010

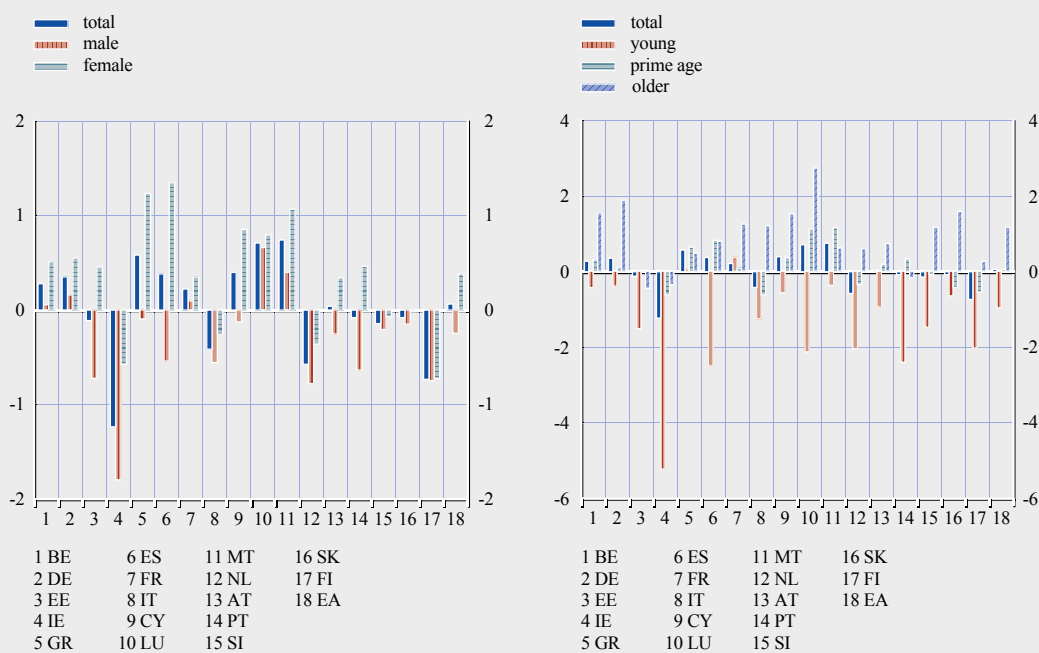
(percentage points)



Sources: Eurostat (LFS database) and own calculations.

Chart A11 Average growth of participation rates in 2009 and 2010

(percentage points)



Sources: Eurostat (LFS database). Own calculations.

Table A4 Alternative indicators of labour underutilisation estimated by the BLS

Indicator	Definition
U-1	Persons unemployed 15 weeks or longer, as a percent of the civilian labour force
U-2	Job losers and persons who completed temporary jobs, as a percent of the civilian labour force
U-3	Total unemployed, as a percent of the civilian labour force (official unemployment rate)
U-4	Total unemployed plus discouraged workers, as a percent of the civilian labour force plus discouraged workers
U-5	Total unemployed, plus discouraged workers, plus all other persons marginally attached to the labour force, as a percent of the civilian labour force plus all persons marginally attached to the labour force
U-6	Total unemployed, plus all persons marginally attached to the labour force, plus total employed part time for economic reasons, as a percent of the civilian labour force plus all persons marginally attached to the labour force



Table A5 Alternative estimates of labour utilisation in the euro area countries

Indicator	Country	2004	2005	2006	2007	2008	2009	2010
Unemployment rate (ILO definition)	euro area	9.07	8.88	8.31	7.42	7.42	9.35	10.00
	BE	7.36	8.44	8.25	7.46	6.98	7.91	8.29
	DE	10.61	10.97	9.84	8.61	7.44	7.72	7.10
	EE	10.01	7.91	5.90	4.66	5.52	13.76	16.88
	IE	4.49	4.24	4.79	4.56	5.25	11.74	13.50
	GR	10.21	9.85	8.89	8.28	7.65	9.46	12.53
	ES	11.08	9.16	8.51	8.26	11.34	18.01	20.06
	FR	9.18	8.85	9.45	8.11	7.67	9.49	9.31
	IT	7.89	7.72	6.79	6.09	6.74	7.79	8.42
	CY	4.33	5.30	4.54	3.92	3.65	5.30	6.18
	LU	5.11	4.49	4.75	4.07	5.06	5.19	4.42
	NL	4.65	4.72	4.50	3.59	3.04	3.83	4.45
	AT	5.27	5.15	4.74	4.40	3.82	4.77	4.39
	PT	6.35	7.62	7.66	7.98	7.59	9.47	10.80
	SI	6.01	6.51	5.95	4.82	4.37	5.86	7.24
SK	18.60	16.26	13.37	11.14	9.51	12.03	14.38	
FI	10.36	9.60	8.94	6.85	6.37	8.25	8.39	
Unemployment rate – including discouraged workers	euro area	9.68	9.66	9.06	8.22	8.25	10.28	11.08
	BE	7.82	8.71	8.48	7.70	7.17	8.09	8.46
	DE	10.74	11.16	9.98	8.75	7.61	7.98	7.30
	EE	12.31	9.92	6.88	5.66	6.26	14.83	17.93
	IE	4.49	4.24	4.79	4.56	5.27	12.31	14.10
	GR	10.39	10.01	9.01	8.43	7.85	9.66	12.74
	ES	11.56	10.28	9.54	8.99	12.23	19.22	21.53
	FR	9.27	8.95	9.59	8.22	7.79	9.64	9.40
	IT	10.42	10.72	9.63	9.65	10.31	11.45	12.53
	CY	4.39	5.45	4.82	4.21	3.85	5.55	6.75
	LU	5.12	4.49	4.76	4.07	5.19	5.47	4.61
	NL	5.32	5.48	5.42	4.33	3.69	4.44	5.13
	AT	5.40	5.29	4.88	4.51	3.92	4.85	4.47
	PT	6.35	7.82	8.00	8.29	7.88	9.74	11.09
	SI	6.01	6.98	6.48	5.25	4.72	6.60	7.93
SK	18.74	16.49	13.77	11.60	9.91	12.40	14.70	
FI	11.42	10.76	9.86	7.55	6.97	9.17	9.44	
Unemployment rate – including discouraged workers and slack work due to technical or economic reasons	euro area	9.85	9.84	9.21	8.37	8.43	10.84	11.45
	BE	8.03	8.96	8.66	7.84	7.36	8.64	8.77
	DE	10.82	11.22	10.01	8.79	7.69	8.69	7.53
	EE	12.43	10.06	6.97	5.71	6.38	15.43	18.38
	IE	4.63	4.32	4.88	4.69	5.44	12.69	14.51
	GR	10.43	10.06	9.06	8.47	7.90	9.77	12.89
	ES	11.61	10.33	9.58	9.05	12.32	19.39	21.65
	FR	9.41	9.09	9.72	8.37	7.90	9.94	9.64
	IT	10.84	11.17	10.05	10.06	10.77	12.65	13.54
	CY	4.46	5.55	4.99	4.32	3.97	5.83	6.95
	LU	-	-	4.82	4.11	-	5.67	4.67
	NL	5.78	5.94	5.89	4.71	4.10	5.01	5.79
	AT	5.46	5.37	4.98	4.60	4.01	5.04	4.56
	PT	6.55	8.04	8.13	8.42	8.07	10.05	11.33
	SI	6.07	7.06	6.64	5.33	4.85	7.09	8.34
SK	18.78	16.56	13.84	11.65	9.98	12.90	14.77	
FI	11.61	11.00	10.13	7.74	7.44	10.12	9.96	

Source: Own calculations based on Eurostat EU-LFS data.

**Table A6 Probability of being discouraged. Probit regression results**

		Probability of being discouraged versus being other inactive			
		EE	ES	FI	IT
	Female	-0.0124*** [0.00159]	0.00362*** [0.000458]	-0.00463*** [0.00110]	-0.00359*** [0.000223]
	age	0.00466*** [0.000317]	0.00340*** [9.11e-05]	0.00249*** [0.000201]	0.00583*** [6.03e-05]
	age <sup>2</sup>	-5.59e-05*** [3.53e-06]	-3.83e-05*** [9.61e-07]	-2.97e-05*** [2.18e-06]	-7.49e-05*** [7.17e-07]
<b>Marital status</b>	Married	-0.00185 [0.00128]	-0.00210*** [0.000680]	-0.00496*** [0.00160]	-0.00769*** [0.000331]
	widowed, divorced or legally separated	-0.00175 [0.00151]	-0.00237*** [0.000768]	0.00307 [0.00211]	0.00057 [0.000455]
<b>Household's characteristics</b>	number of members employed <sup>1)</sup>	-0.00760*** [0.00254]	0.00480*** [0.00104]	0.00904** [0.00382]	-0.00885*** [0.000507]
	size	-0.000123* [6.76e-05]	-0.000460*** [0.000176]	-0.00220*** [0.000622]	0.000231*** [8.76e-05]
<b>Nationality</b>	native	-0.000694 [0.00165]	-0.00357** [0.00147]	-0.0230*** [0.00634]	-0.00471*** [0.000597]
<b>Time since last work experience</b>	1-5 months	0.00832* [0.00466]	0.0302*** [0.00215]	0.0178*** [0.00323]	0.00663*** [0.000565]
	6-11 months	0.00672 [0.00469]	0.0203*** [0.00229]	0.00937*** [0.00280]	0.00840*** [0.000752]
	1-4 years	0.00703** [0.00345]	0.0131*** [0.00127]	0.0138*** [0.00247]	0.0112*** [0.000514]
	4 years and above	0.00929*** [0.00262]	0.00542*** [0.000604]	6.72E-05 [0.00153]	0.00746*** [0.000273]
<b>Level of education</b>	upper secondary	-0.00294*** [0.00114]	-0.00331*** [0.000518]	-0.00567*** [0.00115]	-0.00534*** [0.000180]
	tertiary	-0.00566*** [0.00121]	-0.00581*** [0.000460]	-0.00403*** [0.00144]	-0.0101*** [0.000189]
	Observations	39,688	408,582	59,721	1,546,336

Source: own calculations based on Eurostat EU LFS data.

Notes: Marginal effects. Robust standard errors in brackets. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Region and time dummies are not reported for the sake of brevity.

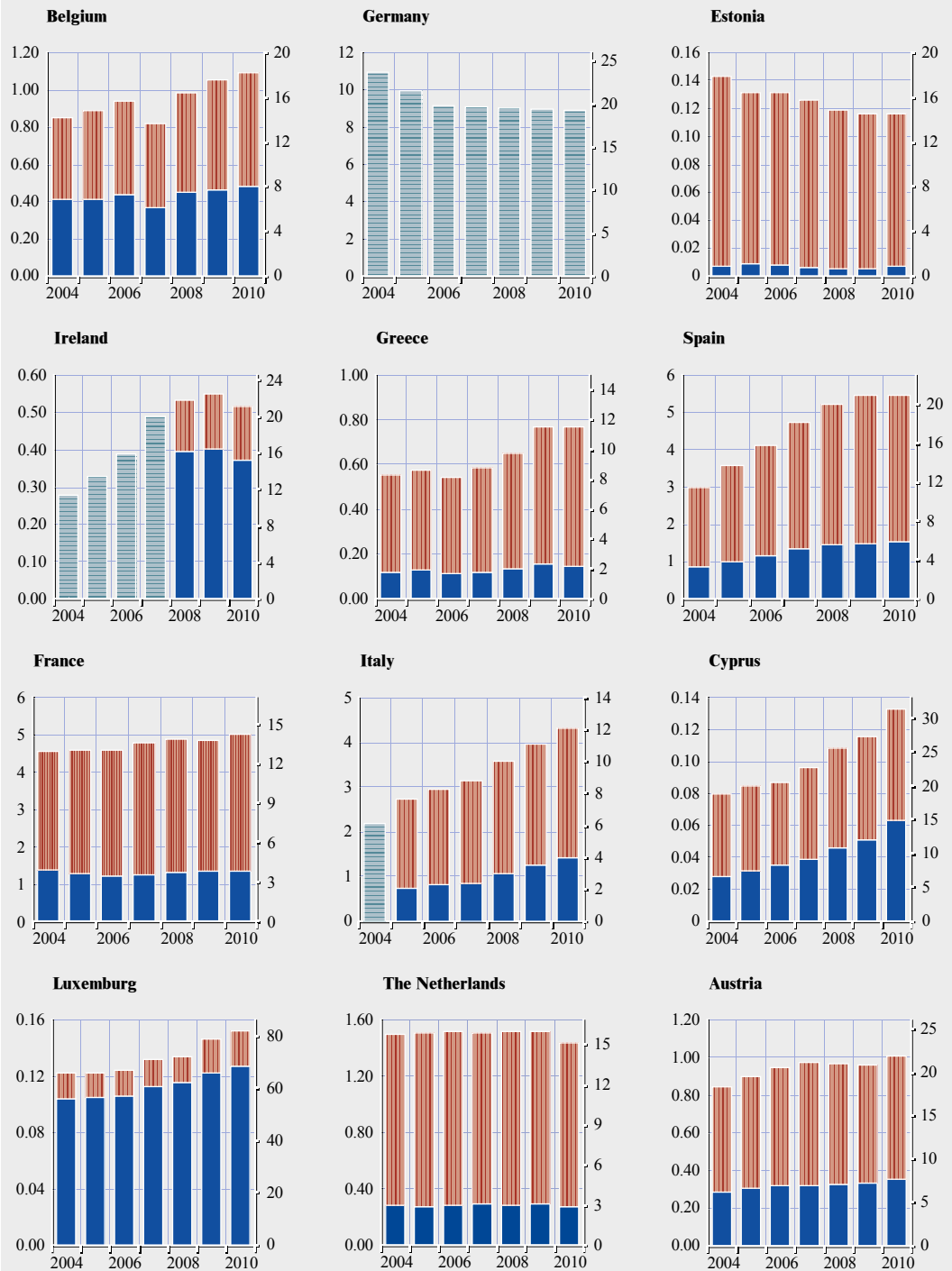
1) As a share of household size.

Probability of being discouraged versus being (ILO) unemployed			
EE	ES	FI	IT
-0.00964	0.0391***	-0.0015	0.136***
[0.00964]	[0.00235]	[0.00524]	[0.00316]
0.00684**	-0.00197***	-0.0178***	0.00198**
[0.00278]	[0.000641]	[0.00130]	[0.000900]
-2.69E-05	6.54e-05***	0.000271***	9.19e-05***
[3.25e-05]	[7.43e-06]	[1.59e-05]	[1.12e-05]
-0.00799	0.00764**	-0.00443	0.0289***
[0.0132]	[0.00363]	[0.00834]	[0.00439]
-0.0443***	-0.0178***	0.005	-0.0515***
[0.0114]	[0.00394]	[0.0105]	[0.00660]
-0.0549**	0.0287***	-0.00882	-0.00311
[0.0226]	[0.00554]	[0.0169]	[0.00824]
-0.000956**	-0.00177*	-0.00148	0.0008
[0.000483]	[0.000938]	[0.00273]	[0.00133]
0.0669***	0.00836*	-0.0236	0.0424***
[0.00952]	[0.00443]	[0.0169]	[0.00660]
-0.119***	-0.0563***	-0.0569***	-0.236***
[0.00947]	[0.00320]	[0.00778]	[0.00337]
-0.0946***	-0.0481***	-0.0635***	-0.211***
[0.00885]	[0.00246]	[0.00622]	[0.00384]
-0.0757***	-0.0409***	-0.0435***	-0.162***
[0.0143]	[0.00270]	[0.00763]	[0.00370]
0.025	0.00399	0.0291**	-0.0437***
[0.0253]	[0.00429]	[0.0133]	[0.00431]
-0.0542***	-0.0166***	-0.0270***	-0.112***
[0.0114]	[0.00265]	[0.00608]	[0.00320]
-0.0629***	-0.0329***	-0.0273***	-0.231***
[0.0102]	[0.00244]	[0.00681]	[0.00371]
6,866	72,210	11,031	185,432

**Chart A12 Immigration from EU27 (EU15 and NMS12) and from non-EU countries in euro area member states**

(percentages)

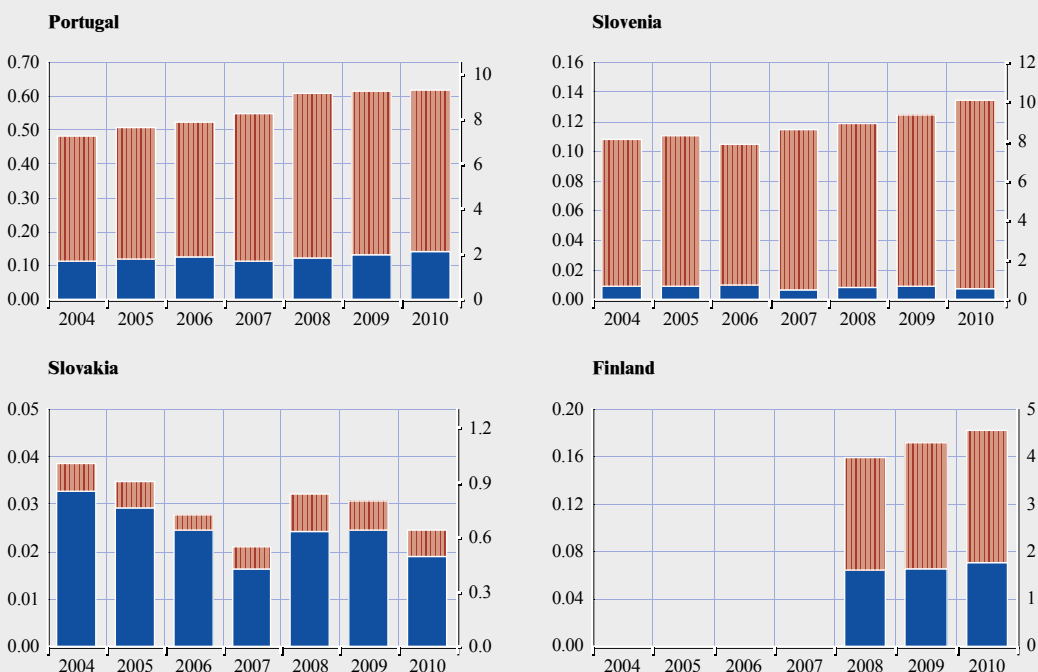
■ EU27 ■ non-EU27 ■ all



**Chart A12 Immigration from EU27 (EU15 and NMS12) and from non-EU countries in euro area member states (cont'd)**

(percentages)

■ EU27 ■ non-EU27 ■ all



Source: EU LFS.  
 Notes: Left-hand scale is in millions of persons. Right-hand scale shows the ratio of immigrants to the native population (persons of working age born in the country of their current residence) expressed as a percentage. Data for Malta are not available. Data for Estonia and Slovenia should be treated with caution due to the limited size of the sample of immigrants.

**Table A7 Evolution of the unemployment rate over the period 2008-2009**

(as a percentage)

	Belgium			Germany		
	2008 Q1	2009 Q4	Change	2007	2009	Change
Entire Population	7.1	8.1	1.0	8.7	8.1	-0.6
Male	6.7	8.2	1.5	8.3	8.2	-0.1
Female	7.6	8.0	0.4	9.0	7.9	-1.1
Male<25	16.5	23.0	6.5	11.5	9.0	-2.5
Female<25	16.2	23.1	6.9	8.1	6.0	-2.1
Male immigrants	na	na	na	15.6	18.1	2.5
Female immigrants	na	na	na	13.8	14.7	0.9

Source: National LFS, except for Germany (GSOEP).

**Table A8 Changes in real wages and composition effects during the crisis**

(in log points; male workers)

Period	Belgium 2007-2009			Germany 2007-2009		
	Observed	Price effect	Composition effect	Observed	Price effect	Composition effect
10%	-7.53	-11.4	3.90	4.91	1.39	3.52
25%	-0.89	-3.03	2.14	1.43	-0.15	1.58
Median	1.13	-1.48	2.61	1.60	-1.22	2.82
75%	3.94	-1.13	5.07	1.49	-1.15	2.64
90%	4.19	-0.47	4.66	3.50	0.33	3.17
Mean	0.87	-2.92	3.79	0.43	-1.48	1.91

Source: National LFS, except for Germany (GSOEP).

Notes: The number of observations is: France, 19,903 in 2007 and 23,325 in 2009; Germany, 3,129 in 2007 and 3,001 in 2009; Italy, 24,225 in 2008 and 22,660 in 2010; Belgium, 67,838 in 2007 and 54,294 in 2009; Portugal, close to 1,400,000 in both years.

**Table A9 Changes in real wages and composition effects during the crisis**

(in log points; female workers)

Period	Belgium 2007-2009			Germany 2007-2009		
	Observed	Price effect	Composition effect	Observed	Price effect	Composition effect
10%	11.1	4.48	6.63	1.80	-3.08	4.88
25%	5.95	1.21	4.74	3.85	-3.35	7.20
Median	4.52	0.07	4.46	1.27	0.82	0.44
75%	5.45	-0.69	6.14	1.87	1.87	0
90%	3.88	-2.03	5.92	-0.30	-0.30	0
Mean	6.81	1.23	5.58	1.58	-3.99	5.57

Source: National LFS, except for Germany (GSOEP).

Notes: The number of observations is: France, 13,977 in 2007 and 16,969 in 2009; Germany, 1,327 in 2007 and 1,342 in 2009; Italy, 14,480 in 2008 and 13,567 in 2010; Belgium, 33,586 in 2007 and 27,093 in 2009; Portugal, close to 1,100,000 in both years.

France			Italy			Portugal		
2007 Q4	2009 Q4	Change	2007 Q4	2009 Q4	Change	2007 Q4	2009 Q4	Change
7.4	9.8	2.4	6.7	8.6	1.9	7.6	10.1	2.5
7.1	9.7	2.6	5.3	7.5	2.2	6.4	9.5	3.1
7.8	9.9	2.1	8.7	10.2	1.5	8.9	10.7	1.8
17.1	24.0	6.9	20.6	26.2	5.6	13.1	20.9	7.8
17.6	21.7	4.1	26.7	30.6	3.8	20.5	23.7	3.2
13.6	17.4	3.7	6.2	10.8	4.6	8.6	16.8	8.2
14.3	16.9	2.6	14.2	15.0	0.8	17.0	14.4	-2.7

France 2008-2009			Italy 2008-2010			Portugal 2007-2009		
Observed	Price effect	Composition effect	Observed	Price effect	Composition effect	Observed	Price effect	Composition effect
1.23	-1.77	3.00	-2.71	-3.72	1.12	6.15	5.14	1.01
2.10	0.49	1.62	-0.77	-1.68	0.91	4.95	3.23	1.71
2.45	0.97	1.47	1.32	-0.23	1.55	4.40	1.52	2.88
1.23	-1.81	3.04	3.85	0.67	3.17	3.76	-1.10	4.85
2.75	-1.49	4.24	-2.61	-2.61	0	5.66	-0.26	5.93
1.65	-1.03	2.68	-0.62	-2.34	1.72	5.23	2.05	3.18

France 2008-2009			Italy 2008-2010			Portugal 2007-2009		
Observed	Price effect	Composition effect	Observed	Price effect	Composition effect	Observed	Price effect	Composition effect
0.81	0.03	0.77	-2.61	-9.06	6.45	7.30	6.19	1.11
-1.63	-2.46	0.83	-0.59	-0.59	0	7.13	5.61	1.52
-0.37	-0.37	0	1.65	0.81	0.84	6.24	3.18	3.05
1.55	-1.03	2.58	3.80	0.29	3.51	6.73	0.66	6.07
0.10	-1.88	1.98	1.60	1.60	0	5.85	-0.95	6.80
1.22	-0.44	1.66	0.95	-1.88	2.83	6.85	3.29	3.55



### The construction of the counterfactual distribution

The counterfactual *wage* distribution is constructed using the method of DiNardo et al. (1996) and Chiquiar and Hanson (2005). We create a counterfactual distribution of wages by reweighting the observed distribution of workers in the initial period (2008 for France and Italy; 2007 for Germany, Belgium and Portugal) to match the distribution of workers across 54 cells (45 for Italy) of education and experience in the targeted period (2010 for Italy; 2009 for France, Germany, Belgium and Portugal). Weights are computed with a simple probit model.

Let  $h(x | t_{x= T}, D_i = 1)$  be the density of observable characteristics  $x$  in year  $T$ , and  $D_i$  a dummy variable equal to one if individual  $i$  is employed and zero otherwise. We define by  $f(w | x, t_w = T)$  the wage density  $w$  in year  $T$  conditional on  $x$ . By definition, the observed unconditional wage density in year  $T$  is:

$$g(w, t_{w,x} = T, D_i = 1) = \int f(w | x, t_w = T) h(x | t_x = T, D_i = 1) dx,$$

where  $t_{w,x} = T$  indicates that the price function and the distribution of characteristics are those of year  $T$ . Consider two years denoted  $T$  and  $T^r$ . The counterfactual wage density using prices of period  $T$  with the distribution of characteristics of period  $T^r$ , denoted  $g(w, t_x = T^r, t_w = T)$ , is unobserved but can be rewritten as a function of the observed density:

$$g(w, t_x = T^r, t_w = T) = \int \theta f(w | x, t_w = T) h(x | t_x = T, D_i = 1) dx,$$

where  $\theta = \frac{h(x | t_x = T^r, D_i = 1)}{h(x | t_x = T, D_i = 1)}$ . Under some assumptions, DiNardo et al. (1996) show that this counterfactual density can be estimated by simply reweighting the observed density, such that

the characteristics are identical to the characteristics of workers in  $T^r$ . By using Bayes Law, the

vector of weights  $\theta$  can be rewritten as  $\theta = \frac{Pr(t_x = T^r, D_i = 1 | x) Pr(t_x = T, D_i = 1)}{Pr(t_x = T, D_i = 1 | x) Pr(t_x = T^r, D_i = 1)}$ . Using Bayes

Law,  $\theta$  can also be decomposed as  $\theta = k \theta^p \theta^q$ , where  $k = \frac{Pr(t_x = T, D_i = 1)}{Pr(t_x = T^r, D_i = 1)}$  is a constant ratio

between the number of individuals in samples  $T$  and  $T^r$ ,  $\theta^p = \frac{Pr(D_i = 1 | t_x = T^r = 1)}{Pr(\sum D_i = 1 | t_x = T, x)}$  reflects

the difference in the employment rate between  $T$  and  $T^r$ , and  $\theta^q = \frac{Pr(t_x = T^r | x)}{Pr(t_x = T, | x)}$  reflects the

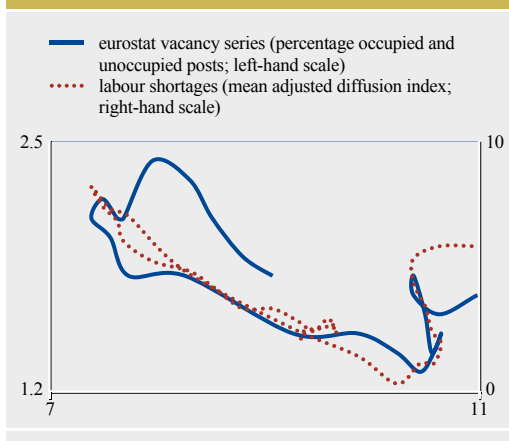
difference in individual characteristics between  $T$  and  $T^r$ .

**COMPARISON OF BEVERIDGE CURVE DEVELOPMENTS FOR THE EURO AREA AS A WHOLE AND INDIVIDUAL EURO AREA ECONOMIES USING EUROSTAT VACANCY RATES AND EMPLOYERS' PERCEPTIONS OF LABOUR SHORTAGES**

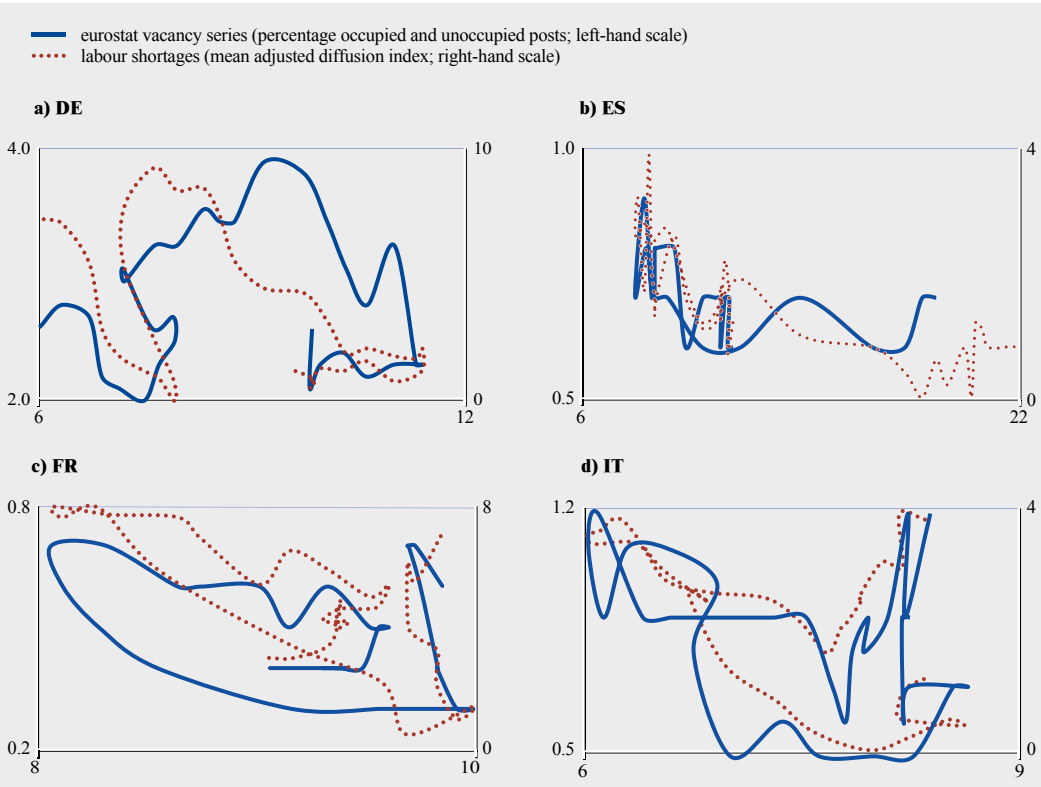
Charts A13a,b shows the correspondence between the official Eurostat vacancy rates (continuous blue line) and the national series based on DG ECFIN's monthly surveys of employers' perceptions of labour shortages (dashed red line). Given (i) the differences in the methods used in the compilation of the various series, (ii) the lack of seasonal adjustment in the Eurostat series and (iii) the rather narrower sectoral coverage of the survey of employers' perceptions (manufacturing only, as opposed to the whole economy in the case of the Eurostat series), it is perhaps not entirely surprising that

the two series do not map one another precisely. Nevertheless, similar patterns do emerge.

**Chart A13a Beveridge curves for the euro area 2003 Q1-2011 Q2**



**Chart A13b Beveridge curves for the four largest euro area economies 2003 Q1-2011 Q2 (cont'd)**



Sources: Eurostat and ESCB calculations.  
 Notes: The x-axis shows the unemployment rate (as a percentage of civilian labour force). Vacancy rates are Eurostat estimates for the non-agricultural economy. Labour shortages are based on EC surveys of manufacturing employers' perceptions of limits to business from labour shortages. Spanish vacancy data are not shown beyond 2009 Q4, due to a structural break in the series.

Chart A14 Beveridge curves for the euro area countries during EMU

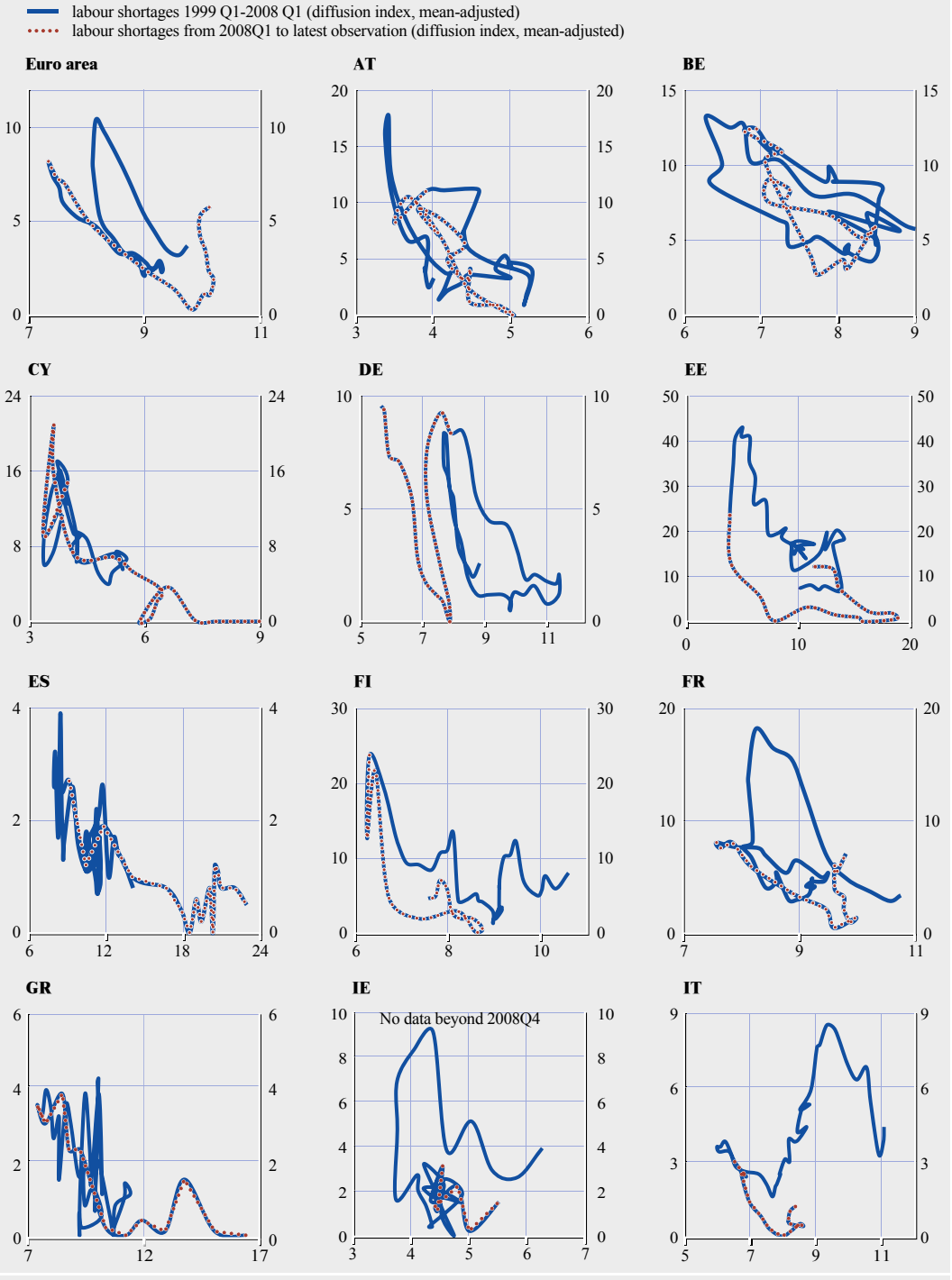
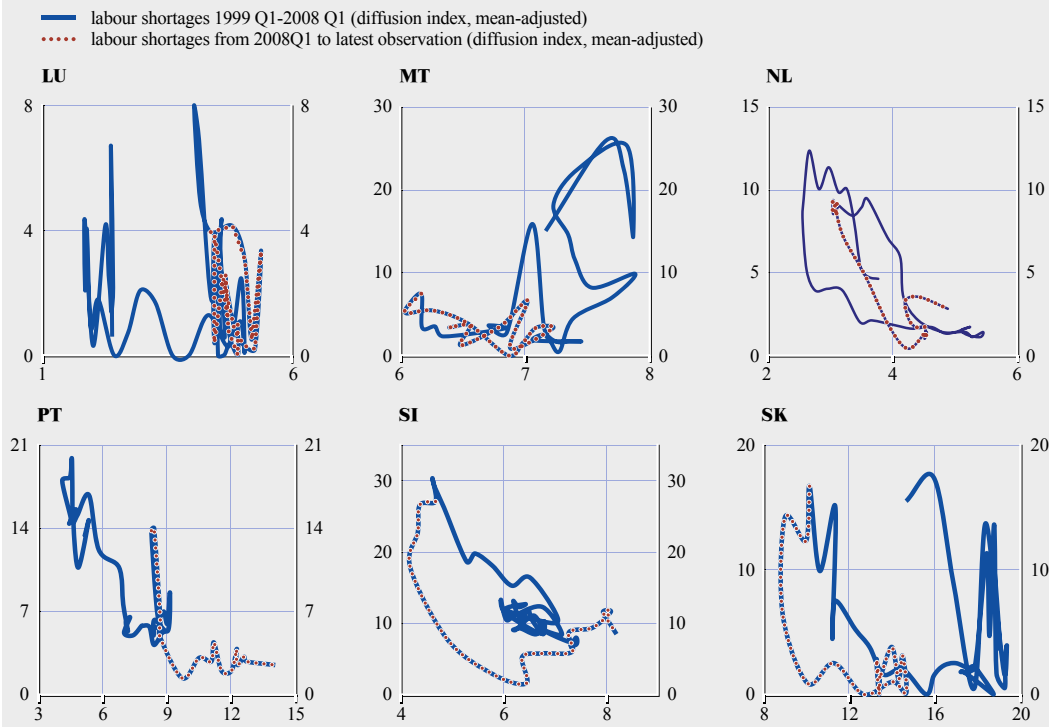


Chart A14 Beveridge curves for the euro area countries during EMU (cont'd)



Sources: Eurostat and ESCB calculations.  
 Notes: The x-axis shows the unemployment rate (as a percentage of the civilian labour force). Labour shortages from EC surveys of manufacturing employers' perceptions of limits to business from labour shortages. \*All countries to 2011 Q3, except: Ireland (to 2008 Q2); Netherlands (to 2011 Q4).

**Table A10 Regression results for beveridge curve analysis: euro area and countries**

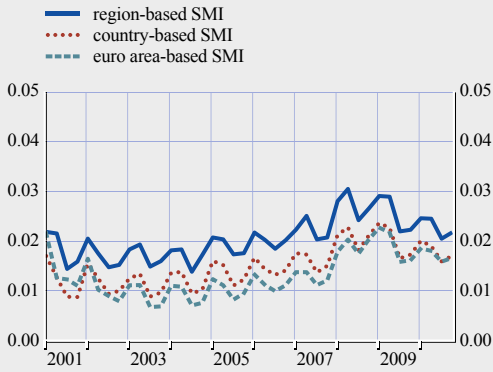
Dependent variable: unemployment rate

	UR	LS	LS <sup>2</sup>	CRI	CRI*LS	Constant	Obs	Adj. R <sup>2</sup>
Euro area	0.828*** [0.0265]	-0.0937** [0.0392]	0.00318 [0.00337]	0.476*** [0.114]	0.00132 [0.0212]	3.265*** [0.496]	66	0.985
Belgium	0.864*** [0.0294]	-0.137*** [0.0442]	0.00396 [0.00292]	-0.349 [0.224]	0.0348 [0.0290]	1.531*** [0.323]	86	0.951
Germany	0.886*** [0.0277]	-0.169*** [0.0342]	0.0106*** [0.00379]	-0.437*** [0.156]	0.0192 [0.0193]	1.134*** [0.189]	82	0.985
Estonia	0.837*** [0.0408]	-0.102 [0.0660]	0.00157 [0.00112]	1.198 [1.249]	-0.0595 [0.0446]	5.742** [2.807]	58	0.949
Ireland	0.953*** [0.0230]	-0.193*** [0.0597]	0.0136* [0.00716]	-0.0845 [0.324]	0.287 [0.212]	1.723* [1.002]	73	0.996
Greece	1.051*** [0.0441]	-0.302** [0.139]	0.0641** [0.0309]	0.790** [0.315]	-0.0158 [0.109]	-0.734 [1.278]	52	0.977
Spain	0.915*** [0.0165]	-0.790*** [0.182]	0.168*** [0.0508]	1.140*** [0.319]	0.502** [0.239]	3.233*** [0.609]	86	0.991
France	0.863*** [0.0221]	-0.0556*** [0.0104]	0.00114*** [0.000334]	0.263** [0.108]	0.00567 [0.0202]	2.569*** [0.341]	86	0.981
Italy	0.992*** [0.0227]	-0.0491 [0.0589]	0.000989 [0.00648]	0.166 [0.181]	-0.0247 [0.0961]	0.671* [0.402]	85	0.981
Cyprus	1.035*** [0.0949]	-0.0693 [0.0567]	0.00362 [0.00233]	-0.0192 [0.322]	0.119** [0.0508]	1.435 [1.026]	41	0.962
Luxembourg	0.947*** [0.0307]	-0.0449 [0.0318]	0.00208 [0.00480]	-0.189* [0.0956]	0.0899** [0.0363]	-0.187 [0.187]	86	0.979
Malta	0.808*** [0.0802]	-0.000960 [0.0257]	-0.000202 [0.00118]	0.255 [0.170]	0.0223 [0.0467]	3.909** [1.482]	46	0.828
Netherlands	0.847*** [0.0220]	-0.125*** [0.0223]	0.00609*** [0.00186]	0.0337 [0.0855]	0.0337* [0.0176]	1.626*** [0.245]	86	0.986
Austria	0.809*** [0.0769]	-0.0312 [0.0275]	0.000539 [0.00156]	-0.0109 [0.150]	-0.00132 [0.0206]	0.773** [0.358]	63	0.837
Portugal	0.903*** [0.0333]	-0.149** [0.0587]	0.00492* [0.00252]	0.0879 [0.215]	-0.00547 [0.0273]	1.308** [0.618]	86	0.986
Slovenia	0.855*** [0.0451]	-0.0995** [0.0398]	0.00179* [0.00103]	-0.149 [0.370]	0.0175 [0.0268]	1.178* [0.639]	62	0.941
Slovakia	0.873*** [0.0424]	-0.147*** [0.0515]	0.00605** [0.00296]	NO RECESSION <sup>(a)</sup>		7.690*** [2.222]	54	0.969
Finland	0.838*** [0.0182]	-0.0240* [0.0122]	-9.62e-05 [0.000291]	0.732*** [0.165]	-0.00110 [0.0182]	6.586*** [0.594]	83	0.990

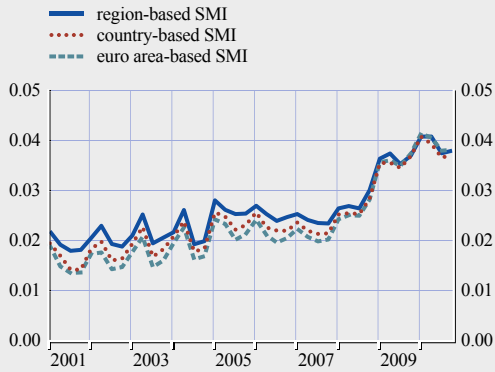
Notes: \*\*\*, \*\* and \* denote statistical significance at 1%, 5% and 10% confidence limits, respectively. Standard errors shown in parentheses; (a) No recession in Slovakia, which registered negative quarter-on-quarter GDP growth for one quarter only. Basic model:  $u_{it} = a_i + b_{1i} u_{it-1} + b_{2i} LS_{it} + b_{3i} LS_{it}^2 + b_{4i} CRI_{it} + b_{5i} CRI_{it} * LS_{it} + e_{it}$ , where  $u$  is the official Eurostat harmonised unemployment rate,  $LS$  is the labour shortages variable (representing vacancy developments), and the subscripts  $i$  and  $t$  denote country and time dimensions.  $LS^2$  ensures the convexity of the Beveridge Curve;  $CRI_{it}$  is a dummy variable indicating the crisis and post-crisis period, taking a value of one from the first of at least two consecutive quarters of negative quarter-on-quarter GDP growth to the end of the series;  $CRI_{it} * LS_{it}$  is an interaction term between the crisis dummy and the labour shortages variable, designed to capture changes in the slope of the Beveridge Curve.

Chart A15 SMIs for the euro area. Sensitivity analysis

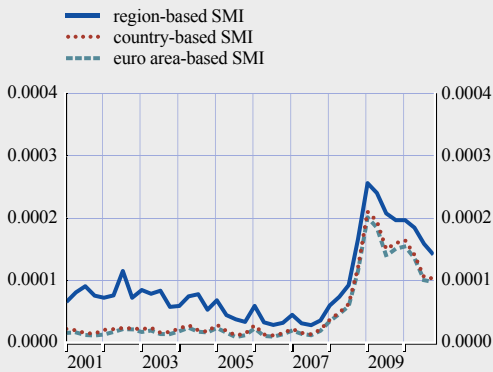
**a) Skill demand proxied by educational distribution of recently (<1 year) created jobs**



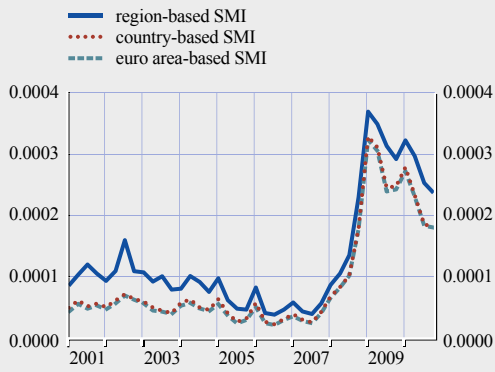
**b) Baseline SMI computed using the absolute value of the difference between skill supply and skill demand**



**c) Combination of education-sector pairs for employed workers and the labour force**



**d) Combination of education-occupation pairs for employed workers and the labour force**



Sources: EC (EU LFS) and own calculations.

**Chart A16 SMIs for individual countries. Distribution of education of employed workers (skill demand) and of labour force (skill supply)**

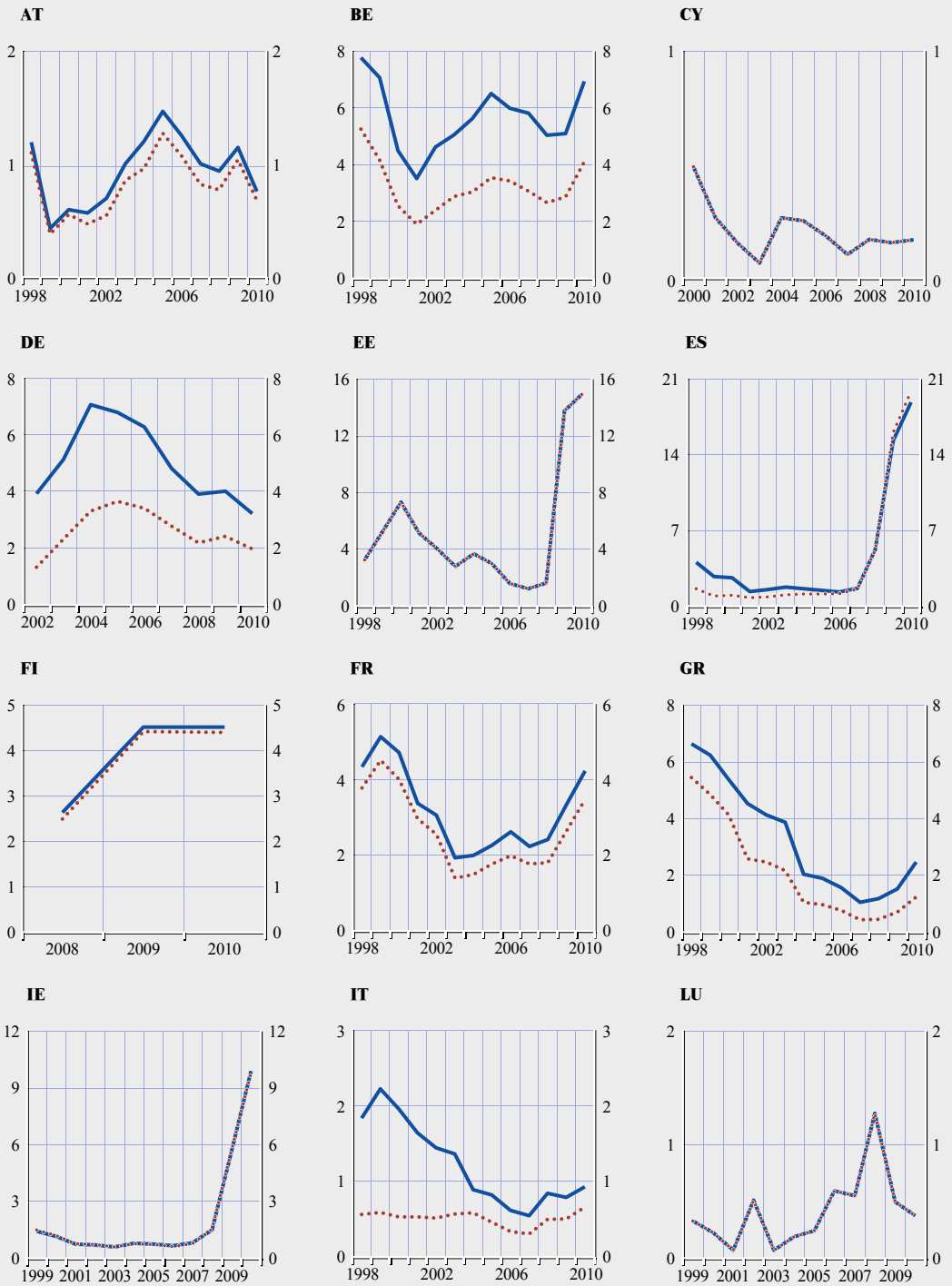
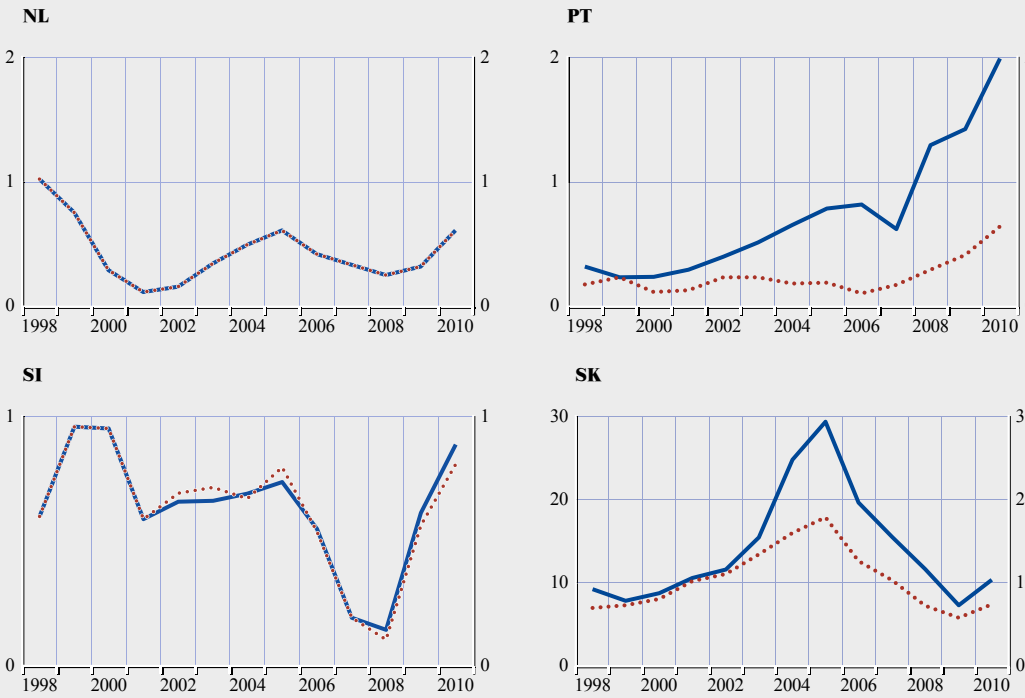




Chart A16 SMIs for individual countries. distribution of education of employed workers (skill demand) and of labour force (skill supply) (cont'd)



Sources: LFS data (EC) and own calculations. Mismatch index rescaled; index \* 10<sup>5</sup>. Blue line is region based SMI, red line is country based SMI.

Chart A17 SMIS for individual countries. skill supply: education of unemployed workers

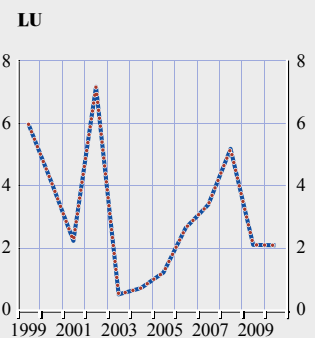
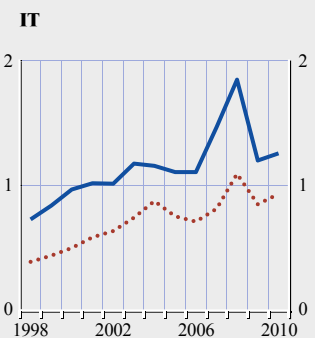
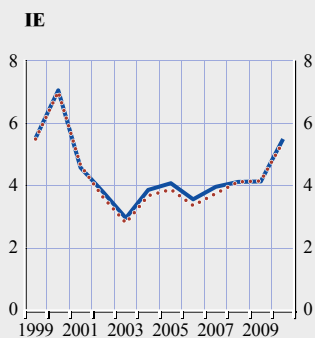
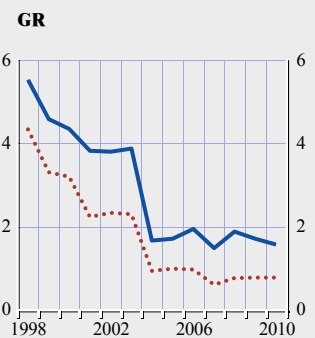
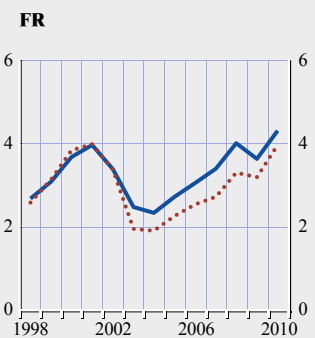
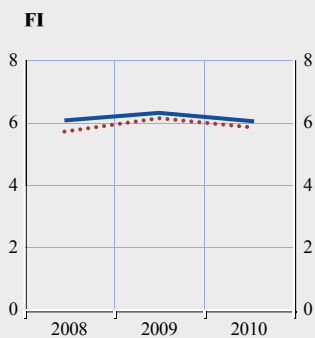
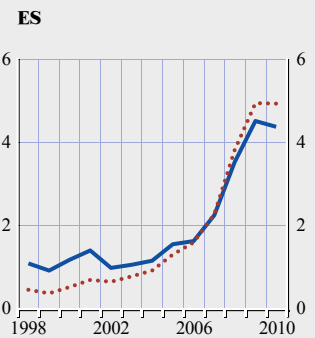
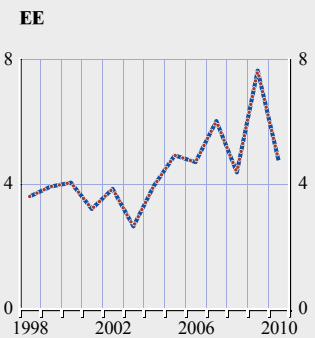
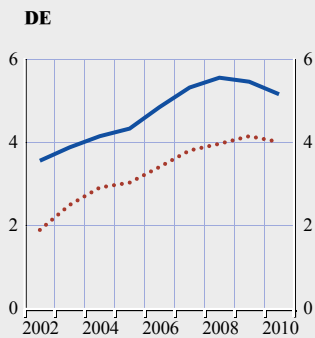
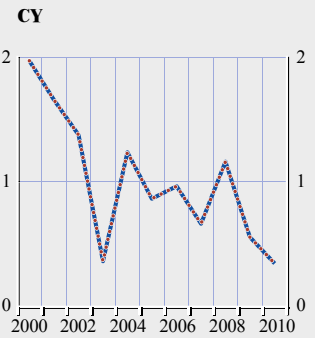
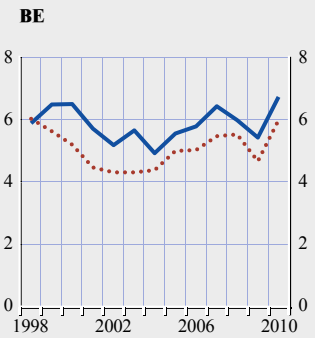
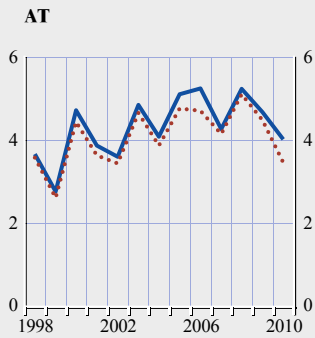
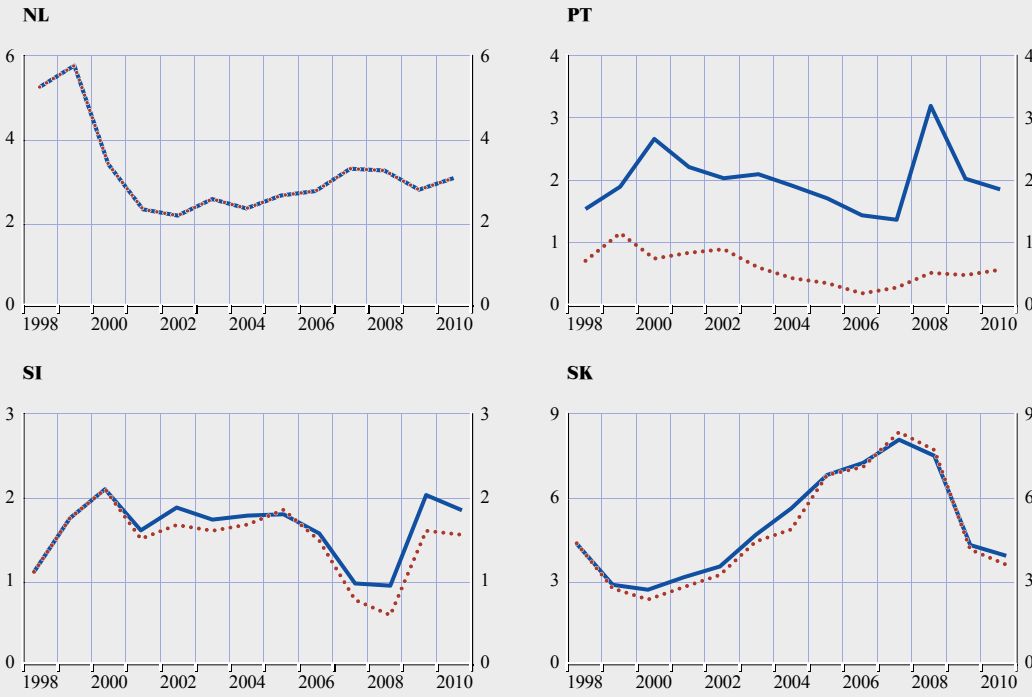


Chart A17 Smis for individual countries. Skill supply: education of unemployed workers. (cont'd)



Sources: LFS data (EC) and own calculations. Mismatch index rescaled; index \* 10<sup>2</sup>. Blue line is region based SMI, red line is country based SMI.

## A MORE DETAILED DECOMPOSITION OF UNCERTAINTIES SURROUNDING STRUCTURAL UNEMPLOYMENT ESTIMATES

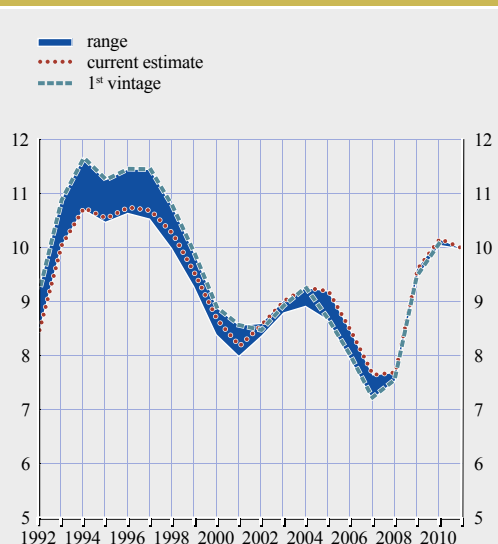
This appendix focuses on data uncertainties. In particular uncertainties around and revisions to both sides of the unemployment gap measure (i.e. unemployment rate data and structural unemployment rate estimates) are considered.

### UNEMPLOYMENT DATA REVISIONS

With regard to data uncertainty, Chart A18 shows the revisions to euro area unemployment rate data across different vintages. Generally these revisions are larger the further back in time one goes. On average, over the period 1999-2010, these were 0.34 pp for the euro area unemployment rate (the average over the period 1992-1998 was 0.81 pp). There was

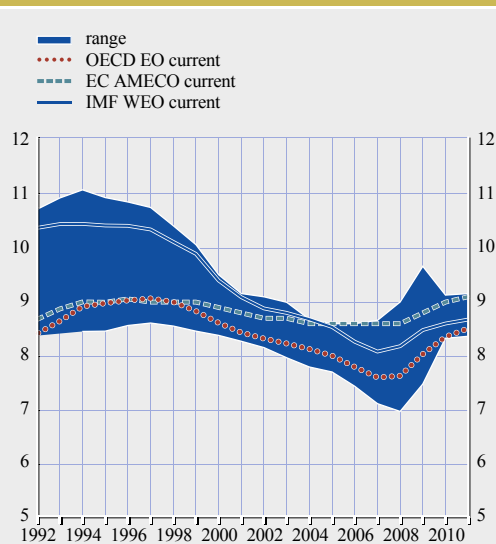
considerable heterogeneity in the degree of revisions across countries, with the highest average revisions being 0.86 pp (Portugal), 0.85 pp (Spain) and 0.80 pp (Germany) – see Table A111 for more details. These revisions should be set against empirical evidence suggesting that the unemployment rate level may enter inflation equations with a negligibly small coefficient. Section [2.3] of this report presents estimates from wage equations. As mentioned by Staiger et al. (1997), “the unemployment rate and changes in the unemployment rates are useful predictors of future changes in inflation. Whilst these two results might seem contradictory, they need not be; in principal, changes in unemployment could be strongly related to future changes of inflation, but the level of unemployment could enter with a negligibly small coefficient”.

Chart A18 Revisions of euro area unemployment rate data



Sources: EC, Eurostat, IMF, OECD and Eurosystem staff calculations.

Chart A19 Range of structural unemployment estimates (and of vintages)



Sources: EC, Eurostat, IMF, OECD and Eurosystem staff calculations.

Table A11 Decomposition of 'data uncertainty' surrounding unemployment gap estimates

	Unemployment rate	NAIRU				Unemployment gap	
		EC	OECD	IMF	IO average	IO average	
Euro area	0.34	0.75	0.38	0.74	1.25	1.13	
Belgium	0.17	0.68	0.85	0.08	1.13	1.07	
Germany	0.80	0.98	1.12	1.20	1.98	2.24	
Estonia	0.44	1.57	-	-	-	-	
Ireland	0.14	1.74	0.57	1.33	2.52	2.25	
Greece	0.17	1.59	0.90	0.82	1.96	1.86	
Spain	0.85	2.07	1.61	2.88	4.34	4.06	
France	0.36	0.75	0.46	0.00	1.66	1.71	
Italy	0.20	1.16	1.37	0.51	1.82	1.57	
Cyprus	0.23	0.84	-	0.69	-	-	
Luxembourg	0.34	0.81	0.55	0.55	1.40	1.44	
Malta	0.29	0.47	-	-	-	-	
Netherlands	0.40	1.21	0.43	1.02	1.60	1.51	
Austria	0.12	0.58	1.11	0.00	1.62	1.55	
Portugal	0.86	1.52	2.07	3.80	4.60	3.81	
Slovenia	0.21	0.55	-	0.21	-	-	
Slovakia	0.21	2.27	1.16	-	-	-	
Finland	0.10	0.96	0.62	1.24	1.70	1.56	

Sources: EC (EU LFS) and own calculations.

Second, as regards estimates of structural unemployment, Chart shows the full range across vintages of the EC, IMF and OECD databases and illustrates the high degree of uncertainty. On average, over the period 1999-2010, the range of estimates using all databases was 1.3 pp (this was somewhat lower when each database was considered in isolation – between 0.4 pp and 0.8 pp on average). However, the range of structural unemployment estimates was particularly large for some countries, in particular Portugal (4.6 pp), Spain (4.3 pp) and Ireland (2.5 pp). The range of structural unemployment estimates seems in line with the findings of Staiger et al. (1997), who argue that “a wide range of values of the NAIRU are consistent with the empirical evidence”.

The combined impact on unemployment gap estimates of (i) revisions to unemployment rate data and (ii) real-time uncertainty surrounding

structural unemployment estimates is illustrated in the final column of Table A11 and in 6 in Section 2.3 of the main text. A striking feature is that for much of the period 1992-2010, the range of unemployment gap estimates across time and institutions spans both positive and negative values.

#### MEASURING UNEMPLOYMENT

In addition to revisions to official unemployment rate data, it may also be the case that official measures of unemployment misrepresent the real level of disoccupation and degree of slack in the labour market (see Box 1.4 for a more detailed discussion of official measures of unemployment and alternative measures of labour underutilisation). The impact of broader measures of unemployment on structural unemployment estimates is discussed below.

### Impact of broader measures of unemployment on structural unemployment estimates

Assume a Gordon-type triangular model (Gordon 1997):  $\pi = f(\pi^e, ugap, ss)$ , where inflation ( $\pi$ ) is modelled using inflation expectations ( $\pi^e$ ), the unemployment gap ( $ugap$ ) – the gap between actual unemployment and structural unemployment – and supply-side ( $ss$ ) factors, such as oil prices or exchange rates. If this model is well specified, the estimated unemployment gap should not depend too much on the measure of unemployment used, but the implied estimate of structural unemployment may. To see this, note that the unemployment gap is defined as actual unemployment minus structural unemployment. Denote  $U$  as the official unemployment rate,  $UA$  as the alternative (broader) unemployment rate and  $UD$  as the difference between the two. Similarly, denote  $U^*$  as the estimate of structural unemployment derived using official unemployment rate data,  $UA^*$  as the estimate of “true” structural unemployment derived using the alternative measure of labour market slack ( $UA$ ) and  $UD^*$  as the difference between the two. If the model is well specified, it should provide the same measure of the unemployment gap (i.e.  $UGAP = U - U^* = UA - UA^* = (U + UAD) - UA^*$ ). This implies that the relationship between the measures derived using the alternative measure of unemployment and the official measure is given by  $UA^* = U^* + UD$ . Thus, estimating structural unemployment using official unemployment rate data is likely to give a distorted estimate if broader measures of unemployment better capture labour market slack – which is changing if  $UD$  is time-varying. Finally, assume instead that the relevant slack in the model of the labour market is given by  $\theta = U/v$ , where  $v$  stands for posted vacancies and  $\theta$  the appropriate measure of the tightness in the labour market. The unemployment metric is in this case crucial, as it directly affects the level of  $\theta$ .

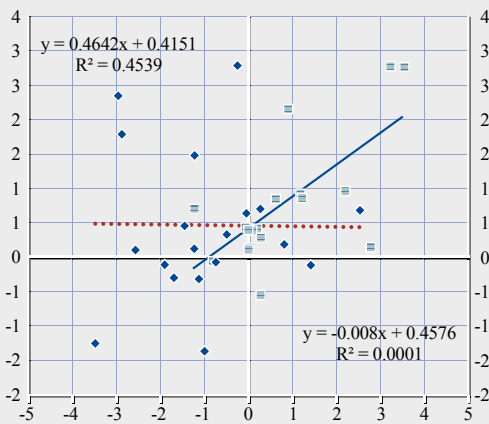
Chart A20 and Chart A21 show developments in part-time employment and discouraged workers, respectively, and those in official estimates of structural unemployment. The degree of co-movement is neither strong nor stable. Chart A20 also shows that there has been an increase in the degree of (involuntary) part-time employment over the period 2007-2010,

whereas Chart A21 depicts the increase (albeit more modest) in the proportion of “discouraged” workers. Apart from their potential impact on the estimation of structural unemployment, the developments in broader measures of unemployment add to the difficulties policy-makers face when trying to assess labour market functioning.

**Chart A20 Involuntary part-time (ipt) employment and structural unemployment**

x-axis: evolution of structural unemployment  
y-axis: evolution of ipt

- ◆ 99-07
- ..... linear (99-07)
- 07-10
- linear (07-10)

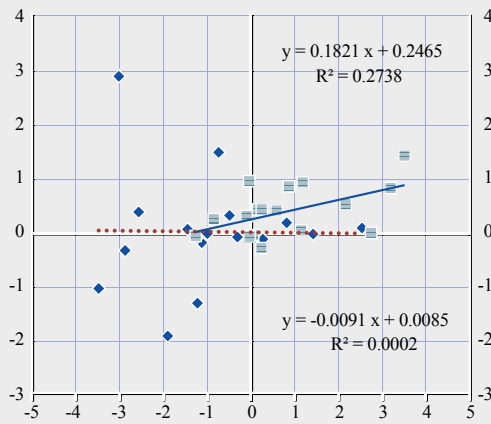


Sources: EC, Eurostat, IMF, OECD and Eurosystem staff calculations.  
Notes: Both the part-time employment (considered “involuntary”) and the discouraged labour force are reported in terms of changes.

**Chart A21 Discouraged workers and structural unemployment**

x-axis: evolution of structural unemployment  
y-axis: evolution of discouraged workers

- ◆ 99-07
- ..... linear (99-07)
- 07-10
- linear (07-10)



Sources: EC, Eurostat, IMF, OECD and Eurosystem staff calculations.  
Notes: Both the part-time employment (considered “involuntary”) and the discouraged labour force are reported in terms of changes.



**Table A12 Wage equation panel estimates**

	Pre-crisis		Whole sample	
	Real	Nominal	Real	Nominal
<b>U</b>	-0.0028 [0.001]	-0.0034 [0.000]	-0.0046 [0.000]	-0.0047 [0.000]
<b>Δ CPI</b>		0.6800 [0.000]		0.7898 [0.000]
<b>D*U</b>	0.0026 [0.001]	0.0032 [0.000]	0.0022 [0.000]	0.0019 [0.000]
<b>Constant</b>	0.0167 [0.018]	0.0300 [0.000]	0.0330 [0.000]	0.0367 [0.000]
<b>Observations</b>	468	468	667	667
<b>R-squared</b>	0.493	0.646	0.668	0.770
<b>Number of cross</b>	13	13	13	13
<b>SER</b>	0.014	0.013	0.016	0.015
<b>Adj-R-sq</b>	0.47	0.62	0.66	0.76

Sources: EC (EU LFS) and own calculations.

Notes: P-values in brackets. Maximum data range: 1995 Q1-2007 Q4 (pre-crisis period); 1995 Q1-2011 Q4 (whole sample period). Unbalanced panel. Unity parameter imposed on productivity term.

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