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Labour Market Institutions in the European Union and Their Impact on Total Factor Productivity Growth

Petra CHOVANCOVÁ*

Department of Economics, Faculty of Economics and Administration, Masaryk University, Lipová 41a, Brno, Czech Republic.

Abstract

The paper provides an insight into the institutional set-up of labour markets in member states of the European Union. Besides the current trends, the impact of labour market institutions on the overall economic performance is assessed. The main goal of this paper is to determine the effect of selected labour market institutions on the total factor productivity growth in the European Union, with an emphasis on their interactions. More precisely, five labour market institutions are considered: active labour market policies, employment protection legislation, the minimum wage, trade unions and unemployment benefits. The impact of institutions on productivity growth is estimated through the application of a policy-augmented productivity equation via panel data regression models. The empirical analysis is conducted on an unbalanced dataset covering observations on 28 member states of the European Union over the period 1995–2017. The main results confirm our assumption that, besides the direct effect of selected labour market institutions, their interactions are also decisive in determining total factor productivity growth.

Keywords

Labour Market Institutions, Total Factor Productivity, European Union, Panel Data Regression

JEL Classification: O43, C33

* petra.chovancova@mail.muni.cz (corresponding author)
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1. Introduction

The consensus on the importance of labour market institutions in determining the economic performance and competitiveness of EU economies has led to a growing debate about appropriate institutional arrangements amongst policy makers. The European Employment Strategy (EES) was implemented in 1997, with the aim of establishing a set of common objectives for employment policy. Nowadays, the EES is incorporated into the Europe 2020 growth strategy and is implemented through the European Semester. The support for well-functioning labour markets across the EU is also emphasized in the current agenda of the European Commission (von der Leyen, 2019). An appropriate institutional arrangement is even more important to enable European labour markets to face rising challenges, such as rapid technological changes, international labour division, increasing digitalization and robotization, global competition, an ageing population and so on. However, before implementing any policy measures, the overall institutional set-up on the European labour markets and its impact on economic outcomes must be considered.

In this study, we focus on the relationship between selected labour market institutions and total factor productivity as it is considered to be an essential determinant of long-run growth and overall economic performance. The crucial role of total factor productivity in explaining economic growth and cross-country income differences has already been confirmed by Abramowitz (1956) and Solow (1957) and later by many others. Notice that, with the term total factor productivity (TFP), we understand a so-called Solow residual that accounts for technological changes and other factors (Barro, 1998).

In the context of new growth theories, total factor productivity growth is endogenously determined (see e.g. Aghion and Howitt, 2009). Therefore, its growth rate can be explained by the accumulation of knowledge and a residual set of factors, including institutions. The economic theory suggests numerous ways in which institutions influence productivity both positively and negatively. This inconclusiveness about the effects of labour market institutions on productivity is not surprising given the fact that their effect crucially depends on the country context and overall institutional set-up. Only empirical research would provide less ambiguous conclusions. A comprehensive evaluation of productivity effects could enrich the current state of knowledge on the role of labour market institutions in determining total factor productivity and serve as a basis for the formulation of adequate policy measures.

The aim of this paper is to determine the effect of selected labour market institutions on total factor productivity growth in the European Union, with an emphasis on their interactions. More precisely, we are interested in five labour market institutions, namely a) active labour market policies (ALMPs), b) employment protection legislation (EPL), c) the minimum wage (MW), d) trade unions (TU) and e) unemployment benefits (UBs). The impact of institutions on productivity growth is estimated through the application of a policy-augmented productivity equation via panel data regression models (multiple regression with a two-way error component model).

As it has been already mentioned, the overall institutional arrangement may alter the effects of single variables. Therefore, we assume that, besides the direct effect of selected labour market institutions, their interactions are decisive in determining total factor productivity growth in the member states of the European Union. Then, the empirical analysis is extended with the inclusion of interaction terms of these institutions. In this paper, we try to enrich our previous research on the impact of labour market institutions and their interactions on productivity in 19 EU member states (Čekmeová, 2016a).

After a brief introduction, we provide an insight into the institutional set-up of labour markets in the EU in the second section. The third section is devoted to the theoretical background and the methodology. Its subsections include a short overview of the most influential theoretical and empirical works on the relationship between the labour market and productivity, the empirical model and the methods for its

estimation, and the data applied in the regression analysis. The last section contains concluding remarks.

2. Labour Market Institutions in the EU

Labour market institutions (LMIs) represent a set of laws, norms and conventions, outcomes of collective choice mechanisms, that alter the decisions of the labour force by imposing constraints or incentives (Boeri and van Ours, 2013). LMIs are introduced with the aim of protecting workers or redistributing income to them, but, at the same time, they can lead to efficiency gains due to their impact on labour market functioning and productivity (Betcherman, 2012).

Regarding the labour law, the EU only complements the policy initiatives of the member states. In compliance with the Treaty (EU, 2012), it adopts directives that set minimum requirements for working and employment conditions and for informing and consulting workers. National authorities can provide greater protection if they wish. Thus, there is no single institutional set-up on the European labour markets.

2.1 Employment Protection Legislation

Employment protection legislation covers a range of mandatory norms and procedures that regulate the ability of employers to fire or hire labour with the aim of improving job security (Sloane et al., 2013). As there is no uniform legislation on employment protection that is binding for all member states, the strictness of employment protection varies across the states. In 2013, the overall index of EPL ranged from 3.29 in Luxemburg to 1.45 in the United Kingdom. While stricter legislation provides greater protection for workers, employers are limited to adjusting labour costs and may be discouraged from hiring new workers. The difference in the level of protection is not only a current phenomenon. Since the beginning of the 21st century, an intention to make labour markets more flexible has been visible in the majority of countries. However, the real decline in the strictness of regulations is only small, with the largest difference apparent in the case of Greece (a reduction of 1.06 in EPL from 2000 to 2013) and Portugal (a reduction of 1.13 in EPL from 2000 to 2013).

Besides these trends, an important fact can be deduced from the data. The member states have different regulations for temporary (EPLtemp) and permanent contracts (EPLreg). As Sloane et al. (2013) pointed out, in countries where the regulations provide a high level of protection for permanent workers, weaker regulations for temporary contracts may improve the flexibility of labour markets. This is the case in countries such as the Czech Republic, Germany, Latvia and the Netherlands. These differences, partially induced by the asymmetric character of EPL reforms, may lead to less influential effectsfewer influencing effects on labour market outcomes and macroeconomic aggregates. However, it is a reasonable strategy in the case of strong political obstacles to large-scale reforms (see e.g. Saint-Paul, 1997).

All these indicators, plus the strictness of collective dismissals (EPL coll), are reported in Table 2.1-1. The overall strictness (EPL) is obtained as the weighted average of partial indicators.

Table 2.1-1 Employment protection legislation in 2013

Country	EPL reg	EPL temp	EPL coll	EPL
Austria	2.37	1.31	3.25	2.31
Belgium	1.89	2.38	5.13	3.13
Bulgaria	-	-	-	-
Croatia*	2.48	2	2.25	2.24
Cyprus	-	-	-	-
Czech Republic	2.92	1.44	2.13	2.16
Denmark	2.20	1.38	2.88	2.15
Estonia	1.81	3	2.88	2.56
Finland	2.17	3.63	1.63	2.48
France	2.38	3.62	3.38	3.13
Germany	2.68	1.13	3.63	2.48
Greece	2.12	2.25	3.25	2.54
Hungary	1.59	1.25	3.63	2.16
Ireland	1.40	0.63	3.5	1.84
Italy	2.68	2	3.75	2.81
Latvia	2.6	0.88	3.75	2.41
Lithuania*	2.45	2.5	2.88	2.61
Luxembourg	2.25	3.75	3.88	3.29
Malta	-	-	-	-
Netherlands	2.82	0.94	3.19	2.32
Poland	2.23	1.75	2.88	2.29
Portugal	3.18	1.81	1.88	2.29
Romania	-	-	-	-
Slovakia	1.84	1.75	3.38	2.32
Slovenia	2.60	1.81	3.38	2.60
Spain	2.05	2.56	3.38	2.66
Sweden	2.61	0.81	2.5	1.97
United Kingdom	1.10	0.38	2.88	1.45
Italy	2.68	2	3.75	2.81

Note: * Data for 2015; – data are not available
Source: Own construction based on data from OECD.Stat

2.2 Unemployment Benefits

Unemployment benefits provide individuals with protection against "uninsurable labour market risks". They offer replacement income through public finances to workers who become unemployed (Sloane et al., 2013). The European Union does not currently regulate UBs at the supranational level; it only determines

which country is responsible for payments. Most member states apply a mandatory system of unemployment insurance, albeit with very different arrangements, leading to a high level of heterogeneity between national systems.

To compare the generosity of UB systems across the EU, we report two alternative indicators for the latest available year in Table 2.2-1: the gross replacement rate (GRR) in 2011 and the long-term net replacement rate (NRR) in 2016. The data on the gross replacement rate indicate that entitled persons in the EU member states on average received gross unemployment benefits equal to almost one-quarter of their previous gross earnings. The national rates varied considerably from 6.2% in the Czech Republic to 42.5% in Ireland in 2011.

Table 2.2–1 Unemployment benefits in the EU

Country	GRR [%]	NRR [%]	Exp. [% of GDP]
Austria	27.5	72.4	0.9
Belgium	37.2	64.3	1.2
Bulgaria	-	78.6	0.4
Croatia	-	70.8	0.3
Cyprus	-	117.5*	0.5
Czech Republic	6.2	65.5	0.2
Denmark	32.1	91.1	0.7
Estonia	-	70.5	0.3
Finland	34.6	79.4	2.3
France	35.6	67.5	1.5
Germany	20.8	74.3	0.7
Greece	10.6	43.8	0.4
Hungary	10.1	58.2	0.1
Ireland	42.5	79.5	1.0
Italy	11.0	71.6	0.7
Latvia	-	75.6	0.5
Lithuania	-	61.9	0.2
Luxembourg	26.7	89.2	0.5
Malta	-	51.6	0.3
Netherlands	33.3	82.8	1.3
Poland	9.9	64.5	0.1
Portugal	39.1	76.2	0.7
Romania	-	44.4	0.1
Slovakia	8.3	59.2	0.2
Slovenia	-	72.9	0.3
Spain	31.4	67.6	1.3
Sweden	37.5	62.9	0.3
United Kingdom	11.7	70.5	0.1

Note: - Data are not available

Considering the effect of income taxation on UBs (NRR), European countries have relatively generous UB systems. Only Greece and Romania had UBs lower than one-half of the previous net earnings in 2016. Besides income taxation and social security contributions, the net replacement rates include housing benefits, social assistance and in-work benefits, leading to, in general, higher rates. In some member states, the differences between the NRR and the GRR were especially large, with the biggest one in the Czech Republic (NRR more than 10 times higher in 2011). Looking at longer time series, we can conclude that the EU member states do not follow a general path in the case of UB generosity. The net replacement rates have increased over the last decades in 13 member states, with the biggest increase in Bulgaria (20.9 percentage points between 2008 and 2016). The rest of the EU member states recorded decreasing values of the NRR, with the most noticeable decline in Slovakia (28.2 percentage points between 2001 and 2016).

The last column of Table 2.2-1 presents the expenditures on full unemployment benefits as a percentage of the GDP in member states of the EU in 2016 (Exp). On average, the expenditure on UBs accounts for a relatively small portion of the GDP, not reaching more than 1% (since 2000). In 2016, expenditures on full unemployment benefits ranged from 0.1% of the GDP in Hungary, Poland, Romania and the United Kingdom to 2.3% of the GDP in Finland (see Table 2.2-1). In the case of these countries, their long-term pattern is to occupy the top and bottom positions. Besides Finland, relatively large shares of UB expenditures to the GDP can be observed in Belgium, Spain, France and the Netherlands. Notice that the yearly rates also vary among countries and over time due to the economic cycle.

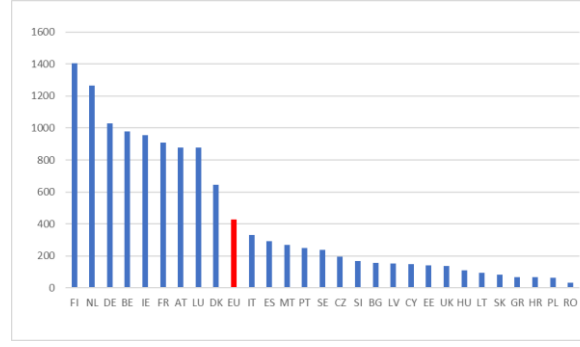

Figure 2.2-1 Average monthly UBs per unemployed person in 2016

As a result of heterogeneity in national unemployment insurance schemes, even more obvious variation exists in the absolute amount of benefits paid to unemployed people. Figure 2.2-1 shows the average monthly full unemployment benefits per unemployed person in all the EU member states for the latest available year (2016) based on data from Eurostat.

While the highest average benefits, in Finland, reached more than 1400 EUR (PPS) per month, in Romania, an unemployed person received on average less than 40 EUR (PPS) per month. At that time, only 9 out of the 28 member states recorded per unit expenditures higher than the EU average, and, in 14 states, the per unit benefits did not even reach half of it.

Comparing institutional descriptions of national systems with data on paid benefits, countries with high expenditures on unemployment typically have less strict eligibility conditions (leading to relatively high coverage), long duration of entitlement and high replacement rates.

2.3 Active Labour Market Policies

Active labour market policies are designed to encourage unemployed or inactive persons to enter the labour market (Sloane et al., 2013). They help those people to increase their skills and work experience and address the main obstacles to finding a new job (EC, 2017). Moreover, ALMPs should improve the quality and productivity of jobs and strengthen social cohesion.

On the EU agenda, active labour market programmes have become important political tools. Although the design of national programmes is particularly heterogeneous, there is a common feature of national policies – they are starting to follow a "more tailored approach to individual needs" (EC, 2017).

As shown in Table 2.3-1, there are clear differences in the number of participants as a percentage of the labour force among the member states. Countries like Bulgaria, Lithuania, Romania and the United Kingdom have a number of participants that is less than 1% of the active population, yet countries like Belgium and France have participation rates that are more than 10 times higher. In 2016, the highest participation rate among the EU member states was Belguim's 16.29% of the labour force. All the latter countries have realized a noticeable increase in participants in the last decades. It is important to mention that an increasing trend has also been a characteristic of the majority of the member states. A noticeable fall in ALMP participants has occurred only in Bulgaria and Romania. In the remaining countries with participation below 1% of the labour force (LF) (Latvia (LV) and the United Kingdom (UK)), there were generally low rates over the whole analysed period.

On the contrary, public expenditure on ALMPs does not vary as much. In addition, in countries with relatively large ALMP coverage (except Denmark and Sweden), the general government expenditures on ALMPs do not exceed 1% of the GDP. The same is observable in comparison with the overall general government expenditures (the last column of Table 2.3-1). In 2016, the general government devoted more than 2% of expenditures to ALMPs only in Sweden and Denmark. Considering longer time series on public expenditures on ALMPs, a slightly increasing trend can be identified over the last decades in the majority of the EU member states. Since 2000, only 6 member states have realized a decrease in expenditures (Belgium (BG), Denmark (DE), France (FR), Ireland (IR), the Netherlands (NL), Romania (RO) and Sweden (SW)), and the development has been relatively stable in Italy.

Table 2.3-1 Active labour market policies in 2016

Country	**Participants** [% of LF]	**Expenditure** [% of GGE]
Austria	5.29	1.51
Belgium	16.29	1.36
Bulgaria	0.85	0.42
Croatia	1.65	0.85
Cyprus	1.37	0.36
Czech Republic	1.49	0.91
Denmark	7.33	3.63
Estonia	2.49	0.79
Finland	5.02	1.69
France	11.89	1.67
Germany	2.48	1.41
Greece	2.04*	0.38
Hungary	5.79	1.99
Ireland	5.17	1.66
Italy	4.32*	0.90*
Latvia	1.05	0.51
Lithuania	0.76	0.87
Luxembourg	9.46	1.70
Malta	1.07	0.86
Netherlands	6.01	1.65
Poland	3.83	1.08
Portugal	4.38	1.03
Romania	0.55	0.19
Slovakia	3.11	0.62
Slovenia	6.18	0.52
Spain	7.68	1.38
Sweden	7.73	2.29
United Kingdom	0.20***	0.81**

Note: * Data for 2015, ** data for 2010, *** data for 2009

Figure 2.3-1 shows the average monthly public expenditure on ALMPs per unemployed person in all the EU member states for the latest available year

(2016). While the highest average expenditure in Denmark reached 1702.42 EUR (PPS) per month, in Greece, the per unit expenditures were on average 31.30 EUR (PPS) per month. At that time, the average monthly expenditure in the EU was around 400 EUR (PPS), while 12 out of the 28 member states recorded higher per unit expenditures than the EU average and the same number of states did not even reach half of it.

Theoretically, extensive ALMPs can mitigate the negative consequences of generous unemployment benefit systems. If we compare the average monthly benefits per unemployed person with the figure spent on active measures, on average, the European governments devoted comparable amounts of monthly payments to UBs and ALMPs. However, with the exceptions of Denmark, Hungary, Luxembourg and Sweden, the expenditures on passive measures were higher than those on active labour market programmes.

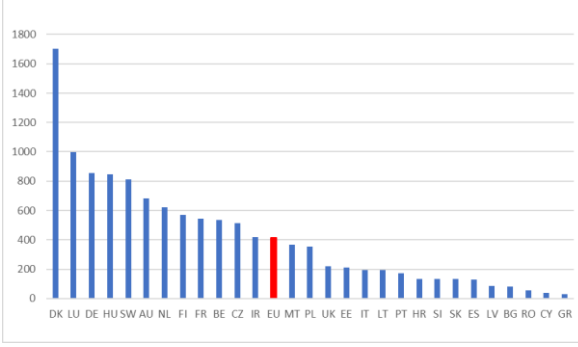

Figure 2.3-1 Average monthly expenditure per unemployed person

To sum up, Scandinavian countries are characteristic of the most extensive ALMPs in the EU. At the other end of the spectrum are the United Kingdom, the Baltic states, Bulgaria, Croatia and Cyprus, with relatively limited coverage and a relatively small amount of expenditures on some types of active measures.

2.4 Trade Unions

Trade unions (TUs) are organizations of voluntary membership that represent the interests of their members and provide a series of other benefits (legal advice, vocational training, etc.). The main purpose of TUs is to bargain with employers over all aspects of employment contracts. From the economic point of view, unions force employers to pay higher wages than the reservation wage of otherwise uncoordinated individuals (Boeri and van Ours, 2013).

Even within the European Union, the basic characteristics of trade unions vary widely among the member states. There is no unified legal framework for their purposes, rate of autonomy and categories of membership. However, all European trade unions, to a greater or lesser extent, adapt their purposes to the EU's economic system and strive for collective bargaining in the form of the European social dialogue. Moreover, the European Trade Union Confederation (ETUC) was established in 1973 to bring together national trade union confederations as well as European industry federations at the EU level. In practice, the ETUC tries to influence legislation and policies through its representatives in various EU institutions and extensive debates with EU authorities.

The presence of TUs varies considerably across countries. The Baltic states and most of the central European countries are characterized by a very low rate of union density, while the trade unions in Nordic countries enjoy the largest membership. In Denmark, Finland and Sweden, workers have bigger incentives to join trade unions due to the so-called Ghent system.

Table 2.4-1 Trade union density, coverage in 2016

Country	UDR [%]	Coverage [%]
Austria	26.9	98.0
Belgium	54.2*	96.0
Bulgaria	13.7	10.8
Croatia	25.8	46.7
Cyprus	47.7**	47.7**
Czech Republic	10.5	46.3*
Denmark	67.2	84.0*
Estonia	4.5*	18.6*
Finland	64.6	89.3*
France	7.9*	98.5**
Germany	17.0	56.0
Greece	18.6	17.8
Hungary	8.5	22.8**
Ireland	24.4	33.5**
Italy	34.4	80.0*
Latvia	12.6*	13.8
Lithuania	7.7	7.1*
Luxembourg	32.0	55.0**
Malta	51.4*	41.8****
Netherlands	17.3	78.6
Poland	12.1	17.2*
Portugal	16.3*	72.3*
Romania	25.2***	35.0***
Slovakia	11.2	24.2*
Slovenia	26.9	70.9
Spain	13.9*	73.1
Sweden	67.0*	90.0*

United Kingdom	23.5	26.3

Note: **** data for 2012; *** data for 2013; ** data for 2014; * data for 2015; - missing value
Source: Own construction based on data from OECD. Stat, ICTWSS Database 5.1 and ILOStat

In 2016, the highest trade union density rate (see UDR in Table 2.4-1) was reached in Denmark, with 67.2% of the labour force involved in trade unions. On the contrary, the lowest membership was recorded in Estonia, with trade union density of 4.5%. Regarding the time series since 2000, Estonia is the member state that has had the second-lowest average density rate after France. The latter is a specific case; while trade unions have relatively small membership, many workers are involved in elections for work councils, industrial tribunals and TU candidates (ETUC, 2010).

One of the most noticeable changes over the past years is a decline in membership in the majority of the European countries. Deunionization has been particularly strong in Eastern bloc countries but also in the United Kingdom and Austria. The sharpest decline was recorded in Estonia, where the union density rate fell from 93.9% in 1992 to 3.6% in 2016. Other countries with a noticeable decline are Hungary, with UDRs of 83.1% in 1990 and 8.5% in 2016, and Slovakia, with UDRs of 64.2% in 1994 and 10.9% in 2015. Exceptions to this decreasing trend are Spain and Belgium, where the existing trade union density rates are comparable to those from 1990.

The current influence of trade unions, measured as the adjusted collective bargaining coverage rate, ranges from 7.1% in Lithuania to 98.5% in France (see Coverage in Table 2.4-1). Besides France, the member states with typically high coverage rates (more than 75%) are Austria, Belgium, Finland, France, Italy, the Netherlands, Spain and Sweden. At the other end of the spectrum are Bulgaria, the Baltic states, Hungary, Greece, Poland and Slovakia, where not even one-quarter of workers' employment contracts are regulated by collective agreements. Over the past decades, the development of the coverage rate has been relatively stable, with a noticeable decline only in Greece.

From the presented data, large differences between unions' presence and influence (excess coverage) are also visible in many countries. France, Spain, the Netherlands, Portugal and Austria are typical examples. Thus, the decreasing membership of trade unions does not automatically mean a loss of their power due to laws that extend the collective agreements beyond their membership. However, there are also countries with relatively low rates of union density as well as relatively low bargaining coverage rates. Bulgaria, Estonia, Latvia, Lithuania and Poland are the best examples.

2.5 Minimum Wage

The minimum wage establishes the lowest limit for wages paid to workers. It can decrease the income inequality in the society as it improves the situation of low-paid workers. It may serve as a remedy to market failures, improving the efficiency of labour markets. Moreover, a moderate rate of the statutory MW would promote equity and balance the bargaining position of employers and workers (EC, 2017).

In the European Union, the current minimum wage policies differ widely among the member states as there is no harmonized minimum wage policy. Even though this issue has been discussed for several years at both the political and the academic level, a clear consensus has still not been reached. Many leading policy makers, scholars and parts of trade union movements advocate the idea of a harmonized minimum wage for all workers in the EU.

Table 2.5-1 Minimum wages in the EU

Country	**Adjusted MW in 2018**		**MW/MEAN in 2017**
	[EUR]	[PPS]	
National statutory minimum wage			
Belgium	1562.59	1411.17	0.40
Bulgaria	260.76	538.75	0.41
Croatia	460.87	688.27	0.40
Czech Republic	477.78	671.87	0.35
Estonia	500.00	636.92	0.35
France	1498.47	1377.12	0.50
Germany	1498.00	1427.02	0.33
Greece	683.76	810.83	0.41
Hungary	444.69	720.43	0.40
Ireland	1613.95	1287.28	0.38
Latvia	430.00	593.97	0.39
Lithuania	400.00	618.80	0.43
Luxembourg	1998.59	1574.88	0.43
Malta	747.54	908.84	0.44
Netherlands	1578.00	1405.33	0.39
Poland	502.75	878.24	0.44
Portugal	676.67	795.27	0.43
Romania	407.86	796.48	0.44
Slovakia	480.00	694.39	0.38
Slovenia	842.79	987.93	0.52
Spain	858.55	930.16	0.34
United Kingdom	1400.99	1216.28	0.44
Statutory minimum wage in certain occupations			
Cyprus	870.00	993.15	0.45
*Non – statutory minimum wage from collective agreements**			

Austria	1121.47	1032.66	-
Denmark	2211.73	-	-
Finland	1251.47	1025.80	-
Italy	1462.93	1457.10	-

Note: * Data for 2015; - missing value
Source: Own construction based on data from OECD. Stat, ICTWSS Database 5.1, ILOStat and Garnero et al. (2015)

In Table 2.5-1, we presented the adjusted monthly minimum wage rates in 2018, and the adjustment refers to the conversion of national minimum wage rates into euros/PPS and is defined per month. In the case of Greece, Portugal and Spain, where workers are entitled to 14 monthly wage payments, the monthly rates are calculated as follows: (monthly rate of MW × 14) / 12.

In 2018, a national statutory minimum wage was applied in 22 EU member states – Belgium, Bulgaria, Croatia, the Czech Republic, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and the United Kingdom. As is obvious from the presented data, the differences in monthly minimum wage floors that were valid on 1 January 2018 are significant. While the highest rate observed in Luxembourg reached 1998.59 EUR, the lowest rate in Bulgaria (260.76 EUR per month) was more than 7 times lower. Indeed, the Bulgarian minimum wage is relatively low even compared with the second-lowest rate of Romania, with 407.86 EUR per month. More generally, 7 out of the 22 member states with a national statutory MW applied minima higher than 1000 EUR, while, in 9 member states, the national minima were lower than 500 EUR (included). If the minimum wage is expressed in PPS, the cross-country differences are smaller, ranging from 538.75 EUR in Bulgaria to 1574.88 EUR in Luxembourg. After adjustment for price levels, none of countries in the sample had a minimum wage lower than 500 EUR (PPS) in 2018.

In Cyprus, a minimum wage was set only for specific occupations. The rest of the EU member states had no national statutory minimum wage. They applied non-statutory minimum wage floors established in sectoral collective agreements. Theoretically, if sectoral minima are accompanied by high collective bargaining coverage, they can be regarded as an equivalent to a statutory minimum wage (Garnero et al., 2015).

Considering data on the adjusted coverage rate in these countries, despite a relatively high rate of coverage, some employees are still not entitled to any minimum wage. On the other hand, those who are covered by sectoral agreements enjoy relatively high minimum wage rates. In 2009 (the latest available data), the sectoral minimum wage in Denmark reached the highest nominal rate (2211.73 EUR) among all the EU member states and the minimum wage rates in Austria, Finland and Italy all exceeded 1000 EUR. This is in line with the theoretical assumption that collectively agreed sectoral minima tend to be higher than those set unilaterally by the government and applied at the national level (see e.g. Boeri, 2012; Kampelmann et al., 2013).

Regarding the differences in productivity, prices and wages across countries, it is useful to look at statistics that relate absolute values of the minimum wage to some central measure of wage distribution. Given minimum relative to mean wages (see the last column of Table 2.5-1), the differences across EU member states are smaller than in the case of absolute measures. The ratios in 2017 ranged from 0.33 in Germany to 0.52 in Slovenia. Generally, small values indicate that the minimum wage floor is far from the centre of wage distribution, leading to a smaller potential impact on employees.

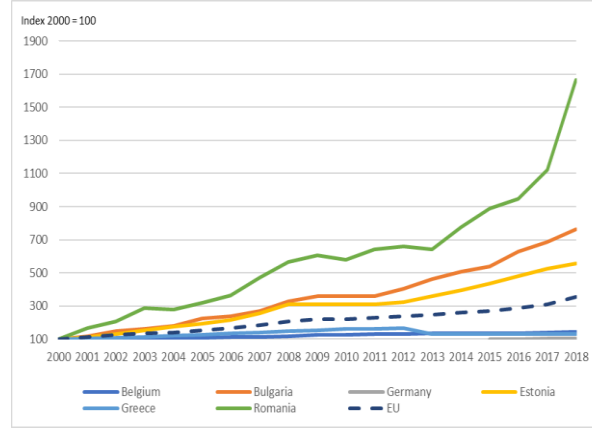

Figure 2.5-1 Development of the minimum wage, 2000–2018

Concerning a longer time period, an upward trend in the development of nominal minimum wage rates can be identified (see Figure 2.5-1). This is not surprising given the following facts: 1) wages tend to be rigid downwards, 2) many countries from the sample apply automatic indexation or annual revisions based on government forecasting and 3) the importance of social partners in determining minimum wage floors is increasing. Since 2000, all 22 EU member states with a statutory national minimum wage have experienced a rise in the minimum wage floor. In Cyprus, an increasing trend was stopped in 2012 and the minimum wage was frozen at the same rate. The highest growth was observed in Romania, Bulgaria and Estonia and the lowest in Germany, Greece and Belgium. Regarding the changes in the nominal minimum wage rates during this period, the biggest

rise was recorded in Luxembourg (an increase of 807.46 EUR in the nominal rate between 2000 and 2018) and the smallest in Germany (an increase of 58 EUR).

3. Theoretical Background and Methodology

As the neoclassical model of growth had failed to explain the differences in performance among countries, a new literature on endogenous growth emerged in the 1980s. It tried to explain growth through the structural parameters of the economy, including those related to economic policy. Therefore, institutions started to be considered as important determinants of economic performance. Furthermore, Acemoglu and Robinson (2010) suggest that economic institutions are key sources of economic growth and prosperity because they shape the incentives of economic agents to invest in physical capital, human capital and technology and influence the organization of production. Regarding labour market institutions, the recent research on LMIs can be characterized by the domination of two contradicting intuitions, distortionism and institutionalism (Freeman, 1993). The former claims that LMIs impede economic growth, while the latter suggests that LMIs may reduce costs, enhance productivity or moderate crises.

3.1 Theoretical Channels between LMIs and TFP

Theoretical and empirical works suggest numerous channels through which labour market institutions may influence productivity (levels and growth rates) with both positive and negative impacts. The positive effect of trade unions on productivity can be induced by

- encouraging training, labour reallocation and technological changes as firms support productivity-enhancing measures when the labour cost rises (Heyes and Rainbird, 2011);
- better organization and efficiency of production (Machin and Wadhwani, 1991);
- lowering the quit rate or improving workers' morale (Freeman and Medoff, 1984).

In the case of a minimum wage, an increase in productivity may be caused by

- the involvement of a larger skilled labour force in the production process (Aaronson and French, 2007; Neumark and Wascher, 2007);
- a greater incentive to invest in the human capital of low-skilled workers to avoid unemployment (Agell and Lommerud, 1997; Cahuc and Michel, 1996).

Moreover, unemployment benefits may improve productivity as they lead to

- the creation of more productive, high-quality post-unemployment jobs (Lippman and McCall, 1979);
- the generation of better job matches and higher-productivity jobs (Acemoglu and Pischke, 1999; Marimon and Zilibotti, 1999).

Active labour market policies have a positive effect on TFP as they

- make workers more employable by increasing their skills (Calmfors et al., 2002);
- lead to a higher rate of innovations (Parello, 2011).

Finally, employment protection legislation may have a productivity-enhancing impact because it

- promotes workers' commitment and thus their willingness to be involved in productivity-enhancing activities (Belot et al., 2007; Buchele and Christiansen, 1999; Soskice, 1997);
- encourages firms to adjust by investing more in both physical and human capital (Betcherman, 2012);
- increases the flexibility of high-risk entrepreneurial firms and their chance to expand and become high-growth firms through less stringent regulations (Acs, 2008).

There are also various theoretical explanations for the productivity-impeding effect. In the case of wage-setting institutions (TUs and MW), the suggested theoretical channels are the following:

- the creation of barriers for potential high-growth firms, in turn having a negative impact on productivity (Henrekson and Johansson, 2009);
- the demotivation of the management to introduce productivity-enhancing technologies if the regulations negotiated by trade unions are restrictive or job losses are expected (Aidt and Tzannatos, 2002);
- the reduction of workers' incentive to invest in training due to a lower differential between high-skill and low-skill jobs (Bassanini, 2008).

Regarding unemployment benefits, too generous a system is likely

- to increase the duration of unemployment, leading to human capital depreciation and inefficient use of resources (OECD, 2006);
- to decrease the work effort of employees (Shapiro and Stiglitz, 1984);
- to reduce the incentives to innovate (Bartelsman et al., 2005) and thereby lower the productivity.

In addition, EPL may make workers more willing to exert less effort, which in turn leads to declining productivity (Boeri and van Ours, 2013; Ichino and Riphahn, 2005). The net effect of institutions will depend on the overall institutional arrangement of labour markets and various other factors, such as the country and industry context, differences in the level of development among countries or organizational features.

3.2 Empirical Model and Methods of Estimation

To estimate the impact of labour market institutions on total factor productivity and verify our suggestion about the decisive role of their interactions, we use a panel data model. The main assumption behind our empirical specification is that TFP is endogenously determined and thus its growth rate can be explained by the accumulation of knowledge and a residual set of factors including institutions (Aghion and Howitt, 2009). More precisely, we use a policy-augmented productivity equation that contains research and development (R&D) and human capital (HC) as variables for knowledge accumulation and labour market institutions (LMIs) as institutional factors.

Formally, the baseline model is as follows:

$$\Delta lnTFP_{it} = \beta R\&D_{it} + \gamma HC_{it} + \sum_k \delta_k LMI_{kit} + \varepsilon_{it} \quad (1)$$

where ε_{it} stands for the disturbance term, i is the country index and t is the time index.

As we focus on the specific set of the European countries and the regression is restricted to the behaviour of these countries, we assume the presence of unobserved (individual) heterogeneity. In that case, the error structure of the disturbance term can be decomposed into an individual time-invariant effect α_i and an iid error term μ_{it}. Then, our baseline model becomes:

$$\Delta lnTFP_{it} = \beta R\&D_{it} + \gamma HC_{it} + \sum_k \delta_k LMI_{kit} + \alpha_i + \mu_{it} \quad (2)$$

Through the application of a fixed-effect estimator, we can control for country-specific differences through individual intercepts and thereby solve the problem of omitted variables. The correctness of this specification is tested with the Hausmann specification test (Hausmann, 1978). In all the regressions, the null hypothesis of a common intercept is rejected at any reasonable significance level, preferring the application of a fixed-effect estimator to the application of a random-effect estimator.

With the aim of controlling for common aggregate shocks that could have an impact on all the European countries in a specific year, we extend the one-way error component regression model based on (2). The regression model founded on a two-way error component with both country- and time-specific effects has the following form:

$$\Delta lnTFP_{it} = \beta R\&D_{it} + \gamma HC_{it} + \sum_k \delta_k LMI_{kit} + \alpha_i + d_t + \mu_{it} \quad (3)$$

where d_t stands for time dummies.

To estimate the impact of the overall institutional set-up on TFP, we extend the baseline model with pairwise interaction terms of LMIs. The interaction terms are modelled following Bassanini and Duval (2010) and take the form of products of institutions' deviations from their sample mean (over countries and years). In the case of one pairwise interaction of LMI_k and LMI_h, the augmented productivity equation is as follows:

$$\Delta lnTFP_{it} = \beta R\&D_{it} + \gamma HC_{it} + \sum_k \delta_k LMI_{kit} + \vartheta_{kh}\left(LMI_{it}^k - \overline{LMI}^k\right)\left(LMI_{it}^h - \overline{LMI}^h\right) + \alpha_i + d_t + \mu_{it} \quad (4)$$

In this specification, coefficient δ_k can be interpreted as the marginal productivity effect of LMI_k at its sample mean, when all the other covariates remained constant at their sample means. For the two institutions LMI_k and LMI_h that increase productivity growth, if the parameter estimate of the interaction term has a positive sign, the marginal productivity effect of LMI_k will be larger the larger the value of LMI_h. Then, the negative sign for the interaction coefficient ϑ_{kh} would provide evidence of reform complementarity. Formally, the partial derivative of TFP growth with respect to the institutional variable LMI_k is given as

$$\partial \Delta lnTFP_{it} / \partial LMI_k = \delta_k + \vartheta_{kh}\left(LMI_{it}^h - \overline{LMI}^h\right) \quad (5)$$

To avoid the issue of heteroscedastic error terms, we use SUR (PCSE) standard errors in all the regression equations.

Another potential issue is endogeneity. It means that the observed relationship between the productivity growth and the institutional variable may reflect the impact of institutions on productivity growth but also the reverse causality (from productivity change to institutional change). To control for policy endogeneity, we use lagged values of the institutional variables in the regressions. Finally, we test the validity of the standard assumptions of normal distribution by providing a residual diagnostic–normality test.

3.3 Data

The empirical analysis is conducted on an unbalanced data set covering observations of 28 member states of the European Union from 1995 to 2017. The choice of time period was determined by the data availability for the countries. In total, the dataset includes 7 explanatory variables (2 control variables and 5 institutional variables) and the growth rate of TFP as the dependent variable. The description of all the variables and the references to sources are presented in Table 3.3-1.

Table 3.3-1 Data – references to sources and description

Variable	Source	Description
TFP_growth	Own calculation	Log difference of total factor productivity
HC_index	Penn World table 9.1	Human Capital Index
RD_govexp	Eurostat	Total government research and development expenditure per inhabitant (PPS)
UB_benefits	Eurostat	Full unemployment benefits per unemployed (PPS)
MW_mean	OECD.Stat, WSI, MLWSI, CYSTAT	Minimum relative to average wages of full-time workers
ALMP_ame	Eurostat	Average monthly active labour market policy expenditures per unemployed (PPS)
TU_udr	OECD.Stat, ICTWSS 5.1	Union density rate
EPL_temp	OECD.Stat	Strictness of employment protection, temporary contracts (index 0-7)

Notice that

- the log difference in total factor productivity acts as a proxy for the growth rates of total factor productivity, and the calculation is performed via the growth accounting method (see Appendix I for more details);
- the average monthly expenditure on active labour market policies was calculated from data on expenditures on active measures (categories 10–70) and the number of unemployed persons adjusted to a monthly rate;
- the minimum to mean wage for Cyprus was calculated based on data obtained on request from the Ministry of Labour, Welfare and Social Insurance and the Statistical Service of Cyprus; the data were adjusted by PPP from Eurostat (EU28=1).

The stationarity of the included time series (condition for unbiased results in panel data regression) was tested using the standard panel data unit root test (Levin, Lin and Chu, 2002). In the case of all the explanatory variables, with the exception of R&D expenditure, the null hypothesis of the presence of a unit root was rejected at the conventional significance level (test with an individual intercept and trend).

4. Empirical Results and Discussion

The empirical results of the least squares dummy variable regressions for the baseline model (3) and its extension by pairwise interactions of LMIs (4) are reported in Table 4-1. The regression results of the institution-augmented productivity equation (3) confirm the importance of knowledge accumulation suggested by the theory. Both control variables, the human capital index and government expenditures on research and development, have a significantly positive effect on TFP growth over the analysed period (the adjusted length of the period is 2004–2016 due to the large number of missing values for ALMP_ame and EPL_temp).

Regarding the institutional variables, three of the selected LMIs have a statistically significant impact on the growth rate of TFP, all of which have negative signs. The most significant effect seems to occur in the case of ALMPs as the average monthly expenditure per unemployed person on active labour market policies has a significantly negative impact on the TFP growth rate at α=0.01 over the period 2004–2016. The average effect of unemployment benefits measured as the full unemployment benefits per unemployed person and the average effect of employment protection legislation for temporary contracts (hiring regulations for workers under temporary contracts) are estimated to be negative over the same period with significance levels of α=0.1 and α=0.05, respectively. These findings are in line with the theoretical expectations about the negative impact of wage-setting institutions, generous unemployment benefit systems and strict employment protection legislation on productivity.

On the contrary, active labour market programmes indicate a negative impact on productivity, although theoretical works give preference to their productivity-enhancing effect. This means that active labour market programmes have not increased the productivity of the persons involved or otherwise promoted the growth

rate of total factor productivity. This contradiction can be explained by the unproductive usage of expenditures on active measures in selected European economies. However, these conclusions are only indicative and, to offer more precise knowledge of the underlying reasons, we would require additional research (selecting different periods and states, testing the impact of various active labour market measures, etc.).

The presented findings about the direct effect of selected LMIs confirm the conclusions from our previous research on the relationship between the unsatisfactory development of TFP in the EU and the institutional set-up of the European labour markets (Čekmeová, 2016a, 2016b, 2016c). The last three columns of Table 4-1 present the estimates of the productivity equation augmented by LMI interactions. We estimated all the possible combinations of the selected LMIs, but we present only those that indicate statistical significance in separate regressions with single interaction terms. The results suggest that the pairwise interactions of UBs with MW (4a), ALMPs with TUs (4b) and ALMPs with EPL significantly explain the growth rate of TFP at the conventional significance level.

The negative sign of the interaction term in the case of UB–MW interaction means that the marginal (negative) productivity effect of unemployment benefits will be larger the higher the level of minimum to mean wage. Therefore, reforms oriented towards decreasing the level of UBs and MW should be implemented together to maximize their impact on productivity growth. The same is true for ALMP–TU interaction. In the case of the ALMP–EPL interaction term, the parameter estimate is positive, indicating that the negative marginal effect of ALMP can be mitigated by stricter regulations on temporary contracts (higher EPLtemp).

Notice that, in the case of the minimum wage and unemployment benefits, their direct effects are not statistically significant in explaining the dependent variable while their combinations with other institutions have a decisive impact on total factor productivity growth in the EU member states.

Table 4–1 Regression results – Least Squares Dummy Variables (LSDV) estimations of the institution-augmented productivity equation

	(3)	(4a)	(4b)	(4c)
constant	-0.274 (-1.703)	-0.263 (-1.770)	-0.191 (-1.178)	-0.377 (-2.186)
lag_HC_index	0.104* (1.832)	0.105** (1.993)	0.109* (1.947)	0.096 (1.644)
lag_d_RD_govexp	0.20e-03* (1.956)	0.20e-03** (2.009)	0.18e-03* (0.1722)	0.21e-03** (2.026)
lag_UB_benefits	-1.63e-06* (-1.750)	-3.55e-06** (-2.488)	-1.86e-06** (-2.049)	-2.28e-06** (-2.330)
lag_MW_mean	-0.149 (-1.221)	-0.148 (-1.229)	-0.164 (-1.326)	-0.113 (-0.923)
lag_ALMP_ame	-4.10e-05*** (-2.744)	-3.51e-05** (-2.242)	-3.94e-05*** (-2.644)	-2.58e-05* (-1.734)
lag_TU_udr	0.001 (0.897)	0.001 (0.753)	-0.002 (-0.847)	0.001 (0.904)
lag_EPL_temp	-0.014** (-2.276)	-0.014** (-2.321)	-0.014** (-2.274)	0.053 (1.561)
lag_UB*lag_MW	-	-9.94e-06** (-2.142)	-	-
lag_ALMP*lag_TU	-	-	-1.22e-06** (-2.490)	-
lag_ALMP*lag_EPL	-	-	-	2.65e-05* (1.834)
Observations	215	215	215	215
Country Dummies	yes	yes	yes	yes
Time Dummies	yes	yes	yes	yes
R-squared	0.68	0.68	0.68	0.68
Adjusted R-squared	0.60	0.60	0.61	0.60
F Statistic	8.821	8.734	8.808	8.782
P-value (F)	0.000	0.000	0.000	0.000

5. Conclusion

Numerous theoretical and empirical works have already confirmed the importance of labour market institutions in determining productivity and in turn long-run growth. Given this fact and the rising challenges that current labour markets must face, an appropriate institutional arrangement is essential to promote better economic performance of the EU. However, neither theory nor empirical studies give an unambiguous answer to the question of how these institutions influence productivity growth.

The current institutional arrangements on the labour markets of the EU member states are highly heterogeneous. The EU only complements national policy initiatives through the adoption of minimum requirements for working and employment conditions, for informing and consulting workers, and determines which country is responsible for unemployment benefit payments. However, we can identify certain common trends in the evolution of the main indicators for selected labour markets.

First, an intention to make labour markets more flexible through less strict employment protection is visible in the majority of countries. However, the changes are only on a small scale. At the same time, increasing differences between regulations on temporary and permanent contracts are present. Second, countries with high unemployment benefits typically have less strict eligibility conditions, a long duration of entitlement and high replacement rates. Third, an increasing trend in the number of participants involved in active labour market programmes is characteristic of the majority of the member states. However, the level of public expenditure is relatively low, even in countries with relatively wide coverage. Fourth, the decreasing membership of trade unions in the EU does not automatically mean a loss of their power due to large excess coverage in many states. Finally, an upward trend in the development of statutory nominal minimum wages was identified.

The aim of this paper was to determine the effect of five labour market institutions on total factor productivity growth in the European Union, with an emphasis on their interactions. Five institutions were considered: active labour market policies, employment protection legislation, the minimum wage, trade unions and unemployment benefits. Total factor productivity was defined as a residual that accounts for technological changes and other factors. We assumed its endogenous determination.

The empirical results of the panel data regression analysis confirmed the importance of knowledge accumulation proposed by endogenous theories. Both the government expenditure on research and development and the human capital index significantly explained the total factor productivity in 23 member states over the period from 2004 to 2016. Regarding the institutional variables, three labour market institutions significantly affected the total factor productivity growth, all of them with a negative sign. The productivity impeding the direct effect of unemployment benefits and employment protection legislation for temporary contracts was in line with the theoretical expectations about the negative impact of wage-setting institutions, generous unemployment benefit systems and strict employment protection legislation on productivity. On the contrary, active labour market programmes indicated a negative impact on productivity, although theoretical works give preference to its productivity-enhancing effect.

After accounting for institutional interactions, the regression results confirm our assumptions that, besides the direct effect of selected labour market institutions, their interactions are decisive in the determination of total factor productivity growth. More precisely, the interactions of unemployment benefits with the statutory minimum wage relative to the mean and expenditures on active labour market programmes with the trade union density rate and with employment protection legislation on temporary contracts indicated a statistically significant impact. The interpretation of these findings leads to the conclusion that reforms oriented towards decreasing the level of UBs and MW (active labour market policies and trade unions) should be implemented together to maximize their impact on productivity growth. Moreover, the negative marginal effect of ALMPs can be mitigated by stricter regulations on temporary contracts.

However, these findings have their limitations. First, the regression analysis includes only 23 member states – 5 cross-sections were dropped due to a large number of missing values for EPL_temp and ALMP_ame. Therefore, the presented conclusions cannot be generalized to the whole EU. Second, all the possible interactions cannot be included in a single estimation as this could lead to a substantial loss of degrees of freedom and raise the issue of perfect multicollinearity. Thus, further empirical analysis is required to assess the impact of all the institutional arrangements at once.

References

AARONSON, D., FRENCH, E. (2007). Product Market Evidence on the Employment Effects of the Minimum Wage. *Journal of Labor Economics* 25: 167-200. https://doi.org/10.1086/508734

ABRAMOWITZ, M. (1956). Resource and Output Trends in the United States since 1870. *American Economic Review* 46: 5-23

ACEMOGLU, D., PISCHKE, J. (1999). Minimum Wages and On-the-Job Training. *Working papers*. No. 99-25: 1-46. Massachusetts: MIT. https://doi.org/10.3386/w7184

ACEMOGLU, D., ROBISON, J. (2010). The Role of Institutions in Growth and Development. *Review of Economics and Institutions* 1: 1-33. https://doi.org/10.5202/rei.v1i2.14

ACS, Z. J. (2008). Foundations of high impact entrepreneurship. *Foundations and Trends in Entrepreneurship* 4: 535–620. https://doi.org/10.1561/0300000025

AGELL,J., LOMMERUD, K. E. (1997). Minimum wages and the incentives for skill formation. *Journal of Public Economics* 64: 25-40. https://doi.org/10.1016/S0047-2727(96)01595-2

AGHION, P., HOWITT, P. (2009). *The Economics of Growth.* Cambridge: The MIT Press.

AIDT, T., TZANNATOS, Z. (2002). *Unions and Collective Bargaining: Economic Effects in a Global Environment.* Washington, DC: World Bank. https://doi.org/10.1596/0-8213-5080-3

BARRO, (1998). Notes on Growth Accounting. *NBER Working Paper*. No. 6654: 1-32. Cambridge: National Bureau of Economic Research. https://doi.org/10.3386/w6654

BARRO, J. R., SALA-i-MARTIN, X. (1997). Technological Diffusion, Convergence, and Growth. *Journal of Economic Growth* 2: 1-27. https://doi.org/10.1023/A:1009746629269

BARTELSMAN, E., et al. (2005). Comparative Analysis of Firm Demographics and Survival: Evidence from Micro-level Sources in OECD countries. *Industrial and Corporate Change* 14: 365-391. https://doi.org/10.1093/icc/dth057

BASSANINI, A. (2008). The Impact of Labour Market policies on Productivity in OECD Countries. *International Productivity Monitor* 17: 3-15

BASSANINI, A., DUVAL, R. (2010). Employment Patterns in OECD Countries: Reassessing the Roles of Policies and Institutions. *OECD Economics Department Working Papers*, No. 486: 1-126. Paris: OECD Publishing.

BELOT, M., et al. (2007). Welfare-improving employment Protection. *Economica* 74: 381-396. https://doi.org/10.1111/j.1468-0335.2006.00576.x

BETCHERMAN, G. (2012). Labour Market Institutions: A review of the Literature. *Policy Research Working Paper*, No. 6276.: 1-56. Washington, D.C.: World Bank. https://doi.org/10.1596/1813-9450-6276

BETCHERMAN, G. (2012). Labour Market Institutions: A review of the Literature. *Policy Research Working Paper*. No. WPS 6276: 1-57. Washington, D.C.: World Bank. https://doi.org/10.1596/1813-9450-6276

BOERI, T. (2012) Setting the Minimum Wage. *Labour Economics* 2012: 281-290. https://doi.org/10.1016/j.labeco.2012.01.001

BOERI, T., Van OURS J. (2013). *The Economics of Imperfect Labor Markets*. USA: Princeton university Press. https://doi.org/10.2307/j.ctt32bc18

BUCHELE, R., CHRISTIANSEN, J. (1999). Labor Relations and Productivity Growth in Advanced Capitalist Economies. *Review of Radical Political Economics* 31: 87-110. https://doi.org/10.1177/048661349903100105

CAHUC, P., MICHEL, P. (1996). Minimum Wage, Unemployment and Growth. *European Economic Review* 40: 1463-1482. https://doi.org/10.1016/0014-2921(95)00035-6

CALMFORS, L. et al. (2002). Does active labour market policy work? Lessons from the Swedish experiences. *Working Paper*. No. 4: 1-73. Uppsala: IFAU. https://doi.org/10.2139/ssrn.305360

ČEKMEOVÁ, P. (2016a). Productivity in the European Union: Do Labour Market Institutions Really Matter? In: *Proceedings of the 3rd International Conference on European Integration 2016.* Ostrava: Technical University of Ostrava, 116-124.

ČEKMEOVÁ, P. (2016b). Unfavourable productivity growth in the European Union – The Role of Labour Market Institutions. In: *Hradec Economic Days 2016*. Hradec Králové: University of Hradec Králové, 136-143.

ČEKMEOVÁ, P. (2016c). Labour Market Institutions and Total Factor Productivity. An evidence in the European Union. In: *34th International Conference on Mathematical Methods in Economics 2016: Conference Proceedings.* Liberec: Technical University of Liberec, 108-113.

DIEWERT, W. (1976). E. Exact and Superlative Index Numbers. *Journal of Econometrics* 4: 115–145.

ETUC. (2010). *Trade Unions and Industrial relations in EU Countries*. Brussel: Euroepan Trade union Confederation. https://doi.org/10.1016/0304-4076(76)90009-9

EUROPEAN COMMISSION. (2017). *Labour market and wage developments in Europe: Annual Review 2017*. Luxembourg: Publications Office of the European Union.

FEENSTRA, R. C., et al. (2015). The Next Generation of the Penn World Table. *American Economic Review* 105: 3150-3182. https://doi.org/10.1257/aer.20130954

FREEMAN, B. R. (1993). Labor Market Institutions and Policies: Help or Hidrance to Economic Development? In: *Proceedings of the World Bank Annual Conference on Developmet Economics*. Washington, DC: The World Bank.

FREEMAN, R. B., MEDOFF, J. L. (1984). *What do unions do*? New York: Basic Books.

FUENTE, A., DOMÉMECH, R. (2006). Human Capital in Growth Regressions. How Much Difference Does Data Quality Make? *Journal of the European Economic Association* 4: 1-36. https://doi.org/10.1162/jeea.2006.4.1.1

GARNERO, A., et al. (2015). Sharp Teeth or Empty Mouths? European Institutional Diversity and the Sector-level Minimum Wage Bite. *British Journal of Industrial Relations* 53: 760-788. https://doi.org/10.1111/bjir.12104

HAUSMANN, J. A. (1978). Specification Tests in Econometrics. *Econometrica* 46: 1251-71. https://doi.org/10.2307/1913827

HENREKSON, M. JOHANSSON, D. (2009). Competencies and Institutions Fostering High-Growth Firms. *Foundations and Trends in Entrepreneurship* 5: 1-80. https://doi.org/10.1561/0300000026

HEYES, J., RAINBIRD, H. (2011). Mobilising resources for union learning: a strategy for revitalisation?' *Industrial Relations Journal* 42: 565-579. https://doi.org/10.1111/j.1468-2338.2011.00643.x

ICHINO, A., RIPHAHN, R. (2005). The Effect of Employment Protection on Worker Effort: Absenteeism during and after Probation. *Journal of the European Economic Association* 3: 120-143. https://doi.org/10.1162/1542476053295296

KAMPELMANN, S., et al. (2013). Minimum Wages in Europe: *Does the Diversity of Systems Lead to a Diversity of Outcomes*? Brussels: European Trade Union Institute.

LEVIN, A., LIN, CH., CHU, J. Ch. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics* 108: 1-24. https://doi.org/10.1016/S0304-4076(01)00098-7

LIPPMAN, S. A., McCALL, J. J. (1979). *Studies in the Economics of Search*. Amsterdam: North-Holland.

MACHIN, S., WANDHWANI, S. (1991). The Effects of Unions of Investment and Innovation: Evidence from WIRS. *Economic Journal* 101: 324-30. https://doi.org/10.2307/2233822

MARIMON, R., ZILIBOTTI, F. (1999). Unemployment vs. Mismatch of Talents: reconsidering Unemployment Benefits. *Economic Journal* 109: 266-291. https://doi.org/10.1111/1468-0297.00432

NEUMARK, D., WASCHER, W. L. (2007). Minimum Wages and Employment. *Foundations and Trends in Microeconomics* 3: 1-182. https://doi.org/10.1561/0700000015

OECD. (2006). *OECD Employment Outlook. Boosting jobs and Incomes*. Paris: OECD. https://doi.org/10.1787/g295a798-en

PARELLO, C. P. (2011). Labor Market Rigidity and Productivity Growth in a Model of Innovation-Driven Growth. *Economic Modelling* 28: 1058-1067. https://doi.org/10.1016/j.econmod.2010.11.022

SAINT-PAUL, G. (1997). Is Labour Rigidity Harming Europe´s Competitiveness? *European Economic Review*1 41: 499-506. https://doi.org/10.1016/S0014-2921(97)00017-2

SHAPIRO, C. STIGLITZ, J. E. (1984). Equilibrium Unemployment as a Worker Discipline Device. *The American Economic Review* 74: 433-444.

SLOANE, P. et al. (2013). *Modern labour Economics.* Abingdon: Routledge. https://doi.org/10.4324/9780203069301

SOLOW, R. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics* 39: 217-235. https://doi.org/10.2307/1926047

SOSKICE, D. (1997). German Technology Policy, Innovation and National Institutional Frameworks. *Industry and Innovation* 4: 75-96. https://doi.org/10.1080/13662719700000005

Additional sources

BRYDEN, J. (2002). *Rural Development Indicators and Diversity in the European Union.* [Online], accessed at 20. 6. 2015. Available from: <http://srdc.msstate. edu/measuring/bryden.pdf>. [web sources, law, …]

EU. (2012). Consolidated version of the Treaty on the Functioning of the European Union. Official Journal C 326. [Online], accessed at 15. 12. 2019. Available from: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT>

VON DER LEYEN, U. (2019). Political Guideline for the Next European Commission 2019-2024. [Online], accesse at 5. 12. 2019. Available from https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

WSI. 2019. WSI Minimum Wage Database. [Online], accessed at 5. 12. 2019. Available from: <https://www.boeckler.de/wsi-tarifarchiv_44064.htm>

Appendix

I. Growth Accounting Method

In general, growth accounting is used to decompose economic growth into components that reflect the contribution of factor inputs and a so-called Solow residual that accounts for technological changes and other factors (Barro, 1998). In this paper, a method elaborated by Diewert (1976) is applied to calculate the TFP growth rates.

The growth rate of the gross domestic product (GDP) is approximated by the first difference of the logarithm of the GDP and decomposed via the following equation:

$$\Delta lnY_t = \frac{1}{2}[a_t + a_{t-1}]\Delta lnK_t + \frac{1}{2}[b_t + b_{t-1}]\Delta lnL_t + \Delta lnA_t$$

where Y_t denotes the GDP, K_t stands for the capital stock, L_t is the number of hours worked, A_t is a measure of the total factor productivity and a_t, b_t represents the shares of labour and capital incomes in the total income (labour and capital compensation).

Then, the total factor productivity growth rate is calculated as follows:

$$\Delta lnA_t = \Delta lnY_t - \frac{1}{2}[a_t + a_{t-1}]\Delta lnK_t - \frac{1}{2}[b_t + b_{t-1}]\Delta lnL_t$$

Labour input is measured as the total hours worked using industry-level data. The capital stock is calculated using the perpetual inventory method (PIM). Its basic equation can be described as

$$K_t = I_t + (1 - \delta)K_{t-1}$$

where I_t denotes the gross investment at current prices at time t and δ_i is the geometric rate of depreciation.

We use the geometric depreciation rates from Feenstra et al. (2015), which are common across countries and constant over time but unique to industries (the applied average depreciation rate is 21%).

The initial capital stock is calculated based on Fuente and Doménech (2006):

$$K_0 = \frac{I_0}{g_I + \delta}$$

where I_0 is gross capital formation, g_I is the growth rate of investment and δ is the average depreciation rate.

The rate of labour income in the total income a at time t is derived as the ratio of compensation of employees *CE* plus mixed income *MI* to the total income *Y*, written mathematically as follows:

$$a_t = \frac{CE_t + MI_t}{Y_t}$$

As the rate of labour income and the rate of capital income together give 1, the latter is computed as follows:

$$b_t = 1 - a_t$$

Assuming geometric depreciation of the capital and constant industry-level depreciation rates, the basic equation for capital stock can be rewritten in the following way:

$$K_{i,t} = \sum_{l=0}^{n-1}(1 - \delta_i)^l I_{i,t-1} + (1 - \delta_i)^n K_{i,t-n}$$

where n denotes a fixed moment in time for which we express the initial level of capital stock, l represents a length of time between the actual and the initial year and i is an index for industry.

The proposed computation method leads to the broadest measure of TFP growth. Besides disembodied technological progress, it includes the effects of technological progress embodied in physical capital as well as human capital accumulation.