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The effects of labour market institutions on unemployment in the EU

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Abstract

The aim of this thesis is to examine the direct effects of labour market institutions on unemployment rates in the selected EU Members. For this purpose, we use macroeconomic cross-country, time series analysis for 21 OECD European members over the 2001-2011 period. The results gained from our empirical analysis are rather inconclusive over the possibility to explain the development of European unemployment solely by analysing the effects of labour market institutions. This finding might as well be caused by the volatile evolution of both output and unemployment over the observed period. The importance of business cycle is confirmed by our results as the measure for the output gap appears highly significant in every model specification. Unlike the majority of previous literature, in our estimates the proxies for macroeconomic shocks do not turn out to be significant. Hence, we decided not to examine mutual interactions between macroeconomic shocks and institutions.

JEL Classifications: J08, J30, J51, J64

Keywords: unemployment, labour market institutions, EU, active labour market policies

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Abstrakt

Tato práce zkoumá dopady institucí trhu práce na míru nezaměstnanosti ve vybraných státech Evropské Unie. Za tímto účelem jsme použili standartní ekonometrické metody pro analýzu makroekonomických panelových dat. Náš datový soubor byl tvořen 21 evropskými státy, které jsou zároveň členy OECD, za období 2001-2011. Výsledky získané z empirické analýzy naznačují, že vývoj nezaměstnanosti nelze vysvětlit pouhými dopady institucí trhu práce. Tento fakt může být do velké míry způsoben velkými výkyvy v makroekonomických indikátorech během sledovaného období - jak nezaměstnanost, tak HDP vykázali velmi turbulentní vývoj. Důležitost dopadů hospodářského cyklu na nezaměstnanost byla potvrzena i našemi odhady - proměnná měřící mezeru mezi aktuálním a potencionálním výstupem HDP byla signifikantní ve všech specifikacích našeho modelu. Narozdíl od většiny předešlé literatury se dopady makroekonomických šoků neukázali signifikantní. Z tohoto důvodu jsme odpustili od záměru zkoumat účinky interakcí institucí trhu práce s makroekonomickými šoky.

JEL klasifikace: J08, J30, J51, J64

Klíčová slova: nezaměstnanost, instituce trhu práce, EU, aktivní politika zaměstnanosti

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List of Abbreviations

Abbreviation	Meaning
ALMP	Active labour market policies
almpu	Public expenditures on ALMP divided by the relevant unemployment rate
anrr	Average net replacement rate
AW	Average wage
bs	Baseline specification
corp	Degree of corporatism
cuhp	Cyclical unemployment
EPL	Employment protection legislation
epl	Employment protection legislation
EU15	Older EU Member States
EU21	EU Member States that are also OECD countries
FE	Fixed-fffects
FGLS	Feasible Generalized Least Square
highcorp	High degree of corporatism
intcorp	Intermediate degree of corporatism
log	Specification with logarithmic transformation
lowcorp	Low degree of corporatism
LSDV	Least Squares Dummy Variable
ltu	Specification with long-term unemployment as dependent variable
ltur	Long-term unemployment rate
mw	Specification with minimum wage
nrr1	Initial net benefit replacement rate
OLS	Ordinary Least Squares
outgap	Output gap
RE model	Random-effects
rintshock	Real interest rate shock
rminmed	Minimum wage
sh	Specification with shocks
su	Specification with structural unemployment as dependent variable
surhp	Structural unemployment
TFP	Total factor productivity
totshock	Terms of trade shock
tudens	Trade union density
twcoup	Tax wedge
ubendur	Unemployment benefit duration
urt1564	Unemployment rate (persons aged 15 to 64 years)
VIF	Variance inflation factor
cuhp	Cyclical unemployment

1 Introduction

Relatively high levels of unemployment in European countries have been a serious issue since the 1960s. This is of a particular importance, since extensive unemployment has negative impacts at both macroeconomic and microeconomic levels. At the macroeconomic level, unemployment burdens state budget through both lowered revenues (tax losses) and increased expenses (unemployment benefits and state contributions to a social protection system). At the microeconomic level, unemployed individuals suffer from a lack of material resources as well as from psychological deprivation and, potentially, also marginalization at the society. This Master thesis attempts to a find possible relationship between high unemployment in selected European countries and improper labour market institutional set-ups[1].

As a response to the OECD 1994 Jobs Study which called for fundamental labour market reforms to tackle with persistently high unemployment, emerged a considerable amount of macroeconomic studies focusing on the effects of labour market institutions. Nevertheless, recently this issue has not been on the top of the priority list of economic research agenda, as the latest studies on this topic (e.g. Bassalini and Duval, 2006) work with a dataset ending in 2003. Therefore, this Master thesis attempts to fill in this space and examine the possible effects of labour market institutions on European unemployment over the turbulent 2001-2011 period. To the best of our knowledge, this work is the only one focusing on the European labour market institutions and unemployment in the recent decade, and the only one examining the relationship between labour market institutions and unemployment in the time of the recent economic and financial crisis in the EU countries.

This thesis is divided into five parts. The first part is the introduction. The second chapter presents the list of relevant research literature which examines the role of labour market institutions and policies for tackling unemployment. It discusses solely the macroeconomic cross-country studies. The focus is on the main findings provided by these studies which allow comparison with our results obtained and described later in the thesis. The third chapter is devoted to the

[1]The term "selected European countries" cover 19 EU Member States which are also the OECD Member countries, plus Norway and Switzerland. The only EU countries which are the OECD members and are not included in our sample are Estonia and Slovenia. They were omitted due to a significant number of missing data.

methodology of the empirical analysis. Firstly, the dataset is described and used variables are defined. Then it discusses the econometric tools for estimating the effects of labour market institutions on unemployment. In the fourth chapter, the results gained from our empirical analysis are presented. In the first section of this chapter, the development of unemployment in European Union countries during the observed period is described. In the second part of this chapter, the results of different models which are applied on the panel data are elaborated. The final chapter summarizes the key findings from the analysis. Finally, it attempts to draw some policy implications.

2 State of Art

The content of this chapter is to provide a comprehensive list of the existing research literature which examines the role of labour market institutions and policies in unemployment rates. Only the macroeconomic cross-country studies are considered. The emphasis is put on the main findings, but the methodological differences and issues of the selected studies are discussed as well. All the presented papers focus on OECD countries. It is due to the fact that the majority of scholars examining the effects of labour market institutions on unemployment are at least party affiliated with the OECD, but more importantly, policies and institutional indicators which are comparable across countries are constructed solely by the OECD. The time span of the relevant literature goes from the late 1980s to the most recent one in 2006.

2.1 The 1994 OECD Jobs Study

The pioneering cross-country studies date back to the turn of the 1980s and the 1990s. Beam and Symons (1989) and mainly Layard et al. (1991)[2] started to research possible impacts of labour market institutions and policies on the aggregate level of unemployment. However, most of the studies are published after the year 1994, when the OECD came up with its Jobs Study. The OECD 1994 Jobs Study (1994) can be understood as one of the key facts that triggered the emergence of the empirical studies focusing on labour market institutions as main determinants of unemployment. Hence, the main findings of the 1994 Jobs Study, in particular, policy recommendations, are discussed in the following paragraph.

The policy recommendations in the 1994 Jobs Study aim to enhance the ability of labour markets to adjust to exogenous shocks as well as to improve conditions for job creation. The tight budgetary constraints of governments were considered, therefore most of the recommendations focus on encouragement to actively participate in the labour force, instead of living on social welfare support. Responsibilities rising from successful policies implementation are related

[2]The paper written by Layard et al. in 1991 is of a particular importance as the one he co-authors with Nickell, who, building on this paper, wrote an influential paper "Unemployment and labor market rigidities: Europe versus North America" in 1997.

to all participants of labour markets, not only to governments alone. In order to improve employment performance, it is necessary to introduce both macroeconomic and structural reforms (OECD, 1994). The policy recommendations are listed below, some of them might sound too general, but to describe each and every one of them in detail is beyond the interest of this thesis.

1. "Set macroeconomic policy such that it will both encourage growth and, in conjunction with good structural policies, make it sustainable.
2. Enhance the creation and diffusion of technological know-how by improving frameworks for its development.
3. Increase flexibility of working time (both short-term and lifetime) voluntarily sought by workers and employers.
4. Nurture an entrepreneurial climate by eliminating impediments to, and restrictions on, the creation and expansion of enterprises.
5. Make wage and labour costs more flexible by removing restrictions that prevent wages from reflecting local conditions and individual skill levels, in particular of younger workers.
6. Reform employment security provisions that inhibit the expansion of employment in the private sector.
7. Strengthen the emphasis on active labour market policies and reinforce their effectiveness.
8. Improve labour force skills and competences through wide-ranging changes in education and training systems.
9. Reform unemployment and related benefit systems – and their interaction with the tax system – such that societies' fundamental equity goals are achieved in ways that impinge far less on the efficient functioning of labour markets" (OECD, 1994, p. 44-45).

The 1994 Jobs Study (1994) emphasised the necessity of fundamental labour market reforms, in order to prevent an excessive increase in unemployment. As a result, a number of scholars tried to address the question, whether above mentioned recommendations are in line with the empirical evidence. In other

words, if the proposed institutional and policy reforms positively affect the level of unemployment and resilience of labour markets. The review of the existing macroeconomic cross-country literature is the content of the following section.

2.2 The Previous Cross-Country Literature

The 1994 Jobs Study initiated an effort of many scholars to put research agenda further in this particular field, but we must not forget that it did not come out of the blue. It was the OECD´s reaction to an unfavourable trend of labour market worsening which had started in the 1970s and was not reversed in many countries until the 1990s. In the following paragraphs, the most influential studies that attempt to explain the rise in unemployment via labour market institutions are presented. The studies are sorted chronologically.

Scarpetta (1996)

Scarpetta (1996) points out to major differences in labour market conditions across OECD countries. From the late 1970s to the early 1990s, in Japan and the USA, unemployment rates followed cyclical fluctuations and were able to come back to initial values, whereas, in many European countries, unemployment rates tended to sustain high after economic turmoils suggesting that the part of cyclical unemployment was transformed into structural (equilibrium) unemployment[3]. The increase in unemployment in European countries was shortly followed by rising of incidence of long-term unemployment[4].

Scarpetta in his empirical analysis addresses how different labour market institutional set-ups affect both levels of structural unemployment and persistence of unemployment. To that end, he uses an annual data over the 1983-1993 period for 15 (17 based on specifications) OECD countries. To estimate the effects of policy and institutional factors on structural unemployment, he employs a static Feasible Generalized Least Square (FGLS) model with random effects of country variables. Due to the fact that policies and institutions may have different

[3]This fact can be described by the so called hysteresis effect. The hysteresis effect in European labour markets was in detail described by Blanchard and Summers (1986).

[4]Incidence of long-term unemployment is a number of long-term unemployed (for more than 12 months) as a percentage of the total unemployed.

impacts on different groups of population, Scarpetta uses four alternatives for a dependent variable: i) the aggregate structural unemployment rate; ii) the youth unemployment rate, iii) the long-term unemployment rate; iv) and the non-employment rate. Explanatory variables are also divided into four groups. Cyclical factors are captured by the output gap. Policy variables are: active labour market policies (ALMP), unemployment benefits, employment protection legislation (EPL), and non-wage labour costs (tax wedge). Institutional factors are: unions and the wage bargaining process, and as a proxy for product market competition, exposure to trade was used. The other factors consist of real interest rate and the terms of trade.

The main empirical findings are presented and compared with the pioneering studies from the turn of the 1980s and the 1990s. The estimated effects of AMLP are small and, in many cases, not statistically significant. This is against the results gained by above mentioned Layard et al. (1991). Generous unemployment benefits appear to have a strong negative impact on unemployment rates. Similarly, stringent EPL leads to high unemployment. High union density which defines workers bargaining power seems to lead to higher unemployment, but if co-ordination among employers is added to the equation, it can reduce unemployment significantly, no matter of union density. The results also support the so called hump-shaped hypothesis which suggests that both highly centralised and fully decentralised wage bargaining systems lead to the best outcomes. In contrast to Layard et. al (1991), the tax wedge does not have any effects on unemployment. The other factors (real interest rate and the terms of trade) did not contribute to unemployment over the observed period. If the persistence of unemployment is considered, generous unemployment benefits and stringent EPL contribute to duration of unemployment the most.

Nickell (1997, 1998)

Nickell (1997, 1998) in his two influential studies attempts to address two major questions: what is behind much higher unemployment across all OECD countries in the 1980s and the 1990s comparing to the situation in the 1960s, and what causes the enormous variations in unemployment across OECD countries. To answer these questions, Nickell constructs a clear framework for examining relationships between unemployment and labour market institutions. He uses a

dataset over the 1983-1994 period for 20 OECD countries, but unlike Scarpetta (1996) who works with annual data, he uses only two six-years periods (1983-1988 and 1989-1994). This can be done mostly due to a stable character of policy and institutional indicators. He also employs a static FGLS model with random effects. Tree different dependent variables are used: i) the logarithm (log) of aggregate unemployment; ii) the log of long-term unemployment; iii) and the log of short-term unemployment. The policy and institutional explanatory variables are: EPL, the replacement rate, unemployment benefits duration, ALMP, union density, union coverage, bargaining co-ordination, and the total tax rate. Besides, the regression encompasses a change in inflation during the period as a proxy for short-term macroeconomic situation, a dummy for the second period, and in Nickell (1998) also owner occupation rate as a proxy for barriers to regional mobility.

All the policy and institutional variables are significant with expected signs, the only exception is EPL which has no significant effect. In contrast with the results gained by Scarpetta (1996), ALMP may substantially contribute to a reduction of unemployment. The replacement rate, unemployment benefit duration, union density and coverage, bargaining co-ordination, and the tax wedge all have very significant effects on both aggregate and long-term unemployment. The results are rather strong as we can see on the example of ALMP when an increase in spending by 10 pp should lower the unemployment rate by 1.92 pp. Furthermore, macroeconomic situation proxied by inflation influences unemployment as well, and quite strongly again, as an increase in inflation by a one pp should lead to decrease in unemployment by 1.36 %[5]. No matter of how strong the results look, Nickell remains quite cautious with his answers to above mentioned questions.

Blanchard and Wolfers (2000)

Blanchard and Wolfers (2000) focus on the European labour market, in particular, they attempt to explain the rise in European unemployment since the 1960s and the enormous heterogeneity in unemployment across individual countries. Unlike Scarpetta (1996) and Nickell (1997, 1998), they acknowledge the importance of macroeconomic shocks, and mainly, interactions of shocks with institutions. They argue that adverse shocks might as well be responsible for the

[5]These concrete numbers are considered for a country with 8 % of unemployment.

rise in unemployment, but the shocks do not differ enough to explain differences between countries. Analogously, distinct labour market policies and institutions might cause differences between countries, but they are not able to explain the general trend of growing unemployment, as many of them were present at the times of low unemployment. Therefore, the authors look at the interactions of adverse shocks with adverse institutional set-ups as the possible explanation of both of above mentioned phenomena.

In order to capture the evolution of European unemployment better, the authors use a dataset which covers a longer period of time - from 1960-1996, with six-years observations for 20 OECD countries[6]. The Non-Linear Least Squares method is applied to estimate the effects of interactions between shocks and institutions on unemployment. The dependent variable is the aggregate unemployment rate. The set of policy and institutional variables is the same as in above described Nickell (1997). Both time invariant and time-varying institutions are considered. The authors model two different specifications for shocks. In the first one, shocks are treated as unobservable and common across countries (time effects). In the second one, shocks are observable and country specific[7]. Due to the fact that in this paper shocks (interactions) are considered as primary determinants of unemployment for the first time, the more detailed description of three used proxies for shocks follows.

In the 1970s, when European unemployment rates started to rise, Europe experienced a significant slowdown in total factor productivity (TFP) growth. This fact was overshadowed by an increase in oil prices, nonetheless, the slowdown in TFP growth appears to have played a big role in the rise of unemployment. The question remains whether the weaker TFP growth can lead to the permanent increase in unemployment. Dramatic changes in the real interest rate are the other proxy for shocks. The real interest rate became negative in the 1970s and then strongly positive in the 1980s and the 1990s[8]. The authors argue that the real interest rate can influence labour demand through the accumulation

[6]To put more emphasis on recent years, the last two years are treated as separate observations.

[7]The use of both time invariant and time-varying institutions alongside with both observable and unobservable shocks, leads to four different specifications of interactions.

[8]Here, we discuss the real interest rate, not the nominal interest rate. Thus, it does not mean that nominal interest rates were negative in the 1970s, but that high inflation which was present, caused real interest rates to get into negative figures. This comes from the simple Fischer equation: $r = i - \pi$, where r denotes the real interest rate, i denotes the nominal interest rate, and π denotes inflation.

of capital. As in the previous case, there are doubts if the effects caused by changes in the real interest rate can bring permanent effects on unemployment. A shift (the decline in the 1980s and the 1990s) in labour demand is the other shock that the authors find relevant for changes in unemployment.

The main findings over the effects of labour market institutions from this paper are more or less in line with Nickell (1997). In contrast, but consistent with Scarpetta (1996), effects of ALMP are negligible. Also, the coefficient for union coverage results to be insignificant. The authors are positively surprise about the goodness of fit of the model which seems to explain both the rise in unemployment and its heterogeneity across countries. In particular, interactions between institutions and shocks appear to be responsible for most of the heterogeneity between countries. Nonetheless, the authors are cautious with assertive judgements pointing out tree possible caveats: the results are preliminary, time-varying institutions lead to the weaker results (should be opposite), and the fact that the specifications fit the data does not prove any theory.

Belot and van Ours (2001)

Belot and van Ours (2001) address the akin research question as previous studies: what is behind the different development of unemployment across OECD countries. They refer to the fact that from the 1960s until the early 1980s, there was more or less the similar trend (the rise in unemployment) across all OECD countries, whereas, since then, disparities in unemployment rates between countries have grown larger. They focus on the direct effects of labour market institutions, but beyond that, they add mutual interactions between individual institutions to the research agenda. The importance of interactions within an institutional framework is stressed in, e.g. Freeman (1998) or Coe and Snower (1997).

The authors construct a dataset for 18 OECD countries over the 1960-1994 period with 7 five-years observations. The coefficients are estimated by using OLS with both country and time fixed effects. The dependent variable is the aggregate unemployment rate. As for explanatory variables, six policy and institutional indicators are chosen, namely - the replacement rate, union density, union coverage, tax wedge, bargaining co-ordination, and EPL. Interactions

between these variables are allowed as well. Besides, as in Nickell (1997), inflation as a proxy for the short-term macroeconomic situation is included.

The direct effects of institutions are slightly surprising and mostly unconvincing. When fixed effects are not in the regression, then all the coefficients are significant (higher EPL unexpectedly lowers unemployment), but the R-squared is rather low (0.4). If fixed effects are introduced, R-squared of the model is doubled (0.8), but none of the variables is significant. If interactions between institutions are allowed, most of them are significant. For instance, the effect of more generous unemployment benefits is amplified by higher tax wedge or, in the case of decentralized bargaining, an increase in union density leads to higher unemployment. This paper shall be highly regarded for introducing interactions between institutions into the research agenda, nevertheless, it does not provide robust evidence on the effects of these interactions.

Nunziata (2002)

Many times mentioned cross-country differences in unemployment are the content of Nunziata (2002). In his analysis, Nunziata encompasses both interactions between institutions and shocks (as proposed by Blanchard and Wolfers (2000)) and mutual interactions between institutions (as in Belot and van Ours (2001)). Furthermore, building on his own study (Nunziata (2001)), he attempts to show that the impact of institutions on unemployment is the same as the impact of institutions on real labour costs. In other words, if institutions increase real labour costs, then it is probable that they contribute to higher unemployment as well.

Nunziata (2001) aims his work to examine the effects of institutions on the wage determination process (labour costs). He concludes that labour market institutions are greatly responsible for the rise in labour costs, under the assumption that productivity is controlled (Nunziata, 2001). Daveri and Tabellini (2000) focus their research in a similar direction. They examine a possible impact of taxation on unemployment and GDP growth. They suggest that higher labour taxation inevitably leads to greater labour costs, and subsequently, to an increase in unemployment and slower GDP growth. According to their findings, higher labour taxes have been shifted onto higher real wages which has forced

firms to substitute labour force with capital (Daveri and Tabellini, 2000). It would surely be worthwhile to devote more attention to this appealing paper, but its content stands a bit aside of the interest of this work.

Nunziata (2002) works with annual observations over the 1960-1995 period for 20 OECD countries. The dependent variable is aggregate unemployment. On the right side of the equation, he uses a set of labour market institutions (very much the same as Nickell (1997), thus it is not described again). He also includes mutual interactions between institutions, both fixed country and time specific country effects, year dummies, and the vector for macroeconomic shocks which consists of: labour demand shocks, TFP shocks, money supply shocks, the long term real interest rate, and the terms of a trade shocks. He also presents a specification in which the Oswald´s Home Ownership variable (a proxy for labour mobility) is included[9]. Every regression is estimated by fixed effects FGLS model accounting for heteroskedasticity and serial correlation.

The empirical results confirm the conjecture from Nunziata (2001) that labour market institutions have the same impact on unemployment as on real labour costs. The other findings are mainly in line with the previous literature - generous benefits, tax wedge, and union density contribute to higher unemployment, EPL is not significant. Furthermore, these effects are amplified by mutual interactions between institutions. The hump shaped hypothesis is not confirmed by the data. The most of macroeconomic shocks have significant effects on the evolution of unemployment. All in all, Nunziata offers a comprehensive analysis of the impact of institutions, their mutual interactions and interactions between institutions and shocks on the level of unemployment. Moreover, he exceeds other scholars in methodological punctuality and, mostly in Nunziata (2001), he points out to many econometric shortcomings that cross-country studies inevitably face.

Baker et al. (2003)

The previous studies are mostly optimistic, even though cautiously, about the possibility to explain the rise in unemployment and its heterogeneity across countries through different labour market institutions. On the contrary, Baker et

[9]For detailed information, we refer to Oswald (1996). Nonetheless, the variable does not appear significant in the regression.

al. (2003) support the hypothesis that labour market institutions are responsible only for a minor part of the evolution of unemployment from the 1960s to the 1990s. In order to verify their hypothesis, the authors firstly examine whether there is a simple correlation between individual institutions and unemployment over the 1980s and the 1990s. The findings are surprisingly unambiguous - if individual institutions are gradually plotted against unemployment, there is hardly any correlation. Only the replacement rate appears to be correlated with unemployment, but if Spain as an outlier is removed, then even this correlation disappears. On the other hand, a predicative value of such a simple correlation is very limited, thus the authors construct an empirical model based on the previous studies.

The authors use a dataset for 20 OECD countries over the 1960-1999 period with five-years observations. The dataset exceeds previous ones, because some of the missing observations from 1960s are filled, but mostly due to the fact that it covers the late 1990s when many OECD countries experienced a sharp decline in unemployment, thus it might offer a new perspective into the research agenda. They employ various models based on the previous studies - Nickell (1997), Blanchard and Wolfers (2000), Belot and van Ours (2001), and others. They pay particular attention to Nickell (1997), in fact, they re-estimate the model with the augmented data and new versions of institutional indicators. The gained results differ markedly from the original ones, as none of the institutional variables turns out significant. Later, the more complex model allowing also for interactions between institutions is constructed. The results are also inconclusive leaving a substantial part of the evolution of unemployment unexplained. Overall, the authors attempt to emphasise the lack of robustness in empirical evidence of the impact of labour market institutions on unemployment. According to them, the recommended deregulation of labour markets suggested by the OECD (1994) is based on the ambiguous empirical findings.

Bassanini and Duval (2006)

Baker et al. (2003) conclude that the lack of robustness and high sensitivity of results on chosen model specifications are still present in the existing research literature. Bassanini and Duval (2006) address this drawback, and by using augmented indicators of policies and institutions, they aim to provide more reliable

empirical results which could work as a basis for assessing actual labour market policies. Realising the criticism, they, unlike some of the previous scholars, put a strong emphasis on distinguishing which findings are robust and which are not. To this purpose, as complex analysis as possible is used. The direct effects of institutions, the effects of mutual interactions between institutions and, the indirect effects of institutions via their interactions with macroeconomic shocks on unemployment are subsequently considered.

To estimate all model specifications a dataset with annual observations over the 1982-2003 period for 20 OECD countries is used. Aggregate unemployment is the dependent variable for all specifications. When estimating the direct effects of institutions, an output gap measure, country and time fixed effects, and a set of policy and institutional measures are at the right side of the regression equation. The output gap measure is substituted by TFP shocks, terms of trade shocks, real interest rate shocks, and labour demand shocks in some specifications. In addition to standard policy and institutional variables, anti-competitive product market regulation is included.

The authors come to a conclusion that the direct effects of institutions can explain two thirds of the evolution of unemployment over the observed period, if the business cycle is controlled. The impact of individual institutions is more or less in line with previous studies. Extensive sensitive analysis verified that the main findings are robust. The model seems to fit the data perfectly as the R-squared exceeds 0.9 in all cases. In the model where mutual interactions between institutions are allowed, some of them appear to be significant and robust. In particular, high spending on ALMP seems to mitigate the negative impact of generous unemployment benefits. Although the direct effects of institutions appear to be fundamental for explaining the development of unemployment, the indirect effects via interactions with macroeconomic shocks significantly contribute to unemployment patterns as well. All four proxies for the macroeconomic shocks negatively influence unemployment rates. There is also robust evidence that interactions with institutions can either amplify or dampen the negative effects of these shocks. For instance, generous unemployment benefits tend to amplify the negative effects, whereas highly co-ordinated wage bargaining systems dampen these effects.

Bassanini and Duval (2006) offer the most comprehensive study dealing with the connection between labour market institutions and unemployment rates.

They are very much aware of the methodological drawbacks of the previous studies. And through incorporating all the major existing approaches, they address the issue of the lack of robustness which is strongly present in the preceding literature.

Other relevant studies

In the following paragraphs, cross-country studies which stand a bit aside from the main stream of the relevant literature, but still managed to contribute to the question of the effects of labour market institutions, are briefly discussed[10]. Bertola et al. (2007) focus on the impact of labour market institutions on employment (unemployment) patterns of different demographic groups, mostly on the disadvantageous groups - youth, older individuals, and women. They come to the several interesting remarks which may be useful for both theory and policymakers, for instance, high influence of unions in wage setting process leads to lower youth and elderly employment and higher unemployment among women (Bertola et al., 2007).

Boon and Van Ours (2004) attempt to explain how effective different ALMP are in reducing unemployment and bringing people back to work. Generally, ALMP seem to reduce unemployment, unsurprisingly, some programmes appear to be more effective than the others. Among the most effective measures belongs labour market training. On the other hand, the higher unemployment benefits lower unemployment rates far less significantly and subsidizing jobs seems not to work at all. These findings concerning effectiveness of ALMP are considered from the macroeconomic perspective, the microeconomic literature on ALMP exhibit substantially different results - the effects of labour market training are not as persuasive (for an example of a micro evaluation study see Martin and Grubb (2001)). These results shed some light on the impact of ALMP on unemployment - on an important piece of the complex puzzle (Boon and Van Ours, 2004).

The importance of product market regulation on unemployment rates is acknowledged in some recent studies (e.g. Bassanini and Duval, 2006). Nicoletti and Scarpetta (2005) examine thoroughly whether various levels of product market

[10]These studies usually address in detail one particular fragment of labour market institutional set-up and its impact on unemployment.

regulation have any effects on functioning of labour markets. In particular, the authors look at outcomes of interactions between labour market institutions and product market policies. They conclude that product market regulation, which prevents competition and free entry into markets, significantly lowers employment. Vice versa, product market deregulation might work as a useful complement to labour market reforms which aim to reduce unemployment and rigidities (Nicoletti and Scarpetta, 2005).

3 Methodology

This chapter, based on the previous theoretical chapter, discusses the chosen strategy for our empirical analysis. The whole dataset as well as individual variables are described in detail.

3.1 Description of the Data and the Variables

The aim of this work is to examine the effects of labour market policy and institutional indicators on the unemployment rates in the EU. The reliable macroeconomic labour market policy and institutional indicators are published only by the OECD, therefore only EU Member States which are also members of the OECD are considered in our analysis. The dataset covers 19 EU countries, namely: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Spain, Sweden, and United Kingdom, plus two other European countries: Norway and Switzerland. Two EU Member States that are also OECD Member countries have to be omitted from the sample due to a significant number of missing observations (Estonia and Slovenia)[11]. The dataset is over the 2001-2011 period with annual observations. The time span of the dataset is determined by availability of the data. Most of the data are obtained from the OECD. The source of each data is in detail described at the list of the variables below.

The following list depicts the basic variables used in the empirical analysis. In some model specifications, the variables are also transformed, mostly to the logarithmic transformation. At every variable, definition, source, and data adjustments are noted. Below the list of variables, summary statistics of the variables are depicted in table 1.

[11]The possible reason for so many missing observations for Estonia and Slovenia, might be the fact that both countries joined the OECD quite recently - in 2010. Nonetheless, we believe that excluding these countries from analysis will not diminish the relevance of gained results for the EU labour market.

3.1.1 Dependent Variables

Unemployment rate (*urt1564*)

Definition: Number of unemployed persons in working age population (persons aged 15 to 64 years) divided by the labour force. The methodology of measuring is based on national Labour Force Surveys.

Source: OECD (2014a), Online OECD Employment Database.

Structural unemployment (*surhp*)

Definition: Structural component of aggregate unemployment (also called core or equilibrium unemployment) gained from *urt1564* by using Hodrick-Prescott filter with smoothing parameter $\lambda = 100$.

Source: OECD (2014a), Online OECD Employment Database, author´s calculations.

Long-term unemployment (*ltur*)

Definition: Number of long-term unemployed persons (12 months or more) divided by the labour force.

Source: Eurostat (2014a), Employment and unemployment (Labour Force Survey). In case of Switzerland, World Bank (2014), World Development Indicators.

3.1.2 Independent Variables - Policy and Institutional Indicators

Average unemployment net benefit replacement rate (*anrr*)

Definition: Average net (after any tax and social security contributions have been deducted) replacement rate excluding social assistance and housing benefits across two income levels (67 and 100 % of average wage (AW)) and three family situations (single, one-earner couple, two-earner couple).

Source: OECD (2014b), Tax-Benefit Models

Initial unemployment net benefit replacement rate (*nrr1*)

Definition: Average net replacement rate for the initial phase of unemployment (during the first year) excluding social assistance and housing benefits for single earner with 67 % of AW .

Source: OECD (2014b), Tax-Benefit Models

Unemployment benefit duration (*ubendur*)

Definition: Ratio of average to initial net benefit replacement rate.

Source: OECD (2014b), Tax-Benefit Models

Tax wedge (*tw*coup)

Definition: Difference between labour costs to the employer and the corresponding net take-home pay of the employee for a single-earner couple with two children earning 100% of AW.

Source: OECD (2014c), Taxing Wages Database

Employment protection legislation (*epl*)

Definition: Overall indicator of the stringency of employment protection. It measures the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts.

Source: OECD (2014a), Online OECD Employment Database, author´s calculations.

Data adjustments: In the year 2008, there was a change in methodology of measuring *epl*.

Trade union density (*tudens*)

Definition: Trade union density rate - the percentage of employees who are members of a trade-union.

Source: OECD (2014a), Online OECD Employment Database.

Degree of corporatism (*corp - highcorp, intcorp, lowcorp*)

Definition: Indicator of the degree of centralisation/co-ordination of the wage bargaining processes, which takes values 1 for decentralised and unco-ordinated processes, and 2 and 3 for intermediate and high degrees of centralisation/co-ordination, respectively (Bassalini and Duval, 2006).

Source: Bassalini and Duval (2006), OECD (2004), Employment Outlook, European Trade Union Institute (2014).

Data adjustments: In original data from OECD (2004), five-year averages classify countries with the scale 0-5 from the least to the most corporatist ones. Bassalini and Duval (2006) rescaled the indicator along a 1-3 scale. The indicator exhibits a stable nature. Therefore the latest values (from the year 2003) from Bassalini and Duval (2006) were considered alongside with the values for collective bargaining coverage from European Trade Union Institute (2014) to divide countries into three groups - *highcorp*, *intcorp*, and *lowcorp*.

Public expenditures on active labour market policies (*almpu*)

Definition: Public expenditures on active labour market programmes expressed in percentages of GDP, divided by the unemployment rate *(urt1564)*. As the active programmes, the categories 20-70 by the OECD´s classifications are considered.

Source: OECD (2014a), Online OECD Employment Database, Eurostat (2014b), Labour Market Policy database.

Data adjustments: In the OECD (2014a) some observations were missing, thus they were added from Eurostat (2014b). The data for the United Kingdom in years 2001-2003 and 2010-2011 were linearly extrapolated.

Minimum wage (*rminmed*)

Definition: Ratio of statutory minimum wage to median wage in percentages.

Source: OECD (2014a), Online OECD Employment Database.

Data adjustments: The relevant data on statutory minimum wage are published only by the OECD and only for 21 countries, out of which 8 of the selected countries are missing. Thus, *rminmed* is used only in some model specifications.

3.1.3 Independent Variables - Macroeconomic indicators

Output gap (*outgap*)

Definition: Measure of the gap between actual and potential output as a percentage of potential output.

Source: OECD (2013), Economic Outlook.

Terms of trade shock (*totshock*)

Definition: Logarithm of the relative price of imports weighted by the share of imports in GDP, i.e. $totschock = (\frac{M}{Y}) * log(\frac{P_M}{P_Y})$, where M and Y denote total imports and GDP in nominal terms, respectively, and $\frac{P_M}{P_Y}$ is the ratio of the deflator of total imports to the GDP deflator (Bassalini and Duval, 2006).

Source: OECD (2013), Economic Outlook, author´s calculations.

Real interest shock (*rintshock*)

Definition: Difference between the 10-year nominal government bond yield (in %) and the annual change in the GDP deflator (in %) (Bassalini and Duval, 2006).

Source: OECD (2013), Economic Outlook, author´s calculations.

Table 1: **Summary Statistics, 2001-2011**

Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent Variables					
urt1564	231	7.220	3.826	1.565	21.340
surhp	231	7.197	3.386	2.116	19.978
ltu	231	3.164	2.579	0.300	12.300
Institutional Variables					
anrr	231	39.876	15.015	19.401	72.308
nrr1	231	63.268	16.423	18	88
ubendur	231	0.670	0.301	0.301	1.593
twcoup	231	22.170	8.392	5.557	38.808
epl	231	2.613	0.459	1.677	4.095
tudens	231	32.902	19.564	7.543	78.052
highcorp	231	0.380	0.486	0	1
intcorp	231	0.285	0.452	0	1
lowcorp	231	0.333	0.472	0	1
almpu	231	0.098	0.079	0.004	0.489
rminmed	143	0.470	0.059	0.345	0.618
Macroeconomic Variables					
outgap	231	0.647	3.073	-7.785	9.478
totshock	231	-0.341	0.200	-0.829	0.184
rintshock	231	2.211	2.418	-6.456	14.701

Source: Author´s calculations on the basis of the data sources described in the list of the variables.

3.2 Model Specification

To determine the effects of policy and institutional indicators on unemployment, we employ standard econometric tools for cross-country, time-series analysis. In the following section, we examine only the direct effects of policy and institutional indicators, thus interactions between institutions and shocks are omitted. The econometric model is in line with theoretical models of labour market equilibrium, such as a standard job-search model presented in Pissarides (2000). The baseline static model looks as follows:

$$U_{it} = \alpha + \sum_{j} \beta^j X_{it}^j + \gamma G_{it} + \epsilon_{it},$$

where subscript i represents cross-sectional units and t refers to time-periods, U_{it} is the unemployment rate (*urt1564*), $\alpha$is the intercept, X_{it}^j is the set of policy and institutional indicators, G_{it} is the measure of the output gap (*outgap*), ϵ_{it} is the disturbance term, and βs and γ are coefficients.

In some model specifications, instead of *urt1564*, *surhp* and *ltur* are used as the dependent variable, as well as a logarithmic transformation of *urt1564*. The measure for macroeconomic situation which is proxied by *outgap* is substituted in some specifications by the shock variables - *totshock* and *rintshock*. The set of policy and institutional indicators contains the following items:

$$\beta^j X_{it}^j = \beta_1 anrr + \beta_2 nrr1 + \beta_3 ubendur + \beta_4 twcoup + \beta_5 epl + \beta_6 tudens + \beta_7 corp + \beta_8 almpu.$$

For the empirical estimations, the standard econometric techniques for panel data are used. Firstly, we apply pooled OLS model which neglects the panel structure of the data and simply estimates coefficients. Later, we employ methods that allow us to deal with the omitted variable bias problem within panel data. Particularly, the fixed-effects (FE) model which assumes that there might be some information within the individual entities which may bias the predictor. In other words, individual countries´ error terms are correlated with the explaining variables. Individual fixed effects remove the impact of these time-invariant characteristics on the predictor. At the same basis works the least squares dummy variable (LSDV) model which enables to capture individual

characteristics of each country through the set of dummy variables. In the situation when we assume that time-invariant characteristics of individual countries are correlated (error terms across countries are correlated), it is more plausible to employ the random-effects model (RE). The RE model assumes that individual time-invariant characteristics are uncorrelated with explaining variables and therefore also with a dependent variable. To distinguish whether FE or RE estimator is more suitable, we use the Hausman specification test. This test as well as the other relevant tests are described together with the empirical results in the next chapter.

4 Empirical Results

The following chapter presents the main findings gained from our empirical research. Before focusing on the effects of the labour market institutions on the unemployment rates, the development of unemployment in the EU during the observed period is analysed.

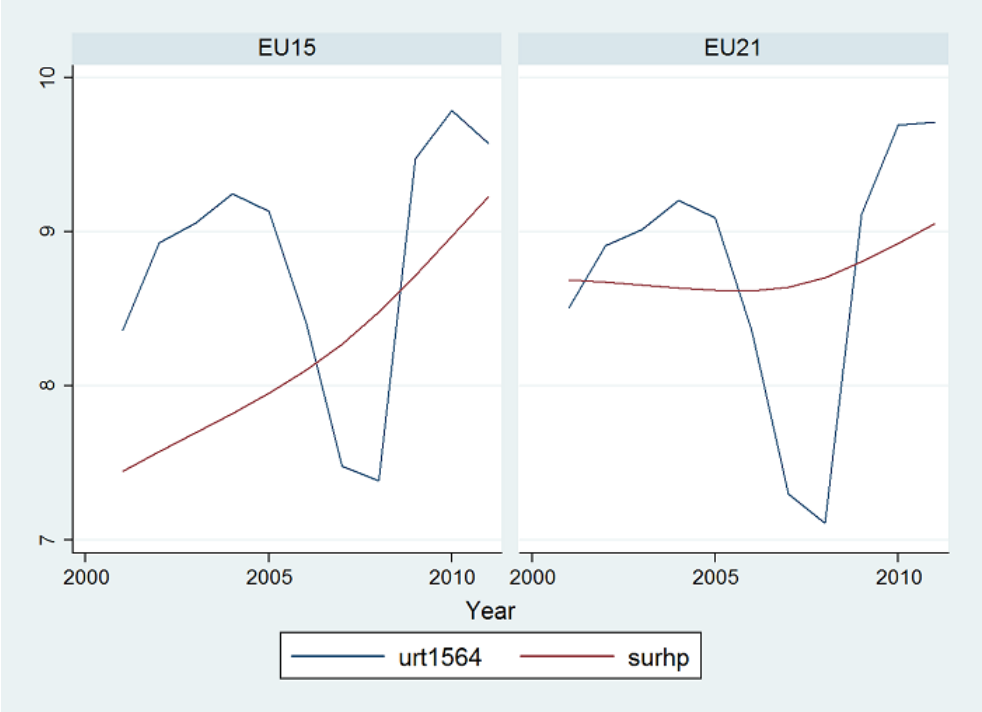
4.1 Development of Unemployment in the EU

The first decade of the New Millennium was a turbulent time for all sectors of European economies. The European labour market was not an exception. One of the most closely followed indicator of the labour market - unemployment rate (depicted in figure 1); shows that the labour market conditions had been worsening until the year 2004, when unemployment in Europe reached the top[12]. Since 2004 until the second half of the year 2008, the cyclical component of unemployment was lowering the unemployment rates in Europe significantly. This trend was stronger in EU21[13] where, in the year 2008, cyclical unemployment lowered unemployment by -1.59 p.p. It is remarkable that the evolution of structural unemployment (gained by using the Hodrick-Prescott filter) in older Member States (EU15) and EU21 differs notably. In EU15, there is a clear-cut trend of rising of core unemployment, whereas in EU21 core unemployment remained quite stable. Disregarding these differences, both EU15 and EU21 was heavily hit by the financial turmoil which subsequently led to a steep increase in the European unemployment rates.

[12] If not stated otherwise, the term "unemployment rate" denotes in the previous chapter described *urt1564*.

[13] The term EU21 represents the 21 Member States of the EU which are also members of the OECD. Thus in EU21, there are additional countries which were a part of the EU 2004 Enlargement - Czech Republic, Estonia, Hungary, Poland, Slovenia, and Slovakia.

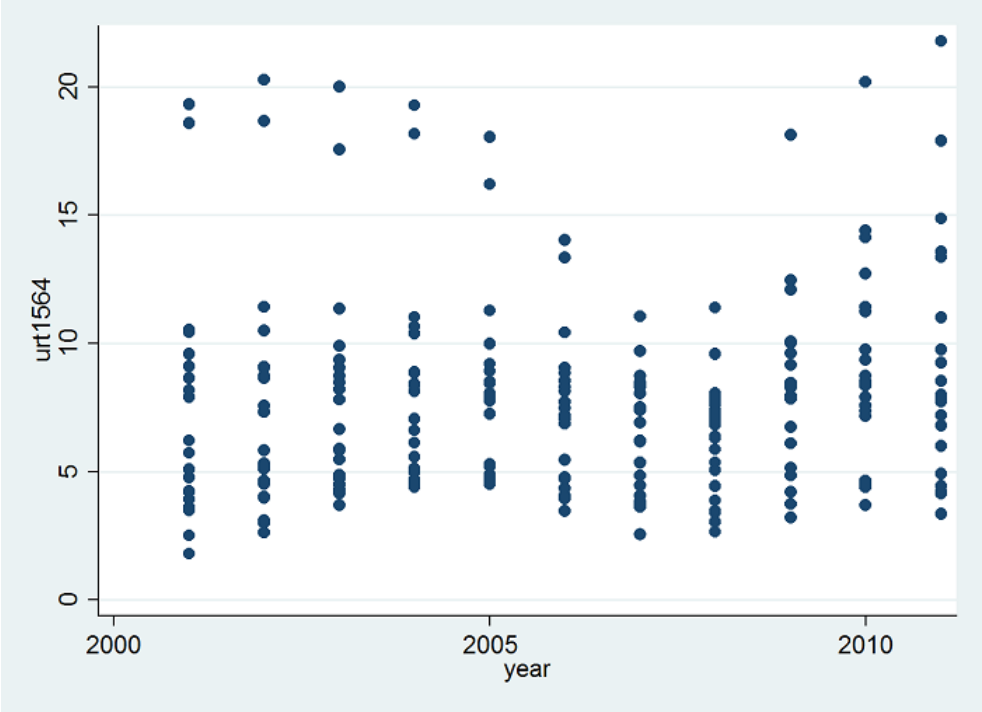
Figure 1: **Unemployment Rates, 2001-2011**



Source: Author´s calculations on the basis of the OECD (2014a).

In the previous paragraph, we are describing the basic evolution of unemployment on the aggregate (European) level. It is vital to point out that there has been considerable variation in the rates of unemployment between European countries. From the scatter plot (figure 2), it is visible that every year there are outliers that mark countries with distinctively higher unemployment than the rest of the sample. In the first years, only Poland and the Slovak Republic had significantly higher unemployment, on the other end of the spectrum, Luxembourg, the Netherlands, and Switzerland stood below the others. From 2002, the countries started to converge to each other and in 2007, there were hardly any outliers. The response of the labour markets to the financial crisis was heterogeneous, therefore the countries started to diverge again.

Figure 2: **Unemployment Rates, 2001-2011**



Source: Author´s calculations on the basis of the OECD (2014a).

Table 2 lists basic summary statistics of the unemployment rates to support the above mentioned development with numeric values. From every statistic, the trend of initial convergence, which was followed by divergence caused by the financial crisis, is apparent. It might be the most evident on the variation, which decreased from initial 19.82 to 4.51 in 2008, only to grew again to 19.97 in 2011. The standard deviation followed precisely the same trend. In the lowest unemployment countries, unemployment was raising in the first half of the observed period, until the economic boom reversed this trend. The crisis caused a strong increase in unemployment again with the minimum unemployment remaining 1.5 % higher than in 2001. The maximum unemployment rates in the Europe developed similarly like previous statistics. The big difference is that countries which used to have the highest unemployment - Slovakia and Poland, were swapped at the "bottom" of the sample by the countries that were hit the most severely by the crisis - Spain, Greece, and Ireland. The individual

development is further discussed in the following paragraphs. The relationship of mean and median is definitely worth pointing. Outlining countries with really high unemployment kept mean above median for most of the years. Nonetheless, the final values of both variables stood 1.5 p.p. respectively 2 p.p. higher then the initial values.

Table 2: **Summary Statistics, Unemployment, 2001-2011**

Statistics	2001	2003	2005	2007	2009	2011
Min	1.809	3.691	4.497	2.557	3.206	3.344
Max	19.330	19.986	18.032	11.040	18.116	21.769
Mean	7.279	7.950	8.106	6.528	8.331	9.232
Median	6.808	7.892	8.028	7.006	8.328	8.260
Std. Dev.	4.452	3.994	3.422	2.161	3.181	4.469
Variation	19.820	15.955	11.713	4.670	10.118	19.972

Source: Author´s calculations on the basis of the OECD (2014a).

European countries differed in absolute values of unemployment, but also in the actual development of unemployment during the observed period (graphically in figure 3). We can roughly divide the sample in three categories - the first category consists of the countries whose level of unemployment remained quite stable (we focus more on the initial and the final years and not on the fluctuations due to the economic boom and subsequently the recession), the second category is represented by the countries that experienced a steep increase in unemployment, and the third category represents countries which managed to lower their initially very high levels of unemployment.

Figure 3: **Unemployment Rates and Structural Unemployment, 2001-2011**

Source: Author´s calculations on the basis of the OECD (2014a).

The last but one column in table 3 presents the absolute difference in unemployment between the final year (2011) and the initial year (2001) of the observed period. The very last column shows the same difference but in relative values to the year 2001, i.e. $\Delta(11-01)\% = (urt1564_{2011} - urt1564_{2001})/urt1564_{2001}$. If we look at the absolute values, the countries whose unemployment stayed around the initial values are for instance Austria, France or Norway. The relative values yield us the same countries for this category. It is not surprising that the countries which were hit the most severely by the post-financial crisis recession, suffered the biggest increase in the unemployment rate - Spain 11.24 %, Ireland 10.93 % or Portugal 9.12 %. If we take into account the relative values then we get a bit different picture. Unemployment in 2011 compared to 2001 in Ireland rose by hardly imaginable 278 p.p., it was 214 p.p. in Portugal and 172 p.p. in Luxembourg. In Spain, which was on the top of the list in the

absolute increase, the relative increase was "only" 106 p.p. There are, however, other countries whose evolution of absolute values do not look so severe, but in the relative terms, the increase was quite significant - 83 p.p. in Denmark, 76 p.p. in the Netherlands or 67 p.p. in the United Kingdom. Although we get an interesting outlook from the relative values, the fact that the level of unemployment directly influences people´s lives as well as a functioning of economies, the absolute values might as well stay the most important indicator, as we can hardly state that the increase in the unemployment rate from 1.80 % to 4.93 % in Luxembourg was more devastating that the increase from 10.52 % to 21.76 % in Spain.

Table 3: **Unemployment Rates, 2001-2011**

Country	2001	2003	2005	2007	2009	2011	$\Delta(11-01)$	$\Delta(11-01)\%$
AUS	3.59	4.31	5.19	4.46	4.84	4.20	0.60	16.86
BEL	6.21	8.21	8.50	7.50	7.95	7.19	0.98	15.80
CZE	8.18	7.82	7.97	5.37	6.75	6.80	-1.37	-16.83
DNK	4.21	5.47	4.89	3.83	6.10	7.71	3.50	83.21
FIN	9.11	9.03	8.44	6.91	8.38	7.86	-1.25	-13.77
FRA	8.63	8.48	8.91	8.03	9.15	9.25	0.61	7.15
DEU	7.90	9.36	11.28	8.74	7.83	6.01	-1.89	-23.98
GRC	10.41	9.88	9.99	8.40	9.61	17.88	7.47	71.74
HUN	5.72	5.89	7.25	7.40	10.07	11.01	5.28	92.33
IRL	3.92	4.70	4.82	4.86	12.45	14.85	10.93	278.81
ITA	9.59	8.74	7.82	6.17	7.89	8.52	-1.07	-11.18
LUX	1.80	3.69	4.49	4.07	5.15	4.93	3.12	172.71
NLD	2.51	4.15	5.29	3.61	3.73	4.44	1.93	76.93
NOR	3.49	4.51	4.66	2.55	3.20	3.34	-0.15	-4.29
POL	18.59	19.98	18.03	9.71	8.27	9.75	-8.83	-47.53
PRT	4.25	6.65	8.07	8.47	10.02	13.37	9.12	214.56
SVK	19.33	17.55	16.19	11.04	12.09	13.58	-5.75	-29.75
ESP	10.52	11.35	9.20	8.31	18.11	21.76	11.24	106.83
SWE	5.07	5.83	7.76	6.22	8.45	7.93	2.86	56.47
CHE	2.51	4.21	4.51	3.71	4.20	4.13	1.62	64.54
GBR	4.78	4.88	4.71	5.33	7.83	7.99	3.21	67.29
EU21	8.50	9.01	9.09	7.29	9.11	9.70	1.20	14.12
EU15	7.40	7.96	8.24	7.10	9.19	9.69	2.29	30.93

Source: Author´s calculations on the basis of the OECD (2014a).

The countries that managed to lower their unemployment rates are the Visegrad countries with the exception of Hungary, which was initially characterised by

the very good functioning of the labour market, but unlike the other post-communist Central European countries, it suffered the substantial increase in unemployment during the observed period. Still at the beginning of the 21st century both Slovakia and Poland faced very high post-transformation levels of unemployment. Especially in Poland, the situation was really severe and many of Polish unemployed sought for jobs in other European countries (Kowalska and Strielkowski, 2013). In years 2006 and 2007, the extremely strong growth of GDP in both countries (both years more than 6 % in Poland and in Slovakia even more - 8.3 % respectively 10.5 %) caused an unprecedented acceleration of jobs creation which subsequently led to an extreme drop in unemployment rates. This trend was stopped by the financial crisis, nevertheless, a decrease by 8.83 p.p. in Poland is quite remarkable. The Czech Republic was in a different situation as, by most of the scholars anticipated and abrupt increase in unemployment after the transformation did not occur. The term "Czech unemployment miracle" was also used. This situation, however, did not reflect the true face of the Czech labour market. It was eventually revealed by the negative effects of the monetary crisis in 1997 (Flek et al., 2004). Ever since the unemployment rate oscillated around 8 %, only until an overheating of the economy in years 2005-2007 lowered unemployment to the artificially low levels (Strielkowski and Hněvkovský, 2013). Disregarding the post-crisis increase, unemployment in the Czech Republic fell by 1.37 p.p. during the observed period.

This section outlines the development of unemployment in selected EU countries over the 2001-2011 period. We focused on both aggregate (European) and individual (country) levels. On the aggregate level, we can observe a common trend of initial growing of unemployment which was reversed by the rapid economic growth causing the steep drop in unemployment, only to be followed by the abrupt post-crisis increase. Still we must not forget that the European labour market is a very heterogeneous space in which countries tent to exhibit substantially diverse levels of unemployment - from around 3 % in Norway up to more than 20 % in Spain in year 2011. Besides the differences in absolute values, the countries were also characterised by various developments in relative terms. The aim of this section was to provide better understanding of the development of unemployment in this turbulent period so that we can more easily evaluate possible effects of labour market institutions and policies on unemployment in the next section.

4.2 The Effects of Labour Market Institutions on Unemployment

The main aim of this thesis is to estimate the effects of labour market institutions on unemployment rates in Europe. Hence, we employ the standard econometric methods on our dataset of 21 countries over 11 years. This section is organised in following manner: firstly we define six different model specifications which we want to estimate, then these specifications are estimated gradually by pooled OLS model, LSDV model, FE model, and RE model, and finally these models are mutually compared to find out which one yields the best results. At every model, the requisite assumptions are checked. Each of the used models can exhibit distinct results. Our strategy will be to comment the results yielded from particular models gradually and then critically evaluate them to find the most reasonable outcomes of our analysis.

4.2.1 Model Specifications

We have defined these six model specifications[14]:

1) Baseline (*bs*) specification is defined as in the previous methodological chapter, i.e.:

$$urt1564 = anrr + nrr1 + ubendur + twcoup + epl + tudens + corp + almpu + outgap.$$

2) In the second specification (*sh*), we substitute the measure of a macroeconomic situation (*outgap*) with two variables aiming to control for cycles fluctuations (*totshock*) and (*rintshock*). It is both due to the fact that the studies which this work is based on (Bassalini and Duval, 2006; Blanchard and Wolfers 2000, and others) used this strategy, but also because the variables that control business cycle fluctuations might significantly contribute to an explanation of the evolution of unemployment in this very turbulent period of time.

$$urt1564 = anrr + nrr1 + ubendur + twcoup + epl + tudens + corp + almpu + totshock + rintshock.$$

[14]The aim is to list the variables which are used in the specifications, not a correct econometric term of the equations, therefore coefficients and constants are not mentioned.

3) The third specification (*mw*) incorporates (*rminmed*) to examine if higher minimal wage tends to increase unemployment. Unfortunately, a reliable measure of statutory minimal wage is available only for 13 out of 21 countries. Hence, the panel to stay strongly balanced, we have to use only 143 observations in this specification.

$urt1564 = anrr + nrr1 + ubendur + twcoup + epl + tudens + corp + almpu + outgap + rminmed.$

4) The forth specification (*log*) uses a logarithmic transformation of both the dependent variable and the independent variables (with the exception of *outgap*). We come out of previous studies (Scarpetta, 1996; Nickell 1997 and 1998) to analyse whether the logarithmic transformation fits the data better. More economic interpretation of a logarithmic transformation will be presented with the results.

$lurt1564 = lanrr + lnrr1 + lubendur + ltwcoup + lepl + ltudens + lcorp + lalmpu + outgap.$

5) In the fifth specification (*su*), the dependent variable *urt1564* is replaced by structural unemployment (*surph*) which is filtered from *urt1564* by using the Hodrick-Prescott filter. The idea is to filter the cycle component of unemployment and then use the set of institutional variables (of course without the *outgap*) to examine to which extent can institutions explain core unemployment.

$$surhp = anrr + nrr1 + ubendur + twcoup + epl + tudens + corp + almpu.$$

6) The sixth specification (*ltu*) aims at analysing the effects of institutions on one of the most painful phenomenon of the European labour market - high shares of long-term unemployed. Unlike the previous specification, the variable *outgap* stays in the equation. We assume that this variable should be significant as there are channels through which business cycle affects

long-term unemployment. One of the possible mechanisms is the hysteresis effect which says that a part of people, who are made redundant due to economic recession, becomes long-term unemployed because they lose work habits and they stay unemployed or out of the labour force even after an economy recovers.

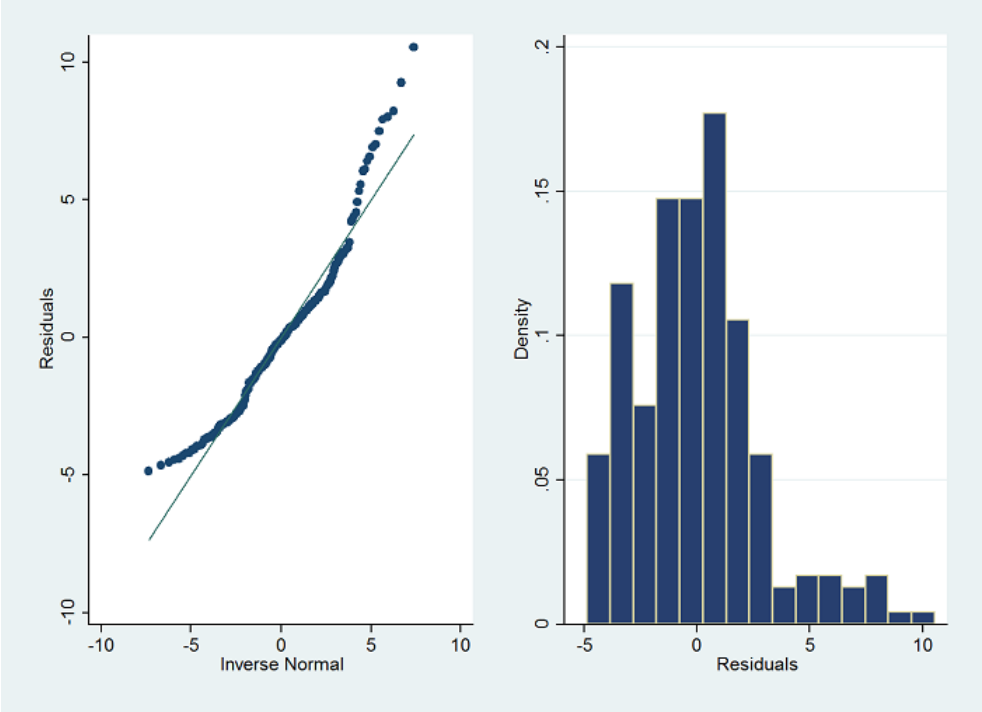
$$ltu = anrr + nrr1 + ubendur + twcoup + epl + tudens + corp + almpu + outgap.$$

4.2.2 Pooled OLS

Firstly, we estimate our model specifications by using pooled OLS model. It is a model which do not consider a structure of the panel, but simply pool the data together and estimate coefficients[15]. In order to check the classical assumptions of OLS model, we run the baseline specification. Both White test and Breusch-Pagan test strongly reject the null hypothesis of homoskedasticity. In case that residuals are not homoskedastic, it can lead to biased estimates of coefficients. Especially, in values of standard errors and with that connected levels of significance. As possible remedies, we can use a regression with options *robust* or *cluster*. We tried both options, but due to the fact that Stata already incorporates a number of clusters into the *robust* option, both methods yields the same results. We mentioned that heteroskedasticity can lead to biased estimates of coefficients. In our case, the robust regressions did not cause the different values of points coefficients, but the coefficients of the standard errors were larger, which caused that some of the variables stopped being significant. In the pooled OLS model, the issue of the insignificant coefficients was not so substantive, but with FE model, the *robust* option eliminated some of the significant variables. Unfortunately, looking over assumptions and other econometric flaws are present in some of the previous studies. We dare to say that this was one of the reasons of such unambiguous and conclusive results of many studies.

[15] All the estimations are done in Stata software. The pivotal commands from Stata are enclosed in appendix.

Figure 4: **Q-Q plot and Histogram, Pooled OLS, *Bs***



Source: Author´s calculations based on the sources from the list of variables.

The other assumption that needs to be tested is normality of residuals. Shapiro-Wilk test rejects normality. On the basis of graphical tests - Q-Q plot and histogram of residuals, we reject normality as well, with an ascertainment that residuals are positively skewed (Figure 4). Nonetheless, the robust regression should deal with this imperfections. Furthermore, we want to find out if there is a problem of collinearity among the independent variables. Table 4 depicts the pairwise correlation between the explaining variables. In the last column of the table, the values for the variance inflation factor (VIF) are presented. There is a conventional benchmark that if the VIF exceeds 10, then this variable is highly correlated and should be addressed. In our sample, none of the variables fulfils this condition, thus we do not have to take further actions. The most correlated variable is *ubendur*, especially with *anrr* and *nrr1*, which is not surprising if we consider that this variable is a ratio of both variables.

Table 4: **Correlation Matrix and VIF, Pooled OLS, *Bs***

Variable	*anrr*	*nrr1*	*ubendur*	*twcoup*	*epl*	*tundens*	*corp*	*almu*	*outgap*	VIF
anrr	1.000									7.39
nrr1	0.389	1.000								7.10
ubendur	0.508	-0.516	1.000							8.49
twcoup	0.299	0.068	0.173	1.000						1.92
epl	0.026	0.400	-0.442	-0.087	1.000					2.60
tundens	0.425	0.240	0.179	0.517	-0.236	1.000				1.82
corp	0.550	0.452	0.036	0.478	0.475	0.344	1.000			3.15
almu	0.587	0.543	0.052	0.337	0.016	0.430	0.480	1.000		2.32
outgap	0.001	-0.079	0.074	-0.117	-0.085	0.024	-0.031	0.159	1.000	1.14

Source: Author´s calculations based on the sources from the list of variables.

In table 5, the results for six specifications of pooled OLS model are presented. In the baseline specification, five of the variables appear to be significant on the 1% level of significance - all three variables connected with unemployment benefits alongside with the measure for macroeconomic situation and ALMP. Generous unemployment benefits may contribute to higher unemployment mostly through two channels. Firstly, it can affect the job-matching process due to lowered job-search intensity of unemployed and their willingness to accept jobs. Hora (2008) confirms this hypothesis from the microeconomic perspective suggesting that even if staying on unemployment benefits is not a preferred strategy for most of unemployed, they demand an income from active work to be distinctively higher than income guaranteed in case of unemployment. If this condition is not fulfilled (high replacement rates or relatively low wages), it can lead to above mentioned lowered job-search intensity. Secondly, generous unemployment benefits relatively lower opportunity costs of unemployment, hence it enables unemployed to have higher wage expectations. At the aggregate level, this can lead to wage pressures which negatively affect vacancies (Bassalini and Duval, 2006).

Table 5: **Unemployment Equation, Pooled OLS, 2001-2011**

Variable	1.*bs*	2.*sh*	3.*mw*	4.*log*	5.*su*	6.*ltu*
Institutional						
anrr	**0.146*** **	**0.113*** **	**0.291*** **	**0.880*** **	**0.155*** **	**0.096*** **
	(0.026)	**(0.029)**	**(0.047)**	**(0.157)**	**(0.027)**	**(0.016)**
nrr1	**-0.083*** **	**-0.033**	**-0.128*** **	**omitted**	**-0.080*** **	**-0.078*** **
	(0.026)	**(0.029)**	**(0.028)**	**collinearity**	**(0.025)**	**(0.015)**
ubendur	**-8.680*** **	**-7.098*** **	**-12.226*** **	**-0.711*** **	**-8.847*** **	**-6.103*** **
	(1.352)	**(1.429)**	**(1.564)**	**(0.113)**	**(1.383)**	**(0.895)**
twcoup	**0.004**	**0.034**	**0.002**	**0.023**	**0.031**	**0.011**
	(0.029)	**(0.032)**	**(0.035)**	**(0.062)**	**(0.030)**	**(0.020)**
epl	**-0.388**	**-0.080**	**-2.144** **	**-0.054**	**-0.117**	**1.050*** **
	(0.551)	**(0.572)**	**(0.892)**	**(0.173)**	**(0.552)**	**(0.352)**
tundens	**-0.011**	**-0.010**	**-0.064** **	**-0.080** **	**-0.017***	**-0.012** **
	(0.010)	**(0.010)**	**(0.026)**	**(0.031)**	**(0.010)**	**(0.006)**
corp	**-0.132**	**-0.370**	**0.085**	**0.216*** **	**-0.309**	**-0.613*** **
	(0.359)	**(0.377)**	**(0.754)**	**(0.083)**	**(0.366)**	**(0.225)**
almpu	**-27.770*** **	**-30.185*** **	**-35.579*** **	**-0.526*** **	**-28.883*** **	**-12.939*** **
	(4.804)	**(5.191)**	**(8.144)**	**(0.044)**	**(4.814)**	**(2.252)**
rminmed			**-11.828**			
			(8.245)			
Macroeconomic						
outgap	**-0.349*** **		**-0.448*** **	**-0.017** **		**-0.174*** **
	(0.062)		**(0.079)**	**(0.007)**		**(0.048)**
totshock		**-2.071***				
		(1.153)				
rintshock		**0.353*** **				
		(0.094)				
Observations	**231**	**231**	**143**	**231**	**231**	**231**
R-squared	**0.474**	**0.456**	**0.594**	**0.586**	**0.412**	**0.491**

Note: Robust standard errors are presented in parenthesis. *, ** ,*** denote statistical significance at 15%, 5%, and 1% levels respectively. In the 3rd specification (*log*) all the variables are in logarithmic form, with the exception of *outgap*.

Source: Author´s calculations based on the sources from the list of variables.

Nonetheless, unemployment benefits can have favourable impacts on unemployment as well. More generous unemployment benefits, mostly the initial benefits after losing a job, enable unemployed to maintain some required standard level of living, with which they have more chances to find better matched job (Bassalini and Duval, 2006). This might prevent a future loss of a job. Furthermore,

a certain level of unemployment benefits is considered to be socially desirable. Most of the previous studies conclude that the unfavourable effects of generous unemployment benefits overshadow the favourable ones - leads to higher unemployment (Scarpetta, 1996; Nickell 1998; Blanchard and Wolfers 2000; and others).

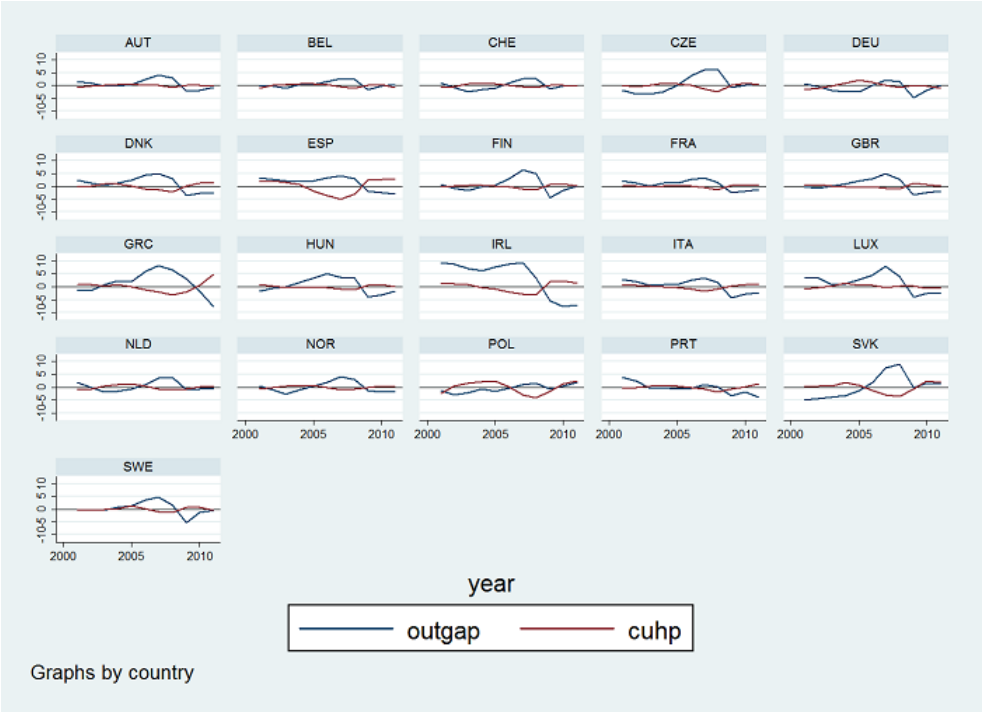
Before discussing our results, we need to make a small methodological remark. In our regressions, a positive sign in front of a variable´s coefficient means that the variable contributes to higher unemployment. If we state "a variable has a positive effect on unemployment", it means that it contributes to higher unemployment. We believe that preserving this mathematical notation will be less confusing. In the baseline specification, actually in all specifications estimated by pooled OLS, the average replacement rate has a positive effect on unemployment. It suggests that the above described adverse effects of unemployment benefits are stronger. The size of the coefficients is also very much reasonable. On the other hand, higher initial unemployment benefits slightly lower unemployment. This fact might support our hypothesis that a higher level of initial unemployment benefits enables unemployed to find a better matched job, but generally, higher unemployment benefits (represented by the net average replacement rate) cause higher unemployment. The third variable connected to unemployment benefits, which should represent the duration of unemployment benefits (*ubendur*), seems to lower unemployment. This is, unfortunately, against both previous literature and any economic reasoning. We adopted the definition of this variable ($ubendur = anrr/nrr1$) from Bassalini and Duval (2006). In their study *ubendur* had the expected positive sign which was probably caused by the fact that both *anrr* and *nrr1* had positive signs. Whereas in our regression *nrr1* had a negative sign, thus it might overturn the sign of *ubendur*.

The other institutional variable that turned out significant in all the specifications is *almpu*. The impact of ALMP on unemployment is a delicate issue which has been addressed from both microeconomic and macroeconomic perspective. It might as well be due to the fact that the other labour market institutions are rather stable, strongly past dependent and very uneasy to reform. On the contrary, both the level of expenditures on ALMP and types of programmes are more easily adjustable. In previous macroeconomic literature, a consensus has been reached about the negative sign of ALMP, but totally not about the

magnitude and significance. Boon and Van Ours (2004) and Nickell (1998) are very optimistic about the effects of ALMP on unemployment, whereas Scarpetta (1996) and Blanchard and Wolfers (2000) consider these effects rather negligible. Studies from the microeconomic perspective focus more on the evaluating of the individual programmes. Hence, it is a difficult task to summarize their main findings. Nevertheless, we can state that the efficiency of ALMP is strongly dependent on the set-up of individual programmes (Martin, 1998; Martin and Grubb, 2001; Calmfors et al., 2002; Carling and Richardson, 2004).

The possible mechanisms via which can ALMP reduce unemployment are mainly: increased efficiency of the job-matching process and amended human capital of unemployed. *Almpu* turned out to be highly significant in all our specifications. It has the expected negative sign and a strikingly high coefficient. But we need to understand that the variable *almpu* is in very small units. The maximum ALMP expenditures in % of GDP is 1.66 and the minimum is only 0.04 with mean equal to 0.56. Furthermore, we wanted to extract the endogenous relationship of the level of expenditures on ALMP with the level of unemployment. In other words, the fact that countries with higher unemployment might tent to invest more in ALMP. Hence we created the variable *almpu* as a ratio of ALMP expenditures to the particular level of unemployment. As the result, *almpu* is even one decimal place lower with the maximum, minimum and mean equal to 0.489, 0.004, 0.098 respectively. Still the estimated effects of *almpu* are very strong. If we took a country with 10 % of unemployment which spends 1 % of GDP on ALMP, we may consider this country as an average country because *almpu* would be equal to 0.1 (mean is 0.098), and this country would increase its spending on ALMP to 1.1 % of GPD, it would ceteris paribus lower the unemployment rate by 2.77 pp based on our baseline equation. This result is similar to Nickell (1998) who concludes that an increase in *almpu* by 10 pp should lower unemployment by 1.92 pp. In spite of this accordance, we should remain very cautious about drawing any strong conclusions about the magnitude of the effects of ALMP on unemployment.

Figure 5: **Output Gap and Cyclical Unemployment (%), 2001-2011**



Source: Author´s calculations on the basis of the OECD (2013).

The measure for output gap appeared to be absolutely significant in all five specifications in which it was included. It confirms the importance of the cyclical component of unemployment. There is no question that business cycle played an important role in the development of unemployment during the observed period. As described in the previous section, in the years before the financial crisis (2005-2007), European economies were overheating, on the contrary, the years after the crisis were charecterized by a strong recession. Figure 6 depicts the evolution of both *outgap* and cyclical unemployment (*cuhp*) in individual countries. The cyclical component was gained as the residual component from above mentioned filtering of *urt1564* by using the Hodrick-Prescott filter. Understandably, the two curves crosses each other quite regularly around the zero value. The *outgap* curve tends to be much more volatile than the *cuhp* curve. The most volatile path followed Ireland which experienced the steepest growth (9.478 in 2007) only to drop into the deepest recession just three years later (-7.785 in 2010).

The cyclical component reached its minimum (helped to lower unemployment the most) in Spain in 2007 (-4.867) and its maximum in Greece in the last year of the period (4.806).

The estimated coefficient of *outgap* has both the negative sign and the reasonable size. In the baseline equation, in the situation when output is 1 % above its potential, the cyclical component of unemployment should lower unemployment by 0. 349 pp. This values seem to reflect the reality quite adequately.

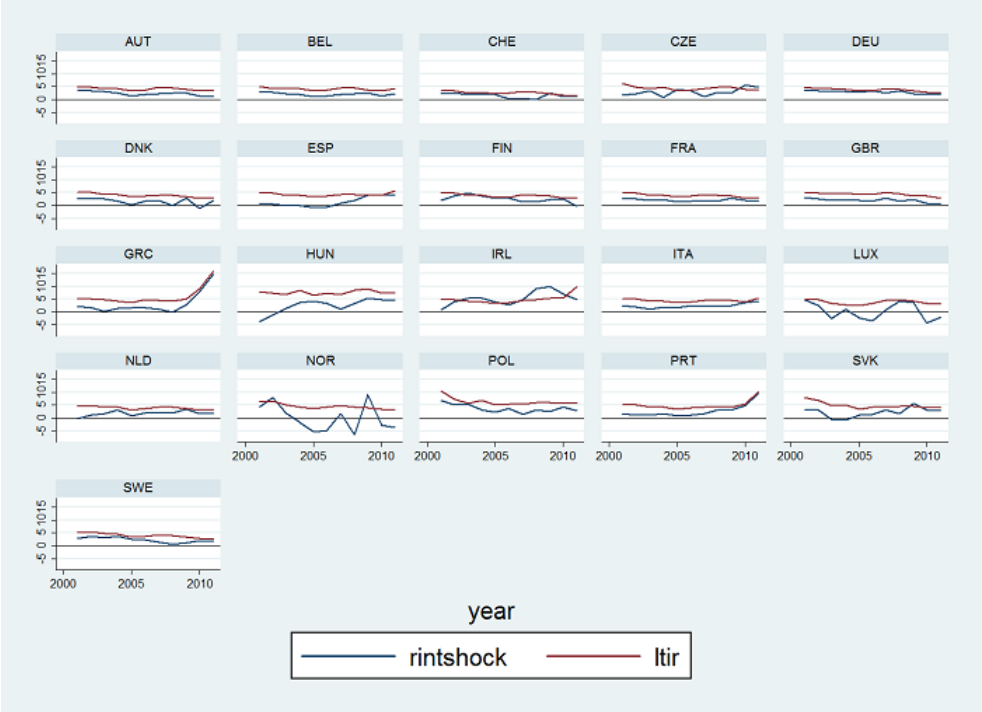
In the second specification (*sh*), we substituted the measure of business cycle (*outgap*) by two other variables which might capture the current macroeconomic situation. Terms of trade shock (*totshock*) and real interest rate shock (*rintshock)*. The shocks are constructed as follows: $totschock = (\frac{M}{Y}) * log(\frac{P_M}{P_Y})$ and *rintshock* = long-term interest rate - annual change in GDP deflator (in %)[16]. Nunziata (2001) assumes that adverse shifts in *totshock* can have effects on labour costs via wage pressures. These wage pressures are caused by an increase of a difference between consumer (import) and producer prices (Layard et al., 1991). And as Nunziata (2002) confirms, the impact of shocks and institutions on labour costs is usually in line with the impact on unemployment. Blanchard and Wolfers (2000) brought into the light a possible importance of *rintshock* on the evolution of European unemployment. They point out to the fact that the real interest rate became sharply negative in the second half of the 1970s and then largely positive in the 1980s and the 1990s. The possible mechanism how changes in the real interest rate can affect unemployment is through changes in capital accumulation, which in the case of given wages, can lead to a shift of labour demand.

The estimates of the effects of both shocks are rather inconclusive. The changes in the real interest rate appear absolutely significant for the development of the unemployment rates. The coefficient of *rintshock* is positive, thus this finding is perfectly in line with the previous literature, where the real interest rate shocks tented to be positive and significant (Blanchard and Wolfers, 2000; Bassalini and Duval, 2006; and others). This holds in spite of the fact that the development of the real interest rate was much less fluctuant than in the second half of the 20th century. The size of *rintshock* coefficient suggests that if the real interest rate increases by 1 pp, it will lead to an increase in unemployment by 0.353 pp. The

[16]The formulas of the shocks were taken from Bassalini and Duval (2006). For more information, see the Description of Data and Variables in the chapter Methodology.

change in the real interest rate can be caused by both positive and negative shifts in both nominal interest rate and inflation. For instance, if a nominal interest rate increases by 1 pp, in the situation when the inflation remains unchanged, it will lead to an increase in unemployment by 0.353 pp.

Figure 6: **Nominal and Real Interest Rates, 2001-2011**



Source: Author´s calculations on the basis of the OECD (2013).

Figure 6 depicts both nominal interest rates (*ltir*) and real interest rates (*rintshock*), cleaned of inflation by using GDP deflator. The real interest rate hardly ever fell into negative figures. For longer time only in case of Norway which was highly rated by the markets, among other reasons due to incomes from the oil production, therefore it had very low nominal interest rates, but at the same time, it experienced quite high inflation (even above 10 % in 2008). The other reason for positive real interest rates is relatively stable and low inflation during the observed period. The only other time when inflation got into double digits was in Hungary in the very first year of the period (11.5 %).

Terms of trade shock is significant but only on the 10 % level of significance. The negative sign of its coefficient is very problematic for interpreting as it goes against both previous literature and the economic sense. We cannot find any economic justification why an increase in import or import prices should contribute to lower unemployment.

In the third specification (mw), we aim at analysing the effects of minimal wage on unemployment. Due to the fact that reliable internationally comparable data are only in countries where minimal wage is statutory, we had to restrain the sample to 13 countries - 143 observations. Theoretically, if we accept the assumption of perfectly competitive markets, any minimum wage set above the market clearing level, should lead to involuntary unemployment. The previous studies which dealt with the effects of statutory minimum wage on unemployment (Elmeskov et al., 1998; Bassalini and Duval, 2006) concluded that the effects are ambiguous and hardly ever significant. Our estimates confirmed this hypothesis as *rminmed* do not appear significant.

The logarithmic transformation is used in the forth specification to examine whether the logarithmic data fit the model better. The biggest distinction from the previous specifications is the fact that the degree of corporatism and trade union density are significant on 1 % and 5 % level respectively. Strong trade unions have powers to push wages above the market clearing level. Nevertheless, it is believed that the impact of unions on unemployment is strongly dependent on the level of centralisation of collective bargaining. Decentralized wage bargaining does not allow unions to push wages too high, which should prevent from increasing of unemployment. On the contrary, in very centralized wage bargaining, unions internalise the negative effects of too high wages - loss of employment, therefore it leads to moderation of wage claims (Bassalini and Duval, 2006). Some of the previous studies support this "hump-shaped" hypothesis that both decentralized and highly centralized wage bargaining structures lead to lower unemployment (Scarpetta, 1996; Elmeskov et al., 1998). On the other hand, estimates from Nunziata (2002) do not confirm this hypothesis. In our case, the more centralized wage bargaining should marginally increase unemployment, whereas stronger unions should, also marginally, lower unemployment.

In the last two specifications we use alternative dependent variables. In the fifth specification (su), we model the effects of institutions on structural (core)

unemployment. We gained structural unemployment by filtering off the residual (cyclical) component of *urt1564*. We deal with core unemployment, which should not be influenced by the effects of business cycle, therefore we omit *outgap* from our equation. The results are analogous to the results from previous specifications. All variables connected with unemployment benefits and *almpu* are very significant. Furthermore, *tundens* is significant on the 10 % level, but with very marginal effects as an increase in trade union density by 1 % should lower unemployment only by 0.017.

Figure 7: **Long-Term Unemployment to Unemployment (%), 2001-2011**

Source: Author´s calculations based on the sources from the list of variables.

The dependent variable in the last specification (*ltu*) is long-term unemployment. We use the same explanatory variables as in the baseline specification, it means that the measure of macroeconomic situation is also included. The impact of a recession/boom on long-term unemployment is still a bit different than on aggregate unemployment. At the beginning of a recession, people are

made redundant which creates a wave of newly unemployed, but this relatively and temporarily lowers the share of long-term unemployed to all unemployed (Jurajda and Munich, 2003). Subsequently, the number and also the share of long-term unemployed starts to grow as a part of the unemployed loses their work habits and do not come back to work. This phenomenon was described in the so called hysteresis effect and outlines the fact that a part of the cyclical unemployment transforms into structural unemployment. In other words, if a recession lasts long enough or it is deep enough, it increases the natural rate of unemployment of a particular economy. Hněvkovský (2012) comes up with the hypothesis that this process should work also in the opposite direction, i.e. if the cyclical component lowers unemployment for a substantially long period of time, it should subsequently cause a drop in the natural rate of unemployment as well.

There is a considerable variation in the incidence of long-term unemployment across European countries. Some of the countries had the share of the long-term unemployment to unemployment constantly around 20 %. It is a group of countries which exhibits low levels of aggregate unemployment as well - Scandinavian countries and Austria. At the other end of the spectrum, there are countries in which the number of long-term unemployed oscillated around 50 % - Germany, Greece, Italy, etc. Absolutely the worst situation was in Slovakia where long-term unemployed created almost 80 % of all unemployed in years 2005-2007.

The effects of all variables (with an exception of *twcoup*) on long-term unemployment appear significant. The most of the coefficients are lower than in the equations for aggregate unemployment, but if we consider the sizes of both long-term and aggregate unemployment, the coefficients are proportionally smaller. The negative sing in front of *corp* suggests that centralized wage bargaining should lower long-term unemployment. Unlike in the equation for aggregate unemployment, the employment protection legislation is highly significant with a positive sign. There are several channels through which *epl* might affect unemployment. Firstly, it influences wages both positively and negatively. Firms might offer lower wages to workers as a compensation for incurring dismissing costs. On the contrary, incumbent workers are better protected, thus they have bigger bargaining power. As the result of wage tensions, firms reduce hiring costs. This increases the duration of unemployment, but also the opportunity

costs of unemployment are higher, hence job seekers are willing to accept worse paid jobs. As the whole, *epl* lowers labour turnover (both hiring and layoff) and increases the duration of unemployment (Bassalini and Duval, 2006). The previous literature have not found any clear-cut empirical effects of *epl* on unemployment. In line with our findings, Bassalini and Duval (2006) state that *epl* should contribute to higher long-term unemployment as it prolongs the duration of unemployment and lowers labour turnover.

R-squared of the specifications oscillated between 0.4 and 0.6. The lowest R-squared was in the fourth specification (*su*) where the dependent variable was structural unemployment. We can say that in this specification, we analysed the net effects of institutions as we did not include any measures for the macroeconomic situation. The baseline specification stood somewhere in the middle with R-squared equalled to 0.474. It was slightly higher than for the specification where we substituted *outgap* with the shock variables. The data fitted the model best in the specification with minimum wage (R-squared = 0.594).

4.2.3 LSDV

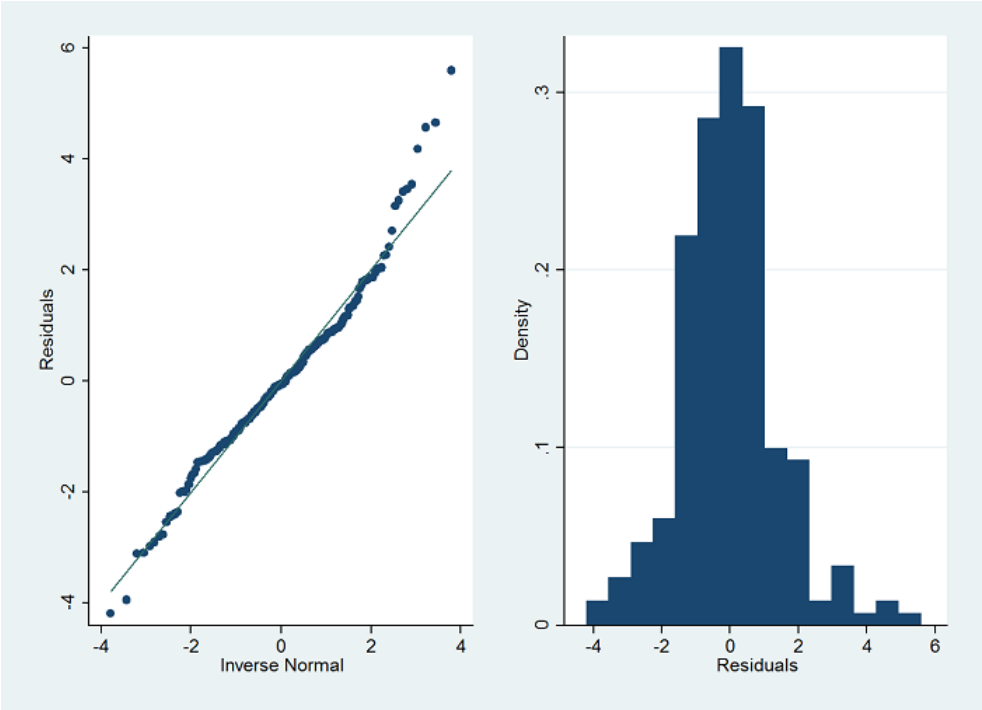
In the previous sub-section, we used pooled OLS model for estimates, a method which neglects the structure of the panel. Now we employ LSDV model which is identical to pooled OLS with the exception that it includes an additional set of dummy variables that allow us to resolve the omitted variable bias. In other words, we add a dummy variable for each country (with the exception of the first country whose individual effect is basically reflected in general intercept), therefore we allow every country to have a different value of intercept. This dummy variables enable us to account for unobserved heterogeneity across countries. The pros of LSDV estimator is that we can see the particular values (coefficients) in front of each dummy variable, i.e. we know the values of each country´s individual intercept. On the contrary, with the high number of entities, LSDV model becomes chaotic and it also leads to loss of a lot of degrees of freedom. The baseline specification for LSDV model looks following:

$$urt1564 = \alpha + \beta_1 anrr + \beta_2 nrr1 + \beta_3 ubendur + \beta_4 twcoup + \beta_5 epl + \beta_5 tudens + \beta_6 corp + \beta_7 almpu + \gamma_1 outgap + \delta_1 c2 + ... + \delta_{20} c21.$$

To check the assumptions of the model, we use the same tests as in the case of pooled OLS. The homoskedasticity is not rejected by White test, but it is

strongly rejected by Breusch-Pagan test. We decided to use the robust regression to control for heteroskedasticity. The residuals are more normally distributed than in the case of pooled OLS, but after running Shapiro-Wilk test and graphical analysis from Q-Q plot and histogram of residuals, we rejected the normality as well (figure 8). The another problem that might occur while adding dummy variables controlling for individual effects into the equation is an increased collinearity between variables. This fact was confirmed in our case. The VIF exhibits enormously high values - the only two explanatory variables that had lower values than the benchmark 10 were *outgap* and *almpu*. Mean VIF equalled to 31.28. This is a serious drawback that needs to be addressed.

Figure 8: **Q-Q plot and Histogram, LSDV, *Bs***



Source: Author´s calculations based on the sources from the list of variables.

We decided to take no further remedies and to present the results from LSDV model only as figurative and without proper interpretation. We did so from the reason that estimates of the coefficients from FE model, which is pivotal for us, are identical as from LSDV model. The differences are only in sizes of

standard errors of the variables, therefore also in significance of the variables and the overall goodness of fit of the model. Hence, we will discuss the findings in the next sub-section and the results in table 6 are only illustrative. We also did not include coefficients for individual country dummies in table 6 as we find it unnecessary. One more important test needs to be run on LSDV regression before using FE model. It is F-test with the hypothesis that individual dummy variables are jointly equal to zero. We can strongly reject the hypothesis, hence we are justified to use FE model as it is better than pooled OLS.

Table 6: **Unemployment Equation, LSDV, 2001-2011**

Variable	1.*bs*	2.*sh*	3.*mw*	4.*log*	5.*su*	6.*ltu*
Institutional						
anrr	**0.149*** **	**0.219** **	**0.114**	**0.388** **	**0.312*** **	**0.087** **
	(0.053)	**(0.098)**	**(0.089)**	**(0.168)**	**(0.066)**	**(0.043)**
nrr1	**-0.025**	**-0.041**	**0.115** **	**omitted**	**-0.092** **	**-0.039*** **
	(0.044)	**(0.059)**	**(0.062)**	**collinearity**	**(0.044)**	**(0.031)**
ubendur	**-6.753**	**-11.363***	**0.512**	**-0.191*** **	**-15.823*** **	**-4.422***
	(3.488)	**(6.254)**	**(5.631)**	**(0.141)**	**(4.154)**	**(2.806)**
twcoup	**0.226*** **	**0.271*** **	**0.215*** **	**0.121***	**0.289*** **	**0.189*** **
	(0.061)	**(0.069)**	**(0.064)**	**(0.080**	**(0.065)**	**(0.044)**
epl	**-2.434** **	**-2.625** **	**-2.952** **	**-0.338***	**-2.145** **	**-1.292** **
	(0.985)	**(1.184)**	**(1.185)**	**(0.230)**	**(1.028)**	**(0.704)**
tundens	**0.087** **	**0.091**	**0.229*** **	**-0.060**	**-0.028**	**0.084** **
	(0.051)	**(0.080)**	**(0.065)**	**(0.149)**	**(0.056)**	**(0.036)**
corp	**-1.516*** **	**-1.284***	**-5.450*** **	**-0.167***	**-0.734**	**-1.373*** **
	(0.475)	**(0.729)**	**(1.698)**	**(0.110)**	**(0.533)**	**(0.333)**
almpu	**-18.214*** **	**-29.642*** **	**-24.268*** **	**-0.398*** **	**-19.422*** **	**-8.411*** **
	(4.440)	**(6.160)**	**(7.844)**	**(0.036)**	**(4.231)**	**(2.476)**
rminmed			**-7.643**			
			(8.148)			
Macroeconomic						
outgap	**-0.371*** **		**-0.391*** **	**-0.031** **		**-0.164*** **
	(0.037)		**(0.048)**	**(0.003)**		**(0.029)**
totshock		**-5.062**				
		(1.153)				
rintshock		**0.148*** **				
		(0.066)				
Observations	**231**	**231**	**143**	**231**	**231**	**231**
R-squared	**0.860**	**0.808**	**0.875**	**0.920**	**0.851**	**0.858**

Note: Robust standard errors are presented in parenthesis. *, ** ,*** denote statistical significance at 15%, 5%, and 1% levels respectively. In the 3rd specification (*log*) all the variables are in logarithmic form, with the exception of *outgap*.

Source: Author´s calculations based on the sources from the list of variables.

4.2.4 FE

Fe model, as well as LSDV model, assumes that there is some unobserved heterogeneity across countries which may bias the predictor. In FE model, this individual heterogeneity across countries is captured by unknown not time-depending intercepts that vary across countries. The logic is the same as in LSDV model where this individual characteristics are captured by country dummy variables creating not time-depending intercepts as well. The only difference is that in LSDV model we estimate the coefficients of dummy variables, therefore the individual characteristics are known, and in FE model the individual characteristics are captured in unknown intercepts.

We do not use command *regress,* as in previous cases, thus we have to use different tests to check model assumptions. As mentioned above, the F-test rejected the hypothesis that the constant term is the same across countries, therefore there are some individual characteristics that may influence the estimates. Hence, FE model will yield us better estimates then pooled OLS. To check the assumption of homoskedasticity, we perform modified Wald test for groupwise heteroskedasticity in fixed effect regression models. The hypothesis of homoskedasticity is strongly rejected. The distribution of residuals is the same as in the case of LSDV model (figure 8) - we reject the assumption of normality. We reject the hypothesis in Wooldridge test for serial autocorrelation, thus the data have first-order autocorrelation. To deal with these drawbacks in the assumptions, we should use the option *cluster*, but Stata 11 already clusters the data in the option *robust*, thus robust regression should prevent any possible biases, mostly smaller standard deviations of the coefficients which would cause higher significance of the variables. This fact was also supported by our estimates. When we ran regression without the option *robust*, standard deviations of the coefficients were smaller and the variables exhibited much higher significance.

Table 7: **Unemployment Equation, FE, 2001-2011**

Variable	1.*bs*	2.*sh*	3.*mw*	4.*log*	5.*su*	6.*ltu*
Institutional						
anrr	**0.149***	**0.219**	**0.114**	**0.388**	**0.312****	**0.087***
	(0.080)	**(0.161)**	**(0.094)**	**(0.358)**	**(0.140)**	**(0.053)**
nrr1	**-0.025**	**-0.041**	**0.115***	**omitted**	**-0.092**	**-0.039**
	(0.083)	**(0.108)**	**(0.071)**	**collinearity**	**(0.079)**	**(0.049)**
ubendur	**-6.753**	**-11.363**	**0.512**	**-0.191**	**-15.823***	**-4.422**
	(5.499)	**(9.948)**	**(6.427)**	**(0.302)**	**(8.566)**	**(3.678)**
twcoup	**0.226***	**0.271****	**0.215***	**0.121**	**0.289****	**0.189***
	(0.127)	**(0.122)**	**(0.136)**	**(0.091)**	**(0.116)**	**(0.099)**
epl	**-2.434***	**-2.625***	**-2.952***	**-0.338**	**-2.145**	**-1.292**
	(1.391)	**(1.620)**	**(1.562)**	**(0.365)**	**(2.108)**	**(0.932)**
tundens	**0.087**	**0.091**	**0.229*****	**-0.060**	**-0.028**	**0.084***
	(0.076)	**(0.152)**	**(0.065)**	**(0.210)**	**(0.118)**	**(0.043)**
corp	**omitted**	**omitted**	**omitted**	**omitted**	**omitted**	**omitted**
	collinearity	**collinearity**	**collinearity**	**collinearity**	**collinearity**	**collinearity**
almpu	**-18.214****	**-29.642*****	**-24.268***	**-0.398*****	**-19.422****	**-8.411***
	(7.053)	**(9.372)**	**(12.688)**	**(0.058)**	**(6.973)**	**(4.066)**
rminmed			**-7.643**			
			(11.001)			
Macroeconomic						
outgap	**-0.371*****		**-0.391*****	**-0.031****		**-0.164*****
	(0.055)		**(0.074)**	**(0.004)**		**(0.037)**
totshock		**-5.062**				
		(6.521)				
rintshock		**0.148**				
		(0.119)				
Observations	**231**	**231**	**143**	**231**	**231**	**231**
R-squared	**0.577**	**0.418**	**0.681**	**0.698**	**0.362**	**0.446**

Note: Robust standard errors are presented in parenthesis. *, ** ,*** denote statistical significance at 15%, 5%, and 1% levels respectively. In the 3rd specification (*log*) all the variables are in logarithmic form, with the exception of *outgap*.

Source: Author´s calculations based on the sources from the list of variables.

Table 7 lists the estimates from FE model. By the first look at the table, it is visible that the variables are less significant than in the previous (pooled OLS, LSDV) models. In the baseline specification, *outgap* is significant at 1 %, *almpu* at 5%, and *anrr*, *twcoup* and *epl* are significant at 15 % level. The possible mechanism through which the variables can influence unemployment

were thoroughly discussed at pooled OLS model, thus they will not be discussed here. The exception is *twcoup* which appeared insignificant in pooled OLS model, hence we will focus on it in more detail now.

To remind, in our case *twcoup* is defined as the difference between labour costs to the employer and the corresponding net take-home pay of the employee for a single-earner couple with two children earning 100% of AW. If we consider perfectly competitive labour markets, workers would bear the whole tax burden through lower net wages and the equilibrium unemployment would remain unchanged. The assumption of perfectly competitive labour markets is rather theoretical, in practise it might be violated by several causes. For instance, wages can be set above market-clearing levels, workers bargain, at least partially, over net not gross wages, and there must not be any institutional constraints preventing from shifting the tax burden onto wages. If these conditions are met (labour markets are imperfect), an increase in the tax wedge cannot be put solely on workers, which causes pressures on labour costs and an increase in unemployment (Bassalini and Duval, 2006). Most of the previous studies came to the conclusion that higher labour taxes lead to a rise in unemployment, e.g. Daveri and Tabellini (2000) conclude that higher tax wedges lead to higher labour costs which are greatly responsible for rising unemployment. On the other hand, some of the studies found the tax wedge insignificant for the development of unemployment (Scarpetta, 1996; Baker et al., 2003).

Twcoup is significant in 5 out of 6 specifications (but only on 15 % or 5 % levels). Both the positive sign and the value of the coefficient is in line with the previous literature confirming the hypothesis that an increase in labour taxes influences unemployment through lowered labour demand. In the baseline specification, the coefficients for *anrr* and *outgap* are very much the same as in the case of pooled OLS model. The effect of *almpu* is lower, nonetheless, it still remains quite strong. The negative sign of *epl* suggests that the pros of more stringent employment protection outweigh the cons of lower labour turnover.

Unlike the previous models, neither *totshock*, but mainly, nor *rintshock* appear significant. Minimum wage is again insignificant, but interestingly, in this specification trade union density is strongly significant with a positive sign. This has probably nothing to do with adding minimum wage into the equation, but rather because we use only 13 countries in which there is statutory minimum wage. Therefore, for this sub-sample of countries, the level of *tundens* might

be more important than in the whole sample. It looks like the logarithmic transformation of the variables is not very reasonable for our data as none of the institutional variables is significant (with the exception of *almpu*). In the structural unemployment equation, both *anrr* and *twcoup* are significant with stronger effects than previously. Four institutional variables (*anrr*, *twcoup*, *tundens* and *almpu*) are significant in the long-term unemployment equation, but all only at 15 % level. As in the previous models, the coefficients are proportionally smaller.

The data fit the model reasonably good. The R-squared of specifications ranges from 0.35 to 0.7. The R-squared is the lowest for the equation explaining structural unemployment. On the other hand, the highest R-squared is for the logarithmic transformation. The logarithmic transformation of variables usually increases the goodness of fit of panel data, but it needs also an economic justification and significant variables. In our case, none of the institutional variables is significant, thus we do not highly regard this specification. We decided to implement the logarithmic equation only due to the fact that some of the preceding studies opted for it. The second highest R-squared is in the specification with minimum wage, however, the variable *rminmed* is insignificant and its effect is negligible. The cause is rather that the data fit the model better for the sub-sample of 13 countries with statutory minimum wage. The lowered heterogeneity across countries might as well play a part, as the countries which are not covered in the sub-sample are mostly the countries with better functioning labour markets (Scandinavian countries, Austria, Switzerland, Germany). The baseline specification is again in the middle with the R-squared equal to 0.57.

The other method to estimate panel data is using random effects model. The difference between RE and FE model is that, unlike FE model, the variation across countries is assumed to be random and it cannot be captured only by different not time-depending intercepts for each country. To decide whether we should use RE model, we firstly used Breusch-Pagan Lagrange multiplier test which rejected the null hypothesis that variances across countries is zero, thus RE model is more appropriate than pooled OLS. Then we ran Hausman specification test to see whether RE model is suitable. Under the null hypothesis RE model is consistent and more efficient than FE model. But Hausman specification test rejected the null hypothesis, hence RE model is inconsistent and we cannot apply it on the data. This result is also in accordance with the

general structure of our dataset, as the individual characteristics should differ across countries, but within countries, there should be a pattern that can be captured by an individual country intercept.

4.2.5 Comparison of the Models

In all of the models, the classical assumptions (homoskedasticity, normality of residuals) were not satisfied. Therefore, we were forced to use option *robust* to prevent bias estimates. This remedy caused that some of the variables stopped being significant (mostly in FE model). Firstly, we used pooled OLS model which neglects the structure of the panel. The results for the baseline specification gained from pooled OLS suggested that some of the variables are highly significant for the development of unemployment (three institutional variables connected with unemployment benefits, *almpu*, and *outgap*). Both variables standing for shocks were significant, especially the real interest rate seems to have been substantial. The findings for the long-term unemployment specification were even more conclusive as all variables but *twcoup* appeared significant at 1 % level.

Furthermore, we applied LSDV model, which estimates the coefficients as pooled OLS with additional dummy variables for each country. This dummy variables account for unobserved heterogeneity across countries. F-test rejected the hypothesis that individual dummy variables are equal to zero, hence LSDV and FE models yield better estimates than pooled OLS. The coefficients gained from LSDV model are identical with the ones from FE model. The substantial differences are in significance of coefficients and the goodness of fit. Most of the variables were highly significant in LSDV model and the R-squared exceeded 0.8 in all specifications. These results seem plausible, but there is a problem with big multicollinearity between variables in LSDV model. Hence, these results should not be overestimated.

FE model is pivotal for us. As mentioned above, the coefficients were the same as from LSDV model, but the variables were much less significant. In the baseline equation, besides highly significant *outgap* and *almpu*, only *twcoup*, *anrr*, and *epl* were significant at 15 % level. Neither of the shock variables were significant. The situation was very much the same in the other specifications

as the only highly significant variables remained *outgap* and *almpu*. Hausman specification test proved RE model to be inconsistent, thus we did not employ it. To summarize the comparison between models, pooled OLS and LSDV model gained rather plausible results over the effects of labour market institutions on the development of unemployment in the period 2001-2001, but the estimates from FE model seem to be the most precise and realistic.

5 Conclusions and Policy Implications

We examined the effects of labour market institutions on unemployment relating to the increase of unemployment from the second half of the 1960s. Some of the scholars came to rather strong conclusions over the possibility of explaining the increase in unemployment through the effects of labour market institutions (Nickell, 1998; Blanchard and Wolfers, 2000; Nunziata, 2002; Bassalini and Duval, 2006). In this work, we decided to adopt the same strategy, namely to use macroeconomic cross-country, time series analysis, and to check whether these conclusions are still valid even in the up-to-date data.

On our dataset, which covers 21 European countries over the 2001-2011 period, we applied three different econometric models. From pooled OLS model, we gained the results that are more or less in line with the majority of previous literature, but F-test pointed out to unobserved heterogeneity across countries, thus FE model turned out to be more appropriate in our case. The results from FE model are far less conclusive with none of the institutional variables (except for the variable capturing the effects of ALMP on unemployment which stands a bit aside) appeared significant at 5 % level. These findings are in accordance with some of the preceding studies (Belot and Van Ours, 2001; Baker et al., 2003). We came to the conclusion that the stable character of labour market institutions prevent them from accounting for the majority of the volatile development of unemployment in the turbulent period 2001-2011.

We consider the chosen period as one of the key factors why the labour market institutions appeared mostly insignificant. The preceding scholars mostly worked with datasets covering longer periods of time with much less volatile economic, as well as unemployment, development. Therefore, labour market institutions were able to capture this gradual development. Whereas, our observed period was characterized by both the very strong economic growth and subsequently the deep crisis. The development of unemployment was not any more moderate. We can hardly expect that the changes in institutions over a decade can capture enormous increases in unemployment - around 10 pp in Spain, Portugal or Ireland, as well as big drops in unemployment - more than 8 pp in Poland.

The importance of business cycle was confirmed by our estimates as the measure of output gap turned out highly significant in every specification. From

the baseline specification we got the following figures: if output is 1 % below its potential, it leads to an increase in unemployment by 0.371 pp. The effects of output gap (the cyclical component of unemployment) were the strongest in Ireland, where the economic overheating lowered unemployment by 3.5 % in 2007, and only three years later, the cyclical component contributed to higher unemployment by almost 3 %. These numbers are in accordance with the findings from the previous studies (e.g. Bassalini and Duval, 2006). Output gap contributed also to higher long-term unemployment - by 0.164 pp per every percent output stays below its potential. This finding confirms the above discussed hysteresis hypothesis. We were also keen on examining the effects of institutions on structural/core unemployment. For this purpose, we subtracted the cyclical component of unemployment by using Hodrick-Prescott filter. Both the average replacement rate and tax wedge appeared significant at 5 % level with positive signs, suggesting that more generous unemployment benefits and higher labour taxes contribute to higher core unemployment.

Some of the previous studies (Blanchard and Wolfers, 2000; Bassalini and Duval, 2006) emphasised the importance of shocks and their interactions with institutions. We also examined the role of two shocks - terms of trade shock and real interest rate shock, by substituting them for the measure of macroeconomic situation (output gap). The real interest rate appeared highly significant with a positive sign in pooled OLS model, but in FE model, neither deteriorations in the terms of trade nor changes in the long-term real interest rates were significant. Due to insignificance of both shock variables, we decided to abolish the initial intention to examine the effects of interaction of shocks with institutions on unemployment. We might as well aim at enhancement of shock variables and analysing their interactions with institutions in future research.

The impact of ALMP on unemployment has been addressed from both microeconomic and macroeconomic perspective. In previous macroeconomic literature, consensus has been reached about the negative sign of ALMP, but totally not about the magnitude and significance. Our findings tend to Boon and Van Ours (2004) and Nickell (1998) who are very optimistic about the effects of ALMP on unemployment. From the estimates of the baseline specification we found that an increase in ALMP by 10 pp (in case that the particular unemployment rate remains unchanged) lowers unemployment by 1.82 pp. These findings suggest that ALMP can work as an extremely effective tool for tackling high European

unemployment. On the other hand, with regard to the ambiguous conclusions from the preceding literature, these results shall be interpreted cautiously. We also acknowledge that the efficiency of ALMP is strongly dependent on the set-up of individual ALMP programmes (see e.g. Martin and Grubb, 2001).

If we should draw some policy implications from our empirical analysis, we would put emphasis on ALMP, as both the level of expenditures on ALMP and types of programmes are more easily adjustable than the rest of labour market institutions. The changes in the other labour market institutions (generosity of unemployment benefits, levels of minimum wage and labour taxes, etc.) are usually conditioned by more complex reforms which are harder to implement through the legislation process. Also the effects of ALMP are much more significant and clear-cut in our estimates. Nevertheless, we analysed the overall macroeconomic effects of ALMP on unemployment, therefore some of the categories of ALMP might be much more effective than the others. Furthermore, we stress the necessity to combine our findings with microeconomic evaluations of the efficiency of individual ALMP programmes. The impact of ALMP is also less significant for the development of long-term unemployment.

More generous unemployment benefits and higher labour taxes contribute to higher unemployment. These effects are also evident in the equation of long-term unemployment, but they are the strongest in the case of core unemployment. Hence, for addressing structural and long-term unemployment, policymakers might try to attenuate the negative incentives of generous unemployment benefits and lower labour tax burdens for employees rather than invest into ALMP. On the contrary, the effects of initial unemployment benefits are not so straight forward any more. In most of the specifications, initial unemployment benefits are insignificant and also the sign of the coefficient changes. The assumption that current levels of minimum wage in Europe contribute to higher unemployment is not supported by our estimates. We take this finding as preliminary and with a vague predicative value due to the fact that we operated only with 13 countries with statutory minimum wage and our empirical analysis was not particularly aimed at analysing the effects of minimum wage, therefore we avoid drawing any implications out of it.

Labour market institutional set-ups surely have some effects on unemployment in Europe. Some of the previous studies came to rather robust findings over the possibility to explain the rise of unemployment in the second half of the

20th century solely by analysing the effects of labour market institutions and their interactions with macroeconomic shocks. Even though the data fitted our model reasonably well, the results from our empirical analysis are less conclusive. First and foremost, we examined the development of unemployment over a shorter period of time (11 years) with annual observations, and this period was characterized by both strong economic overheating and subsequently the consequences of the severe crisis. Hence, even though the cyclical component of unemployment represented by the measure of output gap captured some of the variation in unemployment caused by the macroeconomic turmoil, the stable character of labour market institutions prevented them from explaining the rest of the volatile development of unemployment during the observed period. We are convinced that in the case of more stable macroeconomic development, labour market institutions would end up more significant and would be able to capture more of the evolution of unemployment in Europe. Nevertheless, we believe there are some valuable theoretical conclusions and policy implications that can be taken from our empirical analysis. Namely, ALMP can reduce unemployment significantly, both generous unemployment benefits and high labour taxes increase especially long-term and core unemployment, and the effects of stringent EPL and union density are ambiguous.

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7 Appendix

Basic Stata Commands

Pooled OLS Model

```
set matsize 500
xtset countrycode year
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap
imtest, white
hettest
predict residuals, resid
qnorm residuals
histogram residuals
swilk residuals
vif
pwcorr anrr nrr1 ubendur twcoup epl tundens corp almpu outgap
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, r
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu totshock rintshock ltir,r
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu rminmed outgap if
regress lurt1564 larr lrr1 lubendur ltwcoup leplr lundens lcorp lalmpu outgap,r
regress surhp anrr nrr1 ubendur twcoup epl tundens corp almpu,r
regress ltu anrr nrr1 ubendur twcoup epl tundens corp almpu outgap,r
```

LSDV Model

regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap c2-c21
imtest, white
hettest
predict residuals, resid
qnorm residuals
histogram residuals
swilk residuals
vif
pwcorr anrr nrr1 ubendur twcoup epl tundens corp almpu outgap totshock rintshock
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap c2-c21, r
test c2 c3 c4 c5 c6 c7 c8 c9 c10 c11 c12 c13 c14 c15 c16 c17 c18 c19 c20 c21
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu rintshock totshock c2-c21,r
regress urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu rminmed outgap c2-c21
regress lurt1564 larr lrr1 lubendur ltwcoup leplr lundens lcorp lalmpu outgap c2-c21,r
regress surhp anrr nrr1 ubendur twcoup epl tundens corp almpu c2-c21,r
regress ltu anrr nrr1 ubendur twcoup epl tundens corp almpu outgap c2-c21,r

FE Model

xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, fe
xttest3
xtcsd, pesaran abs
xtserial urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, fe r
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu totshock rintshock, fe r
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu rminmed outgap, fe r
xtreg lurt1564 larr lrr1 lubendur ltwcoup leplr lundens lcorp lalmpu outgap, fe r
xtreg surhp anrr nrr1 ubendur twcoup epl tundens corp almpu, fe r
xtreg ltu anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, fe r

RE Model

```
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, re
xttest0
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, fe
estimates store fe1
xtreg urt1564 anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, re
estimates store re1
hausman fe1 re1
...
xtreg ltu anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, fe
estimates store fe6
xtreg ltu anrr nrr1 ubendur twcoup epl tundens corp almpu outgap, re
estimates store re6
hausman fe6 re6
```

Key Diagnostic Tests

Pooled OLS Model

White's test
Ho: homoskedasticity
Ha: unrestricted heteroskedasticity
chi2(53) = 165.14
Prob > chi2 = 0.000

Cameron & Trivedi's decomposition of IM-test		
Source	chi2	p
Heteroskedasticity	165.14	0.000
Skewness	36.42	0.000
Kurtosis	4.03	0.044
Total	Total	0.000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of urt1564
chi2(1) = 25.31
Prob > chi2 = 0.0000

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
residuals	231	0.946	9.125	5.124	0.000

Variation inflation factor	
Variable	VIF
ubendur	8.49
anrr	7.39
nrr1	7.10
corp	3.15
epl	2.60
almpu	2.32
twcoup	1.92
tundens	1..82
outgap	1.14
Mean VIF	3.99

LSDV Model

White's test
Ho: homoskedasticity
Ha: unrestricted heteroskedasticity
chi2(53) = 230.53
Prob > chi2 = 0.252

Cameron & Trivedi's decomposition of IM-test		
Source	chi2	p
Heteroskedasticity	230.53	0.252
Skewness	51.95	0.003
Kurtosis	5.09	0.024
Total	287.56	0.035

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of urt1564
chi2(1) = 72.15
Prob > chi2 = 0.000

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
residuals	231	0.973	4.547	3.510	0.000

Variable	**VIF**	**Variable**	**VIF**	**Variable**	**VIF**	**Variable**	**VIF**
ubendur	212.42	corp	25.06	c12	12.71	c11	7.63
anrr	122.85	c4	24.42	c6	10.46	almpu	6.98
tundens	108.11	epl	22.24	c2	10.21	c7	4.90
c21	63.08	c10	20.82	c3	9.21	c8	4.23
nrr1	61.67	twcoup	18.59	c17	9.18	c15	3.42
c19	33.04	c16	18.23	c18	7.98	outgap	1.40
c5	26.82	c14	14.79	c20	7.83	**Mean VIF**	**31.28**

F-Test: c1, ...,c21 = 0
F(19,202) = 50.42
Prob>F=0.000

FE Model

Modified Wald test for groupwise heteroskedasticity in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (21) = 1560.70
Prob>chi2 = 0.000

Pesaran's test of cross sectional independence
H0: cross sectional independence = 6.791
Prob = 0.000
Average absolute value of the off-diagonal elements = 0.405

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 20) = 67.655
Prob > F = 0.0000

RE Model

Hausman Specification test
H0: differencein coefficients not systematic
chi2(8) =17.70
Prob>chi2 = 0.0236

Master Thesis Proposal

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The effects of labour market institutions on unemployment in the EU

Topics Characteristics:

For the past several years, the EU labour market has been characterized by the high rates of unemployment. The world's economic and financial crisis that induced the crisis at the Eurozone surely contributed to this, but there were other factors that influenced the situation with unemployment in most of the EU Member States. It is peculiar that in spite of the importance of this issue, there have not been many macroeconometric studies focusing on determinants of high unemployment rates in the EU countries. Vast majority of scholars examined determinants of unemployment in the selected OECD countries and the latest studies worked with datasets that were merely ten years old. Thus, there seems to be plenty of room for the justified research of determinants of unemployment in the EU. This Master thesis will analyse determinants of unemployment in the selected EU Members. This thesis will focus on labour market institutions and their effects on unemployment. Among the labour market policy and institutional indicators belong: unemployment benefits, taxes, minimum wage, active labour market policies (ALMPs), etc. Furthermore, this work will try to address the hypothesis that policies and institutions contribute to unemployment patterns not only directly, but also indirectly via their interactions with macroeconomic shocks. In order to achieve this purpose, the dataset that covers the years of the economic boom and subsequently the period of the economic and financial crisis will be employed. The data used in this thesis will originate from databases of Eurostat, the OECD and the World Bank. Overall, this work will tackle the issues that were not described in the economic literature, as well as to address policy implications for levelling unemployment and the standards of living in the EU.

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Hypotheses:

1. There are not only economic, but also policy and institutional determinants of unemployment that might come through as statistically significant.
2. Business cycle played a vital role in the development of unemployment in the EU in recent years.
3. ALMPs can work as an effective tool for tackling unemployment in the EU.
4. High unemployment benefits amplify the impact of adverse shocks on unemployment.
5. Policies and institutions are likely to contribute to unemployment patterns via interaction with macroeconomic shocks

Methodology:

Initially, obtained data will be analysed and variables will be stratified in line with the existing literature. Due to the fact that the cross-country time-series analysis is used, standard panel data methods will be employed - pooled OLS regression, fixed-effects model and random-effects model.The latter part will consist of analysing the interactions between policies and institutions with macroeconomic shocks. In order to achieve this, the non-linear least squares unemployment equation with interactions between time-invariant institutions and unobserved/observed shocks will be used.

Outline:

1. Introduction
2. Literature review
3. Empirical research
   - 3.1. Data Description
   - 3.2. Estimation of Unemployment determinants for the selected EU Members
   - 3.3. Estimation of unemployment determinants for the selected EU Members
   - 3.4. Estimation of impacts of interactions between policies and institutions with macroeconomic shocks on unemployment
4. Conclusion

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