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THE EFFECT OF EMPLOYMENT PROTECTION LEGISLATION ON PRODUCTIVITY GROWTH IN OECD-COUNTRIES, GIVEN THE SKILL LEVEL OF A SECTOR

A MASTER'S THESIS

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[Abstract]

Productivity growth is an understudied part of the macro-economic impact of employment protection legislation (EPL), which usually focuses on the impact on employment. This thesis studies the influence of EPL on productivity growth, focussing on both total factor productivity (TFP) and labour productivity (LP). It also distinguishes between the effect of EPL on low-skilled sectors and the effect on high-skilled sectors. Using a multi-level cross-classified model based on sector level productivity data from the EU KLEMS database, it shows that generally productivity growth in low-skilled sectors is influenced more by changes in EPL compared to productivity growth in high-skilled sectors. The effect is stronger for TFP growth compared to LP growth. It also shows that product market regulation has a significant impact on both TFP and LP growth.

Contents

1. Introduction

After the economic crisis of '08-'09 and the subsequent Eurocrisis, "enhancing flexibility" was the codeword for most developed countries (OECD, 2013a). Large job losses during the years of economic malaise, countries were turning to reducing employment protection legislation (from here: EPL) in an attempt to increase employment. EPL, which includes things like hiring and firing restrictions and certain social benefits, is sometimes regarded as part of the labour market rigidities that constrict markets from gaining efficient outcomes (International Monetary Fund, 2007). In the discussion of the economic effects of EPL, the emphasis has been on employment effect of this legislation. Many researchers have provided both theoretical (Blanchard & Wolfers, 2000; Garibaldi & Brixiova, 1998) as well as empirical evidence on this topic (Blanchard & Landier, 2002; Mooi-Reci & Dekker, 2015). This has led to fierce discussion within the field and a pluralistic view on the topic.

However, a topic that might warrant more research, is the impact changes in EPL have on productivity growth. If we talk about economic outcomes, employment is not the be-all-end-all. In fact, although employment levels have been steadily rising in most OECD-countries, productivity growth is the slowest it has been in decades (OECD, 2018). Since GDP per capita is determined by labour utilisation (hours worked) *and* labour productivity (Bassanini & Venn, 2008), the idea that curtailing EPL would lead to better economic outcomes assumes that it increases employment without reducing innovation and productivity growth (Vergeer & Kleinknecht, 2014).

Understanding whether or not this is actually the case could benefit future generations. With a greying population and increasing participation by women in the last few decades, the upper limits of growth through labour utilisation could very well be near for some OECD countries, like the Netherlands (Bouman, 2019). What impacts (labour) productivity growth is thus an important topic to research given the challenges we face in the 21st century.

However, the effect of EPL on productivity growth has not been studied in nearly as much detail as the effect it has on employment and labour utilisation. Furthermore, studies often look at labour market policies in general or at cross-country differences. This is not ideal. The effect of EPL is likely to be greater in some sectors than others. Sectors that show a lot of turnover in the work force are more likely to be affected by restrictions like EPL. Furthermore, if employment rises, like it has done in the OECD in the last few decades, it is assumed that more unskilled workers enter the labour force. On an aggregate, country level,

this would most likely mean a relative decrease in productivity. These *composition effects* (Bassanini & Venn, 2007) are not significantly present on a sector level.

This also presents the opportunity to look at the effects the skill level of a sector has on the overall effect of EPL on productivity. Although some papers that study the effect of EPL on productivity growth incorporate some measure of skill level (Acemoglu & Pischke, 1999; Lisi & Malo, 2017), they are few and far between and do not regard sector skill level as central to their research. This thesis will attempt to remedy that.

This thesis will thus focus on the effects of EPL on productivity growth in OECD-countries. It will use sector level data to distinguish between the effects of EPL per sector and study whether skill level plays a role in the size of that effect.

Research question: *"To what extent does Employment Protection Legislation (EPL) affect productivity growth in OECD-countries, given the skill level of a sector?"*

To study this question, this thesis will first discuss the theoretical background on EPL, productivity growth and sector skill level, and why they are related, in Chapter 2. From that framework, hypotheses are formed. Chapter 3 will discuss how to test these hypotheses, using a model that empirically analyses cross-classified multi-level data. In Chapter 4 will give an in-depth insight in some of the relevant summary statistics relevant for the analysis. The results of the analysis will be presented in Chapter 5. This thesis will end with a discussion and conclusion in Chapter 6.

2. Theoretical Overview

In this chapter, the theoretical mechanism behind the effect EPL can have on productivity is explained. To do that, a definition and explanation of EPL is given. This is followed by a dive into the measures of productivity used in this thesis. After that, previous studies into the effect of EPL on productivity are discussed. This chapter concludes with hypotheses that are derived from the discussed theory.

2.1 Employment Protection Legislation (EPL)

The level of employment protection in a country determines the rules a firm has to follow once it wants to hire or lay-off workers. EPL, despite having the term legislation in its name, is not restricted to legislation alone. The OECD (1999, p. 49) considers it to refer "to all types of employment protection measures, whether grounded primarily in legislation, court rulings, collectively bargained conditions of employment or customary practice". It is thus better defined as "the set of rules governing the hiring and firing of workers" (Bassanini & Venn, 2008, p. 6). Some rules are simply the result of common practices or collective bargaining agreements, rather than legislative conditionalities. In this thesis, this broad definition will be followed.

2.2 Productivity

In this thesis, two measures of productivity will be used, total factor productivity (TFP) and labour productivity.

2.2.1 Total Factor Productivity (TFP)

The most commonly used measure of overall productivity change is that of total factor productivity (from here: TFP), sometimes called multi-factor productivity (or MFP). A good summary of the process with which to obtain different measures of TFP is given by Coelli et al. (2005), but in short it is a measure that examines productivity growth regarding all factors of production. As mentioned by Coellie et al., TFP is essentially a measure of the growth of the total production frontier without a change (or accounting for the change) in underlying inputs (capital or labour). This results in TFP being the most common measurement of productivity growth, because either capital or labour productivity or a combination of both could be influenced by a change in the other (i.e. higher labour productivity could be caused by more capital inputs). Growth in TFP is thus seen as being determined by technological change or innovation.

2.2.2 Labour productivity

The other measure of productivity used in this thesis is labour productivity. Although not a measure of overall productivity, it is interesting to study the effect EPL has on labour productivity as such. Labour productivity is a measure of output per hour worked, and thus a good stand-in for the economic value of workers. As is further elaborated upon later in this chapter, EPL can shift the investment within a firm. EPL might have a positive effect on capital deepening (Bassanini & Venn, 2008) and it is thus also interesting to research if EPL changes the growth rate of labour productivity.

2.2.3 Sector level differences

By using sector level differences instead of country level differences, effects of EPL can be determined more precisely. EPL might increase employment levels, which would most likely lead to more influx of employment in lower-skilled, less productive sectors, without affecting the productivity of workers in other sectors. These composition effects are significant on a country level but are shown to be negligible on a sector level (Oecd, 2007). Furthermore, the speed of labour reallocation is not the same across sector, and so a change in EPL is likely to have a more substantial effect on some sectors than others.

2.3 The influence of EPL on productivity

2.3.1 Why higher EPL could decrease productivity

Both Kleinknecht et al. (2017) and the OECD (2013) see different theoretical mechanisms that could negatively affect productivity growth through EPL, mainly through higher firing costs associated with these kinds of legislation.

One, it could reduce reallocation of employees from declining sectors to innovative ones (Nickell & Layard, 1999; Poschke, 2009). This is in line with the argument by Blanchard & Wolfers (2000) that EPL slows down the adjustment towards the equilibrium level. Declining firms might hold on to their employees longer than necessary because of the costs involved in dismissing them, while innovative firms hire less employees than necessary in fear of the costs of having to dismiss them in the future.

EPL might also reduce incentives to invest in job-costing innovation (Bassanini & Ernst, 2002; Tressel & Scarpetta, 2004). If the costs of firing are higher than the cost-saving results of innovation, firms might be inclined to not invest in this research even though it is beneficial to overall productivity.

Innovation could also result in higher wage claims from "insiders" (entrenched workers), who have become too expensive to fire with strong EPL. This would lead firms to underinvest in innovation and thus reduce future productivity growth (Bentolila, Dolado, Franz, & Pissarides, 1994).

The fourth argument is that firms would be more hesitant to invest in risky projects (Bartelsman, Glyn, & de Wind, 2012). For example, if higher costs are associated with failed risky projects (because of potential lay-offs), it is argued by Saint-Paul (2002) that firms would prefer to invest in safer secondary innovation that improves on existing products. As higher productivity growth is usually associated with riskier investments into new products, this would be another reason why EPL would lead to slower productivity growth.

Lastly, there are arguments centred around job turnover. It is argued that innovation, and consequently productivity growth, is increased by the movement of skilled personnel (Breschi & Lissoni, 2009). Increasing barriers for these kinds of movements by imposing stricter EPL, and thus creating "insiders" and "outsiders", would result in less productivity growth. However, empirical research suggests that job turnover is less dependent on employment protections and associated more with the state of the business cycle (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006).

2.3.2 Why higher EPL could increase productivity

The main arguments for a positive effect of EPL on productivity are based around investment in labour. Higher costs associated with firing workers could lead companies to invest in training programs for its workers (Belot, Boone, & van Ours, 2007; Fella, 2005). Koeniger (2005) argues that another reason for companies to invest in productivity-enhancing measures would be to avoid big lay-offs.

For employees, more rigid EPL can signal that they are more unlikely to get laid-off, which in turn can result in more commitment to the firm. This could result in more effort on the part of the employee, or more incentive to invest in themselves through job-training or other programs that increase productivity. (Belot et al., 2007; Soskice, 1997)

Another argument why EPL could improve productivity is rooted in the efficiency wage theory. EPL influences power relations between employers and their employees, with stronger EPL generally leading to a more equitable power dynamic and thus higher wages. Wage growth is closely aligned with labour productivity growth (Kleinknecht, 2017), as higher

wages tend to reduce turnover (especially for low-skilled jobs) and improve effort of employees (Akerlof, 1982; Katz, 1986), and a push for managers to improve cost-efficiency.

Recently, there has been more focus on successful cooperation within companies as a driving force of productivity growth. After relatively disappointing productivity growth data in the last few years, some economists have suggested that a lack of familiarity within workplaces is to blame (Stam, Van der Veen, & Smetsers, 2019). They suggest the increase of temporary labour could be the leading factor in this, but higher job turnover resulting from decreases in EPL could also be pointed to as a reason for decreasing familiarity.

Empirically, we can also see that rigid labour markets can lead to more innovation. Because firms with higher levels of innovation are better able to absorb the costs of high EPL, they can out-compete technological inferior competitors (Vergeer & Kleinknecht, 2010). Moreover, Acemoglu and Pischke (1999) show that stricter labour regulation leads to investment in training for both higher educated and lower educated workers, while in less strict systems firms tend to invest primarily in higher educated workers.

2.4 Hypotheses

This leads to the hypotheses that will be tested in this thesis. Since the channels of adjustment for EPL could mean either a negative or a positive impact on productivity growth, the first hypothesis is as follows:

1. *Employment Protection Legislation (EPL) has a significant effect on productivity growth*

While the aforementioned research does suggest there is a difference in the effect of EPL on productivity growth based on the skill level in the sector, it does not distinctly establish where the influence would be strongest. This means that for the purposes of this thesis, two competing hypotheses are formed:

2. *The effect of Employment Protection Legislation (EPL) on productivity growth is stronger in high-skilled sectors than low-skilled sectors*
3. *The effect of Employment Protection Legislation (EPL) on productivity growth is stronger in low-skilled sectors than high-skilled sectors*

3. Methodology

This section will explain the methods used to conduct the empirical analysis suggested in the theoretical chapter. It will first introduce the model, before diving deeper into the variables used in this analysis. The databases used will also be mentioned.

3.1 The Model

This thesis will use a model adapted from elements of earlier productivity equations (like Bassanini, Nunziata, & Venn, 2009; Lisi & Malo, 2017) which estimate the effect of skilled and unskilled labour on productivity growth. However, in contrast to those previous analyses, this analysis will be conducted using a cross-classified multi-level model, using both sector and country data over time. Specifically, sectors and years are determined to have cross-classified (i.e. across different levels) effects. The effect of EPL is the main topic of investigation in this thesis and by using interaction effects for high-skilled and low-skilled sectors, we can ascertain whether EPL has a different effect depending on skill level of the sector.

This results in the following equation:

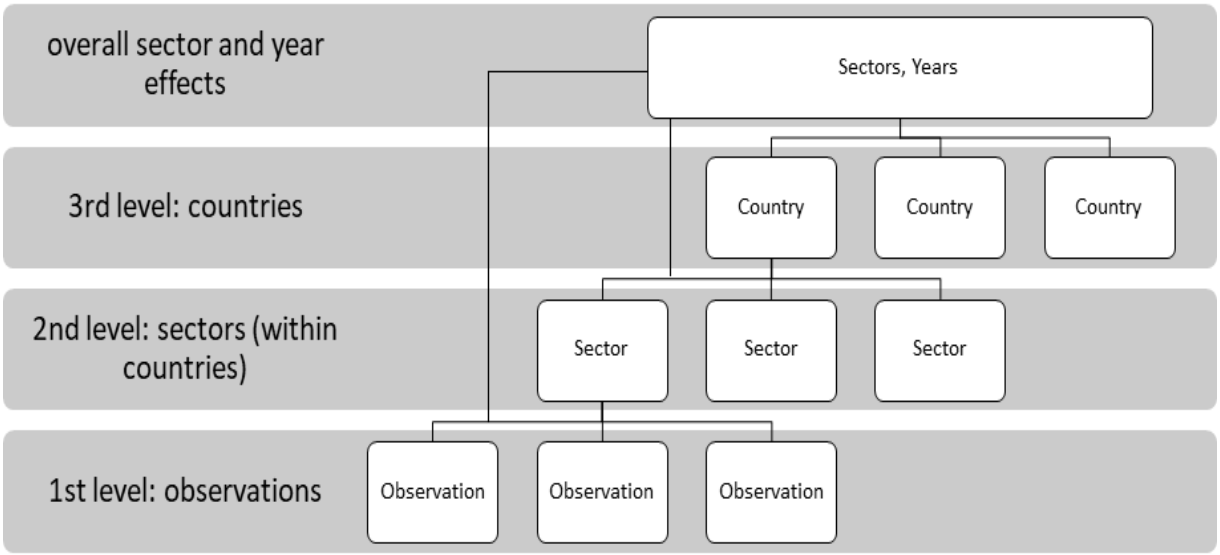
$$\Delta lny_{i(jt)l} = \gamma_{00} + \gamma_{10} EPL_{il} + \gamma_{20} LSS_{jl} * EPL_{il} + X_{i(jt)l} + f_{0l} + \mu_{0il} + v_{0il} + \mu_{0jl} + v_{0jl} + e_{i(jt)l}$$

Where:

- Δlny is productivity growth, the dependent variable
- EPL is an index of employment protection legislation
- LSS is a dummy for low-skilled sectors
- X denotes other control variables, such as: union density, prime-age employment to population, product market regulation
- f_{ol} denotes the cross-classified effects of sector and time
- μ_{0il} and v_{0il} denote, respectively, the fixed and random effects of EPL on a country-specific basis
- μ_{0jl} and v_{0jl} denote, respectively, the fixed and random effects of EPL on a sector-specific basis
- v represents the random parts of the multi-level equation
- i is country, j is sector, t is time, l is cross-classified level

A conceptual model is provided in Figure 1.

Figure 1: conceptual multi-level model



This analysis will cover the timeframe 2000-2013, the earliest and latest year for which EU KLEMS and OECD EPL data is available for all sectors and all countries. Countries that are included in this analysis consist of the members of the EU in 2000 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden and the United Kingdom), collectively called the EU-15, and the United States.

3.2 Variables

3.2.1 Productivity growth

In the analysis, both the growth of labour productivity as well as the growth of total factor productivity (TFP) will be tested. All data for productivity growth is taken from the EU KLEMS database (Jäger, 2017), which contains productivity data for EU countries and the United States on a sector level. 1999 is used as the base level, with data available for 34 sectors. These sectors are based on the fourth revision of the United Nations (UN) International Standard Industrial Classification (from here: ISIC Rev. 4) for all economic activities (United Nations, 2008). For convenience and data availability reasons, some sectors are grouped together to form a total of 17 sectors. Those sectors and the reasons to group hem together will be explained further in Chapter 4.1.

When using labour productivity growth, the growth of capital stock will be added as an control variable to investigate whether or not changes in labour productivity are caused by capital deepening or other changes in capital stock. Data is taken from the OECD STAN database.

3.2.2 Employment Protection Legislation

Data for EPL is taken from the OECD database on employment protection legislation for regular workers (OECD, 2013b), which scores countries on a scale of 0 (least strict) to 6 (most strict) on the OECD's 21 measures of hiring and firing restrictions. Those 21 items are divided into three general groups: (A) restrictions on individual dismissals with a regular contract, (B) restrictions on individual dismissals with a temporary contract, and (C) additional restrictions on collective dismissals. For this thesis, a combined index of A and C, which are mostly about regular contracts, will be used. Specifically, this entails using Version 2 of the EPL indicator of the OECD which is the weighted sum of sub-indicators, with regulations for regular dismissals having a weight of 5/7, while additional provisions for collective dismissals are weighted 2/7. All data is on a country level.

3.2.3 Sector skill level

The difference between high-skilled and low-skilled sectors is determined by the education or occupation of the average worker in said sector. Those workers that have had at least tertiary education and/or work in science and technology tasks are classified as *high-skilled* in this regard. The mean share of high-skilled workers in a sector is then compared to the overall mean share of high-skilled workers in all sectors. From that data, two groups will be created:

high-skilled sectors (HSS) which contains the sectors where the share of skilled workers exceeds the overall mean, and *low-skilled sectors* (LSS) which contains the sectors where the share of high-skilled workers lies below the overall mean. Although this approach presents some challenges, which will be discussed further in 3.3.2, it is the best distinction between low-skilled and high-skilled sectors that is possible given the cross-country data that is available.

Data on the percentage of workers in a sector that have at least tertiary education and/or work in science and is available from the Eurostat database on Science, Technology and Innovation. This database uses the EU standard of NACE Rev. 2 for sectors (Eurostat, 2008) as their application of the UN ISEC Rev. 4 standard.

This approach is similar to other research, like Lisi & Malo (2017). However, due to the new standard of reporting and discussing sectors (ISEC Rev. 4/NACE Rev. 2), this analysis will contain 16 sectors compared to the 10 or 11 used in previous studies.

3.2.4 Control variables

In some models in the empirical analysis, control variables will be added. First of all, there will be controls for other labour market institutions beside EPL, to prevent EPL becoming a stand-in for all conditions that are present at the labour market at the time of analysis. These include: trade union density and the prime-age employment-to-population ratio. For trade union density, data is taken from the ICTWSS database (Visser, 2016). Specifically, the indicator *"Union density rate, net union membership as a proportion of wage earners in employment"* will be used. For the US, which is not available in ICTWSS, OECD data which uses a similar definition will be used. All data is on a country level.

Instead of using unemployment data, prime-age employment-to-population (PA EPOP) will be used. This is generally seen as better than the unemployment rate in capturing country-specific labour market circumstances (ILO, 2018). Data is on a country level.

Furthermore, controls for policies that inhibit competition (like barriers to firm entry) will be used, as there is ample evidence that suggests those policies have a negative effect on productivity growth (Nicoletti & Scarpetta, 2003). This variable will consist of the *product market regulation* indicator (index) of the OECD (Koske, Wanner, Bitetti, & Barbiero, 2015). Data is on a country level.

Since there could be year effects in the dataset (due to certain variables consistently going either up or down), controls (consisting of a time/trend variable) for those effects will also be added in certain models.

3.3 Methodological Challenges

3.3.1 Challenges with regards to the OECD EPL-index

As with all indices, and especially law indices, the EPL dataset of the OECD suffers from some inherent problems. The OECD (2004, p. 99) recognizes as such "problems of subjectivity, the difficulty of attributing scores on the basis of legal provisions that may be applied differently in practice, and the choice of the weighting scheme used to calculate the summary indicator from the various sub-components." These problems are especially prescient for non-contractual, customary practices that are widely used in some countries, which are squarely part of the definition of EPL as has been given by the OECD but are hard to quantify. This can lead to problems with the validity of the employment protection variable – does the measure represent the variable it is intended to? Some other law indices, like the 'employing workers index' of the World Bank and the 'labour regulation index' of the Cambridge Center for Business Research (Adams, Bishop, & Deakin, 2016), have tried to remedy some of the problems with the EPL index. The former has used surveys to construct a database of customary practices, while the latter has tried to prevent weighting of any kind.

However, those indices have their problems as well. By not weighing different measures, all measures are applied as being of the same weight in an (EPL) index. Which actually means that weighing did occur: every measure is weighted equally. And the problem of applying a subjective number to a certain measure still stands. Additionally, by replacing some of the subjectivity on customary practices of experts of the OECD with survey results, expert subjectivity is traded against a kind of 'general' subjectivity. This makes the EPL data from the OECD preferable, even though it is not perfect.

3.3.2 Challenges with regards to (EPL for) temporary employment

This study does not deal with the impact of the employment protection for temporary workers, or temporary employment itself, on productivity growth. This is primarily because of two reasons. One, there are a quite a number of data limitations that come with discussing the impact of the (protection of) temporary workers. EPL for temporary employment showed almost no deviation during the timeframe of this research, which would result in less robust findings or no effect at all. Moreover, defining what is and what is not temporary employment

can be difficult. Although most fixed-term contracts are regarded as temporary employment, most definitions do not see self-employed as being temporarily employed. This is not an ideal situation, as the growth of the self-employed is one of the primary reasons why the share of temporary work is increasing in a country like the Netherlands (Stam et al., 2019).

Second, defining both low- and high-skilled sectors and sectors that have a high or low share of temporary employment would lead to a split of the sectors in four categories: low-skilled high share of temporary employment, low-skilled low share of temporary employment, high-skilled high share of temporary employment, and high-skilled low share of temporary employment. This would result in some categories containing only two or three sectors, which would open it up to temporary, sector-specific, large deviations of productivity growth having an outsize effect on the outcome of the regressions.

Ultimately, correctly representing the influence of temporary work on productivity growth was not possible and would deviate from the main subject of the research. However, this choice does mean this thesis has a potential shortcoming. It begs the question if the standard for EPL that is used, that contains restrictions on hiring and firing for workers with regular contracts and collective dismissals, can have a significant impact in sectors with a large number of temporary workers. A large share of workers in those sectors would be only partly protected under those rules. For example, if we assume there is a higher share of temporary workers in low-skilled sectors, it could be that the index of employment protection that is used in this paper is not a good measure of the actual protection those workers benefit from. It is important to recognize these limitations.

3.3.3 Challenges with regards to skill level

The available data on education level presents some problems. Some of them will be discussed in 4.1, but three are discussed in this chapter. Firstly, the distinction between high-skilled and low-skilled labour that is used in this thesis is binary. Those with at least tertiary education are defined as high-skilled, while everyone below that level is considered low-skilled. The aforementioned data on educational attainment on a sector level is provided by Eurostat, which uses the education standards set by the International Standard Classification of Education (ISCED). The ISCED (2011, p. 46) defines tertiary education as follows: "tertiary education builds on secondary education, providing learning activities in specialised fields of education. It aims at learning at a high level of complexity and specialisation. Tertiary education includes what is commonly understood as academic education but also

includes advanced vocational or professional education." So, for example, in the Netherlands this includes wo and hbo, but excludes mbo. This makes defining the skill level of a sector not ideal. It equates those with years of study after high school, which would generally be regarded as 'medium-skilled', with high school drop-outs, which is considered unskilled or low-skilled. However, these are the limitations of the Eurostat data that is available. It only defines the percentage of workers with at least tertiary education, which in the literature is generally regarded as 'high-skilled'. To at least expand the number of workers that are qualified as high-skilled, this thesis also includes those that work in science and technology tasks as high-skilled, although that does not change the division of sectors in HSS or LSS. More on that in the chapter on summary statistics in 4.1

Moreover, and partially related to the problem of defining skill level, is the fact that this thesis uses whether or not the share of high-skilled employees exceeds the overall mean to assess if it is either a HSS or LSS. This could potentially result in a sector with a slightly higher than average share of high-skilled workers, but apart from that mostly high-school drop-outs, being defined as HSS, while a sector with a lot of medium-skilled employees and slightly below average share of highly-skilled workers being defined as LSS. However, considering the large gap between the two groups, even when accounting for people in science and technology tasks, t

Another limitation of the data that is used, is that it is only available from 2008 onwards. This has to do with the switch to the NACE Rev. 2 standard. However, this does not seem to be a problem as the distribution of high-skilled versus low-skilled sectors remains the same from 2008-2013. It is fairly safe to assume this would also be the case between 2000-2008.

4. Summary Statistics

In this chapter, the summary statistics on sector skill level, productivity growth and EPL will be discussed. The summary statistics on the control variables union density, product market regulation, prime-age employment to population and capital input as well as graphs on productivity per year can be found in Appendix A.

4.1 Sector Skill Level

In Chapter 3, high-skilled sectors (HSS) are defined as those sectors in which the share of employees with at least tertiary education and/or workers occupied in science and technology tasks (HRST2) exceeds the overall mean of all sectors. Those sectors that fall short of the overall mean of all sectors are defined as low-skilled sectors (LSS).

Looking at the data in Table 1, there is a clear distinction between those sectors that are above the overall mean (from 2008-2013) of 44,7% and those below that threshold. The closest above the threshold, Public Administration, is about 12 percentage points higher than the mean. The closest beneath the threshold, Manufacturing, is about 10 percentage points lower. It thus makes sense to split them in two groups, rather than three or four. By splitting the sectors in only two groups it also ensures that there are more observations per skill level.

A few difficulties arise from making this distinction with the data sources that are used. The data provided by Eurostat does not make the same distinction between sectors as the EU KLEMS data and groups multiple sectors as one. Sectors A and B, D-E and F, and S and T are grouped together, while they are separate in the EU KLEMS data. For the purposes of this analysis, it is assumed that those sectors are not significantly different to one another and are regarded as similar in share of skilled employees. This makes sense as the sectors are all quite comfortably below the overall mean of HRST2 and are grouped together in the Eurostat data for their overall similarity. Furthermore, T is dropped completely from the analysis for the lack of data on productivity growth.

On the other hand, EU KLEMS does not make a distinction between M and N sectors, which presents a difficulty as the Eurostat data suggests that M is a HSS while N is a LSS. However, as M is a substantially larger sector (in terms of employed persons) and exceeds the HRST2 mean by a large amount, M-N is defined as being a HSS.

Ultimately, this leads to Information and communication (J), Financial and insurance activities (K), Real estate activities (L), Professional, scientific and technical activities,

administrative and support service activities (M-N), Public administration; activities of extraterritorial organisations and bodies (O), Education (P), Human health and social work activities (Q) and Arts, entertainment and recreation (R) to be regarded as HSS.

Agriculture, forestry and fishing (A), Mining and quarrying (B), Manufacturing (C), Electricity, Gas, Water Supply (D-E), Construction (F), Wholesale and retail trade; repair of motor vehicles and motorcycles (G), Transportation and storage (H), Accommodation and food service activities (I) and Other service activities (S) are regarded as LSS.

Other metrics for the distinction into HSS and LSS were also considered. If the distinction between skill level of sectors would be made by tertiary education only (variable HRST1 in Eurostat), the division of sectors between HSS and LSS would not change (see Table A1 in Appendix A).

Table 1: share of workers with at least tertiary education or working in science and technology tasks

Sector / HRST 2	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*Mean*
Total	41,7	42,8	43,7	45,5	46,8	47,8	44,7
Agriculture, forestry and fishing; mining and quarrying (A, B)	14,6	14,2	14,8	15,6	16,4	17,2	*15,5*
Manufacturing (C)	31,5	32,2	32,9	35,5	36,9	37,5	*34,4*
Electricity, gas, steam and air conditioning supply; water supply and construction (D-E, F)	21,6	23,0	23,9	28,2	29,9	31,4	*26,3*
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	28,3	29,1	29,9	28,1	28,8	29,9	*29,0*
Transportation and storage (H)	21,6	21,9	22,1	23,4	24,9	24,8	*23,1*
Accommodation and food service activities (I)	13,1	13,6	14,5	17,3	18,4	19,6	*16,1*
Information and communication (J)	76,9	79,2	79,4	81,9	82,7	83,8	**80,7**
Financial and insurance activities (K)	63,8	64,6	66,5	66,5	68,0	69,3	**66,5**
Real estate activities (L)	58,7	59,5	61,7	63,7	63,8	62,7	**61,7**
Professional, scientific and technical activities (M)	80,5	81,7	82,4	85,0	86,0	86,2	**83,6**
Administrative and support service activities (N)	28,1	26,6	28,1	29,0	29,5	31,0	*28,7*
Public administration; activities of extraterritorial organisations and bodies (O)	53,5	54,0	55,3	57,8	59,4	60,8	**56,8**
Education (P)	80,4	81,1	81,9	81,8	82,6	83,2	**81,8**
Human health and social work activities (Q)	58,3	58,9	59,3	63,1	64,8	65,2	**61,6**
Arts, entertainment and recreation (R)	61,2	61,2	62,9	63,4	65,2	65,2	**63,2**
Other service activities, activities of households as employers (S-T)	26,8	27,3	27,7	27,8	28,8	30,6	*28,2*

Notes: The numbers in the table (except for years) denote the share of employees with at least tertiary education and/or workers occupied in science and technology tasks (variable HRST2). HSS in **bold**, LSS in *cursive*. *Source:* Eurostat Science, Technology, Innovation database

4.2 Productivity Growth

In Table 2, the overall summary statistics of productivity growth can be found. Overall, productivity growth has been quite volatile, with LP growth being slightly more volatile compared to TFP growth. There are significant differences between the two measures of productivity. On average, yearly TFP growth on a sector basis has been slightly negative (about -0.17%), while average yearly LP growth has been slightly positive (about 0.5%) during the time frame of this research.

Table 2: Overall productivity growth 2000-2013

Variable	Obs.	Mean	Std. Dev.	Min	Max
Total Factor Productivity Growth	2,862	-.0016956	.0502218	-.3049808	.3436408
Total Labour Productivity Growth	3,808	.0049511	.0714391	-.6570702	.5336285

Source: EU KLEMS database

4.2.1 Total Factor Productivity Growth

The difference in number of observations between TFP and LP (which is discussed further in 4.2.2) is mostly due to the absence of data on TFP for Greece, Ireland and Portugal. Furthermore, Luxembourg, the Netherlands and Spain do not have data available for all sectors for all 14 years (Table 3). From those, Luxembourg especially is a potential problem, with only four years of observations. However, excluding Luxembourg from the analysis does not significantly change the results (Appendix C). Overall, we can say that TFP growth on a country basis has been fairly modest, with mean growth between -1% and 1% in most countries.

Table 3: Total Factor Productivity growth per country

Country	Observations	Mean	Std. Dev.	Min	Max
Austria	238	.0052264	.0421623	-.1898847	.1565285
Belgium	238	.0002059	.0408896	-.1659093	.1890745
Denmark	238	-.0040308	.0613914	-.3049808	.3032103
Finland	238	.0018822	.0508996	-.270452	.1651087
France	238	-.0015152	.0376034	-.1536365	.2074909
Germany	238	.0027148	.0617346	-.303771	.3134184
Italy	238	-.0065502	.0406568	-.1679068	.1930904
Luxembourg	68	-.0111185	.0906816	-.2951388	.3436408
Netherlands	204	.0009962	.0373648	-.1807985	.1297927
Spain	210	-.0033276	.0469551	-.2193418	.1327386
Sweden	238	-.0122368	.0617436	-.2977405	.2529135
United Kingdom	238	-.0037471	.0452136	-.2225113	.1328354
United States	238	.0029197	.0464139	-.1640401	.1933351

Source: EU KLEMS database

In terms of sector differences (Table 4), we can see that productivity growth in sectors A and B are significantly more volatile compared to the other sectors, which is not surprising given the overall nature of those sectors. We can also see that the sectors that on average experienced growth or decline are fairly evenly distributed between HSS (2 sectors showed mean growth, 6 decline) and LSS (3 sectors showed mean growth, 6 decline). 14 observations are missing for R and S, due to Spain combining those sectors into one. For the purposes of this analysis, that combined sector has been dropped.

Table 4: Total Factor Productivity growth per sector

Sector	Obs.	Mean	Std. Dev.	Min	Max
Agriculture, forestry and fishing (A)	170	.0133764	.0915253	-.3049808	.3134184
Mining and quarrying (B)	170	-.0177739	.1002513	-.2977405	.2529135
Manufacturing (C)	170	.0147761	.052002	-.1942887	.2012157
Electricity, Gas, Water Supply (D-E)	170	-.0093504	.062118	-.2193418	.3436408
Construction (F)	170	-.0102615	.0379219	-.1368446	.1328354
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	170	.0090811	.0357001	-.1315088	.1172123
Transportation and storage (H)	170	-.0000726	.0398195	-.1569805	.1120834
Accommodation and food service activities (I)	170	-.0082537	.0356318	-.11061	.1328392
Information and communication (J)	170	.0204707	.0396066	-.1664534	.1214762
Financial and insurance activities (K)	170	.0113999	.0546429	-.1683006	.1933351
Real estate activities (L)	170	-.0032107	.0277397	-.2096853	.0869555
Professional, scientific and technical activities (M-N)	170	-.0126377	.029814	-.1160688	.0517583
Public administration and defense; compulsory social security (O)	170	-.0020894	.0210041	-.1177821	.0390363
Education (P)	170	-.010424	.031115	-.212852	.0472441
Human health and social work activities (Q)	170	-.0062916	.0234555	-.1222277	.0505028
Arts, entertainment and recreation (R)	156	-.0094815	.0364099	-.1471515	.1690893
Other service activities (S)	156	-.0093544	.0275888	-.0961533	.0510831

*Notes: HSS in **bold**, LSS in* cursive *Source: EU KLEMS database*

Specific yearly developments in TFP growth are shown in appendix A, Graph A1 and A2, which show per year TFP growth on a country and sector basis, respectively.

4.2.2 Labour Productivity Growth

The data on LP growth poses fewer difficulties compared to TFP growth. Data is available on all countries for all years and all sectors. Most countries (13, Table 5) have experienced an

average yearly growth of LP on a sector basis. However, the countries that experienced an average decline, Greece, Ireland and Luxembourg, have by far the most volatile numbers.

Table 5: Labour Productivity growth per country

Country	Observations	Mean	Std. Dev.	Min	Max
Austria	238	.0118181	.041694	-.1136656	.167922
Belgium	238	.0078216	.0412037	-.1359792	.2373571
Denmark	238	.0066674	.0643437	-.2358685	.2864656
Finland	238	.006138	.0541385	-.2804537	.2291088
France	238	.006077	.0425433	-.1453123	.203619
Germany	238	.0085085	.0595563	-.2869854	.3146086
Greece	238	-.0002402	.10747	-.3608732	.3998547
Ireland	238	-.0104526	.1711667	-.6570702	.5299702
Italy	238	.001649	.0412798	-.1616945	.2068605
Luxembourg	238	-.0072213	.0971199	-.5772505	.5336285
Netherlands	238	.0083068	.0363055	-.1515961	.1337156
Portugal	238	.0095437	.0427811	-.0950441	.1919184
Spain	238	.0075853	.0489027	-.1755695	.1989346
Sweden	238	.0087661	.0519803	-.1911449	.2199507
United Kingdom	238	.0019072	.0516244	-.2491207	.1646862
United States	238	.0123432	.0510633	-.1741123	.2642221

Source: EU KLEMS database

Regarding LP growth on a sector basis (Table 6), the differences are similar to those found with TFP growth. Sectors A and B are again, predictably, volatile, while overall the sectors experiencing either growth or decline are fairly evenly split between HSS (4 sectors showed mean growth, 4 decline) and LSS (5 showed mean growth, 4 decline).

Table 6: Labour Productivity growth per sector

Sector	Obs.	Mean	Std. Dev.	Min	Max
Agriculture, forestry and fishing (A)	224	.0188603	.1091496	-.5772505	.5336285
Mining and quarrying (B)	224	-.0006895	.111992	-.2881174	.5029583
Manufacturing (C)	224	.0269529	.0540132	-.2634315	.1880226
Electricity, Gas, Water Supply (D-E)	224	.0019238	.0731965	-.2804813	.4419365
Construction (F)	224	-.0018453	.0662944	-.3608732	.3998547
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	224	.0122976	.0445788	-.2260695	.179904
Transportation and storage (H)	224	.0026774	.0679313	-.3302927	.2486048
Accommodation and food service activities (I)	224	-.005697	.0460195	-.2788677	.1749792
Information and communication (J)	224	.0348391	.0559319	-.1553574	.2416124
Financial and insurance activities (K)	224	.0200357	.0591652	-.1805	.1937437
Real estate activities (L)	224	-.0065445	.0821904	-.4179688	.3332109
Professional, scientific and technical activities (M-N)	224	-.0016227	.0431291	-.2274714	.2253847

Public administration and defense; compulsory social security (O)	224	.007205	.0194855	-.0913229	.0740461
Education (P)	224	-.0023032	.0362269	-.1990881	.2441607
Human health and social work activities (Q)	224	-.0021647	.0356482	-.2755651	.1884031
Arts, entertainment and recreation (R)	224	.0084656	.0732199	-.2940226	.5299702
Other service activities (S)	224	-.0282216	.1193419	-.6570702	.1397524

*Notes: HSS in **bold**, LSS in* cursive *Source: EU KLEMS database*

Specific yearly developments in LP growth are shown in appendix A, Graph A3 and A4, which show per year LP growth on a country and sector basis, respectively.

4.3 EPL

The amount of EPL in the studied countries varies quite strongly (Table 9). The EPL index is a weighted score of employment protection measures that vary between scores of 0 and 6, with 0 being no protection and 6 the strongest form of protection. We can see that employment protection varies quite a bit in the studied countries, from about 1 to a score of about 4.

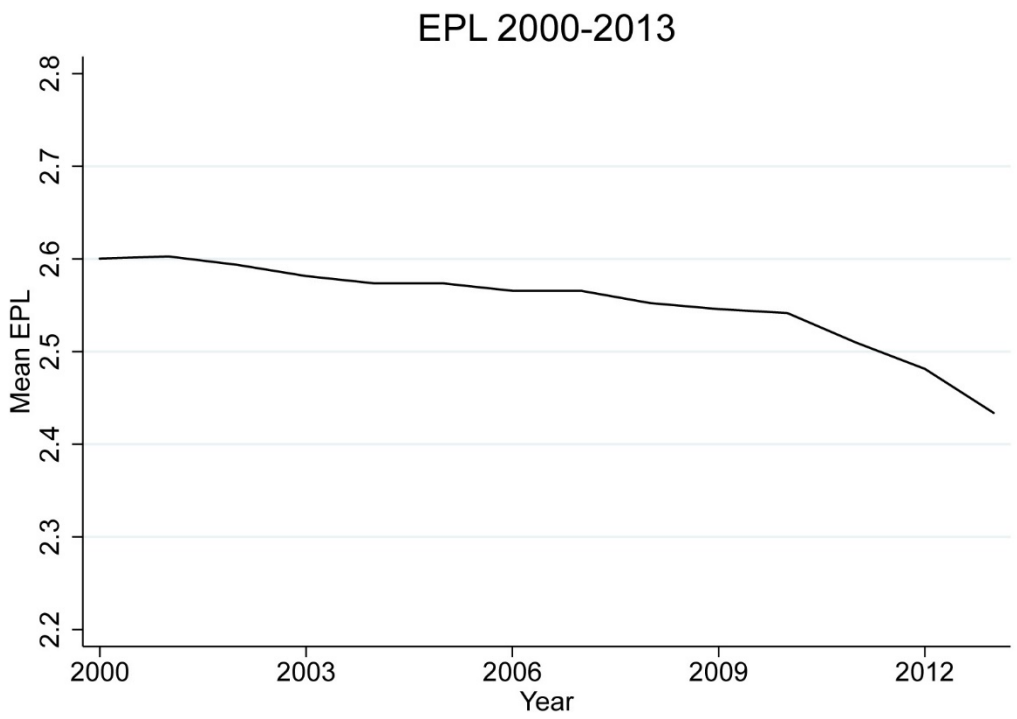
Table 7: Overall EPL 2000-2013

Variable	Obs.	Mean	Min	Max
EPL Regular Workers and Collective Dismissals	3,672	2.550395	1.004762	4.095238

Source: OECD data on Labour

Graph 1 shows a generally stable but slightly downward trend in EPL, which increases after 2010 – coinciding with the calls for reform after the financial crisis.

Graph 1: EPL mean from 2000 to 2013



Notes: the numbers denote the amount of employment protection on a 6-point scale. The higher the number, the stronger the employment protection. Source: OECD data on Labour

Looking at the country differences for EPL for regular workers (Table 10), we can see that there are stark differences between countries, but that those countries have also shifted closer together. In 2000, the strongest EPL was found in Portugal with a value of 4.1. In contrast, the

lowest EPL was found in the US with 1.0, a difference of 3.1. In contrast, in 2013 the biggest difference was between Italy at 2.98 and the US with 1.0, a difference of only 1.98.

In general, there has been a trend towards lower EPL, but, apart from an outlier like Portugal, there have been no extreme changes. Germany, Luxembourg and the US did not change their EPL for regular workers during the timeframe of this research. However, excluding them did not lead to significantly different results (Appendix D). Additionally, there has been no data on EPL in Luxembourg before 2007.

Table 8: EPL Regular Workers and Collective Dismissals

Time	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Country														
Austria	2,89	2,89	2,89	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62	2,62
Belgium	2,78	2,82	2,82	2,82	2,82	2,82	2,82	2,82	2,82	2,82	2,95	2,95	2,82	2,82
Denmark	2,56	2,56	2,56	2,56	2,56	2,56	2,35	2,35	2,35	2,35	2,35	2,39	2,39	2,39
Finland	2,19	2,19	2,08	2,08	2,08	2,08	2,08	2,08	2,01	2,01	2,01	2,01	2,01	2,01
France	2,64	2,64	2,64	2,73	2,73	2,73	2,73	2,73	2,73	2,67	2,67	2,67	2,67	2,67
Germany	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95	2,95
Greece	2,93	2,93	2,93	2,93	2,93	2,93	2,93	2,93	2,93	2,93	2,93	2,48	2,48	2,44
Ireland	1,81	1,81	1,81	1,81	1,81	1,81	1,91	1,91	1,91	1,91	1,91	1,91	2,00	2,00
Italy	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	3,15	2,98
Luxembourg	..	..	..	..	..	..	..	..	2,71	2,71	2,71	2,71	2,71	2,71
Netherlands	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,87	2,87	2,87	2,87	2,93
Portugal	4,10	4,10	4,10	4,10	3,98	3,98	3,98	3,98	3,69	3,69	3,49	3,49	3,08	2,81
Spain	2,76	2,76	2,76	2,76	2,76	2,76	2,76	2,76	2,76	2,76	2,76	2,65	2,65	2,43
Sweden	2,61	2,61	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58	2,58
UK	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,72	1,60
US	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Notes: the numbers in the table denote the amount of employment protection on a 6-point scale. The higher the number, the stronger the employment protection. Source: OECD data on Labour

5. Results

In this chapter the results of the analysis will be discussed. First, the effects of EPL on TFP growth will be discussed. Then the effects of EPL on LP growth will be discussed.

5.1 Effect of EPL on TFP Growth

Table 9: Overall EPL effect on ΔlogTFP

	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment
	b/se	b/se	b/se	b/se	b/se
EPL	0.027				
	(0.02)				
EPL HSS		0.0023	-0.00033	-0.0041	0.029
		(0.03)	(0.03)	(0.03)	(0.03)
EPL LSS		0.052**	0.049*	0.044*	0.075***
		(0.03)	(0.03)	(0.03)	(0.03)
Trend			-0.00075	-0.0011	-0.0015**
			(0.00)	(0.00)	(0.00)
UD				0.00058	0.000096
				(0.00)	(0.00)
PMR				-0.013*	-0.032***
				(0.01)	(0.01)
PA EPOP					-0.0021***
					(0.00)
Observations	3032	3032	3032	2996[a)]	2834[b)]
Log lik	4934.8	4935.8	4936.5	4950.5	4706.8

Notes: The numbers in the table (except for the observations and the log likelihood) denote the overall effect on total factor productivity growth. EPL is employment protection legislation for regular workers, HSS is high-skilled sector, LSS is low-skilled sector. Trend denotes the time trend, UD union density, PMR product market regulation and PA EPOP prime-age employment to population ratio.

*** Significant the at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

[a)] The drop in observations is due to union density not being available for all years for France, Germany, Luxembourg, Sweden

[b)] Further drop in observation due to lack of prime-age employment to population data for some countries

5.1.1 Overall effects

Table 12 shows the effects of EPL on total factor productivity growth. Looking only at the general effect of EPL (1), there is not a significant relationship regarding TFP. However, when controlling for sector skill level (2), the effect is significant for the sectors that have a low number of high-skilled workers (LSS). Columns (2) through (5) show a consistently positive effect of EPL on total factor productivity growth in LSS, significance at at least the

10% level. When adding prime-age employment to the model (5), the effect jumps to an even higher number and is significant at the 1% level.

Although the size of the effect of EPL in LSS changes, it is fair to say that it is most likely ranging from zero to a small positive effect. The coefficients of EPL in LSS on TFP growth are quite large, but this is understandable as it is a function of an increase of 1 in EPL. As the range of EPL is from about 1 (lowest) to 4 (highest), a change of 1 in EPL is quite high and unlikely to occur. However, it does suggest that modest increases in EPL for regular workers would lead to modestly higher growth in TFP in low-skilled sectors. More specifically, following model (5), a 0.1 increase in the EPL index would lead to an average higher TFP growth in low-skilled sectors of 0.75%.

Meanwhile, the effect of EPL in HSS is mostly indistinguishable from 0, showing modest positive effects in (2) and (5) and modest negative effects in (3) and (4). Overall, we can all but exclude a negative effect from an increase in EPL on TFP growth, especially in LSS.

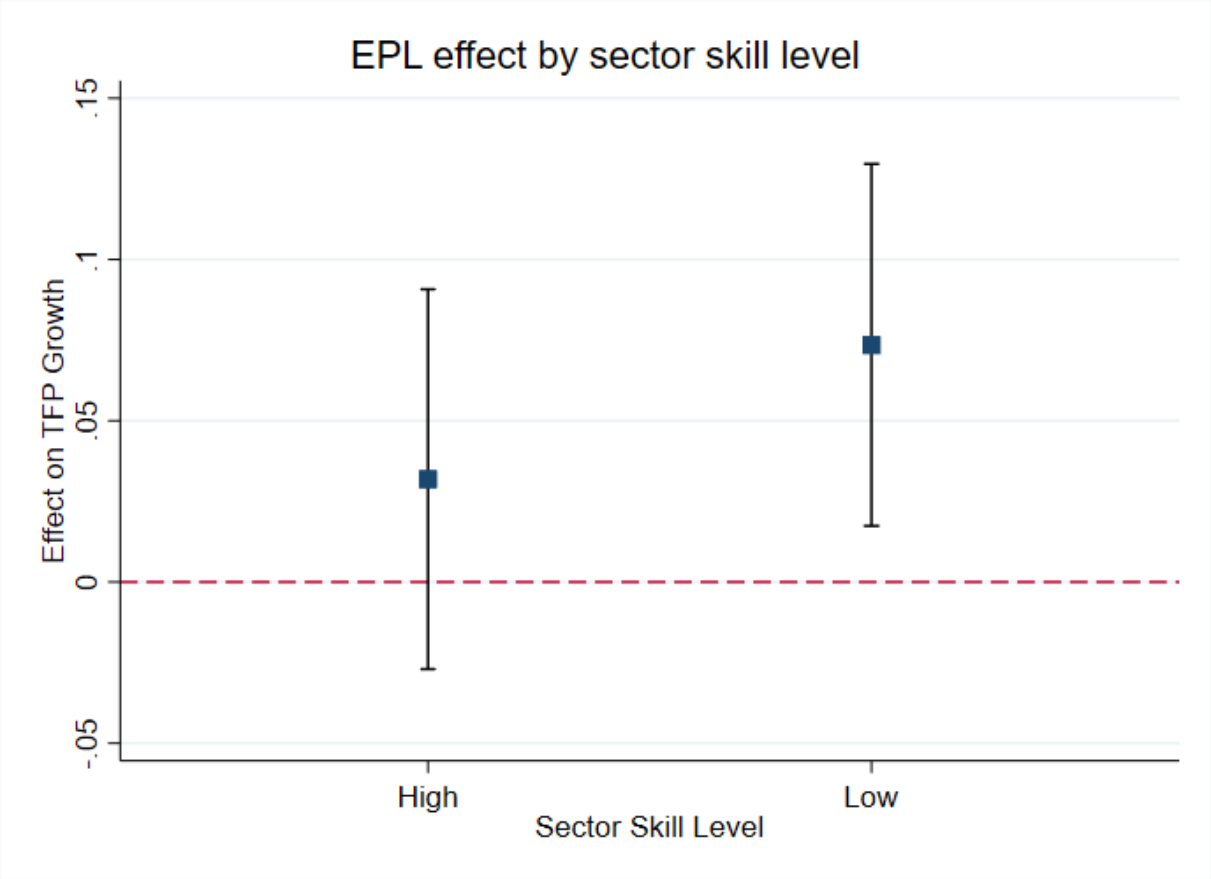
These results support the third hypothesis presented in 2.4. The effect of EPL on TFP growth is stronger in sectors that are considered low-skilled, compared to those that are considered high-skilled. This also means that the second hypothesis can be rejected for TFP growth, as even in the less strict models there is no evidence to suggest that EPL has a stronger effect on TFP growth in high-skilled sectors.

Looking at the control variables, we can almost certainly dismiss the idea that union density has a large effect on TFP growth. Neither (4) or (5) shows a significant effect at the 10% level, and the coefficients are relatively small. There is more evidence to suggest that product market regulation has an effect on productivity growth. This effect is most likely negative, as predicted by previous research by Koske et al. (2015). This underscores the importance for governments to promote competition in the marketplace, as regulations preventing that have a significant negative effect on productivity growth.

Adding the employment-to-population ratio for prime-age individuals (PA EPOP) has a clear impact on the results from the model. This is to be expected, as Kleinknecht et al. (2006) have shown that productivity growth is most likely closely related to the overall conditions on the labour market and the state of the business cycle, for which PA EPOP is a good proxy.

Figure 2 shows the predicted overall effect of an increase of 1 in the EPL index on TFP growth. This is using the underlying model (5).

Figure 2: TFP growth effect of a change of 1 EPL at the mean EPL, using model (5)



Notes: figure shows the effects of an increase of EPL of 1 on productivity growth, using TFP model (5). Shown is the mean with 95% confidence interval. Source: author calculations

5.1.2 Analysis at different levels

Due to the multilevel nature of the model, we can look at specific levels of analysis at both the fixed and random portions of the country and sector levels and what variance can be explained by them. But we will first look at cross-classified explained variance, which include the overall year and sector effects (Table 10).

Table 10: cross-classified explained variance

	(1)	(2)	(3)	(4)	(5)
var(year)	0.000090***	0.000090***	0.000081***	0.000083***	0.000083***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(sector)	0.00011***	0.00011***	0.00011***	0.00011***	0.00012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

At the overall (highest) level of analysis, we can differentiate between the random year and sector effects. Both are significant, with general sector effects explaining a large portion of the variance. This means that both year and sector effects have general effects on productivity growth, that is not nested in in either countries or sectors. This is to be expected, as both year and sector effects tend to transcend the boundaries of countries. An economically relevant event that affects productivity growth often is not confined to one country

The same goes for sector effects as well. Problems affecting, say, TFP growth in manufacturing in Germany are often entangled with problems affecting manufacturing in other countries. Judging from the explained variance, these effects are quite substantial.

Table 11: explained variance at country level

	(1)	(2)	(3)	(4)	(5)
var(epl in country)	8.6e-22	6.8e-22	8.4e-23**	5.8e-19	5.1e-17
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(country)	0.000015***	0.000015***	0.000015***	0.000017***	0.000015***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

At the country level, we can see that there are mostly no significant random effects of EPL within a country. This not unexpected, as EPL does not show large changes in most countries. However, there is significant explained variance in the fixed part of the country level, which is indicative of differences between countries in the effects of EPL.

Table 12: explained variance at sector level

	(1)	(2)	(3)	(4)	(5)
var(epl in sector)	0.0092**	0.0087***	0.0087***	0.0097***	0.010***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
var(sector)	0.000013**	0.000013***	0.000013***	0.0000084***	0.0000065***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

At the sector level of analysis we can see that TFP growth is distinctly impacted by different sectors (the fixed part) and different effects of EPL (the random part) in those sectors. This supports the overall conclusion that EPL has distinctly different effects in different sectors.

5.2 Effect on LP growth

Table 13: EPL effect on ΔlogLP

	(1) General EPL effect b/se	(2) EPL effect by sector skill b/se	(3) EPL effect by sector skill + Trend-Effects b/se	(4) EPL effect by sector skill + Control Variables b/se	(5) EPL effect by sector skill + Prime-age Employment b/se	(6) EPL effect by sector skill + Capital Input b/se
EPL	0.0095					
	(0.01)					
EPL HSS		0.0053	0.0016	-0.0053	0.027	0.011
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
EPL LSS		0.013	0.0096	0.017	0.052**	0.059*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Trend			-0.00100*	-0.00083	-0.0018**	-0.0016**
			(0.00)	(0.00)	(0.00)	(0.00)
UD				0.0018***	0.00072	0.0011
				(0.00)	(0.00)	(0.00)
PMR				-0.014	-0.036***	-0.033***
				(0.01)	(0.01)	(0.01)
PA EPOP					-0.0030***	-0.0019**
					(0.00)	(0.00)
GFCF						0.0018**
						(0.00)
Observations	3672	3672	3672	3502 a)	3349 b)	2624
Log lik	4831.1	4831.1	4832.7	4751.2	4532.9	3965.0

Notes: The numbers in the table (except for the observations and the log likelihood) denote the overall effect on labour productivity growth. EPL is employment protection legislation for regular workers, HSS is high-skilled sector, LSS is low-skilled sector. Trend denotes the time trend. UD is union density, PMR product market regulation and PA EPOP prime-age employment to population ratio, which are all on a country level. GFCF is a log version of capital input on a sector level.

*** Significant the at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level. *Source:* Author calculations.

a) The drop in observations is due to union density not being available for all years for France, Germany, Luxembourg, Sweden

b) Further drop in observation due to lack of prime-age employment to population data for some countries

c) Drop in observations due to limited availability on capital input

5.2.1 Overall effects

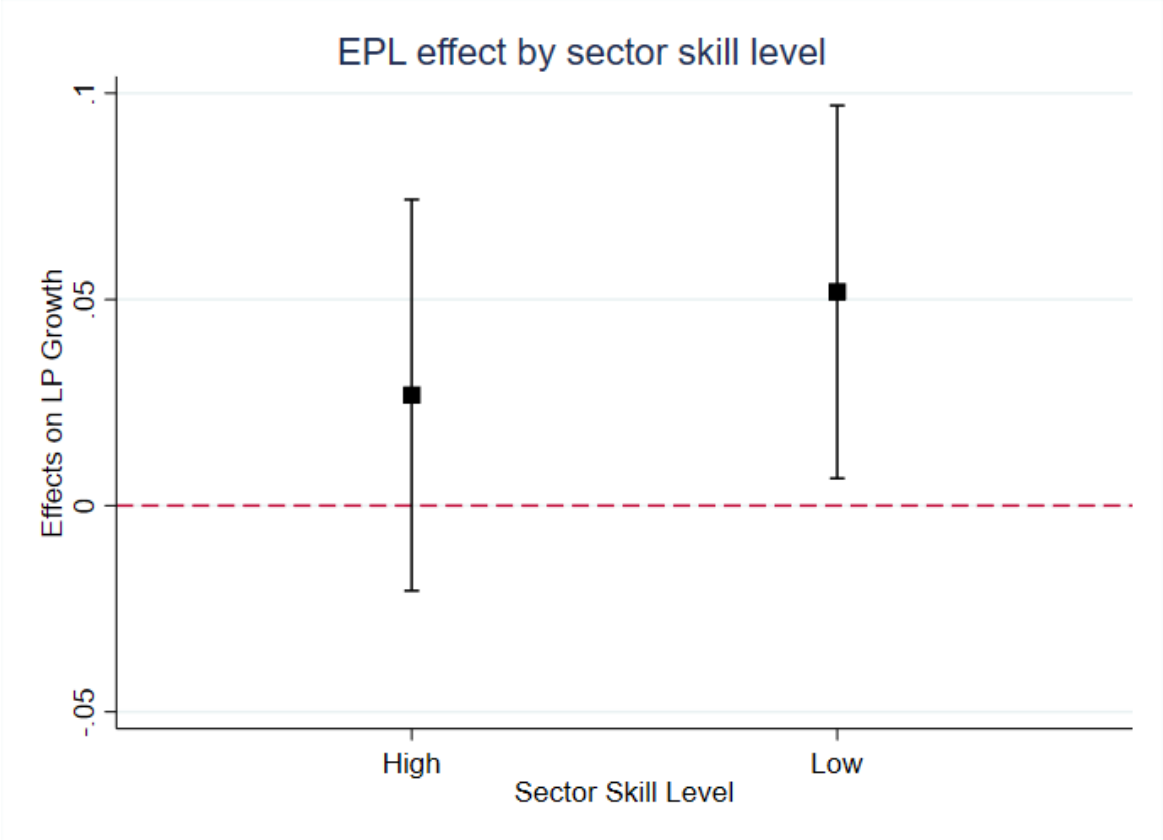
The results in Table 13, which show the effect of EPL on labour productivity growth, are similar in size but less robust to those found in Table 9. While there seems to be no overall effect of EPL on labour productivity growth, there is some evidence to suggest that there is an effect in LSS, albeit smaller and less clear cut compared to the results found for total factor productivity growth. More specifically, following model (5), a 0.1 increase in the EPL index

would lead to an average higher LP growth in low-skilled sectors of 0.52%. This is a lower number than that found for TFP growth (0.75%), but still quite high.

It seems that part of the rise in labour productivity growth can be explained by capital input (model (6)). This is consistent with previous research on this topic and basic economic theory: an increase in capital makes labour more productive. It could explain most of the growth in labour productivity due to changes in EPL, as the positive effect of EPL on productivity growth is less clear in model (5). Even though the significance of the effect drops from significant at the 5% level to significant at the 10% level, this is not that large of a difference if studied more closely. The difference between the effects with and without capital input is well illustrated in figures 3 and 4, respectively using model (5) and (6), which show the predicted overall effect of an increase of 1 in the EPL index on LP growth.

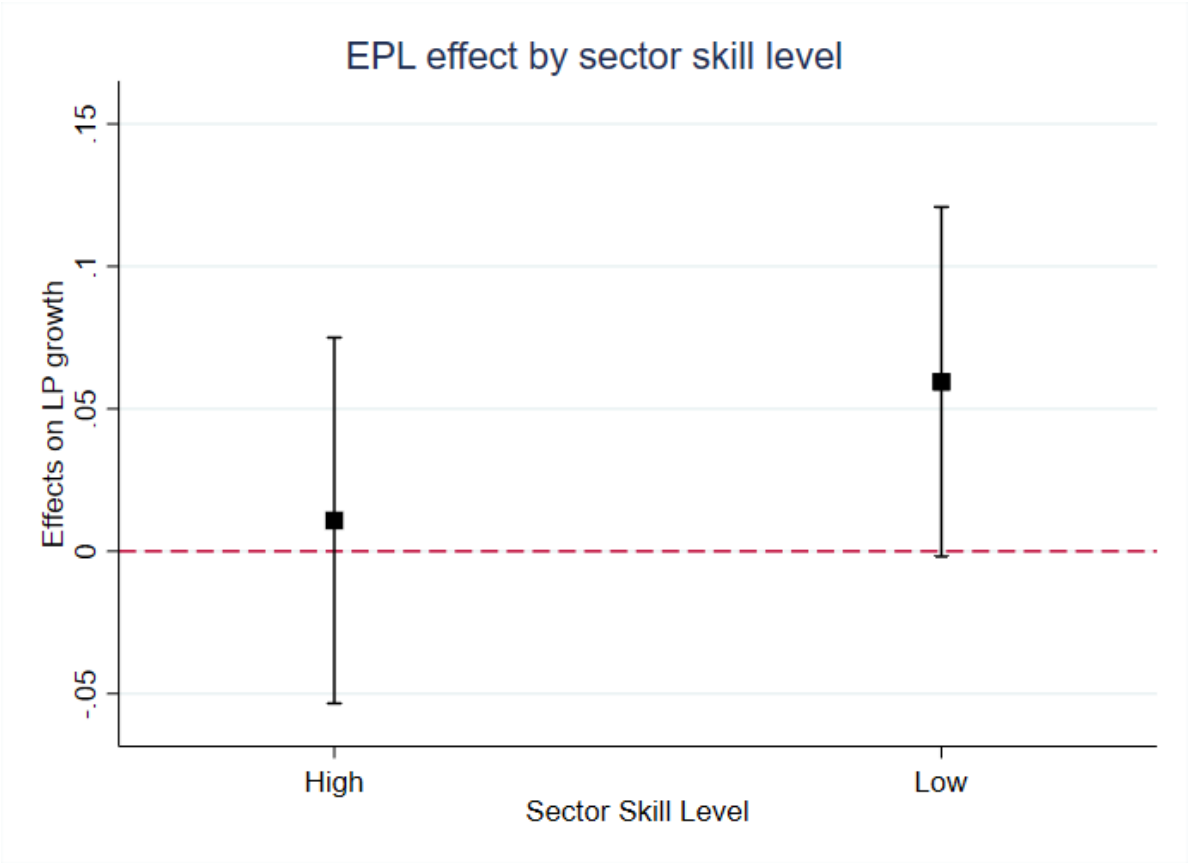
One caveat is that the decline in significance could also be due to data availability limitations, since there is a significant drop in observations using this model (from 3349 to 2624) because data on capital input is not available for all countries for all years.

Figure 3: LP growth effect of a change of 1 EPL at the mean EPL, using model (5)



Notes: figure shows the effects of an increase of EPL of 1 on productivity growth, using LP model (5). Shown is the mean with 95% confidence interval. Source: author calculations

Figure 4: LP growth effect of a change of 1 EPL at the mean EPL, using model (6)



Notes: figure shows the effects of an increase of EPL of 1 on productivity growth, using LP model (6). Shown is the mean with 95% confidence interval. Source: author calculations

In general, these results support the third hypothesis presented in 2.4, although less clearly than the results for TFP growth. The effect of EPL on LP growth seems stronger in sectors that are considered low-skilled, compared to those that are considered high-skilled. We can, however, again reject the second hypothesis, as there is no evidence in any model to suggest that EPL has a stronger effect on LP growth in high-skilled sectors.

5.2.2 Variance at different levels

Due to the multilevel nature of the model, we can look at specific levels of analysis at both the fixed and random portions of the country and sector levels and what variance can be explained by them. But we will first look at cross-classified explained variance, which include the overall year and sector effects (Table 14).

Table 14: cross-classified explained variance

	(1)	(2)	(3)	(4)	(5)	(6)
var(year)	0.000060	0.000060	0.000044	0.000049***	0.000045	0.000045***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(sector)	0.00012	0.00012	0.00012	0.00012***	0.00013	0.00014***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)

It is not clear that whether or not there are overall effects of different years and different sectors, especially compared to the more consistently significant effects found at this level for TFP growth. However, looking at the last three models, which are the most strict, two of them show a significant effect at the 1% level. The overall sector effects are quite large compared to the year effects, which is consistent with theory.

Table 15: explained variance at country level

	(1)	(2)	(3)	(4)	(5)	(6)
var	3.6e-16	2.7e-16	2.8e-14	8.1e-17	3.6e-17	1.7e-14**
(epl in country)	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var	4.1e-30	4.1e-28	1.6e-25	4.5e-26***	2.9e-25	0.0000059***
(country)	(.)	(.)	(.)	(0.00)	(.)	(0.00)

At the country level we see similar results to those found for TFP growth, although only in models (4) and (6). The fixed part, var(country), explains a significant part of the variance in those models. Less clear is the explained variance of the random slope part of this level, var(epl in country).

Table 16: explained variance at sector level

	(1)	(2)	(3)	(4)	(5)	(6)
var	0.0090	0.0091	0.0091	0.0097***	0.011	0.017***
(epl in sector)	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(sector)	0.00099	0.00099	0.00099	0.0010***	0.0011	5.6e-12***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)

Table 16 tells a similar story to those discussed above: only model (4) and (6) show variance that is significantly different from 0. However, they do show that a very large part of the variance can be explained by the random slope effect of EPL in specific sectors. This is consistent with the thought that EPL has clearly different effects in different sectors. This is also consistent with the findings for TFP growth. Different to the results for TFP growth are

those found regarding the fixed part of this level. Var(sector) in model (4) is quite large but is quite a lot smaller in model (6), even though both are significant. This suggests that although the effect of a certain sector within a certain country is significant, it is mostly explained by the difference in capital input in those sectors.

6. Conclusion and Discussion

In this chapter the results of this study will be discussed. First and foremost, this will be done by answering the main research question and the hypotheses that were formulated. Results from the study that are not directly related to those will also be discussed. After that, the results will be placed in the scientific context of the studied topic. Third, the impact on policy these results might have will be discussed. This chapter will conclude with a summation of the limitations of this study and recommendations for future research in this field.

6.1 Discussion on the Results

6.1.1 Research question and hypotheses

The optimal amount of EPL has been a subject of discussion ever since the first legislation that restricted hiring or firing of employees was passed. Usually, this discussion has centred around the influence of those restrictions on employment levels or more qualitative measures of employment satisfaction. The influence of EPL on productivity growth has generally been overlooked in this regard, even though it, along with labour utilisation, is what ultimately determines real GDP per capita. This thesis set out to correct that by correcting that wrong, and more specifically focus on the impact EPL has on productivity growth in sectors with different skill levels. The following research question was formulated:

"To what extent does Employment Protection Legislation (EPL) affect productivity growth in OECD-countries, given the skill level of a sector?"

To adequately answer this question, three hypotheses were formed. First, a general hypothesis was formulated that focussed on the overall effect of EPL on productivity growth.

1. *Employment Protection Legislation (EPL) has a significant effect on productivity growth*

The other two were competing hypotheses. As a study of the relevant literature on this topic showed that both higher-skilled sectors and lower-skilled sectors could have an impact on the effect of EPL on productivity growth, two competing hypotheses were formed:

2. *The effect of Employment Protection Legislation (EPL) on productivity growth is stronger in high-skilled sectors than low-skilled sectors*
3. *The effect of Employment Protection Legislation (EPL) on productivity growth is stronger in low-skilled sectors than high-skilled sectors*

These hypotheses were tested by looking at data on both total factor productivity (TFP) growth and labour productivity (LP) growth. As discussed in chapter 5, the results of this study show that in most models we see a clear effect of EPL on TFP growth in low-skilled sectors, while the effect of EPL on TFP growth in high-skilled sectors is not significant. The results show that a 0.1 higher EPL leads to an average 0.75% higher growth rate for TFP. Similar results are found for LP growth, albeit smaller (0.52% higher growth rate per 0.1 EPL increase) and significantly less pronounced when controlling for capital input in a sector.

These results thus partly support the first hypothesis. Although overall EPL does not seem to have a significant effect on productivity growth, EPL does seem to have a significant effect on productivity growth in low-skilled sectors. This thus corroborates the third hypothesis, which states that the effect is stronger in low-skilled sectors compared to high-skilled sectors. Maybe the strongest result is found for the rejection of the second hypothesis. Not a single model that was used suggests the effect of EPL is stronger in high-skilled sectors compared to low-skilled sectors. All of these effects are stronger for TFP growth than LP growth.

6.1.2 Other Results

Although not the main topic of this research, other interesting results came up during this study. Contrary to results of earlier studies, trade union density does not seem to be an important factor (either positive or negative) of productivity growth. However, product market regulation does have a significant effect on productivity growth. The results found in this thesis underwrite the concept that regulations that harm competition have a negative effect on productivity growth. Governments seem to realise this, as most countries are moving to reducing barriers to entry and promoting competition within their economies (Graph A5 in Appendix A). Furthermore, as expected, capital input plays a major role in the growth of labour productivity. It suggests that some, if not most, of the effect from EPL on LP can be explained by differing capital inputs. This could be due to some kind of capital deepening: more protections on workers lead to more capital input from employers, which improve productivity.

The use of a multi-level analysis also led to some noteworthy results. Foremost seems to be that not only do sectors within countries behave differently, there seems to be an overall cross-country effect for sectors. For example, not only is the growth in productivity different for manufacturing in Germany compared to transportation in Germany, there is also a general cross-country effect between every manufacturing or transportation sector regarding

productivity growth. Another result from the multi-level analysis seems to be that the effect of EPL on productivity growth is significantly different in each country. These results are not unexpected but do reaffirm the complexity in measuring the effects on productivity growth.

6.2 Place in the Scientific Field

This thesis studies a topic that is barely touched on by other research. Although there are quite a number of studies that research the effect of EPL on productivity (Bassanini & Venn, 2008; Kleinknecht, 2017; Kleinknecht et al., 2006; Oecd, 2007; Poschke, 2009), they rarely touch on sector skill level. Even if they do, like Lisi and Malo (2017), it is not central to their research but rather used as a control variable. This is one possible reason why previous studies mostly find either null-effects or negative effects of EPL on productivity growth.

Another possibility for the difference in results is the research method that is used. Most of the aforementioned studies use either a fixed effects model or, most often, a difference-in-difference estimation based on sectors that those researchers see as most affected by changes in EPL. Like Bassanini and Venn, who determined the sectors that are most affected on the basis of higher than average job turnover ratio over three years in the US (2007, p. 13). That research method requires doing assumptions that are not necessarily supported by other evidence. On the other hand, there is the research that focusses on the R&D portion of productivity growth, like Vergeer and Kleinknecht (2011), which generally does show a positive impact of more restrictive labour market policies on productivity growth.

Lastly, there is the matter of the data that is used. Due to the changing standards of sector reporting (from ISIC Rev. 3 to ISIC Rev. 4), most studies are using the sectoral divisions from the old (ISIC Rev. 3) dataset, which sets the upper-limit of the timeframe in the mid-2000's. Because this thesis uses the newer (ISIC Rev. 4) standard, there is a lack of data from before the 2000's, but the upper-limit is higher. It thus utilizes more recent data, but over a slightly shorter timeframe (2000-2013).

Concluding, this thesis adds a new model for conducting research into this topic to the field. The use of multi-level cross-classified models is unique for this topic, but, given that the data is gathered at multiple levels of analysis and over time, is fitting for the research at hand. This thesis presents a model that is more complex than a fixed effects model and less reliant on assumptions compared to the difference-in-difference models that have been used in other research. Using this method, along with the more recent dataset and the focus on sector skill level, results in different outcomes than most studies. The positive effect of EPL on

productivity growth that is shown in this thesis, challenges the conventional wisdom that reducing employment protection leads to more favourable macro-economic outcomes.

6.3 Policy Implications

The results that are presented in this thesis could force a rethinking of future policy proposals. It seems that sectors with a lot of low-skilled employees are most likely to be impacted most by changes in EPL. This does not mean that governments should necessarily severely increase their employment protections. Because there are not a lot of fluctuations within countries regarding EPL, it is hard to say whether or not the benefits of employment protection would hold up with serious increases. But the results do suggest that governments should be wary of the impact of declining employment protection on those who work in low-skilled sectors. Not only does it seemingly make their productivity growth slower, that slower growth could mean lower wages given the close relationship between the two (Katz, 1986; Kleinknecht, 2017). This all means the effects of the declining employment protection since the early 2000's (Graph 1) should not be underestimated by governments, especially with regards to those working in low-skilled sectors.

Although not one of the primary subjects of this study, the results regarding product market regulation also suggest that government should try even more to reduce regulation that restricts entry to markets, if it wants to improve productivity growth. Further reducing barriers of entry and enforcing antitrust regulation could lead to improved productivity growth.

6.4 Limitations and Future Research

Most of the limitations of the research have already been discussed, most notably in Chapter 3.2 and Chapter 3.3. Some are worth repeating here, as they present opportunities for future research.

First, defining regulations and placing the resulting protections on a scale leads to some difficulties. Not all regulation is created equal, but law indices like the one used for EPL just make a distinction whether or not it provides more or less protection to workers. In the process some nuance is lost, which is why we need more research that focusses on the effects on productivity growth of specific employment protection legislation.

Second, defining sectors to be either low-skilled or high-skilled based on share of workers with tertiary education and/or working in science and technology tasks, could be conceived as a quite binary distinction. Moreover, this distinction does invite the suggestion that those working in the more likely to be impacted low-skilled sectors are necessarily low-skilled, and

vice versa, which does not have to be so. However, it is the best distinction to make given the available data and distribution of skill-level over the sectors.

Third, this thesis does not deal with the impact of temporary employment on productivity. Even though one of the most important labour market developments is the increase of the use of temporary labour in the last quarter of a century (Cazes & Laiglesia, 2014), it presented too many difficulties to successfully incorporate temporary labour into this thesis. Although some attempts have been made, like Lisi and Malo (2017), it is hard to research the impact of temporary employment on productivity growth. Not only are there data constraints, like the lack of deviation within EPL for temporary employment during the timeframe of this thesis, it is also very hard to define a cross-country concept of what temporary employment is. For example, the Netherlands has seen an increase in the number of self-employed persons (ZZP'ers), who by most definitions are not seen as temporary employment. It would be beneficial to the field to see more research into the impact of temporary employment on productivity growth.

This is related to another point, which is that this thesis does not deal with the *why* of the impact of employment protection on productivity growth, given the skill level of the sector. Some of these reasons have been discussed in the literature, most of which centre around the idea that more employment protection could lead to more investment in workers, innovation, or both. This is supported by the results found in this thesis. A substantial amount of the expected effects of EPL on labour productivity can be explained by changes in capital stock. The effects that are found are also most pronounced for TFP growth, which includes technological change and innovation. Other explanations point to decreasing familiarity within the workplace resulting in worse cooperation. This could be due to the aforementioned increase in temporary labour, but it could also be the result of decreasing employment protection.

Future research should focus on these potential drivers or detractors of productivity growth, which could become more and more prescient in a developed world with stagnating or even declining working populations. If increasing the amount of people that work is no longer possible, productivity growth becomes the most important factor in sustaining growth. This thesis shows that increased employment protection might play a role in facilitating more productivity growth for low-skilled sectors.

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8. Appendices

8.1 Appendix A: Summary Statistics

8.1.1 Tables

Table A.1

Sector/ HRST 1	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*Mean*
Total	28,7	30,0	30,9	31,8	33,0	34,0	*31,4*
Agriculture, forestry and fishing; mining and quarrying (A, B)	11,8	12,0	12,5	12,8	13,7	14,3	*12,9*
Manufacturing (C)	20,3	21,0	21,8	22,3	23,4	23,9	*22,1*
Electricity, gas, steam and air conditioning supply; water supply and construction (D-E, F)	15,0	16,0	16,8	17,5	18,6	19,8	*17,3*
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	16,1	16,8	17,5	18,2	19,1	20,2	*18,0*
Transportation and storage (H)	14,0	14,5	14,6	15,3	16,2	16,6	*15,2*
Accommodation and food service activities (I)	11,3	11,9	12,6	13,2	13,8	14,6	*12,9*
Information and communication (J)	50,9	54,0	54,4	56,1	57,8	58,6	**55,3**
Financial and insurance activities (K)	41,7	42,8	44,7	46,1	47,4	48,9	**45,3**
Real estate activities (L)	31,0	32,7	34,9	35,2	36,5	37,0	**34,5**
Professional, scientific and technical activities (M)	59,0	60,6	61,8	63,1	64,6	65,8	**62,5**
Administrative and support service activities (N)	18,8	18,4	19,8	20,3	20,9	22,0	*20,0*
Public administration; activities of extraterritorial organisations and bodies (O)	35,4	36,4	37,8	38,4	39,6	40,8	**38,1**
Education (P)	65,6	66,6	67,6	67,6	68,8	69,5	**67,6**
Human health and social work activities (Q)	40,7	41,9	42,5	44,2	45,3	46,5	**43,5**
Arts, entertainment and recreation (R)	36,3	37,4	38,2	38,1	40,3	41,2	**38,6**
Other service activities, activities of households as employers (S-T)	19,1	19,8	20,3	20,8	21,7	23,0	*20,8*

Notes: The numbers in the table (except for years) denote the share of employees with at least tertiary education (variable HRST1). HSS in **bold**, LSS in *cursive*. Source: Eurostat Science, Technology, Innovation database

Table A2

Country	Variable	Obs.	Mean	Min.	Max.
Austria	Union Density	*238*	31.46887	27.3975	36.60333
	Product Market Regulation	*238*	1.479026	1.191759	1.917415
	Prime-Age Employment	*238*	83.075	81.425	84.325
Belgium	Union Density	*238*	54.83658	53.67688	56.3499
	Product Market Regulation	*238*	1.597375	1.385659	2.031627
	Prime-Age Employment	*238*	78.46429	76.5	80.45
Denmark	Union Density	*238*	69.22698	66.33595	73.92608
	Product Market Regulation	*238*	1.38547	1.209334	1.588647
	Prime-Age Employment	*238*	84.11964	81.875	87.5
Finland	Union Density	*238*	71.0545	68.61137	74.96512
	Product Market Regulation	*238*	1.43504	1.293483	1.758836
	Prime-Age Employment	*238*	81.92679	80.85	84.3
France	Union Density	*238*	7.75446	7.547652	8.055359
	Product Market Regulation	*238*	1.668766	1.468032	2.13621
	Prime-Age Employment	*187*	81.40227	80.525	83.15
Germany	Union Density	*238*	20.6818	17.71325	24.57076
	Product Market Regulation	*238*	1.584591	1.284893	2.055439
	Prime-Age Employment	*153*	81.05556	77.375	83.425
Greece	Union Density	*119*	23.54285	21.51502	24.90218
	Product Market Regulation	*238*	2.259182	1.740815	2.65357
	Prime-Age Employment	*238*	71.57857	61.325	76
Ireland	Union Density	*238*	33.81391	31.02048	36.36764
	Product Market Regulation	*238*	1.495981	1.350473	1.747677
	Prime-Age Employment	*238*	74.63571	69.15	78.6
Italy	Union Density	*238*	34.82336	33.57497	37.26874
	Product Market Regulation	*238*	1.637681	1.289135	2.137068
	Prime-Age Employment	*238*	71.11429	67.95	73.45
Luxembourg	Union Density	*170*	37.90869	32.81821	42.80029
	Product Market Regulation	*238*	1.524094	1.436931	1.693844
	Prime-Age Employment	*187*	81.1	77.8	83.1
Netherlands	Union Density	*238*	20.19626	18.02765	22.61147
	Product Market Regulation	*238*	1.205052	.9150317	1.684469
	Prime-Age Employment	*238*	83.19643	81.3	85.5
Portugal	Union Density	*221*	20.53578	18.34291	22.41811
	Product Market Regulation	*238*	1.83135	1.294834	2.402507
	Prime-Age Employment	*238*	79.91786	74.575	82.3
Spain	Union Density	*238*	16.2738	14.33986	17.60503
	Product Market Regulation	*238*	1.69831	1.441946	2.151812

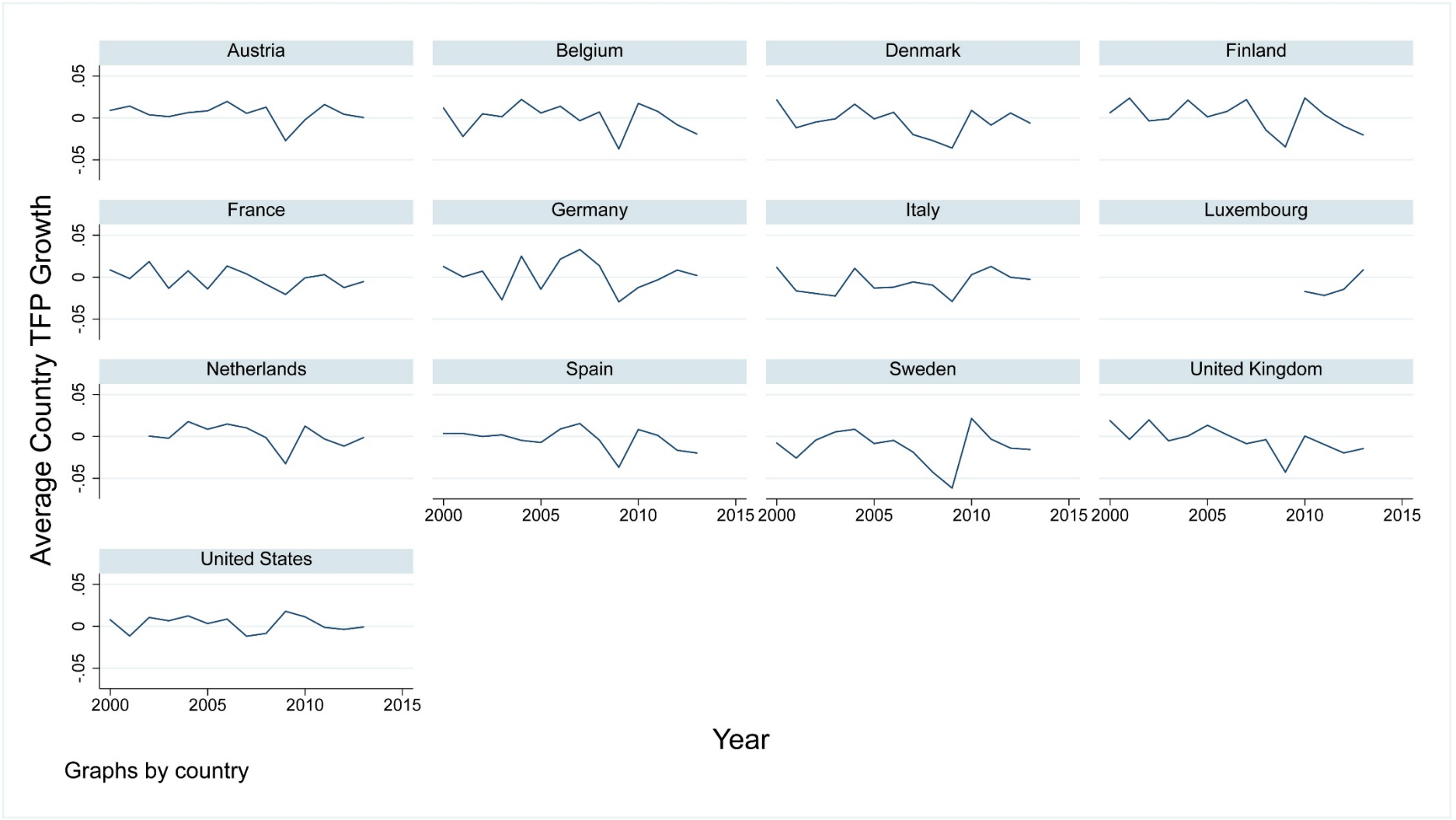
	Prime-Age Employment	*238*	71.3625	65.825	77.1
Sweden	Union Density	*221*	73.43894	67.38124	80.11257
	Product Market Regulation	*238*	1.576562	1.503713	1.735104
	Prime-Age Employment	*221*	84.63077	82.95	86.475
United Kingdom	Union Density	*238*	27.63799	25.67346	30.13481
	Product Market Regulation	*238*	1.153344	1.084027	1.23077
	Prime-Age Employment	*238*	80.62321	79.75	81.3
United States	Union Density	*238*	11.85787	10.80783	12.90868
	Product Market Regulation	*238*	1.540743	1.436608	1.590563
	Prime-Age Employment	*238*	78.20586	75.09118	81.46412

Table A3: Capital Input (log)

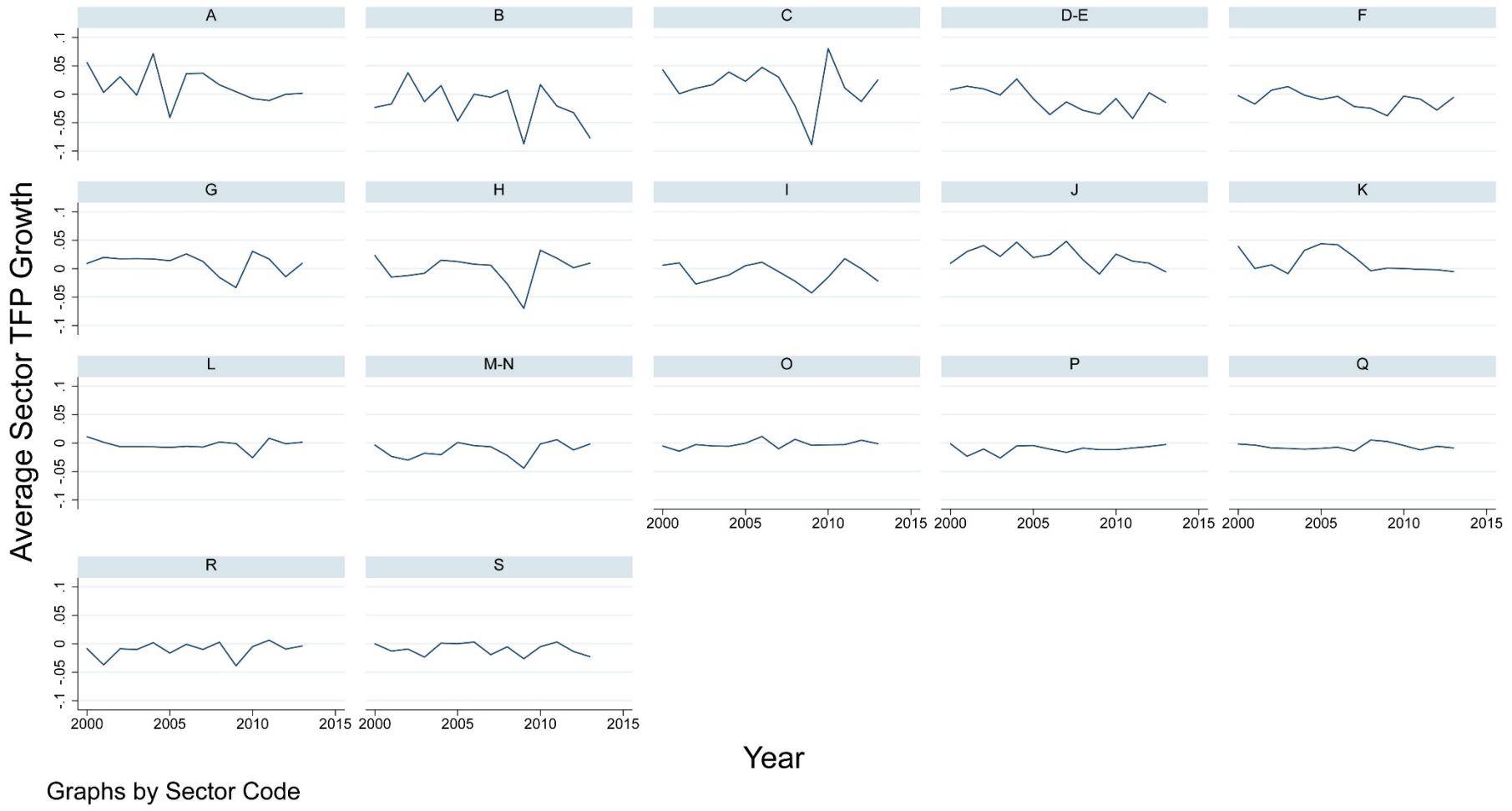
Sector	Obs.	Mean	Std. Dev.	Min	Max
Agriculture, forestry and fishing (A)	182	10.9804	1.52715	6.57679	13.22584
Mining and quarrying (B)	182	9.460282	2.342278	3.663262	14.3005
Manufacturing (C)	182	12.19027	1.609096	8.44572	15.01042
Electricity, Gas, Water Supply (D-E)	182	11.68046	1.563501	7.959206	14.54371
Construction (F)	182	10.56307	1.67102	6.664581	12.97957
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	182	11.29764	1.515812	7.489498	14.36039
Transportation and storage (H)	182	11.73048	1.494273	8.19136	13.97768
Accommodation and food service activities (I)	182	10.10601	1.592917	6.413595	13.22968
Information and communication (J)	182	11.00141	1.560371	7.47652	14.52527
Financial and insurance activities (K)	182	10.56195	1.67705	7.301452	14.02658
Real estate activities (L)	182	14.00255	1.579047	9.908869	16.6801
Professional, scientific and technical activities (M-N)	182	11.16349	1.696157	7.155825	14.18412
Public administration and defense; compulsory social security (O)	182	12.50051	1.587356	9.198953	16.31281
Education (P)	182	10.97214	1.340732	7.598217	13.16173
Human health and social work activities (Q)	182	11.01745	1.652425	7.042363	14.12387
Arts, entertainment and recreation (R)	168	10.17814	1.478651	7.02899	12.59578
Other service activities (S)	168	9.557805	1.720819	5.499474	13.26099

8.1.2 *Graphs*

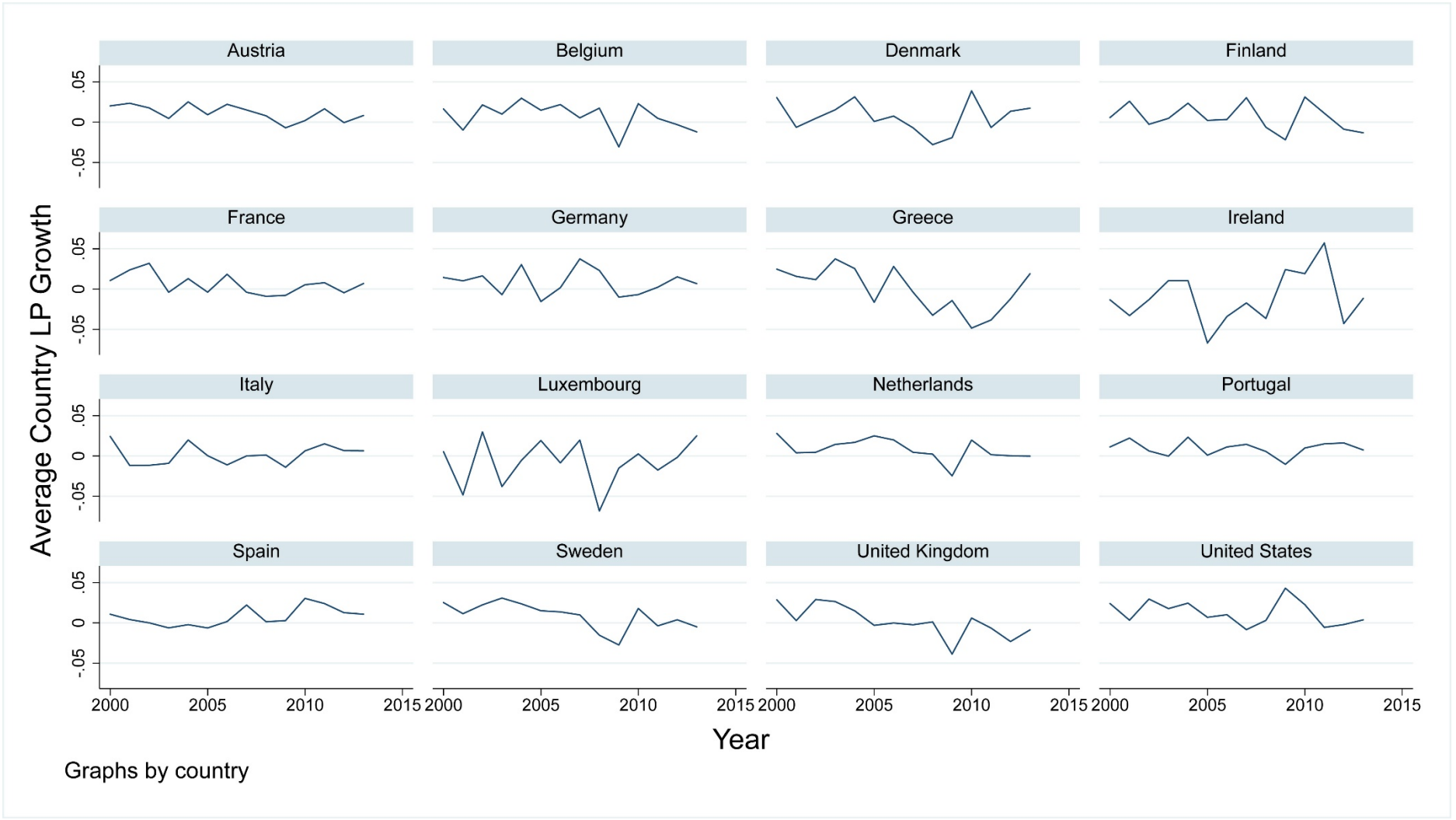
Graph A1: average Total Factor Productivity Growth per sector per year



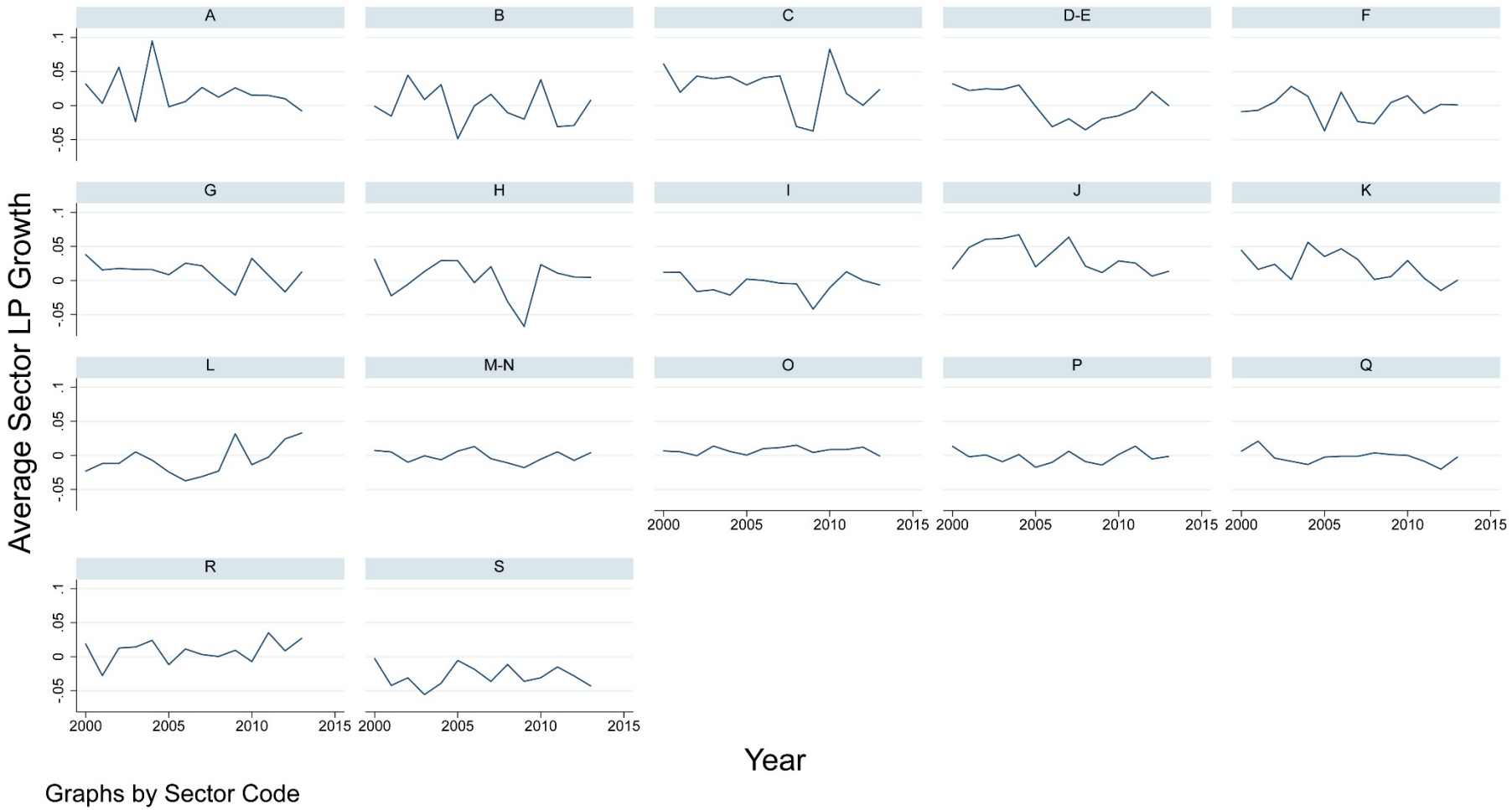
Graph A2: average Total Factor Productivity Growth per sector per year



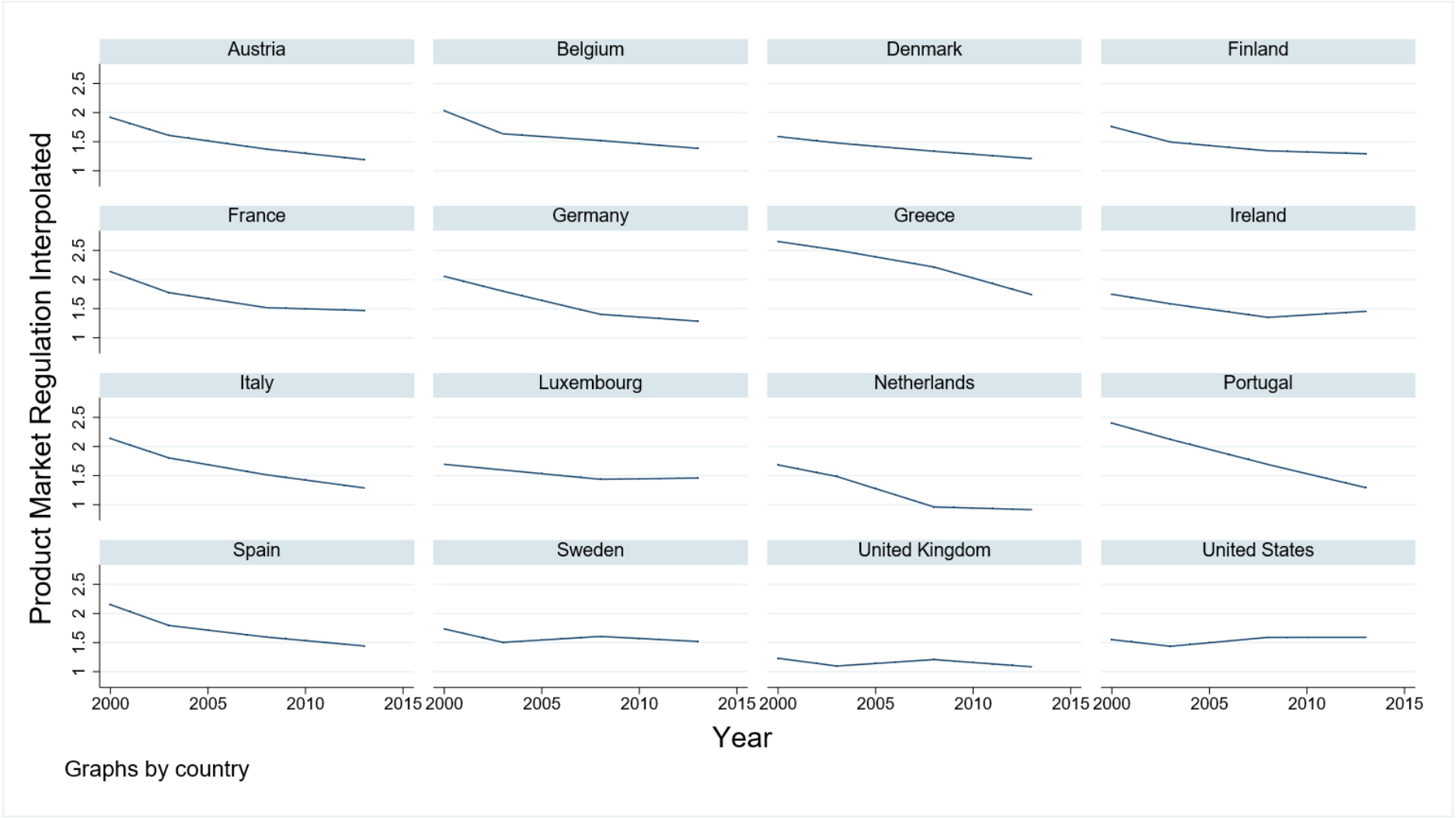
Graph A3: average Labour Productivity Growth per country per year



Graph A4: average Labour Productivity Growth per sector per year



Graph A5: Product Market Regulation per country over time



8.2 Appendix B: Full Results

TFP Growth

Table B1: TFP Growth

	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment
	b/se	b/se	b/se	b/se	b/se
EPL	0.030				
	(0.02)				
EPL HSS		0.0061	0.0031	-0.00059	0.032
		(0.03)	(0.03)	(0.03)	(0.03)
EPL LSS		0.051**	0.048*	0.044*	0.074***
		(0.03)	(0.03)	(0.03)	(0.03)
Trend			-0.00078	-0.0011	-0.0016**
			(0.00)	(0.00)	(0.00)
UD				0.00056	0.000070
				(0.00)	(0.00)
PMR				-0.014	-0.033***
				(0.01)	(0.01)
PA EPOP					-0.0021***
					(0.00)
Constant	-0.0019	-0.0019	0.0040	0.0066	0.0097
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
var(year)	0.000090***	0.000090***	0.000081***	0.000083***	0.000083***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(code)	0.00011***	0.00011***	0.00011***	0.00011***	0.00012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in country)	8.6e-22	6.8e-22	8.4e-23**	5.8e-19	5.1e-17
	(0.00)	(.)	(0.00)	(0.00)	(.)
var(country)	0.000015***	0.000015***	0.000015***	0.000017***	0.000015***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in sector)	0.0092**	0.0087***	0.0087***	0.0097***	0.010***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
var(sector)	0.000013**	0.000013***	0.000013***	0.0000084***	0.0000065***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(error)	0.0023***	0.0023***	0.0023***	0.0022***	0.0021***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2862	2862	2862	2828	2675
Log lik	4593.0	4593.7	4594.4	4609.5	4382.7

Table B2: LP Growth

	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment	(6) EPL effect by sector skill + Capital Input
	b/se	b/se	b/se	b/se	b/se	b/se
EPL	0.0095					
	(0.01)					
EPL HSS		0.0053	0.0016	-0.0053	0.027	0.011
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
EPL LSS		0.013	0.0096	0.017	0.052**	0.059*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Trend			-0.00100*	-0.00083	-0.0018**	-0.0016**
			(0.00)	(0.00)	(0.00)	(0.00)
UD				0.0018***	0.00072	0.0011
				(0.00)	(0.00)	(0.00)
PMR				-0.014	-0.036***	-0.033***
				(0.01)	(0.01)	(0.01)
PA EPOP					-0.0030***	-0.0019**
					(0.00)	(0.00)
GFCF						0.0018**
						(0.00)
Constant	0.0051	0.0051	0.013**	0.011*	0.018***	-0.0030
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
var(year)	0.000060	0.000060	0.000044	0.000049***	0.000045	0.000045***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(code)	0.00012	0.00012	0.00012	0.00012***	0.00013	0.00014***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(epl in country)	3.6e-16	2.7e-16	2.8e-14	8.1e-17	3.6e-17	1.7e-14**
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(country)	4.1e-30	4.1e-28	1.6e-25	4.5e-26***	2.9e-25	0.0000059***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(epl in sector)	0.0090	0.0091	0.0091	0.0097***	0.011	0.017***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(sector)	0.00099	0.00099	0.00099	0.0010***	0.0011	5.6e-12***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
var(error)	0.0037	0.0037	0.0037	0.0033***	0.0033	0.0027***
	(.)	(.)	(.)	(0.00)	(.)	(0.00)
Observations	3672	3672	3672	3502	3349	2624
Log lik	4831.1	4831.1	4832.7	4751.2	4532.9	3965.0

8.3 Appendix C: TFP results without Luxembourg

	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment
	b/se	b/se	b/se	b/se	b/se
EPL	0.028				
	(0.02)				
EPL HSS		0.0044	0.0017	0.0012	0.032
		(0.03)	(0.03)	(0.03)	(0.03)
EPL LSS		0.050**	0.047*	0.046*	0.074***
		(0.03)	(0.03)	(0.03)	(0.03)
Trend			-0.00076	-0.0011	-0.0016**
			(0.00)	(0.00)	(0.00)
UD				0.00039	-0.000040
				(0.00)	(0.00)
PMR				-0.014	-0.032***
				(0.01)	(0.01)
PA EPOP					-0.0020***
					(0.00)
Constant	-0.0015	-0.0015	0.0042	0.0069	0.0098
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
var(year)	0.000095***	0.000095***	0.000086***	0.000087***	0.000086***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(code)	0.00012***	0.00012***	0.00012***	0.00011***	0.00011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in country)	3.0e-16**	1.5e-16	2.7e-16**	3.2e-20***	2.9e-23
	(0.00)	(.)	(0.00)	(0.00)	(.)
var(country)	0.000014***	0.000014***	0.000014***	0.000014***	0.000013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in sector)	0.011***	0.010***	0.010***	0.010***	0.011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(sector)	0.000019***	0.000019***	0.000019***	0.000015***	0.000014***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(error)	0.0021***	0.0021***	0.0021***	0.0021***	0.0020***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2794	2794	2794	2777	2624
Log lik	4577.4	4578.2	4578.8	4559.8	4333.1

8.4 Appendix D: Results without Germany, Luxembourg, US

Table D1: TFP results without Ger, Lux, USA					
	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment
	b/se	b/se	b/se	b/se	b/se
EPL	0.023				
	(0.02)				
EPL HSS		-0.0014	-0.0043	-0.0040	0.018
		(0.03)	(0.03)	(0.03)	(0.03)
EPL LSS		0.044*	0.041	0.040	0.059***
		(0.03)	(0.03)	(0.03)	(0.03)
Trend			-0.00088	-0.0019**	-0.0020**
			(0.00)	(0.00)	(0.00)
UD				0.000019	-0.000014
				(0.00)	(0.00)
PMR				-0.027**	-0.036***
				(0.01)	(0.01)
PA EPOP					-0.0012
					(0.00)
Constant	-0.0023	-0.0023	0.0042	0.012	0.012
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
var(year)	0.00012***	0.00012***	0.00011***	0.00011***	0.00011***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(code)	0.00013***	0.00013***	0.00013***	0.00013***	0.00013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in country)	1.5e-15	2.8e-15	3.6e-15	1.3e-17	2.1e-14*
	(.)	(.)	(.)	(0.00)	(0.00)
var(country)	0.000014***	0.000014***	0.000014***	0.000015***	0.000014***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(epl in sector)	0.013***	0.012***	0.012***	0.012***	0.012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(sector)	0.000036***	0.000036***	0.000036***	0.000033***	0.000029***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
var(error)	0.0019***	0.0019***	0.0019***	0.0019***	0.0019***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2318	2318	2318	2301	2233
Log lik	3888.0	3888.8	3889.4	3872.0	3754.6

Table D2: LP results without Ger, Lux, USA						
	(1) General EPL effect	(2) EPL effect by sector skill	(3) EPL effect by sector skill + Time-Effects	(4) EPL effect by sector skill + Control Variables	(5) EPL effect by sector skill + Prime-age Employment	(6) EPL effect by sector skill + Capital Input
	b/se	b/se	b/se	b/se	b/se	b/se
EPL	0.0081					
	(0.02)					
EPL HSS		0.0035	-0.00068	-0.0083	0.027	0.019
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
EPL LSS		0.012	0.0081	0.014	0.053**	0.060*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Trend			-0.0011*	-0.00079	-0.0017**	-0.0023***
			(0.00)	(0.00)	(0.00)	(0.00)
UD				0.0020***	0.00084	0.0010
				(0.00)	(0.00)	(0.00)
PMR				-0.012	-0.035**	-0.043***
				(0.01)	(0.01)	(0.01)
PA EPOP					-0.0038***	-0.0030***
					(0.00)	(0.00)
GFCF						-0.000000078***
						(0.00)
Constant	0.0050	0.0050	0.013**	0.011	0.018**	0.023***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
var(year)	0.000068	0.000068	0.000050	0.000058	0.000054	0.000055***
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(code)	0.00014	0.00014	0.00013	0.00013	0.00013	0.00015***
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(epl in country)	1.4e-21	1.3e-21	1.3e-20	1.8e-21	1.6e-10	3.8e-12*
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(country)	4.4e-28	2.6e-27	9.0e-28	6.6e-27	1.3e-19	0.0000023***
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(epl in sector)	0.0095	0.0096	0.0096	0.010	0.012	0.019***
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(sector)	0.0012	0.0012	0.0012	0.0012	0.0012	0.000025***
	(.)	(.)	(.)	(.)	(.)	(0.00)
var(error)	0.0036	0.0036	0.0036	0.0033	0.0033	0.0025***
	(.)	(.)	(.)	(.)	(.)	(0.00)
Observations	3094	3094	3094	2941	2873	2148
Log lik	4082.0	4082.1	4083.7	3993.6	3901.7	3333.6