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Labour Market Transitions, Shocks and Institutions in Turbulent Times: A Cross-Country Analysis

IZA Discussion Papers, No. 11443

Provided in Cooperation with:
IZA – Institute of Labor Economics

Suggested Citation: Bachmann, Ronald; Felder, Rahel (2018) : Labour Market Transitions, Shocks and Institutions in Turbulent Times: A Cross-Country Analysis, IZA Discussion Papers, No. 11443, Institute of Labor Economics (IZA), Bonn

This Version is available at:
https://hdl.handle.net/10419/180461

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ABSTRACT

Labour Market Transitions, Shocks and Institutions in Turbulent Times: A Cross-Country Analysis*

This paper analyses the impact of the business cycle on labour market dynamics in EU member states and the US during the first decade of the 21st century. Using unique measures of labour market flows constructed from worker-level micro data, we examine to what extent macro shocks were transmitted to national labour markets. We apply the approach by Blanchard and Wolfers (2000) to analyse the role of the interaction of macroeconomic shocks and labour market institutions for worker transitions in order to explain cross-country differences in labour market reactions in a period including the Great Recession. Our results suggest a significant influence of trade unions in channelling macroeconomic shocks. Specifically, union density moderates these impacts over the business cycle, i.e. countries with stronger trade unions experience weaker reactions of the unemployment rate and of worker transitions.

JEL Classification: J6, E24, E32

Keywords: worker flows, labour market dynamics, institutions, Great Recession

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* We thank Thomas K. Bauer, Daniel Baumgarten, Giuseppe Bertola, Romain Duval, Hanna Frings, Matthias Giesecke, Philipp Jäger, Lisa Leschnig, Pedro S. Martins, Christian Merkl, Battista Severgnini as well as participants of the 30th Annual Congress of the European Economic Association, the IZA/OECD Employment Seminar, the World Bank DIME seminar, the "Conference in honor of Christopher A. Pissarides" at SciencesPo, Paris, the FAU/IABSeminar Macroeconomics and Labor Markets in Nürnberg, the 9th RGS Doctoral Conference in Economics, the 21st SMYE, the Jahrestagung of the Verein für Socialpolitik 2016 and seminars at RWI for helpful comments and suggestions. We are grateful to Fernanda Martinez Flores for excellent research assistance.

1 Introduction

The recent Great Recession was associated with job losses and displacements for a substantial number of persons, and a strong and persistent increase in unemployment in many European countries. The average unemployment rate in the Eurozone rose from an average of 7.0% in 2008 to 10.9% in 2013 (Eurostat, 2014). This figure, however, masks large divergences in labour market reactions across the EU and associated countries (European Central Bank, 2012; OECD, 2013). In Austria, Belgium, Germany, Luxembourg and Norway the unemployment rate hardly increased during the crisis, whereas in Estonia, Greece and Spain, it rose strongly, reaching a level of 25%. Worker flows which determine the level of unemployment, exhibit substantial heterogeneity as well (Bachmann et al., 2015). For certain countries, an increase in job losses during the Great Recession led to large outflows from employment, while for others a decline in job creation led to small outflows from unemployment. These cross-country differences are not only likely to be strongly influenced by cross-country differences in the magnitude of economic shocks, but also by the institutional framework of national labour markets.

In this paper, we therefore investigate the role of labour market institutions for the transmission of macroeconomic shocks to labour markets looking at both the unemployment rate and worker flows. In particular, we apply Blanchard and Wolfers' (2000) empirical method which was originally used to examine the causes of diverging development of US and European unemployment from the 1960s until the mid-1990s.[1] By contrast, our analysis focuses on cross-country differences in unemployment and labour market dynamics between 1999 and 2013, a period covering the Great Recession, for a large number of European countries as well as the US. We enhance their model by allowing for changes in institutional variables over time, which accounts for the variation of institutions within countries as motivated by Nickell (1997). Specifically, we analyse the impact of shocks and the interaction of shocks and labour market institutions. We separately identify (i) the direct impact of macroeconomic shocks and (ii) how shocks of a given size were transmitted to the national labour markets through the prevailing institutional framework. The latter thus measures the indirect effect of institutions on labour market dynamics.

The main result of our analysis concerns the role of trade unions in shaping macroeconomic shocks for labour market dynamics. In particular, higher union density is associated with more moderate labour market reactions in recessions as well as in economic upturns. One explanation is the objective of trade unions to provide job security to their members, which leads to both lower employment growth in economic upturns and lower job destruction in recessions. As this result has not been found by the preceding literature, it seems to be a particular phenomenon of the time period leading up to and including the Great Recession.

[1] Note that this methodology does not yield causal effects. The word "effect" should therefore be broadly interpreted in the following.

Furthermore, our results lend support to findings from the literature that employment protection legislation becomes more important for labour market flows when the trend growth of the economy is low (e.g. Bentolila and Bertola, 1990; Messina and Vallanti, 2007).

Our analyses are related to two strands of the economic literature. On the one hand, there is a considerable and rapidly growing literature on worker flows, focusing on the mechanisms underlying the cyclical behaviour of the unemployment rate. These studies investigate the relative importance of the inflows into and the outflows from unemployment, with the most recent articles establishing a relatively balanced role of inflows into and outflows out of unemployment (e.g., Elsby et al., 2009; Yashiv, 2008; Fujita and Ramey, 2009).

On the other hand, our paper is connected to a large body of theoretical and empirical literature examining heterogeneity in the unemployment rate caused by institutions across and within countries. An overview of these studies is provided by Boeri and Van Ours (2013). In theory, labour market institutions can have ambiguous effects on labour market performance as they play two contrasting roles. First, they may worsen labour market outcomes by forming rigidities which distort price- and wage-setting mechanisms (Layard et al., 1991; Layard et al., 2005; Blanchard, 1999); second, they may have positive effects by disseminating information and increasing coordination (Traxler and Kittel, 2000) in the labour market.

Bassanini and Duval (2006), Eichhorst et al. (2010), Orlandi (2012), de Serres and Murtin (2013), Gal and Theising (2015) and Bertola (2017) represent recent examples of empirical research applying cross-country comparisons. They provide evidence for an adverse effect of generous unemployment insurance systems and large tax wedges on unemployment. In contrast, high levels of wage bargaining coordination and active labour market programmes exert a favourable influence. Only Eichhorst et al. (2010) cannot find support for the relevance of classical labour market institutions, but they attribute a key role to the internal flexibility of labour markets.

Our contributions to the literature are as follows. First, we extend the framework of Blanchard and Wolfers (2000) which has been extensively used to examine differences across countries in labour market stocks, especially unemployment, to an analysis of labour market transitions. Taking into account worker transitions allows us to investigate the behaviour of national labour markets over the business cycle more precisely, since flows are generally more sensitive to macroeconomic shocks and respond more quickly than it is the case for stocks, which could especially be seen in many European countries during the Great Recession (Bachmann et al., 2015). The analysis of worker flows yields insights into the mechanisms underlying the dynamic components of employment and unemployment, which is at the core of the "ins vs. outs" debate. Our study provides indications regarding potential institutional reasons for cross-country differences in the relative contribution of inflows into and outflows from unemployment being highly policy relevant. Moreover, labour market transitions are measures of employment security (for worker flows from employment

to unemployment) and of unemployment duration (for worker flows from unemployment to employment). As high employment security and low unemployment duration are valued by workers, our study provides welfare implications of labour market institutions.

Second, we investigate labour market behaviour during the time period 1999 to 2013, i.e. the Great Recession and the preceding decade.[2] This period is particularly interesting as it includes a long expansion with strong employment creation in many industrialised countries, as well as the Great Recession which featured an economic shock much larger than what could be seen in previous recessions. This leads to relatively high variation in our restricted sampling period which enables us to investigate the transmission of shocks through institutions to national labour markets. Finally, in contrast to many existing studies, we analyse the entire first decade of the 21st century. Therefore, we take into account the (medium-run) effects of important changes in labour market institutions that had taken place in or just before this decade in many Southern European countries such as Italy and Spain, but also Central European countries such as Germany.

The remainder of the paper is structured as follows. Section two describes the data used to construct the measures for labour market dynamics and for macroeconomic shocks as well as provides descriptive evidence for the 21 countries in our sample. Section three illustrates labour market institutions and reviews their potential impact on labour market dynamics from a theoretical point of view. Section four explains the empirical identification strategy. Section five presents the results, including a set of robustness tests. The last section summarizes the main findings and concludes the discussion.

2 Unemployment and Labour Market Flows Over the Cycle

Our sample of analysis consists of 20 European countries[3] as well as the US. We obtain labour market dynamics of European countries from the European Labour Force Survey (EU-LFS) which is based on a large number of representative national household surveys. It includes all EU Member States without Croatia (EU 27) as well as Norway, Iceland and Switzerland. The Labour Force Surveys are conducted by the national statistical agencies applying harmonized concepts and definitions, which enables us to perform a cross-country comparison. From a person's current and previous labour market status, we compute the stock of employed, unemployed and non-participating individuals, along with transition rates between every labour market state by year and country. In the data, an individual's current labour market status is defined

[2]The analysis of the evolution of unemployment by Bertola (2017) also includes the time period of the Great Recession.

[3]The countries are Austria, Belgium, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Hungary, Italy, Luxembourg, Norway, Poland, Portugal, Sweden, Slovenia, Slovak Republic and the United Kingdom.

according to the ILO standard.[4] By contrast, the labour market status in the previous year is based on self-perception of the interviewed person. Although these two definitions might not overlap perfectly, using both to identify labour market flows from one year to the next is preferable to alternative approaches, which would not allow for a consistent approach across countries (see Appendix B).

US data on labour market status and worker transitions are taken from the IPUMS-CPS database (Flood et al., 2015), which is derived using the Current Population Survey (CPS). In order to make worker flows comparable with the EU-LFS, we impose the time structure of the EU-LFS data set on the CPS data. In particular, for each month of the observation period, we construct stocks and flows for individuals observed in the same month one year before. For each year, the monthly values are averaged yielding one measure for each labour market outcome per year.

In our analysis, we focus on the time period 1999 to 2013. This time period corresponds to the largest number of available country-year combinations for which information on labour market transitions is available in the EU-LFS. As explained in detail in Appendix B, we exclude several European countries from the EU-LFS because of limited data availability; for the same reason, we need to impute some missing values. The final data set includes the unemployment rate and transition rates between employment and unemployment at the country-year level. At the individual level, we restrict the sample to dependent-status employees, and omit individuals living in institutional households (e.g. retirement homes or military barracks), working for the military as well as children under the age of 15 and adults aged 65 and over.

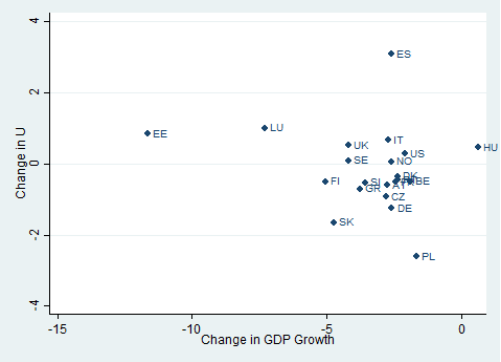
The initial observation motivating our analysis is that changes in the unemployment rate and in the worker flow rates between employment and unemployment show large cross-country variation over the business cycle, especially during the Great Recession, a period of strong labour market turbulence. Figure 1 illustrates these differences by relating the changes in annual GDP growth to changes in unemployment and the transitions between employment and unemployment from 2007 to 2008. This makes clear that countries with very similar changes in GDP, such as Austria, Italy and Spain – with a reduction in GDP growth of about 3 percentage points – differ considerably in their labour market reactions.

This suggests that similar macroeconomic shocks were transmitted heterogeneously to national labour markets. Furthermore, the response in the transition rate from unemployment to employment was of comparable size, but the reverse worker flow and therefore the unemployment rate exhibited extremely contrasting trends. This is an indication that the answer to the "ins vs. outs" debate is likely to differ between countries (see. e.g. Petrongolo and Pissarides, 2008 and Elsby et al., 2013 for an explicit cross-country analysis of these issues).

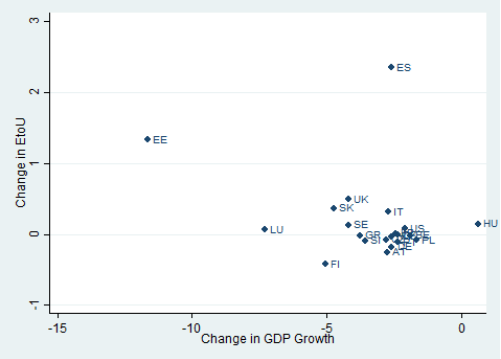
[4]This means that a person is defined as employed if he or she performed some work for wage/salary or for profit or family gain, or – if temporarily not at work – had a formal attachment to his or her job or was with an enterprise; and as unemployed if he or she was without work, currently available for work, and seeking work (ILO, 1988).

Figure 1: Relationship between annual GDP growth and labour market reactions at the beginning of the Great Recession, 2007 and 2008

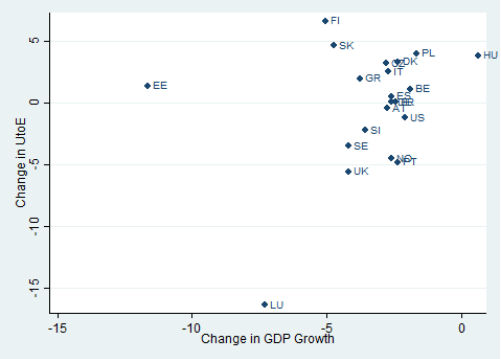
(a) Unemployment rate



(b) Transition rate from employment to unemployment



(c) Transition rate from unemployment to employment



Notes: Country codes: AT: Austria, BE: Belgium, CZ: Czech Republic, DE: Germany, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, FR: France, GR: Greece, HU: Hungary, IT: Italy, LU: Luxembourg, NO: Norway, PL: Poland, PT: Portugal, SE: Sweden, SI: Slovenia, SK: Slovak Republic, UK: United Kingdom, US: United States of America.
Source: EU-LFS, CPS, ICTWSS, own calculation.

Looking at our variables of interest in more detail, we first focus on macroeconomic shocks. In order to proceed as parsimoniously as possible, we use the most aggregate measure of the business cycle available, the annual growth rate of real GDP.[5] The annual GDP time-series for countries provided by the OECD allows us to compute economic growth rates. Figure A.1 shows that all countries experienced country-specific stable growth levels with moderate business cycle movements in the time period 1999 to 2007, except for a dip in the early 2000s driven by the new economy recession which followed the dot-com bubble. In 2007/2008, when the Great Recession hit economies, an extreme reduction in GDP growth in most countries is visible. The extent of the fall was heterogeneous across countries. While the recession was relatively mild in countries such as Norway, the US, France, Belgium and Germany, where the decrease in the growth rate is at most 3 percentage points, it was rather strong in Slovenia, Slovakia and Estonia with a decline of up to 11 percentage

[5]An alternative measure of the business cycle is the output gap, which we apply in a robustness test (see Section 5.2).

points. Furthermore, in the aftermath of the recession, some countries such as Estonia and the US, recovered relatively quickly, whereas other countries such as Greece and Spain, faced a protracted recession.

Turning to the detailed descriptive evidence on the unemployment rate and labour market transitions, clear cyclical features become apparent for the time period 1999 to 2013 (Figures 2 and 3): The unemployment rate and the transition from employment to unemployment were countercyclical, whereas the transition from unemployment to employment was procyclical. This pattern was especially strong in 2007 and 2008, the beginning of the Great Recession. In addition, the figures indicate that the extent of labour market reactions at the start of the recession and their persistence in the following years varied remarkably across countries.

In particular, the adverse responses in the unemployment rate during the Great Recession range between one percentage point in the Czech Republic to 14 percentage points in Spain (Figure 2). In countries where the unemployment rate rose considerably, it remained stubbornly high until 2013. An exceptional case is Estonia. After the rate peaked in 2010, it decreased quickly, almost going down to its initial level. Only a few countries experienced hardly any change or even a decrease in unemployment during the observation period. For example, the unemployment rate was stable in Austria, Belgium, Finland, Norway and Poland; in Germany it fell during most of the recession years.[6]

A heterogeneity of similar extent emerges for the transition rates from employment to unemployment and unemployment to employment. Changes in worker flows from employment to unemployment were especially big in 2008, which is in line with expectations (Figure 3): At the start of the recession, the large adverse shock raised job destruction, increasing the transition rates from employment to unemployment. Countries which were strongly hit by the economic downturn, such as the US, Spain, Greece, Portugal and Estonia, experienced a substantial rise in the corresponding rate of up to 7 percentage points. However, they display very different speeds of recovery. The transition rate in the US dropped to almost its pre-recession level in 2011, whereas in Hungary it was still above the respective value in 2013. Again, Germany was an exception as the transition rate from employment to unemployment decreases slightly during the Great Recession.

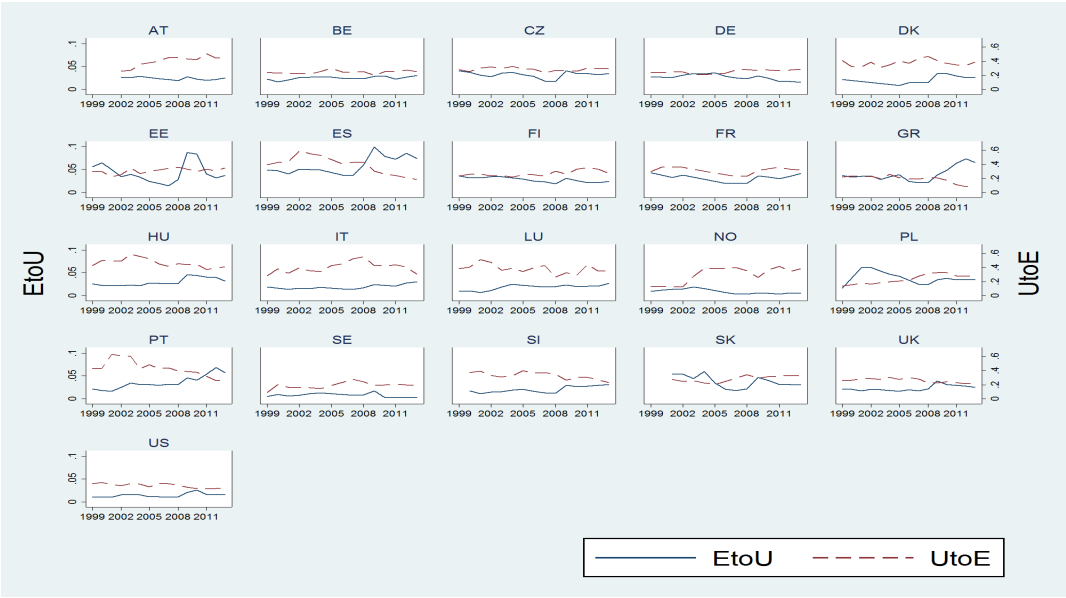
The evolution of worker flows from unemployment to employment shows pronounced trends in a number of countries, together with some business cycle turbulence (Figure 3). In economic downturns job creation and, hence, hirings are lower. Therefore, the transition rate from unemployment to employment decreases. Indeed, this is the case for most of the countries during the Great Recession. The initial drop was the highest in Spain, Italy and Norway where it equalled roughly 20 percentage points. However, some countries, such as Austria and Poland, experienced an increase in this transition rate. Since the variation of the rate within a country over time is high, it is not feasible to draw conclusions on the speed of recovery.

[6]See e.g. Burda and Hunt (2011) and Burda and Weder (2016) for an analysis of the German experience during the Great Recession.

Figure 2: Unemployment rate by country, 1999 – 2013

Notes: See Figure 1 for the country codes.
Source: EU-LFS, CPS, own calculation.

Figure 3: Annual transition rates between employment and unemployment by country, 1999 – 2013



Notes: See Figure 1 for the country codes. Transitions from employment to unemployment are plotted against the primary axis. Transitions from unemployment to employment are plotted against the secondary axis.
Source: EU-LFS, CPS, own calculation.

3 Labour Market Institutions and their Interaction with Shocks

The main question arising from the descriptive evidence above is whether and how national labour market institutions are responsible for differences in the labour market reactions to macroeconomic shocks. Looking at the indicators for employment protection legislation and union density supports the intuition that labour

market institutions exert an indirect, rather than a direct, influence on national labour markets, since the measures vary little over the observation period within countries (Figures A.2 and A.3 respectively). Moreover, the level of the indicators differs substantially across countries. To go back to the previous example: While Italy and Spain were similarly hit by the Great Recession, they display very dissimilar labour market reactions, which could be explained by union density being substantially higher in Italy compared to Spain. Taken together this indicates that institutions amplify or diminish the impact of economic turbulence.

Specifically, labour market institutions influence the transmission of economic shocks to national labour markets in a twofold manner. Initially, they affect the intensity of a shock hitting the labour market and later the adjustment process back to the steady-state level. Institutions describing the flexibility of labour markets by creating wage or employment rigidities exhibit both attributes, whereas institutions influencing the reservation wage and job search intensity relate mainly to the adjustment process.

Following Blanchard and Wolfers (2000) we capture the institutional setting of national labour markets by using eight indicators.[7] They cover the unemployment insurance system, employment protection legislation (EPL), the collective bargaining system, active labour market policies (ALMP), and the tax burden of employees for each country. Table A.1 depicts descriptive statistics of our variables and illustrates their size, variation and availability.[8] The correlation between the various institutions is overall strong and positive (Table A.2). For instance, strict EPL is significantly positively correlated with all indicators except for union density. This poses a challenge for our empirical analysis which we address using different strategies in our benchmark models as well as in robustness tests (see Section 4 for a discussion).

We next describe the economic rationale for each of these indicators. From a theoretical point of view, trade unions take centre stage in the determination of wages. In a right-to-manage model (Nickell and Andrews, 1983), unions and employer organisations negotiate over wages, which are then taken as given by individual firms in their decision over employment. Thus, higher trade union power is associated with higher wages. By contrast, in an efficient bargaining model (McDonald and Solow, 1981), both wage and employment are bargained over, which implies that an increase in trade union power does not necessarily cause adverse effects.

Nevertheless, trade unions can create wage rigidities being especially relevant for the responsiveness of wages to a change in aggregate economic conditions. In particular, with higher downward wage rigidity initially more job matches are destroyed as a reaction to a large adverse shock, leading to higher worker transitions from employment to unemployment and a stronger increase in unemployment (Bertola and Rogerson, 1997). Yet, the overall influence of trade unions in economic turbulence is not clear-cut, because trade

[7]The institutional measures are the replacement rate of unemployment benefits and their length, employment protection legislation, union coverage, union density, the level of wage bargaining, active labour market policies and the tax wedge.

[8]See the appendix B for a detailed description of the shocks and institutions variables, as well as the respective data sources.

unions aim to protect the jobs of their members (Freeman, 1978; Medoff, 1979) which can mitigate extreme reactions of labour markets. On the one hand, the job security motive generates a scope for modification at the intensive margin, e.g. reducing working hours in order to prevent job losses. This goes along with lower adverse labour market reactions and a faster recovery of the economy. On the other hand, the same motive fosters the segregation of labour markets making it harder for outsiders, the unemployed, to enter employment. Thus, during an economic upturn strong trade unions might affect the buildup of the employment stock thereby hindering the reduction of unemployment. Taken together, these effects lead to low variation in the unemployment and employment stocks over the business cycle. This is in line with evidence presented by Colonna (2010) and Goerke and Pannenberg (2011) who find that union membership decreases the probability of dismissal. Also, Hijzen and Martins (2016) investigating government-issued extensions in collective bargaining coverage confirm this relationship. Overall however, not only the size of the trade unions is important, but also the structure of collective wage bargaining (Traxler and Kittel, 2000) which influences the capability of national labour markets to internalize detrimental effects caused by asymmetric information. We therefore consider three measures of wage-setting institutions in our empirical analysis: Union coverage, union density and the coordination of the bargaining process.

Employment protection legislation (EPL) measures employment rigidity. EPL represents the costs that arise for firms in case of the dismissal of an employee and is an indicator for the flexibility of a labour market. In a simple steady-state search-and-matching model of the labour market, the following mechanism holds (Mortensen and Pissarides, 1999): The stricter EPL, the more costly it is for employers to lay off workers, which reduces worker outflows from employment. Because employers are forward-looking, it also decreases vacancy creation and therefore inflows to employment. Therefore, EPL lowers labour turnover with ambiguous effects on unemployment. There exists empirical evidence in line with this theory: Higher EPL is associated with lower aggregate labour market flows, and there is no clear association between EPL and the unemployment rate (Scarpetta, 1996; Nunziata, 2002). However, this picture changes when considering varying business cycle conditions as the impact of EPL on labour market dynamics has been shown to be more important under lower trend growth than under higher trend growth, both theoretically (Bentolila and Bertola, 1990) and empirically (Messina and Vallanti, 2007).

The relation of EPL, economic turbulence and the labour market is thus straightforward. In economic upturns firms will hire less employees if EPL is high, which leads to lower employment growth. Similarly, at the beginning of recessions, strict EPL is associated with lower unemployment since firms cannot adjust properly to the situation. This mechanism also hinders the recovery process. Thus, over the business cycle, EPL affects both the initial impact of an economic shock as well as its persistence on the labour market. However, this effect is likely to vary over the business cycle. In our empirical analysis, we therefore study the

link between EPL and labour market dynamics for the whole time period investigated, as well as separately by boom and recession periods. Furthermore, we use the EPL measure governing regular employment which applies to workers with permanent contracts on labour market dynamics, as this is generally the most prevalent employment type.

Next, we concentrate on labour market institutions that influence individuals' job search intensity and the reservation wage of the unemployed. In theory, both affect only the adjustment process of the labour market back to the steady-state after economic turbulence. One of the most important institutions in this context is the unemployment insurance system. The likelihood of taking up a job decreases when unemployment benefits are higher and when benefit entitlements are longer, since these factors lower the incentives to search for work. At the same time due to lower opportunity costs of unemployment, a generous unemployment insurance pushes up the reservation wage. Indeed, empirical evidence suggests that unemployment benefits have a significant adverse effect on unemployment and on worker flows from unemployment to employment (among others Nunziata, 2002; Nickell et al., 2005; Schmieder and von Wachter, 2016).

As for cyclical features in this context, by the same reasoning we expect that during economic upturns, a more generous unemployment insurance system goes together with a higher unemployment rate and lower unemployment to employment transitions. During recessions a similar mechanism is likely to apply. However, the job market perspectives of unemployed persons worsen irrespective of the generosity of the unemployment insurance system, which means that the moral hazard induced by a generous unemployment insurance system may be lower in recessions than in booms (Schmieder et al., 2012). Among the variables characterizing the unemployment insurance system, we choose the benefit replacement rate and the duration of unemployment benefits. While the replacement rate captures the level of unemployment benefits relative to previous earnings, benefit duration measures how long individuals are entitled to unemployment benefits.

Taxes relate to both job search intensity and the reservation wage, too. The labour tax wedge measuring the difference between the labour costs to the employer and net take-home pay of the employee increases the reservation wage and reduces the efforts of an unemployed individual to search for a job. Therefore, it is associated with lower transitions from unemployment to employment and higher unemployment. However, Blanchard and Wolfers (2000) argue that this effect is small, because the labour tax wedge contains, among others, payments for health benefits and retirement. Nevertheless, many empirical studies find a strong adverse relationship between the tax wedge and unemployment (Belot and Van Ours, 2004; Nickell, 1997).

On the labour supply side, the tax wedge can be expected to have a similar influence as the unemployment insurance system. That is, during economic booms the tax wedge is adversely related to outflows from unemployment and to the unemployment rate. During recessions the interaction is expected to be negligible. In addition, however, one can expect effects on the labour demand side, with a high tax wedge implying

labour costs and thus reducing labour demand. This could amplify the negative labour-market effects in a recession.

Active labour market policies (ALMP) influence the labour market mainly via changes in job search intensity. ALMP programmes aim at reducing unemployment by improving the job matching process and by enhancing opportunities for unemployed to accumulate skills and work experience affecting their job search behaviour. Thus, unemployed individuals become more employable. In theory, programmes of this type lower the unemployment rate as transitions from unemployment to employment increase. In practice, this effect has been shown to depend strongly on the specific programme design (Card et al., 2010; Card et al., 2017). Concerning the channelling and persistency property with respect to adverse macroeconomic shocks, ALMP does not influence the initial depth of a downturn, but in contrast exerts a positive impact on the recovery of the labour market by supporting recently unemployed to get back into work. In an economic upturn the impact is expected to be small since the programmes are not very effective for long-term unemployed.

4 Methodology

The aim of our empirical analysis is to examine the medium-term developments of European and US labour markets dynamics over the time period 1999 to 2013. We apply the empirical methodology of Blanchard and Wolfers (2000) to investigate the importance of the interaction of macroeconomic shocks and labour market institutions for the unemployment rate and worker flow rates. Therefore, we estimate two models: The first model assumes that shocks are unobservable but common across countries, whereas the second model allows for observable and country-specific shocks. While the former uses a very general shock measure which incorporates the correlation of prevailing economic conditions between countries, the latter takes into account differences in GDP growth between countries, which includes the depth of the Great Recession.

The unobserved shocks model reads as follows:

$$\Lambda_{it} = c_i + d_t + \sum_j b_j (d_t * X_{it}^j) + \epsilon_{it} \tag{1}$$

where Λ_{it} is the dependent variable which is either the unemployment rate or a worker flow rate in country i at time t, c_i are country dummies and d_t represent time dummies. As explained in more detail below, t represents a time period of three years. The time dummies serve as common unobserved shocks across countries. Their coefficients measure the direct effects of these common economic shocks on national labour markets. Furthermore, X_{it}^j is the value of institution j in country i at time t. The coefficient of interest, b_j, quantifies the interaction between shocks and institutions. In particular, the estimate captures the

transmission property of the corresponding institution and, thus, depicts the indirect effect of institutions via shocks on the outcome variable.

In the second model, the common observed shocks are replaced by an explicit country-specific macroeconomic shock measure, the annual growth rate of GDP. It has the following form:

$$\Lambda_{it} = c_i + \theta Y_{it} + \sum_j b_j * (\theta Y_{it} * X_{it}^j) + \epsilon_{it} \tag{2}$$

where the notation is the same as before, only that Y_{it} denotes the shock in terms of GDP growth.

Note a distinct feature of the main coefficient. Institutions enter the model only in the interaction term representing their transmission property for a given shock. We perform non-linear least squares estimations because the shock coefficient is simultaneously estimated as coefficient for the macroeconomic shock alone and for the interaction with institutions. Both empirical models account for the theoretical mechanisms invoked in Section 3. Hence, the same macroeconomic shock may generate very heterogeneous labour market reactions in countries with different institutions.

The regression sample is defined as follows. It covers 20 European countries and the US. We split the observation period from 1999 to 2013 into five three-year sub-periods, i.e. 1999 to 2001, 2002 to 2004, 2005 to 2007, 2008 to 2010, and 2011 to 2013. For each sub-period, we compute averages of yearly unemployment and transition rates, as well as of real annual GDP growth rates. This implies three advantages compared to the use of annual data. First, as argued in Blanchard and Wolfers (2000), the slow movement of institutions only justifies a model in which all variables are summarized over a longer period of time. Second, it diminishes autocorrelation, i.e. it reduces the degree of first-order autocorrelation in the error term, which would lead to wrong standard errors and inference. Finally, business cycle effects are smoothed, allowing us to abstract from short-run labour market reactions. The eight labour market institution measures described in detail in Section 3 are constructed as deviations from the cross-country mean following Blanchard and Wolfers (2000). Table A.3 illustrates descriptive statistics of all variables employed in the benchmark regressions.

The main concerns for identification are endogeneity of labour market institutions and shock measures, multicollinearity of the institutional set, autocorrelation and heteroscedasticity. First, endogeneity arises from reverse causality between the evolution of labour markets on the one hand and institutions and shocks on the other hand. Put differently, labour market reforms can take place as a reaction to adverse or advantageous labour market conditions. Second, changes in GDP may be driven by labour market reactions. Therefore, our benchmark specification estimating equations (1) and (2) using time-varying institutional measures, is potentially subject to an endogeneity problem. In order to deal with these issues, we follow four strategies. Foremost, we reduce the endogeneity of GDP by using 3-year averages. With respect to

institutional endogeneity, we restrict the variation in the institutional variables by considering only their values in the first year for each time window. In addition, we perform a robustness test in which we fix institutions to their level in the first years of our observation period, 1999. Thus, changes in labour market institutions are eliminated after 1999. Finally, we check whether the estimates are sensitive to substituting the measures with their respective 3-year-lagged values.

Multicollinearity between institutional measures arises if the indicators are strongly correlated with each other. As Table A.2 illustrates, this is clearly an issue here. Moreover, institutions change very slowly over time. Therefore, the value of one institution in period t in a country is correlated with the same institution in the adjacent periods. Typically, the consequences of multicollinearity are particularly sensitive estimates and inflated standard errors. Hence, we run both models on five subsets of institutions to check the stability of our estimates.

Finally, autocorrelation and heteroscedasticity are of concern in our regression specification. The application of 3-year-intervals of all variables should reduce the severity of this identification threat.

5 Results

5.1 Main Analysis

We begin to examine the role of labour market institutions for the reaction patterns of national labour markets over the business cycle with the unobserved shocks model introduced in Section 4. Table 1 displays the regression results of our three labour market outcomes, the unemployment rate, the transition rate from employment to unemployment and the transition rate from unemployment to employment. Note that when interpreting the coefficients, we focus on those which are stable across the specifications of a given regression model.

The analysis indicates that the level of wage bargaining and the degree of union coverage account for a notable part of the heterogeneity in the trajectory of the unemployment rate across countries. In particular, a coordinated wage bargaining process reduces the impact of shocks to national labour markets; furthermore, there is some (weak) evidence that a higher union coverage rate amplifies the magnitude of the reactions. Both relationships are in line with Blanchard and Wolfers (2000)' findings and with theoretical predictions and consistent with the view that trade unions influence labour markets ambiguously. On the one hand, strong trade unions establish wage rigidities reinforcing negative shocks. On the other hand, they relate to more coordination providing a basis for internalising detrimental effects, which turns out to be the dominant influence in the subsequent analysis. Furthermore, the results suggest that the other labour market

institutions considered in our analysis cannot explain the observed movements in the unemployment rate.

Turning to labour market transitions between employment and unemployment, we get the general picture that the interaction of shocks and institutions is a negligible factor for these flows in the unobserved shocks model. Note however that the estimates for union density concerning the worker flows to unemployment are close to significance implying that a higher share of union members in a country is associated with lower layoffs, a result which is mirrored in the observed shocks model discussed below.

As the unobserved shocks model displays a general lack of significant explanatory variables, the question arises whether this model is well-specified. In this context, it is worth noting that all executed regressions with the unobserved shocks model exhibit an R-squared value ranging from 0.70 to 0.74 (see Table 1). By contrast, the R-squared values of the observed shocks model lie in the interval from 0.95 to 0.98 (see Table 2). This implies that the assumption that the business cycle is the same across countries is not adequate for the period analysed, 1999 to 2013. Furthermore, with respect to the fit, the observed country-specific shocks model outperforms the unobserved shocks model.[9]

Contrary to this result, Blanchard and Wolfers (2000) conclude that the empirical model with unobserved shocks predicts the trajectory of unemployment patterns better. As they investigate the time period 1965 to 1994, one explanation for this discrepancy could be that the heterogeneity of recessions and economic upturns across countries has increased over time. Indeed, Table A.4 shows that this holds true. The variation in annual GDP growth rates across countries in our sample during the latest recessions rose from one recession to the next. Therefore, we proceed with the observed shocks model as our benchmark model for the further investigation.

As expected, the shock measure in the observed shocks model, the annual GDP growth rate, is highly significant and negatively correlated with the unemployment rate and transitions out of employment (Table 2). The correlation between GDP growth and worker flows from unemployment to employment is positive. The significance of this correlation is not as clear-cut as for the worker flows in the opposite direction, which is not surprising as the matching process on the labour market weakens the influence of the business cycle. For countries with mean values for all institutions ($X = 0$) unemployment decreases by about 0.5 percentage points as GDP growth rises by one percentage point. This is very similar to reported coefficients from Okun's Law (Perman et al., 2015).

With respect to the interaction of shocks and institutions, the unemployment benefit system (the replacement rate and the length of benefit entitlements) does not play a role neither for the unemployment rate,

[9]The root-mean-square error of the unemployment rate regression including the full set of institutions corresponds to 2.099 for the unobserved and to 2.088 for the observed model. The values of the employment to unemployment transition are 0.768 and 0.600, respectively. A comparison of the unemployment to employment transition is impossible since the unobserved model does not converge.

nor for worker transitions between employment and unemployment. This is probably due to the fact that our period of analysis is strongly influenced by the Great Recession, i.e. the results are mainly driven by the labour market reactions during an economic downturn. As spelt out in detail in Section 3, this means that the impact of the unemployment benefit system can be expected to be relatively weak. The same explanation is likely to apply to the non-significance of ALMP. It is much more important during an economic upswing than during a recession. Again, as our results are mainly driven by the Great Recession, this is a probable explanation for the lack of significance of the variable. The tax wedge is also hardly significant. As it turns out below, this picture changes when looking at different business cycle phases.

The interaction of GDP and employment protection also does not seem to play a role for the evolution of labour markets, both with respect to stocks and flows. For the unemployment stock, this is in line with the literature which does not yield consistent results with respect to the effects of EPL on the unemployment stock (e.g. Bertola, 1990; Boeri, 1999; Nickell et al., 2005). As for flows, a standard steady-state search-and-matching model such as Mortensen and Pissarides (1994), predicts a clear negative correlation between worker flows and EPL. However, recent cross-country evidence shows that employment protection does not necessarily reduce transitions from employment to non-employment (Bassanini and Garnero, 2013).

Furthermore, the effect of EPL on labour market dynamics seems to be weaker when trend growth is higher, and stronger when trend growth is lower (Bentolila and Bertola, 1990; Messina and Vallanti, 2007). Our results lend support to this conclusion because the time period analysed includes a relatively long period of sustained growth (i.e. the time period before the Great Recession), which dampens the effect of EPL on worker flows. This picture is corroborated by our separate analysis of upturns and downturns, which is described below.

As for the importance of trade unions, the significant results for coordination and union coverage in the unobserved shocks model do not materialize in the observed shocks model. Nevertheless, the direction of the respective estimates are broadly the same. Furthermore, another variable capturing the role of trade unions, union density, is generally significant at conventional levels for all outcomes and specifications. In particular, union density is negatively correlated with the unemployment rate, worker flows from employment to unemployment, as well as worker flows from unemployment to employment (although only weakly so in the latter case). Evaluating the equation for unemployment at a GDP growth of -1 percent implies that an increase in union density of 1 percentage point is associated with a decrease in unemployment of about 0.02 percentage points. Given that union density varies between 6.9% and 81.6% in our country sample (see Table A.1), this seems like a large impact. For a GDP growth rate of 1 percent the relationship becomes -0.02 percentage points.

Table 1: Unobserved shocks model

Dependent Variable	**U**					**E to U**					**U to E**		
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*IV*
Replacement Rate	−0.055	−0.048	0.026	−0.054	−0.022	−0.006	0.008	0.017	−0.006	−0.030	0.000	−0.065	0.011
	(−1.49)	(−1.26)	(0.73)	(−1.47)	(−0.37)	(−0.23)	(0.32)	(0.59)	(−0.24)	(−0.75)	(0.00)	(−0.09)	(0.12)
Benefit Length					0.063					0.070			
					(0.94)					(1.50)			
Employment Protection	−0.017	−0.290	−0.160	−0.010	−0.084	0.318	0.131	0.126	0.315	0.169	1.241	0.157	1.147
	(−0.04)	(−0.54)	(−0.28)	(−0.02)	(−0.14)	(0.77)	(0.30)	(0.28)	(0.76)	(0.38)	(0.86)	(0.02)	(0.71)
Union Coverage	0.025	0.041	0.061*	0.021	0.067	−0.008	0.004	0.020	−0.010	0.015	−0.027	0.388	−0.005
	(1.31)	(1.66)	(1.82)	(1.07)	(1.66)	(−0.56)	(0.25)	(0.94)	(−0.66)	(0.73)	(−0.60)	(0.16)	(−0.10)
Union Density		−0.034	0.027		0.014		−0.034	−0.025		−0.034		−1.123	
		(−1.43)	(1.00)		(0.41)		(−1.63)	(−1.13)		(−1.30)		(−0.17)	
Coordination			−1.811**		−1.761**			−0.440		−0.238			
			(−2.25)		(−2.08)			(−1.05)		(−0.56)			
ALMP					−0.215					−0.359			
					(−0.20)					(−0.29)			
Tax Wedge				0.024	0.016				0.017	0.004			−0.137
				(0.55)	(0.28)				(0.46)	(0.10)			(−0.79)
Observations	105	105	105	105	105	102	102	102	102	102	104	104	104
R-squared	0.708	0.718	0.736	0.709	0.742	0.711	0.725	0.726	0.712	0.736	0.699	0.726	0.700

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Time and country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.
Specifications III and V including the measure for coordination do not converge for the dependent variable transition from unemployment to employment and are therefore not displayed in the table above.

Table 2: Observed shocks model

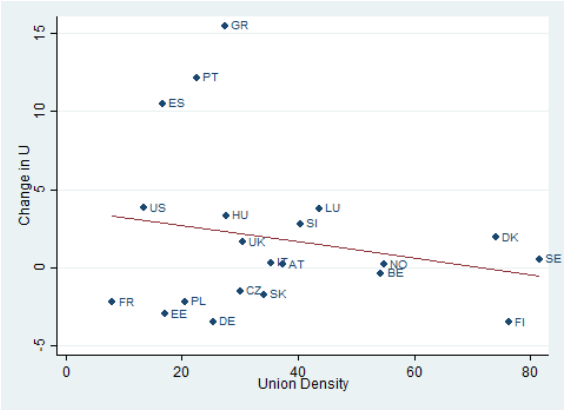
Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.457***	−0.477***	−0.478***	−0.459***	−0.507***	−0.226***	−0.233***	−0.233***	−0.226***	−0.242***	0.502	0.546*	0.549*	0.497	0.592*
	(−3.50)	(−3.77)	(−3.76)	(−3.51)	(−3.92)	(−5.49)	(−6.19)	(−6.17)	(−5.46)	(−6.32)	(1.65)	(1.85)	(1.85)	(1.63)	(1.96)
Replacement Rate	−0.001	0.019	0.018	−0.000	−0.002	0.003	0.020	0.020	0.003	−0.012	−0.025	0.016	0.014	−0.027	−0.012
	(−0.05)	(0.90)	(0.84)	(−0.01)	(−0.06)	(0.17)	(1.59)	(1.54)	(0.18)	(−0.54)	(−0.44)	(0.36)	(0.32)	(−0.46)	(−0.16)
Benefit Length					−0.004					0.027					−0.013
					(−0.11)					(1.02)					(−0.16)
Employment Protection	−0.039	−0.298	−0.339	−0.050	−0.266	0.125	−0.121	−0.145	0.123	−0.115	−0.008	−0.512	−0.585	0.013	−0.552
	(−0.10)	(−0.79)	(−0.88)	(−0.13)	(−0.73)	(0.49)	(−0.54)	(−0.63)	(0.48)	(−0.51)	(−0.01)	(−0.66)	(−0.74)	(0.01)	(−0.74)
Union Coverage	0.001	0.013	0.010	−0.001	0.006	−0.006	0.005	0.004	−0.007	0.002	0.016	0.038	0.033	0.018	0.026
	(0.07)	(1.18)	(0.85)	(−0.07)	(0.56)	(−1.00)	(0.87)	(0.56)	(−1.01)	(0.32)	(0.68)	(1.32)	(1.14)	(0.75)	(0.98)
Union Density		−0.043**	−0.046**		−0.052**		−0.041***	−0.043***		−0.047***		−0.084	−0.088		−0.104*
		(−2.19)	(−2.22)		(−2.43)		(−3.47)	(−3.45)		(−3.71)		(−1.53)	(−1.54)		(−1.71)
Coordination			0.152		0.194			0.085		0.162			0.272		0.675
			(0.57)		(0.68)			(0.53)		(0.93)			(0.49)		(1.04)
ALMP					1.333					0.963					1.818
					(1.39)					(1.65)					(0.91)
Tax Wedge				0.022	−0.002				0.003	−0.020				−0.040	−0.082
				(0.82)	(−0.08)				(0.18)	(−1.13)				(−0.65)	(−1.18)
Observations	105	105	105	105	105	102	102	102	102	102	104	104	104	104	104
R-squared	0.947	0.951	0.951	0.947	0.952	0.955	0.963	0.964	0.955	0.965	0.975	0.977	0.977	0.975	0.978

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

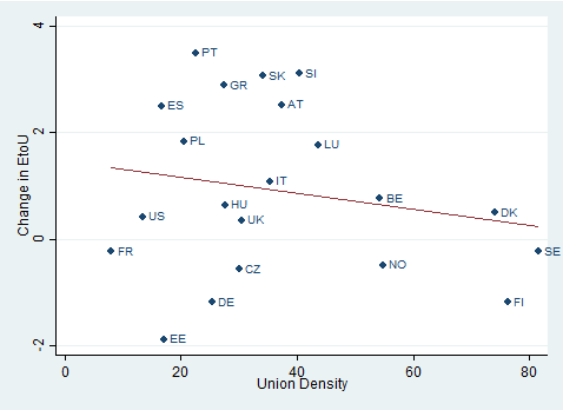
This relationship can be illustrated by correlating union density with changes in unemployment (Figure 4, panel (a)) and with changes in the transition rate from employment to unemployment (Figure 4, panel (b)), where the change considered is between the years 1999 and 2013. From these correlations, it becomes apparent that countries with higher union density experienced a lower increase in unemployment, and lower transition rates from employment to unemployment were a major contributing factor to this. Our findings results, in turn, show that this conclusion remains intact when considering the size of the economic shock, particularly in interaction with labour market institutions.

Figure 4: Relationship between union density and labour market reactions, 1999 and 2013

(a) Unemployment rate



(b) Transition rate from employment to unemployment



Notes: See Figure 1 for the country codes.
Source: EU-LFS, CPS, ICTWSS, own calculation.

Since it is very consistent across our model specifications, we examine the role of union density in more detail. The estimations suggest that higher union density in a country is associated with more moderate labour market reactions to shocks. The observed pattern may be driven by trade unions aiming to protect employed workers from unemployment, which leads to segregated labour markets. These are characterised by a situation where insiders, i.e. workers employed in stable jobs, gain and outsiders, i.e. persons who are not employed or very rarely so, face difficulties to enter the labour market at all. An alternative mechanism by which unions influence labour market dynamics is an adjustment at the intensive margin such as the reduction of working hours during the Great Recession, implemented for example in Germany by a short-time work scheme. However, for our main finding, the indirect influence of union density, using working hours provided by Ohanian and Raffo (2012), we find in the Great Recession period neither a negative correlation between union density and working hours nor a statistically significant negative relationship using fixed effects OLS regression techniques. Therefore, the intensive margin does not play an important role in our context. Following either of these lines of reasoning – segregated labour markets or adjustment along the intensive margin –, we expect to find that union density relates to lower unemployment outflows during

economic growth periods and lower employment outflows in recessions.

To test this hypothesis, we conduct separate regressions for periods of economic boom and bust. Accordingly, we replace the interaction term with a growth or recession dummy, respectively.[10] Hence, the model still comprises the intensity of the shock. In the preceding analysis we have used 3-year-intervals instead of yearly observations to account for potential endogeneity in the shock and institution measures between the years. For this investigation we now rely on annual data in order to have sufficient observations.[11] Indeed, Tables A.6 and A.7 support the notion that union membership is related with more robust labour market reactions over the business cycle. The coefficients on union density imply countries with a high union membership display a smaller reduction in unemployment during an economic upturn. The same result materialises in recessions, i.e. strong union density reduces the adverse impact on the unemployment rate. The results for the worker flows confirm these findings.

Furthermore, the separate analysis with respect to business cycle periods shows that in economic growth periods, the level of wage coordination amplifies national labour market reactions. The opposite holds true for recession periods. Therefore, a high level of wage coordination is a favourable influence, which is in line with the literature, among others Bassanini and Duval (2006), Gal and Theising (2015) and Bertola (2017). Moreover, during recessions the benefit length and the tax wedge intensify, whereas EPL weakly cushions the adverse effects on the labour market. The first result can be explained by a longer benefit length slowing down the unemployment exit rate; however, this result seems particular to the Great Recession, as research for earlier time periods has shown that the unemployment benefit system plays a more important role in boom than in recession periods (Schmieder et al., 2012). The negative link with the tax wedge is in line with existing research (Belot and Van Ours, 2004; Nickell, 1997). Interestingly, this result only materialises in the recession sample, which can be viewed as an indication that the negative labour-demand effects described in Section 3 play a dominant role in this context. The result on EPL stands in contrast to the non-significant effect of EPL on labour market flows indicated above for the entire time period. However, our finding of a significantly negative effect of EPL for recession periods is in line with and confirms the result by Bentolila and Bertola (1990) and Messina and Vallanti (2007) that the impact of EPL is stronger the weaker trend growth is, as well as evidence on the stabilising role of EPL on job tenure during the Great Recession in Europe (Bachmann and Felder, 2018).

Overall, our investigation indicates that institution variables related to trade unions exhibit explanatory power for the prevailing patterns in labour market dynamics across countries. Specifically, we find that the

[10] This means that in equation 2, we use $Y_{it} * X^j_{it} * D_{it}$ instead of $Y_{it} * X^j_{it}$, where D_{it} takes the value 1 in case of a recession, and 0 otherwise, or the reverse in case of an economic boom. A recession is defined as a negative or zero yearly GDP growth rate. Accordingly, an economic boom is defined by a positive GDP growth rate.

[11] Table A.5 displays the estimates of the benchmark model using annual data. The results are very similar compared to applying three-year windows.

interaction of shocks with union density weakens labour market reactions. Strong trade unions tend to lower employment growth in economic upturns and employment contractions in recessions, which overall results in more moderate reactions of the unemployment rate over the business cycle.

5.2 Robustness

In order to support our conclusions with respect to the determining role of trade unions in shaping unemployment and worker transitions between employment and unemployment, we run a battery of robustness tests.

First, we present estimates testing for endogeneity in our benchmark regression. Endogeneity poses a threat for identification, because of the potential for reverse causality between the evolution of national labour markets on the one hand, and institutions and shocks on the other hand. Institutional reforms may be induced by unfavourable labour market conditions, and changes in labour market dynamics may influence the business cycle, respectively. We therefore run regressions with (i) institution measures lagged by one period and (ii) institution measures fixed at their values for the year 1999 instead of using contemporary values.

The results of these sensitivity tests show that generally, our benchmark conclusions are robust (Tables A.8 and A.9). In particular, the moderating role of trade unions for labour markets is a consistent result. However, in the specifications controlling for union density, the lagged model indicates that union coverage adversely influences worker flows from employment to unemployment. This points to the two opposing features of trade unions discussed in Section 3. On the one hand, trade unions establish wage rigidities which reinforce negative macroeconomic shocks, while on the other hand trade unions aim at making jobs more secure, which has effects in the opposite direction.

To investigate the endogenous nature of the GDP growth rate with unemployment we run Granger causality tests. The results suggest that reverse causality is not an important concern for most countries since we can reject for 15 countries that unemployment Granger causes GDP growth. Furthermore, we replace the GDP growth rate with its one period lagged value as well as with an alternative measure for macroeconomic conditions, the output gap. Both robustness tests do not change our results and conclusions significantly (results available from the authors upon request).

Second, we assess the sensitivity of our benchmark model to changes in the sample. We exclude countries that represent extreme cases with respect to the intensity of the Great Recession. Portugal, which was hit strongly by the economic recession and which features very strong employment protection, is omitted in Table A.10. The smoothing behaviour of trade unions on labour market dynamics over the business cycle

is confirmed by the regression. Additionally, the estimates without the observations of Portugal imply that the effects of a negative economic shock on national labour markets are less pronounced in countries with higher EPL, which is line with the investigation of economic upturns only. Excluding Germany (Table A.11), a country where the labour market was hardly affected by the Great Recession, also leaves the conclusions of the main specification intact. Additionally, we run separate regressions where we remove two country groups (the Nordic and the East European Countries), and individual countries (Belgium, Denmark, France, Spain and the US) from the sample. The findings are robust to these alterations (results available from the authors upon request). Moreover, we estimate the influence of institutions on labour markets separately by gender and for young and old individuals. Institutions have a higher relevance for men and young individuals (results available from the authors upon request).

Third, we check the robustness by accounting for temporary employment. Since temporary workers are less costly to lay off for firms than regular workers, the share of temporary employees is an indicator for the flexibility of labour markets. We expect that countries with a high rate of temporary workers experience higher adverse reactions in unemployment and in worker outflows from employment. Indeed, Table A.12 provides evidence for this perception. Controlling for temporary employment, the transition rate from employment to unemployment is not adversely influenced by union coverage as suggested by other specifications. This may be due to the additional collinearity imposed on the model. Nevertheless, the importance of union density in influencing national labour markets is strongly reflected.

Fourth, we assess whether including movements out of the labour force change our main results. This is of interest as it has been argued that such worker flows are an important aspect of the cyclical features of the labour market Ebell (2011). We therefore extend our analysis to aggregate employment outflows to both unemployment and nonparticipation. The corresponding results presented in Table A.13 are similar to the estimation results for transitions from employment to unemployment. Therefore, taking into account the participation margin does not alter our main results.

Finally, for our analysis distinguishing between booms and recessions, instead of running regressions on separate estimation samples, we run the regressions on the pooled sample and include asymmetric interaction effects for economic recession and boom periods. This yields very similar results to the regressions on separate samples.

6 Conclusion

In this paper, we examine the reasons for cross-country differences in labour market dynamics for a large number of European countries as well as the US for the time period 1999 to 2013. Thereby, we focus on both

the unemployment rate and worker flows between employment and unemployment, which we compute from micro data at the worker level. In our analysis, we employ the methodology of Blanchard and Wolfers (2000) to separately identify the impact of shocks on the one hand, and the transmission of shocks to national labour markets through the institutional framework on the other hand. We thus extend the existing literature by (i) explicitly analysing worker flows, in addition to the unemployment rate, and (ii) analysing the time period of the Great Recession as well as the preceding decade.

Our results suggest that institutions play an important channeling role of macroeconomic shocks to national labour markets. While this is not the case for the unemployment benefit system, the results of our empirical analysis provide evidence for the importance of trade unions in this context. Specifically, union density, i.e. the share of union members, relates to more moderate labour market reactions to shocks. This result is more pronounced for worker flows from employment to unemployment than for worker flows from unemployment to employment. In particular, the analysis shows that trade unions tend to reduce employment growth in economic upturns and employment contractions in recessions. As a result, the unemployment rate in countries with stronger trade unions features a lower variation over the business cycle. Our results furthermore confirm findings from the literature that employment protection legislation becomes more important for labour market flows when the trend growth of the economy is low (e.g. Bentolila and Bertola, 1990; Messina and Vallanti, 2007). Finally, we show the negative link between the tax wedge and unemployment only materializes in the recession and is therefore likely to be driven by labour-demand considerations.

In order to analyse the robustness of our results, we conduct a number of tests. It turns out that the potential endogeneity of both shocks and institutions, country outliers with respect to institutions and the depth of the recession, and the importance of temporary employment in national labour markets do not significantly affect our analysis. Furthermore, including the participation margin, i.e. worker transitions out of the labour market, also does not alter our main conclusions.

Our results with respect to trade unions stand in contrast to Blanchard and Wolfers (2000) and Nickell (1997) who show that up to the mid-1990s strong unions were positively associated with unemployment. However, the results are partially in line with Bassanini and Duval (2006) who study a more recent period from 1982 to 2003 and who also find a dampening role of unions. Moreover, we examine the Great Recession, an extreme case of an economic downturn in history, which caused heterogeneous, but at the same time strong and persistent labour market reactions a countries.

The welfare implications of our results with respect to trade unions are not clear-cut. On the one hand, lower volatility of unemployment (i.e. lower unemployment inflows and outflows) is associated with higher subjective well-being (Wolfers, 2003), which means that unions would be welfare-enhancing. On the other hand, lower volatility of unemployment is likely to go together with a lower permeability of labour markets.

This implies the existence of segregated labour markets where a part of the workforce benefits from stable employment relationships while another part of the workforce has great difficulties entering the labour market or only attains low-paid and/or unstable jobs. In this respect, unions would be welfare-decreasing.

Against this background, two lines of further research appear particularly interesting. First, the exact mechanisms by which unions reduce unemployment fluctuations should be investigated, which only appears possible with linked employer-employee data containing information on both the worker and the firm side. Second, dual labour markets imply the existence of winners and losers. It is therefore of great interest to examine which groups of the population gain and which ones lose out because of lower employment volatility, which would also allow for a rigorous analysis of the welfare effects indicated above.

References

Bachmann, R., Bechara, P., Kramer, A. and Rzepka, S. (2015), 'Labour market dynamics and worker heterogeneity during the Great recession - Evidence from Europe', *IZA Journal of European Labor Studies* **4**(19).

Bachmann, R. and Felder, R. (2018), 'Job stability in Europe over the cycle', *International Labour Review* (forthcoming).

Bassanini, A. and Duval, R. (2006), 'The determinants of unemployment across OECD countries: Reassessing the role of policies and institutions', *OECD Economic Studies* **42**(1), 7–86.

Bassanini, A. and Garnero, A. (2013), 'Dismissal protection and worker flows in oecd countries: Evidence from cross-country/cross-industry data', *Labour Economics* **21**, 25–41.

Belot, M. and Van Ours, J. C. (2004), 'Does the recent success of some OECD countries in lowering their unemployment rates lie in the clever design of their labor market reforms?', *Oxford Economic Papers* **56**(4), 621–642.

Bentolila, S. and Bertola, G. (1990), 'Firing costs and labour demand: how bad is eurosclerosis?', *The Review of Economic Studies* **57**(3), 381–402.

Bertola, G. (1990), 'Job security, employment and wages', *European Economic Review* **34**(4), 851–879.

Bertola, G. (2017), 'European unemployment revisited: Shocks, institutions, integration', *Research in Economics* **3**(71), 588–612.

Bertola, G. and Rogerson, R. (1997), 'Institutions and labor reallocation', *European Economic Review* **41**(6), 1147–1171.

Blanchard, O. (1999), 'European unemployment: The role of shocks and institutions'. Baffi Lecture Rome.

Blanchard, O. and Wolfers, J. (2000), 'The role of shocks and institutions in the rise of European unemployment: The aggregate evidence', *The Economic Journal* **110**(462), 1–33.

Boeri, T. (1999), 'Enforcement of employment security regulations, on-the-job search and unemployment duration', *European Economic Review* **43**(1), 65–89.

Boeri, T. and Van Ours, J. (2013), *The economics of imperfect labor markets*, Princeton University Press.

Burda, M. C. and Hunt, J. (2011), 'What explains the German Labor Market Miracle in the Great Recession?', *Brookings Papers on Economic Activity* **2011**(1), 273–319.

Burda, M. C. and Weder, M. (2016), 'Payroll taxes, social insurance, and business cycles', *Journal of the European Economic Association* **14**(2), 438–467.

Card, D., Kluve, J. and Weber, A. (2010), 'Active labour market policy evaluations: A meta-analysis', *The Economic Journal* **120**(November), F452–F477.

Card, D., Kluve, J. and Weber, A. (2017), 'What works? A meta analysis of recent active labor market program evaluations', *Journal of the European Economic Association* (forthcoming).

Colonna, F. (2010), 'Does union membership increase job security? Evidence from British panel data'. Mimeo.

de Serres, A. and Murtin, F. (2013), Do policies that reduce unemployment raise its volatility?, OECD Economics Department Working Paper 1020.

Ebell, M. (2011), 'On the cyclicality of unemployment: Resurrecting the participation margin', *Labour Economics* **18**(6), 822–836.

Eichhorst, W., Feil, M. and Marx, P. (2010), 'Crisis, what crisis? Patterns of adaptation in European labor markets', *Applied Economics Quarterly* **61**(Supplement), 29–64.

Elsby, M., Hobijn, B. and Sahin, A. (2013), 'Unemployment dynamics in the OECD', *Review of Economics and Statistics* **95**(2), 530–548.

Elsby, M. W., Michaels, R. and Solon, G. (2009), 'The ins and outs of cyclical unemployment', *American Economic Journal: Macroeconomics* **1**(1), 84–100.

European Central Bank (2012), Euro are labour markets and the crisis, ECB Occasional Paper Series 138.

Eurostat (2014), 'Harmonized unemployment rate'. `http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=teilm020`, accessed 03/02/2014.

Flood, S., King, M., Ruggles, S. and Warren, J. R. (2015), Integrated public use Microdata Series, Current Population Survey: Version 4.0. [Machine-readable database], Technical report, Minneapolis: University of Minnesota.

Freeman, R. B. (1978), A fixed effect logit model of the impact of unionism on quits, NBER Working Paper 280.

Fujita, S. and Ramey, G. (2009), 'The cyclicality of separation and job finding rates', *International Economic Review* **50**(2), 415–430.

Gal, P. and Theising, A. (2015), The macroeconomic impact of policies on labour market outcomes in OECD countries, OECD Economics Department Working Paper 1271.

Goerke, L. and Pannenberg, M. (2011), 'Trade union membership and dismissals', *Labour Economics* **18**(6), 810–821.

Hijzen, A. and Martins, P. S. (2016), 'No extension without representation? evidence from a natural experiment in collective bargaining', *International Monetary Fund Working Paper 16/143* .

ILO (1988), *Current International Recommendations on Labour Statistics, 1988 Edition*, International Labour Organisation, Geneva.

Layard, P. R. G., Nickell, S. J. and Jackman, R. (2005), *Unemployment: Macroeconomic performance and the labour market*, Oxford University Press.

Layard, R., Nickell, S. J. and Jackman, R. (1991), *Unemployment: Macroeconomic performance and the labour market*, Oxford University Press.

McDonald, I. M. and Solow, R. M. (1981), 'Wage bargaining and employment', *The American Economic Review* **71**(5), 896–908.

Medoff, J. L. (1979), 'Layoffs and alternatives under trade unions in US manufacturing', *The American Economic Review* **69**(3), 380–395.

Messina, J. and Vallanti, G. (2007), 'Job flow dynamics and firing restrictions: evidence from europe', *The Economic Journal* **117**(521).

Mortensen, D. T. and Pissarides, C. A. (1994), 'Job creation and job destruction in the theory of unemployment', *The review of economic studies* **61**(3), 397–415.

Mortensen, D. T. and Pissarides, C. A. (1999), *New developments in models of search in the labor market*, Handbook of Labor Economics, in: O. Ashenfelter & D. Card (ed.), Edition 1, Chapter 39, 2567–2627, Elsevier.

Nickell, S. (1997), 'Unemployment and labor market rigidities: Europe versus North America', *The Journal of Economic Perspectives* **11**(3), 55–74.

Nickell, S. J. and Andrews, M. (1983), 'Unions, real wages and employment in Britain 1951-79', *Oxford Economic Papers* **35**(Supplement), 183–206.

Nickell, S., Nunziata, L. and Ochel, W. (2005), 'Unemployment in the OECD since the 1960s. What do we know?*', *The Economic Journal* **115**(500), 1–27.

Nunziata, L. (2002), Unemployment, labour market institutions and shocks, Economics Series Working Papers 2002-w16.

OECD (2013), *OECD Employment Outlook 2013*, OECD Publishing.

Ohanian, L. E. and Raffo, A. (2012), 'Aggregate hours worked in OECD countries: New measurement and implications for business cycles', *Journal of Monetary Economics* **59**(1), 40–56.

Orlandi, F. (2012), Structural unemployment and its determinants in the EU countries, European Economy - Economic Papers 455, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

Perman, R., Stephan, G. and Tavra, C. (2015), 'Okun's Law - A meta-analysis', *The Manchester School* **83**(1), 101–126.

Petrongolo, B. and Pissarides, C. A. (2008), 'The ins and outs of european unemployment', *The American Economic Review* **98**(2), 256–262.

Scarpetta, S. (1996), 'Assessing the role of labour market policies and institutional settings on unemployment: A cross-country study', *OECD Economic studies* **26**(1), 43–98.

Schmieder, J. F. and von Wachter, T. (2016), 'The effects of unemployment insurance benefits: New evidence and interpretation', *Annual Review of Economics* **8**, 547–581.

Schmieder, J. F., von Wachter, T. and Bender, S. (2012), 'The effects of extended unemployment insurance over the business cycle: Evidence from regression discontinuity estimates over 20 years', *The Quarterly Journal of Economics* **127**(2), 701–752.

Traxler, F. and Kittel, B. (2000), 'The bargaining system and performance a comparison of 18 OECD countries', *Comparative Political Studies* **33**(9), 1154–1190.

Wolfers, J. (2003), 'Is business cycle volatility costly? Evidence from surveys of subjective well-being', *International Finance* **6**(1), 1–26.

Yashiv, E. (2008), 'U.S. labor market dynamics revisited', *Scandinavian Journal of Economics* **109**(4), 779–806.

Appendix A Figures and Tables

Figure A.1: Annual GDP growth by country, 1999 – 2013

Notes: Country codes: AT: Austria, BE: Belgium, CZ: Czech Republic, DE: Germany, DK: Denmark, EE: Estonia, ES: Spain, FI: Finland, FR: France, GR: Greece, HU: Hungary, IT: Italy, LU: Luxembourg, NO: Norway, PL: Poland, PT: Portugal, SE: Sweden, SI: Slovenia, SK: Slovak Republic, UK: United Kingdom, US: United States of America.
Source: Economic Outlook No. 95, own calculation.

Figure A.2: Employment protection legislation by country, 1999 – 2013

Notes: See Figure A.1 for the country codes.
Source: OECD Indicators of Employment Protection (2013).

Figure A.3: Union density rate by country, 1999 – 2013

Notes: See Figure A.1 for the country codes.
Source: ICTWSS.

Table A.1: Descriptive statistics of labour market institutions

Institution Measure	Obs.	Mean	Std. Dev.	Min	Max
Replacement Rate	105	37.26	15.51	19.44	71.67
Benefit Length	105	17.37	12.21	5.00	48.00
Employment Protection	105	2.36	0.77	0.26	4.58
Union Coverage	105	64.63	28.02	0	100.00
Union Density	105	32.76	20.50	6.89	81.58
Coordination	105	2.83	1.31	1.00	5.00
ALMP	105	0.62	0.45	0.07	2.21
Tax Wedge	105	31.94	8.24	9.88	44.32

Source: OECD Economic Outlook 95, ICTWSS, own calculations.

Table A.2: Pairwise correlations across labour market institutions, total variation

	Replacement Rate	Benefit Length	Employment Protection	Union Coverage	Union Density	Coordination	ALMP
Benefit Length	0.78^{***}	1.00					
Employment Protection	0.12	0.02	1.00				
Union Coverage	0.63^{***}	0.47^{***}	0.37^{***}	1.00			
Union Density	0.48^{***}	0.49^{***}	-0.012	0.52^{***}	1.00		
Coordination	0.58^{***}	0.49^{***}	0.20^{**}	0.74^{***}	0.67^{***}	1.00	
ALMP	0.67^{***}	0.57^{***}	0.10	0.56^{***}	0.59^{***}	0.51^{***}	1.00
Tax Wedge	0.27^{***}	0.27^{***}	0.16	0.40^{***}	0.17^{*}	0.43^{***}	0.36^{***}

Source: OECD Economic Outlook 95, ICTWSS, own calculations. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.

Table A.3: Descriptive statistics of the regression sample

Institution Measure	Obs.	Mean	Std. Dev.	Min	Max
Unemployment rate	105	8.63	4.15	2.19	24.41
Employment to Unemployment Rate	102	2.85	1.50	0.30	7.97
Unemployment to Employment Rate	104	31.11	9.46	9.67	55.72
GDP Growth	105	1.991	2.49	−5.98	8.81
Replacement Rate	105	0.00	15.51	−17.82	34.42
Benefit Length	105	0.00	12.21	−12.37	30.63
Employment Protection	105	0.00	0.77	−2.11	2.22
Union Coverage	105	0.00	28.02	−64.63	35.37
Union Density	105	0.00	20.50	−25.87	48.81
Coordination	105	0.00	1.31	−1.83	2.17
ALMP	105	0.00	0.44	−0.55	1.59
Tax Wedge	105	0.00	8.24	−22.06	12.38

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.

Table A.4: Heterogeneity of main economic recessions

Recessions	SD in GDP growth
1973-1975	0.962
1980-1982	1.115
2001-2003	1.593
2008-2009	2.242

Source: OECD Economic Outlook 95, own calculations.
SD (standard deviation) of the country average of yearly growth rates in the corresponding recession periods.

Table A.5: Observed shocks model, annual data

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.251***	−0.278***	−0.283***	−0.253***	−0.284***	−0.176***	−0.189***	−0.191***	−0.177***	−0.187***	0.151	0.195	0.195	0.149	0.176
	(−4.26)	(−4.72)	(−4.80)	(−4.29)	(−4.78)	(−7.39)	(−8.03)	(−8.06)	(−7.41)	(−7.86)	(0.76)	(0.98)	(0.97)	(0.75)	(0.88)
Replacement Rate	−0.019	0.005	0.005	−0.020	−0.023	0.003	0.018*	0.018*	0.002	−0.009	−0.186	−0.093	−0.093	−0.186	−0.468
	(−0.84)	(0.25)	(0.24)	(−0.91)	(−0.71)	(0.22)	(1.67)	(1.66)	(0.15)	(−0.45)	(−0.62)	(−0.59)	(−0.59)	(−0.61)	(−0.78)
Benefit Length					0.019					0.040*					0.376
					(0.57)					(1.93)					(0.79)
Employment Protection	0.050	−0.235	−0.273	0.032	−0.260	0.286	0.062	0.044	0.277	0.019	−1.973	−2.192	−2.192	−1.967	−2.378
	(0.14)	(−0.71)	(−0.84)	(0.09)	(−0.80)	(1.31)	(0.31)	(0.22)	(1.27)	(0.09)	(−0.66)	(−0.88)	(−0.88)	(−0.65)	(−0.81)
Union Coverage	0.004	0.017*	0.011	0.003	0.011	−0.000	0.010*	0.007	−0.001	0.009	0.020	0.048	0.047	0.021	0.058
	(0.43)	(1.78)	(1.06)	(0.33)	(1.05)	(−0.05)	(1.76)	(1.13)	(−0.14)	(1.38)	(0.34)	(0.76)	(0.68)	(0.36)	(0.67)
Union Density		−0.041***	−0.044***		−0.049***		−0.030***	−0.031***		−0.035***		−0.097	−0.098		−0.181
		(−2.76)	(−2.90)		(−2.99)		(−3.63)	(−3.72)		(−3.80)		(−0.88)	(−0.88)		(−0.87)
Coordination			0.233		0.197			0.102		0.083			0.007		0.197
			(1.08)		(0.90)			(0.80)		(0.63)			(0.01)		(0.17)
ALMP					0.898					0.146					8.524
					(1.03)					(0.28)					(0.81)
Tax Wedge				0.029	0.013				0.014	0.005				−0.041	−0.154
				(1.18)	(0.57)				(0.98)	(0.36)				(−0.28)	(−0.71)
Observations	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
R-squared	0.927	0.930	0.930	0.928	0.931	0.887	0.893	0.893	0.888	0.895	0.925	0.926	0.926	0.925	0.928

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.6: Observed shocks model, economic growth periods

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.250***	−0.268***	−0.267***	−0.248***	−0.281***	−0.179***	−0.187***	−0.187***	−0.179***	−0.186***	0.161	0.196	0.195	0.159	0.248
	(−4.44)	(−4.81)	(−4.85)	(−4.41)	(−5.07)	(−7.86)	(−8.35)	(−8.42)	(−7.84)	(−8.28)	(0.85)	(1.04)	(1.03)	(0.84)	(1.31)
Replacement Rate	−0.028	0.005	−0.005	−0.023	−0.016	0.003	0.023	0.018	0.003	−0.000	−0.257	−0.129	−0.138	−0.251	−0.380
	(−0.91)	(0.17)	(−0.17)	(−0.76)	(−0.41)	(0.20)	(1.49)	(1.16)	(0.19)	(−0.00)	(−0.69)	(−0.64)	(−0.65)	(−0.68)	(−1.10)
Benefit Length					−0.011					0.031					0.288
					(−0.28)					(1.24)					(1.06)
Employment Protection	0.472	0.203	0.019	0.518	0.156	0.411	0.238	0.139	0.410	0.164	−2.556	−2.741	−2.910	−2.500	−1.714
	(0.91)	(0.43)	(0.04)	(0.98)	(0.35)	(1.41)	(0.88)	(0.52)	(1.40)	(0.60)	(−0.71)	(−0.89)	(−0.90)	(−0.69)	(−0.86)
Union Coverage	0.007	0.023*	0.012	0.008	0.009	0.003	0.014*	0.008	0.003	0.008	0.006	0.050	0.039	0.008	0.027
	(0.56)	(1.74)	(0.85)	(0.63)	(0.70)	(0.43)	(1.84)	(0.96)	(0.42)	(1.02)	(0.09)	(0.67)	(0.55)	(0.12)	(0.50)
Union Density		−0.064***	−0.075***		−0.084***		−0.042***	−0.047***		−0.050***		−0.174	−0.183		−0.207
		(−2.83)	(−3.11)		(−3.48)		(−3.50)	(−3.85)		(−3.89)		(−0.95)	(−0.95)		(−1.24)
Coordination			0.713**		0.779**			0.381**		0.402**			0.643		0.713
			(2.30)		(2.57)			(2.33)		(2.40)			(0.45)		(0.62)
ALMP					1.846*					0.161					8.763
					(1.83)					(0.26)					(1.21)
Tax Wedge				−0.033	−0.072*				0.000	−0.019				−0.068	−0.214
				(−0.87)	(−1.93)				(0.01)	(−0.88)				(−0.32)	(−1.02)
Observations	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
R-squared	0.928	0.930	0.932	0.928	0.933	0.888	0.893	0.895	0.888	0.896	0.926	0.927	0.927	0.926	0.929

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.7: Observed shocks model, economic recession periods

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
Annual GDP Growth	−0.271***	−0.288***	−0.272***	−0.269***	−0.248***	−0.175***	−0.183***	−0.175***	−0.174***	−0.159***	0.240	0.258	0.237	0.240	0.204
	(−4.75)	(−5.02)	(−4.73)	(−4.81)	(−4.30)	(−7.57)	(−7.90)	(−7.59)	(−7.58)	(−6.78)	(1.25)	(1.32)	(1.20)	(1.24)	(1.00)
Replacement Rate	−0.019	0.016	0.018	−0.013	−0.094	0.003	0.029	0.031	0.005	−0.098	−0.106	−0.061	−0.065	−0.105	−0.295
	(−0.48)	(0.42)	(0.44)	(−0.35)	(−0.93)	(0.14)	(1.22)	(1.26)	(0.22)	(−1.51)	(−0.57)	(−0.36)	(−0.35)	(−0.56)	(−0.51)
Benefit Length					0.187*					0.132**					0.487
					(1.86)					(2.21)					(0.75)
Employment Protection	−0.944	−1.460*	−1.438*	−0.607	−1.783*	0.244	−0.209	−0.135	0.358	−0.387	−1.271	−1.825	−1.824	−1.216	−3.431
	(−1.27)	(−1.92)	(−1.80)	(−0.83)	(−1.92)	(0.52)	(−0.44)	(−0.27)	(0.75)	(−0.70)	(−0.44)	(−0.62)	(−0.57)	(−0.42)	(−0.72)
Union Coverage	0.000	0.020	0.065**	−0.005	0.087**	−0.007	0.009	0.042**	−0.009	0.058***	0.033	0.053	0.120	0.032	0.176
	(0.01)	(1.07)	(2.13)	(−0.29)	(2.38)	(−0.63)	(0.75)	(2.35)	(−0.79)	(2.77)	(0.48)	(0.68)	(0.82)	(0.46)	(0.79)
Union Density		−0.054*	−0.051*		−0.096**		−0.042**	−0.039**		−0.078***		−0.060	−0.056		−0.128
		(−1.93)	(−1.73)		(−2.29)		(−2.37)	(−2.14)		(−3.06)		(−0.56)	(−0.48)		(−0.64)
Coordination			−1.211**		−1.392**			−0.906**		−1.051***			−1.735		−1.835
			(−2.02)		(−2.07)			(−2.56)		(−2.64)			(−0.66)		(−0.58)
ALMP					0.567					2.690					−3.660
					(0.19)					(1.32)					(−0.29)
Tax Wedge				0.152***	0.156***				0.050*	0.043				0.025	0.003
				(2.79)	(2.66)				(1.75)	(1.37)				(0.15)	(0.01)
Observations	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
R-squared	0.928	0.929	0.930	0.930	0.937	0.887	0.889	0.892	0.888	0.897	0.925	0.925	0.925	0.925	0.925

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.8: Observed shocks model, lagged institutions

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.419***	−0.448***	−0.440***	−0.421***	−0.460***	−0.216***	−0.226***	−0.226***	−0.217***	−0.227***	0.458	0.514*	0.509*	0.453	0.486
	(−3.19)	(−3.59)	(−3.54)	(−3.20)	(−3.66)	(−5.19)	(−6.28)	(−6.23)	(−5.17)	(−6.26)	(1.50)	(1.73)	(1.70)	(1.48)	(1.60)
Replacement Rate	−0.014	0.007	0.005	−0.014	−0.048	−0.005	0.013	0.013	−0.005	−0.030	−0.042	−0.004	−0.004	−0.043	−0.060
	(−0.54)	(0.30)	(0.24)	(−0.53)	(−1.10)	(−0.32)	(1.05)	(1.03)	(−0.31)	(−1.24)	(−0.61)	(−0.08)	(−0.09)	(−0.62)	(−0.57)
Benefit Length					0.047					0.056*					0.068
					(0.97)					(1.90)					(0.58)
Employment Protection	0.288	−0.032	−0.173	0.249	−0.184	0.294	0.005	−0.008	0.288	−0.025	0.254	−0.282	−0.366	0.352	−0.446
	(0.61)	(−0.08)	(−0.41)	(0.53)	(−0.46)	(1.02)	(0.02)	(−0.03)	(0.99)	(−0.11)	(0.25)	(−0.35)	(−0.43)	(0.34)	(−0.49)
Union Coverage	0.009	0.023*	0.019	0.009	0.018	−0.001	0.013**	0.013*	−0.001	0.013*	0.026	0.048	0.046	0.027	0.044
	(0.82)	(1.89)	(1.53)	(0.80)	(1.51)	(−0.12)	(2.05)	(1.89)	(−0.13)	(1.94)	(0.89)	(1.38)	(1.31)	(0.91)	(1.20)
Union Density		−0.051**	−0.058**		−0.070***		−0.048***	−0.049***		−0.053***		−0.087	−0.091		−0.111
		(−2.46)	(−2.52)		(−2.75)		(−4.13)	(−4.00)		(−3.99)		(−1.49)	(−1.46)		(−1.43)
Coordination			0.287		0.326			0.026		0.048			0.165		0.541
			(1.18)		(1.24)			(0.20)		(0.34)			(0.34)		(0.82)
ALMP					1.497					0.627					0.766
					(1.59)					(1.19)					(0.37)
Tax Wedge				0.028	−0.024				0.005	−0.018				−0.070	−0.119
				(0.86)	(−0.68)				(0.24)	(−0.88)				(−0.85)	(−1.11)
Observations	105	105	105	105	105	102	102	102	102	102	104	104	104	104	104
R-squared	0.947	0.953	0.954	0.948	0.956	0.956	0.967	0.967	0.956	0.970	0.976	0.977	0.977	0.976	0.978

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.9: Observed shocks model, fixed institutions

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.416***	−0.435***	−0.442***	−0.418***	−0.458***	−0.218***	−0.227***	−0.227***	−0.218***	−0.227***	0.498	0.559*	0.573*	0.477	0.557*
	(−3.13)	(−3.30)	(−3.36)	(−3.12)	(−3.44)	(−5.11)	(−5.65)	(−5.61)	(−5.08)	(−5.61)	(1.58)	(1.81)	(1.85)	(1.50)	(1.77)
Replacement Rate	0.026	0.037	0.034	0.024	−0.023	0.004	0.016	0.016	0.003	−0.036	−0.006	0.024	0.020	0.012	−0.017
	(1.04)	(1.52)	(1.42)	(0.89)	(−0.49)	(0.23)	(1.10)	(1.08)	(0.18)	(−1.21)	(−0.11)	(0.53)	(0.44)	(0.22)	(−0.19)
Benefit Length					0.038					0.059*					0.043
					(0.70)					(1.68)					(0.40)
Employment Protection	0.375	0.237	0.097	0.365	0.100	0.315	0.172	0.165	0.312	0.150	0.454	0.116	−0.098	0.550	−0.123
	(0.79)	(0.54)	(0.22)	(0.77)	(0.24)	(1.12)	(0.70)	(0.64)	(1.10)	(0.60)	(0.47)	(0.15)	(−0.13)	(0.53)	(−0.16)
Union Coverage	−0.016	−0.010	−0.007	−0.014	−0.010	−0.005	0.001	0.002	−0.004	0.004	0.005	0.016	0.020	−0.005	0.007
	(−1.35)	(−0.93)	(−0.68)	(−1.16)	(−0.83)	(−0.72)	(0.24)	(0.25)	(−0.60)	(0.59)	(0.23)	(0.81)	(0.97)	(−0.21)	(0.33)
Union Density		−0.031	−0.050*		−0.069**		−0.034***	−0.035**		−0.041**		−0.074	−0.102		−0.140
		(−1.60)	(−1.89)		(−2.25)		(−2.97)	(−2.39)		(−2.50)		(−1.48)	(−1.54)		(−1.58)
Coordination			0.322		0.430			0.016		0.017			0.499		0.955
			(1.20)		(1.42)			(0.10)		(0.10)			(0.95)		(1.27)
ALMP					1.902					0.731					1.754
					(1.59)					(1.06)					(0.76)
Tax Wedge				0.008	−0.051				0.003	−0.010				−0.074	−0.143
				(0.24)	(−1.12)				(0.13)	(−0.38)				(−0.82)	(−1.24)
Observations	105	105	105	105	105	102	102	102	102	102	104	104	104	104	104
R-squared	0.949	0.950	0.951	0.949	0.954	0.956	0.962	0.962	0.956	0.964	0.975	0.977	0.977	0.975	0.978

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.10: Observed shocks model, without Portugal

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.410***	−0.423***	−0.435***	−0.415***	−0.473***	−0.207***	−0.212***	−0.214***	−0.208***	−0.226***	0.386	0.416	0.441	0.382	0.501*
	(−3.25)	(−3.43)	(−3.58)	(−3.29)	(−3.85)	(−5.14)	(−5.70)	(−5.86)	(−5.13)	(−6.18)	(1.35)	(1.48)	(1.60)	(1.32)	(1.80)
Replacement Rate	−0.032	−0.010	−0.021	−0.032	−0.049	−0.016	0.004	−0.002	−0.016	−0.043	−0.110	−0.054	−0.075	−0.111	−0.125
	(−1.04)	(−0.36)	(−0.73)	(−1.04)	(−1.16)	(−0.91)	(0.28)	(−0.12)	(−0.90)	(−1.62)	(−0.91)	(−0.66)	(−0.86)	(−0.90)	(−1.05)
Benefit Length					−0.001					0.031					−0.001
					(−0.02)					(1.19)					(−0.02)
Employment Protection	−1.029*	−1.151**	−1.479**	−1.067*	−1.343**	−0.439	−0.584**	−0.779**	−0.451	−0.756**	−2.401	−2.568	−3.214	−2.382	−2.976*
	(−1.87)	(−2.14)	(−2.53)	(−1.95)	(−2.57)	(−1.38)	(−2.00)	(−2.51)	(−1.41)	(−2.60)	(−1.22)	(−1.37)	(−1.53)	(−1.20)	(−1.70)
Union Coverage	0.006	0.017	0.007	0.004	0.002	−0.004	0.007	0.002	−0.004	−0.001	0.033	0.055	0.030	0.035	0.019
	(0.55)	(1.38)	(0.55)	(0.37)	(0.17)	(−0.59)	(1.08)	(0.25)	(−0.65)	(−0.09)	(0.93)	(1.23)	(0.93)	(0.94)	(0.71)
Union Density		−0.040*	−0.048**		−0.056**		−0.041***	−0.045***		−0.051***		−0.089	−0.102		−0.123
		(−1.91)	(−2.19)		(−2.55)		(−3.19)	(−3.44)		(−3.89)		(−1.25)	(−1.39)		(−1.65)
Coordination			0.558*		0.632*			0.312*		0.426**			1.224		1.732
			(1.71)		(1.89)			(1.71)		(2.20)			(1.24)		(1.56)
ALMP					1.787*					1.249**					3.010
					(1.81)					(2.12)					(1.24)
Tax Wedge				0.034	−0.012				0.009	−0.027				−0.030	−0.119
				(1.16)	(−0.43)				(0.49)	(−1.52)				(−0.41)	(−1.35)
Observations	100	100	100	100	100	97	97	97	97	97	99	99	99	99	99
R-squared	0.952	0.955	0.957	0.953	0.959	0.958	0.965	0.967	0.959	0.969	0.978	0.979	0.980	0.978	0.981

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.11: Observed shocks model, without Germany

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.472***	−0.485***	−0.484***	−0.474***	−0.514***	−0.231***	−0.234***	−0.233***	−0.231***	−0.244***	0.528*	0.556*	0.553*	0.525*	0.591*
	(−3.58)	(−3.82)	(−3.79)	(−3.59)	(−4.01)	(−5.55)	(−6.24)	(−6.20)	(−5.52)	(−6.44)	(1.70)	(1.85)	(1.83)	(1.69)	(1.94)
Replacement Rate	0.002	0.024	0.023	0.003	0.015	0.005	0.025*	0.024*	0.005	−0.002	−0.020	0.023	0.022	−0.022	0.013
	(0.09)	(1.13)	(1.08)	(0.14)	(0.40)	(0.33)	(1.90)	(1.85)	(0.34)	(−0.08)	(−0.37)	(0.53)	(0.49)	(−0.40)	(0.16)
Benefit Length					−0.027					0.013					−0.045
					(−0.62)					(0.47)					(−0.49)
Employment Protection	−0.022	−0.283	−0.332	−0.033	−0.252	0.130	−0.116	−0.143	0.128	−0.108	0.003	−0.496	−0.578	0.020	−0.539
	(−0.06)	(−0.76)	(−0.87)	(−0.08)	(−0.70)	(0.51)	(−0.52)	(−0.62)	(0.50)	(−0.49)	(0.00)	(−0.65)	(−0.72)	(0.02)	(−0.72)
Union Coverage	0.000	0.013	0.009	−0.001	0.004	−0.007	0.005	0.004	−0.007	0.001	0.014	0.037	0.032	0.017	0.023
	(0.02)	(1.17)	(0.80)	(−0.12)	(0.36)	(−1.03)	(0.85)	(0.51)	(−1.05)	(0.14)	(0.65)	(1.30)	(1.11)	(0.73)	(0.88)
Union Density		−0.045**	−0.048**		−0.058**		−0.042***	−0.044***		−0.051***		−0.085	−0.091		−0.113*
		(−2.23)	(−2.26)		(−2.56)		(−3.52)	(−3.49)		(−3.80)		(−1.51)	(−1.51)		(−1.68)
Coordination			0.178		0.268			0.098		0.200			0.293		0.769
			(0.65)		(0.91)			(0.61)		(1.12)			(0.51)		(1.08)
ALMP					1.616					1.113*					2.187
					(1.63)					(1.88)					(1.02)
Tax Wedge				0.023	−0.003				0.004	−0.019				−0.038	−0.082
				(0.85)	(−0.09)				(0.22)	(−1.12)				(−0.63)	(−1.15)
Observations	100	100	100	100	100	97	97	97	97	97	99	99	99	99	99
R-squared	0.946	0.951	0.951	0.947	0.953	0.956	0.964	0.964	0.956	0.966	0.975	0.977	0.977	0.975	0.978

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.12: Observed shocks model, with temporary employment

Dependent Variable	**U**					**E to U**					**U to E**				
Specification	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.450***	−0.465***	−0.466***	−0.451***	−0.477***	−0.220***	−0.226***	−0.226***	−0.219***	−0.227***	0.481*	0.516*	0.516*	0.471*	0.513*
	(−3.73)	(−3.91)	(−3.89)	(−3.71)	(−3.84)	(−6.03)	(−6.62)	(−6.58)	(−5.99)	(−6.40)	(1.70)	(1.84)	(1.83)	(1.67)	(1.79)
Replacement Rate	−0.019	−0.001	−0.001	−0.018	−0.003	−0.012	0.005	0.005	−0.013	−0.013	−0.063	−0.025	−0.025	−0.070	−0.019
	(−0.76)	(−0.06)	(−0.06)	(−0.73)	(−0.08)	(−0.82)	(0.37)	(0.37)	(−0.86)	(−0.58)	(−0.87)	(−0.45)	(−0.45)	(−0.91)	(−0.22)
Benefit Length					−0.008					0.024					−0.020
					(−0.19)					(0.93)					(−0.22)
Employment Protection	−0.103	−0.285	−0.292	−0.106	−0.271	0.080	−0.113	−0.111	0.084	−0.115	−0.150	−0.512	−0.520	−0.122	−0.612
	(−0.28)	(−0.79)	(−0.79)	(−0.28)	(−0.73)	(0.35)	(−0.53)	(−0.51)	(0.36)	(−0.52)	(−0.18)	(−0.66)	(−0.65)	(−0.15)	(−0.75)
Union Coverage	−0.017	−0.005	−0.006	−0.017	−0.006	−0.020***	−0.008	−0.007	−0.019***	−0.007	−0.019	0.004	0.004	−0.017	0.001
	(−1.46)	(−0.45)	(−0.45)	(−1.46)	(−0.48)	(−2.72)	(−1.12)	(−1.04)	(−2.68)	(−0.99)	(−0.75)	(0.17)	(0.14)	(−0.67)	(0.02)
Union Density		−0.032*	−0.032*		−0.035*		−0.033***	−0.033***		−0.036***		−0.064	−0.065		−0.075
		(−1.78)	(−1.72)		(−1.71)		(−3.15)	(−3.00)		(−2.92)		(−1.35)	(−1.32)		(−1.36)
Coordination			0.024		0.050			−0.009		0.050			0.030		0.423
			(0.09)		(0.17)			(−0.06)		(0.29)			(0.05)		(0.64)
ALMP					0.442					0.235					−0.088
					(0.44)					(0.38)					(−0.04)
Tax Wedge				0.006	0.000				−0.010	−0.018				−0.081	−0.089
				(0.23)	(0.01)				(−0.65)	(−1.07)				(−1.08)	(−1.14)
Temporary employment	0.160***	0.138**	0.137**	0.158**	0.127**	0.121***	0.099***	0.100***	0.124***	0.098***	0.327	0.269	0.268	0.359	0.288
	(2.65)	(2.52)	(2.47)	(2.60)	(2.21)	(3.65)	(3.46)	(3.41)	(3.65)	(3.08)	(1.52)	(1.56)	(1.54)	(1.52)	(1.48)
Observations	105	105	105	105	105	102	102	102	102	102	104	104	104		
R-squared	0.955	0.957	0.957	0.955	0.957	0.966	0.970	0.970	0.966	0.971	0.979	0.980	0.980	0.979	0.980

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** *refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Table A.13: Observed shocks model, total E outflows

Dependent Variable	**E to U and N**				
Specification	*I*	*II*	*III*	*IV*	*V*
GDP Growth	−0.246***	−0.253***	−0.253***	−0.246***	−0.255***
	(−4.64)	(−5.03)	(−5.02)	(−4.61)	(−4.97)
Replacement Rate	−0.001	0.017	0.016	−0.001	−0.017
	(−0.03)	(1.05)	(1.00)	(−0.05)	(−0.58)
Benefit Length					0.041
					(1.22)
Employment Protection	0.062	−0.173	−0.200	0.066	−0.202
	(0.21)	(−0.62)	(−0.71)	(0.22)	(−0.71)
Union Coverage	−0.004	0.007	0.006	−0.003	0.006
	(−0.52)	(0.95)	(0.66)	(−0.44)	(0.63)
Union Density		−0.039***	−0.041***		−0.045***
		(−2.74)	(−2.74)		(−2.81)
Coordination			0.097		0.192
			(0.49)		(0.86)
ALMP					0.475
					(0.64)
Tax Wedge				−0.009	−0.031
				(−0.46)	(−1.35)
Observations	102	102	102	102	102
R-squared	0.980	0.982	0.982	0.980	0.983

Source: EU-LFS, OECD Economic Outlook 95, ICTWSS, own calculations.
*Nonlinear least-squares estimation. Country fixed effects are included. T-statistics in parentheses. * / ** / *** refers to* $\alpha = 0.1/0.05/0.01$.
The estimates quantify the respective contribution of institutions and shocks to the shared interaction coefficient.

Appendix B Data description and imputation methods

In order to construct labour market transitions, we use the information available in the variable ILOSTAT (labour market status in the current year according to the ILO definition), as well as the variable WSTAT1Y (self-declared labour market status in the year prior to the survey). An alternative would be to use the variable MAINSTAT (self-declared labour market status in the current year) instead of ILOSTAT. However, as this variable it not available at all for Germany and the UK. Therefore, we opt for ILOSTAT, which is consistent across our country sample.

There is also an issue of missing information for several countries. We therefore delete Bulgaria, Ireland, Iceland, and Switzerland from the sample due to low response rates in the data up to the year 2007. We also exclude the Netherlands from the analysis because information on the previous year's employment status is predominantly missing until 2008. For the same reason, a few yearly data points are not available for several countries. If this is the case, we impute the values by averaging transition rates close to the respective years. Specifically, since we average the observations within 3 year windows in the analysis, we use the available years in these windows for imputation. In three cases, extrapolation is based on only one year. This concerns France (2002 to 2004), Sweden (2005 to 2007) and Slovakia (1998 to 2000). The transition rates from employment to unemployment are missing for Austria in the period 1999 to 2001 and for Denmark from 1999 to 2001 and from 2002 to 2004. Furthermore, no information on worker flows from unemployment to employment is available for Austria between 1999 and 2001. Therefore, these data points do not enter the regression sample, and the number of observations differs between the regressions for transitions from employment to unemployment and the regressions from unemployment to employment.

The GDP growth rate is calculated by annual GDP values in volume measured in market prices extracted from the OECD Economic Outlook No. 25. The OECD applies reference years defined in national official publications which is 2005 for most countries.

The benefit replacement rate and the benefit duration are obtained from the OECD Benefit and Wages Statistics (2014). The former is a summary measure which is defined as the average of the net unemployment benefit replacement rate for two earnings levels, three family situations and 60 months of unemployment. It is available for between 2001 and 2013 for all countries of the sample. We impute values for 1999 from the measure in 2001. Our variable for benefit length captures for how many months 40-year old unemployed individuals are entitled to receive unemployment benefits. The source provides measures only for the years 2002, 2005, 2007 and 2010. Since we are interested in the years 1999, 2002, 2005, 2008 and 2010, we use the values most closely to the corresponding year as a proxy for the measure in the three-year window.

Employment protection legislation (EPL) in a country is measured by an index and stems from OECD Indicators of Employment Protection (2013). Several indicators are available. We select version 1, which measures the strictness of regulation of individual dismissal of employees on regular or indefinite contracts. The index ranges from one to fife. For most countries it is available at a yearly frequency in the time period between 1999 and 2011. However, it includes missing data for Estonia, Luxembourg and Slovenia before 2008. We conduct a complete imputation for the previous years using the value of 2008 for these countries.

The dispersion of wage bargaining is characterized by three measures. We take all from the ICTWSS 5.1 (Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts). The first is the coordination of wage setting and represents an indicator ranging from one to five where five is the highest form of collective bargaining that is equal to centralized wage bargaining. It is complete for our country-year combinations. The second measure is union coverage calculated as the ratio of employees covered by collective bargaining agreements to the proportion of all wage and salary earners in employment with the right to bargaining, adjusted for the possibility that some sectors or occupations are excluded from the right to bargain. Since it is missing within countries at most for one year at once, we impute the previous year's value. The last institutional variable to capture the dispersion of wage bargaining is union density, defined as the proportion of trade union members as a percentage of all employees. Here, mainly the same systematic missing structure exists as for the union coverage variable. Thus, we apply the same imputation method. Nevertheless, for Estonia, France, Poland and Greece up to three years are lacking in the data set. Thus, we use for 1999 the information of 2002.

The measure for active labour market policies (ALMP) comes from OECD Employment and Labour Market Statistics (2013). It refers to expenditures on programs that are aimed at helping unemployed individuals to get back into work. The time series is complete for all countries between 1999 and 2011.

The OECD reports a tax wedge indicator. We use the information given in 2015. The measure displays the difference between real labour costs and take home pay for a single-earner couple at 100 per cent of average earnings with two children. Since its values are missing for all countries in 1999, we use the data of 2000 instead.