Factors influencing the long-term unemployment level and development in the European Union

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Abstract. The paper deals with the factors influencing the long-term unemployment rate in the European Union countries in 2001-2010. The applied factors were selected in compliance with the economics of labour market theory and cover three areas: economic environment (GDP growth in market prices, inflation), tax area (tax wedge), social benefit (net replacement ratio) and labour market flexibility (fixed-term contracts, part-time contracts). The panel model estimation has been implemented through a panel regression analysis for two homogenous groups (EU-15 countries and „new countries" – EU-12). The period preceding an economic crisis and a period of economic crisis have been investigated.

The results show that the labour market flexibility influences the long-term unemployment rate in the strongest negative way, then there is evident a positive impact of the tax wedge followed by the macroeconomic environment impact. The negative impact of economic growth operates in these groups with the same intensity, the tax burden in the EU15 countries is higher and vice versa with an increase in the share of part-time workers long-term unemployment decreases markedly in the EU12. The same positive economic growth will contribute to a deeper decrease of long-term unemployment. In the crisis period the positive impact of tax burden is reduced and we also monitor the increasing impact of the proportion of part-time jobs.

Keywords: long-term unemployment, European Union countries, labour market flexibility, panel regression, crisis.

JEL Classification: C23, E24
AMS Classification: 91B84

1   Introduction

The fundamental goal of the paper is to explore factors affecting the development of long-term unemployment. Four groups of factors are considered - macroeconomic environment (economic growth, inflation), the tax burden on labour (tax wedge), the social benefit (net replacement ratio) and the labour market flexibility (temporary contracts and part-time workers). Monitoring the impact of these factors will be further divided for the EU15 and EU12 because of homogeneity. Another key question of this paper is the impact of crisis on the development of long-term unemployment

The article is structured into five parts. Based on an introduction the theoretical concepts and long-term unemployment model are set in the second part. The third part specifies panel model of long-term unemployment by including dummy variables in the additive and multiplicative form. The fourth part deals with data analysis, the estimate of panel model and its verification and economic interpretation. The final part summarises the empirical results.

2   Model theory and concept

Empirical studies that are focused on examining the macroeconomic functioning of labour markets often try to identify factors affecting the level and changes in the level of unemployment. These analyses are usually focused on determining the natural rate of unemployment and an explanation of unemployment development after the second World War II in the OECD countries (Layard, Nickell, Jackman [9]).

In some studies the influence of long-term unemployment on other macroeconomic aggregates is analysed such as Lkaudes [10] examines the impact of long-term unemployment on inflation dynamics on the example of

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19 OECD countries, Tvrdoň [15] explores the relationship between economic cycle and unemployment in the countries of the Visegrad group using Beveridge curve , Katz [8] examines the long-term unemployment in the U.S. in 2007-2009 and Chapman and Kapuczinski [3] deal with the impact of recession on unemployment duration. In the model we use the assumption that there are factors that affect the level and change of unemployment rate. The investigated factors can be simply divided into **four groups** - the macroeconomic environment, the tax burden on labour, social benefits and labour market flexibility. The paper Fisher and Vltavska [4] also investigates effects of total factor productivity on economic output growth.

2.1 Macroeconomic environment (economic cycle, GDP growth, inflation of the subsection (automatically numbered)

Effect of GDP growth in market prices on long-term unemployment rate. Assuming an influence of Okun 's law it can be assumed that the growth of aggregate demand in the phase of economic expansion creates new jobs and thus a decline in unemployment, including long-term unemployment is expected. Tvrdoň [16] on the basis of a study of Abraham and Shimer shows that the average duration of unemployment has decreased for the majority of past business cycles but not as much as for unemployment rate, which has been explained by the dynamics of the labour market. Pisarides [12] describes a possible mechanism of unemployment extension to the overall functioning of the economy.

The relation of inflation and the long-term unemployment. Based on theoretical data based on the interpretation of Philips' curve the aim is to demonstrate trade off relationship between the rate of long-term unemployment and inflation in the monitored period. The relationship between general unemployment and inflation in the EU was examined by G. Popovich and Popovich J [13]. This paper analyses dynamics and interdependence of the ratio between inflation and unemployment rates in the EU for several referential periods (1998-2007, 2000-2009 and 2000-2006). Unemployment and inflation have a significant if inverse relation, both of which indicate the existence of Phillips regularity. The comparison of results has also confirmed the side hypothesis, that is, the regularity fades in case of economic shocks or periods of crises. The paper sets to prove that the long-term dynamics of these values in the EU is related to the findings of Phillips.

2.2 Tax burden on labour area

In this area the indicator called *tax wedge* has been used. The tax wedge on labour costs is defined as income tax on gross wage earnings plus employee and employer social security contributions, expressed as a percentage of total labour costs. This indicator is compiled for single people without children earning 67 % of the average earnings of a worker in business economy. The model assumes that the higher tax burden on labour will increase the rate of long-term unemployment. Tvrdoň [16] on the basis of research results indicates that the tax burden in this way affects the long-term unemployment. Compared to the impact on the unemployment rate, however, these effects were lower.

2.3 Social benefit area

The indicator called *net replacement rate* has been used in this area which is calculated as a share of net income share (after taxation) of unemployed person compared to the previous income after taxation. The closer to one a share is, the less income of unemployed people differ from those who are working. From this viewpoint, the higher value of this indicator can increase the long-term unemployment rate because of reduced incentives to work of unemployed. This situation is referred to as unemployment trap.

2.4 Labour market flexibility area

In this area the impact of *a share of part-time jobs and fixed contracts in the economy* on the long-term unemployment rate is examined. Both of the above forms through their implementation increase labour market flexibility in terms of removing barriers to the transition between jobs and the transition from economic inactivity or unemployment to employment (see Hančlová [5]). In both cases, greater use of these forms may reduce the unemployment rate, and also the long-term unemployment (see Pánková, [11]).

3 Data and methodological and specification issues

Based on theoretical concept of the model we proceed to the econometric formulation of the stochastic model. First of all we introduce the indications of following variables for cross-sectional units (countries EU27) $i = 1,2,…,N$ monitored in period (year) $t = 1,2,…,T$:

- LTU_{it} long-term unemployment the ratio of long-term unemployed more than 12 months on the number of economically active population in % for i-th country in year t;
- GDP_{it} percentage changes of GDP on previous period at market prices for i-th country in year t;

- INF_{it} annual change of Harmonized Index of Consumer Prices for i-th country in year t;
- TX_{it} tax wedge on labour costs as tax rate on low wage earners in % for i-th country in year t;
- NRR_{it} net replacement ratio for i-th country in year t;
- TCW_{it} percentage of employees with temporary contracts for i-th country in year t;
- PTW_{it} part-time workers in % of total employment for i-th country in year t.

We provide unemployment benefit replacement rates for a single worker. The calculations assume a worker, aged 40, who earns the average production worker wage. The selected file of indicators included annual data for 2001-2010. For investigation of crisis period impact a dummy variable $DCRIS_{it}$ ($DCRIS_{it} = 1$ for years 2008-2010, $DCRIS_{it} = 0$ otherwise) was introduced and two groups of countries were further investigated through variable DEU_{it}, which was specified as: $DEU_{it} = 1$ for new countries which joined the EU, $DEU_{it} = 0$ otherwise). Table 1 provides the indication of cross-sectional units and their division into groups.

group	country
$DEU_{it} = 0$ countries EU15	Belgium (BE), Denmark (DK), Germany (GE), Ireland (IE), Greece (EL), Spain (ES), France (FR), Italy (IT), Luxembourg (LU), Netherlands (NL), Austria (AT), Portugal (PT), Finland (FI), Sweden (SE), United Kingdom (UK)
$DEU_{it} = 1$ counries EU12	Bulgaria (BG), Czech Republic (CZ), Estonia (EE), Cyprus (CY), Latvia LV), Lithuania (LT), Hungary (HU), Malta (MT), Poland (PL), Romania (RO), Slovenia (SI), Slovak (SK)

Table 1 Specification of cross-section units and their divison into groups

Formulation of stochastic econometric linear model presents following equations:

$$LTU_{it} = \alpha_1 DCRIS_{it} + \alpha_2 DEU_{it} + \sum_{k=1}^{K} \beta_k X_{kit} + \sum_{k=1}^{K} \gamma_k (X_{kit} \cdot DCRIS_{it}) + \sum_{k=1}^{K} \lambda_k (X_{kit} \cdot DEU_{it}) + u_{it}, \quad (1)$$

where X_{kit} are individual explanatory variables $k = 1, 2, \ldots, K$ and u_{it} are random errors which should be uncorrelated with the observed explanatory variables and with each other and have zero means.

Proposed model was estimated through Panel Generalized Least Squares (PGLS) method in software EViews. Version 7.1 [1]. This methods is also described in Wooldridge [17]. We provide estimation using panel GLS with cross-section weights for removing cross-section heteroscedasticity, which is investigated in Hančlová [6]. We can also generally expect the errors $(u_{it} : t = 1, 2, \ldots, T)$ serially correlated and therefore we used PGLS estimation method. We also tested fixed or random cross-section, resp. time effects but they were not significant. These effects describes Ivaničová, et al. [7]. Cerný [2] deals with linear regression with special data.

4 Empirical results

First, we analyse of input time series in accordance with paper Rublíková [13]. We introduce dummy variables *DCRIS* in additive and multiplicative form for explanation the change in times of crisis. We compare the cross-section parameters differences between the EU15 and EU12 groups through a dummy variable *DEU* again in additive and multiplicative form. Figure 1 shows the level and development of long-term unemployment. The picture and other descriptive statistics showed that in the EU15 group of countries the highest median long-term unemployment was in Germany, Spain and Portugal, where also rose rapidly. In the EU12 the average long-term unemployment was the highest in the Slovakia, Poland and in Bulgaria. Results of analysis of other indicators are not presented because of the scope of the paper.

When estimating panel model for 27 countries in 2001-2010 explanatory variables of inflation (INF_{it}) and net replacement ratio (NRR_{it}) were found statistically insignificant, thus excluded from the model. In addition, to explain the model it was more appropriate to use lagged explanatory variables GDP_{it-1} and TCW_{it-1}. The final estimation of the model (1) by PGLS method is set in the table 2. Determination coefficient R-squared was 0.68. We provide the multivariate extensions of the Jarque-Bera residual normality test which compares the third and fourth moments of the residuals to those form the normal distribution. JB statistics was 4.29 with significance 0.116, ie. we do not reject the null hypothesis of normal distribution of residual components at the 5% significance level.
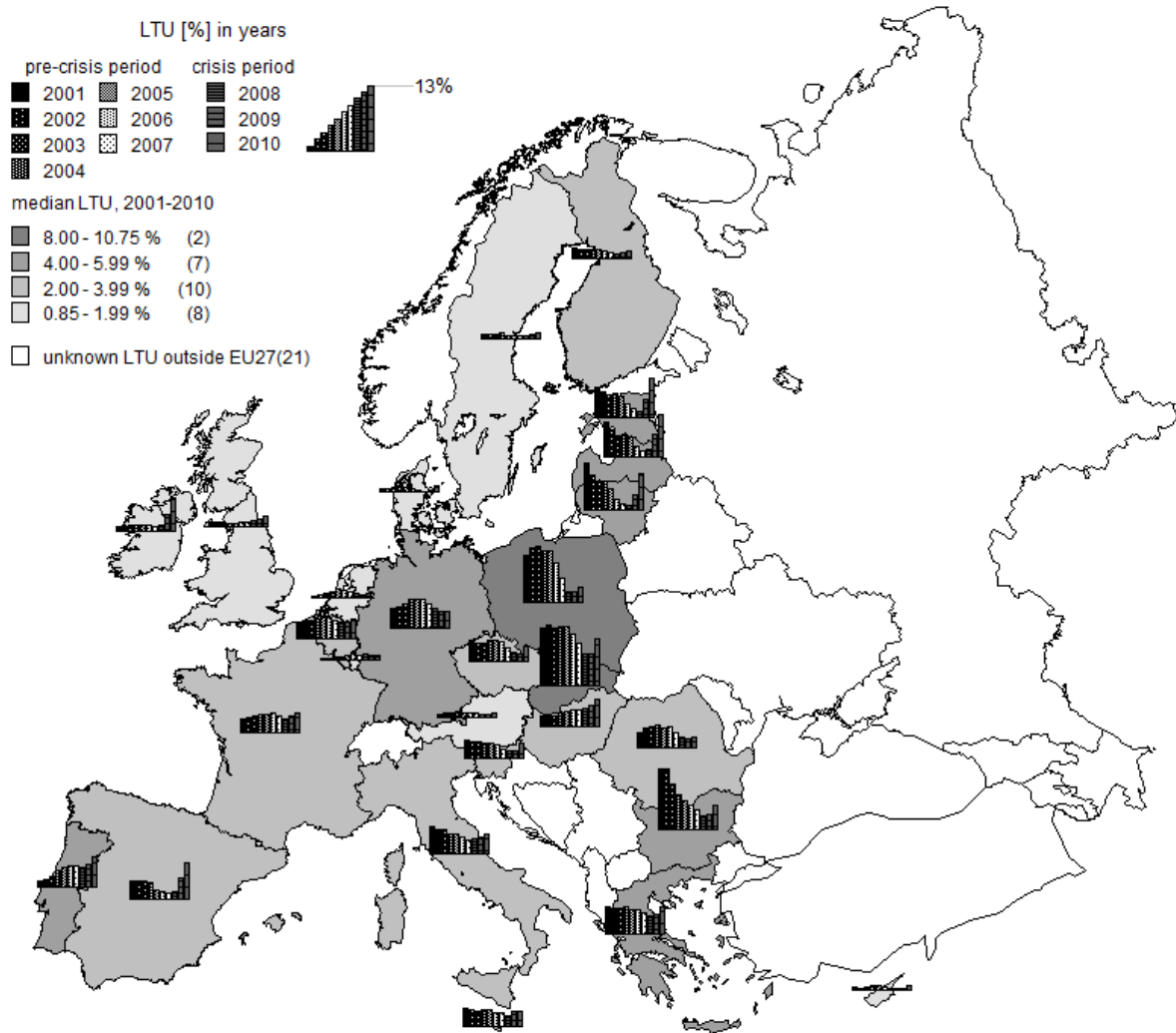
Figure 1 Long-term unemployment development in countries EU15 and EU12

	DCRIS	DEU	GDP(-1)	TX	TCW(-1)	PTW	DCRIS_GDP(-1)	DCRIS_TX	DCRIS_TCW(-1)	DEU_TX	DEU_TCW(-1)	DEU_PTW
Dependent Variable: LTU, *Method*: Panel EGLS (Cross-section weights), *Sample* (adjusted): 2002 2010											
Periods included: 9, *Cross-sections* included: 27, *Total panel* (unbalanced) observations: 238											
Variable	DCRIS	DEU	GDP(-1)	TX	TCW(-1)	PTW	DCRIS_GDP(-1)	DCRIS_TX	DCRIS_TCW(-1)	DEU_TX	DEU_TCW(-1)	DEU_PTW
Coefficient	2.397	4.002	-0.105	0.099	0.035	-0.066	-0.085	-0.086	0.048	-0.036	-0.097	-0.129
Std. Error	0.25	0.504	0.031	0.004	0.009	0.006	0.038	0.011	0.02	0.006	0.016	0.05
t-Statistic	9.592	7.937	-3.437	26.56	3.940	-10.55	-2.259	-7.716	2.367	-6.155	-5.97	-2.609
Prob.	0.0000	0.0000	0.0007	0.0000	0.0001	0.0000	0.0248	0.0000	0.0188	0.0000	0.0000	0.0097

Table 2 Final estimation of long-term unemployment model
Source: EViews and author calculations

The estimations of average long-term unemployment (hereafter *LTU*) in the model can be divided into *four groups* in order of better interpretation according to the dummy variables *DCRIS* and *DEU*.

Group of countries EU15 and pre-crisis period 2001-2007 ($DCRIS_{it} = 0 \wedge DEU_{it} = 0$)

$$L\hat{T}U_{it} = -0.105 GDP_{it-1} + 0.099 TX_{it} + 0.035 TCW_{it-1} - 0.066 PTW_{it} \qquad (2)$$

GDP growth by 1% in previous year enables a decrease of *LTU* by 0.105 % ceteris paribus, tax wedge growth by 1 % contributes to the increase of *LTU* by 0.099 %, one percent growth of employees with temporary contracts in previous period causes an increase of *LTU* by 0.035% a higher share of part-time workers on total employment by 1 % results in a decline of *LTU* by 0.066 %.

Group of countries EU12 and pre-crisis period 2001-2007 ($DCRIS_{it} = 0 \wedge DEU_{it} = 1$)

$$L\hat{T}U_{it} = 4.001 - 0.105GDP_{it-1} + 0.063TX_{it} - 0.062TCW_{it-1} - 0.196PTW_{it} \tag{3}$$

One percent GDP growth contributes to the same decrease of *LTU* as in EU 15 countries in 2001-2007, tax wedge growth by 1 % results in an increase of *LTU* by 0.063 %, one percent growth of employees with temporary contracts in previous period influences *LTU* development negatively (-0.06 %) and an increase of share of part-time workers on total employment by 1 % causes a decrease of *LTU* by 0.196 %, which is greater decrease compared to the EU15.

Group of countries EU15 and crisis period 2008-2010 ($DCRIS_{it} = 1 \wedge DEU_{it} = 0$)

$$L\hat{T}U_{it} = 2.397 - 0.190GDP_{it-1} + 0.013TX_{it} + 0.083TCW_{it-1} - 0.066PTW_{it} \tag{4}$$

GDP growth by 1 % enables to decrease an average *LTU* by 0.190 % in the following year which is more radical decrease in comparison with the pre-crisis period. Tax wedge growth by 1 % increases *LTU* by 0.013 % which is more in comparison with EU15 and EU12 in pre-crisis period. One percent growth of employees with temporary contracts results in an increase of long-term unemployment by 0.083 % in the following year and an increase of share of part-time workers on total employment by 1 % results in decline of long-term unemployment by 0.066 % which is for this group of countries the same as before crisis.

Group of countries EU12 and crisis period 2008-2010 ($DCRIS_{it} = 1 \wedge DEU_{it} = 1$)

$$L\hat{T}U_{it} = 6.399 - 0.190GDP_{it-1} - 0.017TX_{it} - 0.014TCW_{it-1} - 0.196PTW_{it} \tag{5}$$

Increase of GDP by 1 % contributes to the same reduction of *LTU* as for countries and one percent increase in tax wedge causes reduction of *LTU* by 0.017 % in line with expectations. Effect of growth of employees with temporary contracts by 1 % causes as in pre-crisis period the decline of *LTU* but with less intensity (-0.014 %). An increase of the share of part-time workers on total employment by 1 % means reduction of *LTU* by 0.196 % which is the same as for this group of countries in crisis-free period.

5   Conclusions

Comparison of the results of long-term unemployment estimation can be summarized and assessed in terms of those groups of factors, by examining the differences between the group of EU15 and EU12. Comparison of the results of long-term unemployment development can be added to the previous development in 2001-2007 for a period of crisis.

In accordance with the theoretical background the long-term unemployment was affected by:
- macroeconomic environment (due to negative economic growth, which was for the EU15 and the EU12 the same and more intensive in period of crisis);
- tax burden on labour (usually a positive effect which was higher for the EU15 group of countries and in the crisis period decreased in both groups);
- flexibility of labour (the negative impact on part-time workers in % of total employment which is stronger in the EU12, and not influenced by the crisis; effect of temporary contract factor is in the EU12 in line with expectations negative and during the crisis is less intensive but for a group of EU15 we observe a positive impact on long-term unemployment).
- Group of social benefits statistically did not influence significantly on long-term unemployment as well as the inflation.

In terms of group comparison of EU15 and EU12 it was found that the negative impact of economic growth operates in these groups with the same intensity, the tax burden in the EU15 countries is higher and vice versa with an increase in the share of part-time workers long-term unemployment decreases markedly in the EU12. An interesting finding was that the labour flexibility indicator (temporary contracts) acts on long-term unemployment in the EU15 positively and in EU12 negatively.

By comparing the 2001-2007 period and crisis period it was found that the same positive economic growth will contribute to a deeper decrease of long-term unemployment. In the crisis period the positive impact of tax burden is reduced and we also monitor the increasing impact of the proportion of part-time jobs.

The results obtained are consistent with economic theory and researched professional publications and has been verified for two specific groups of countries in the years 2001-2010 through panel model of long-term unemployment.

Acknowledgements

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