
Labour protection and productivity in EU economies: 1995-2005

Mirella Damiani¹ and Fabrizio Pompei²

Abstract

The present study examines cross-national and sectoral differences in multifactor productivity growth in sixteen European countries from 1995 to 2005. The main aim is to ascertain the role of flexible employment contracts and collective labour relationships in explaining the ample differentials recorded in the European economy.

We use the EU KLEMS database for growth accounting and a broad set of indicators of labour regulations, covering two distinct 'areas' of labour regulation: employment laws and collective relations laws. This comprehensive approach allows us to consider arrangements that regulate allocation of labour inputs (fixed-term and part-time contracts, hours worked) and the *payoff* and *decision rights* of employees.

We find that, since 1995, European countries have not followed similar patterns of growth. A large number of variations between European economies are caused by marked differentials in multifactor productivity and part of this heterogeneity is caused by sectoral diversities. We show that, in labour-intensive sectors such as services, fixed-term contracts, which imply shorter-term jobs and lower employment tenures, may discourage investment in skills and have detrimental effects on multifactor productivity increases. Employment protection reforms which slacken the rules of fixed-term contracts cause potential drawbacks in terms of low productivity gains. We also find that more stringent regulation of these practices, as well as a climate of collective relations, sustain long-term relationships and mitigate these negative effects.

JEL Classifications: O40, O43; O47; J50

Keywords: productivity, labour regulation, comparative institutions.

1. Introduction³

Over the past decade, disappointing productivity growth has been recorded in the European economy and the catching-up of Europe on the U.S. has slowed significantly. Productivity differentials have mainly involved market services. Indeed, new research (van Ark et al., 2008) sheds some light on differential patterns of growth in *labour-intensive* sectors, such as services, explaining the different performances of multifactor productivity recorded in the European economy and the US. These findings encourage further inquiry into the role of management of labour resources and their regulation with regard to successes or failures in Europe.

As known, various hypotheses on the role of labour regulation have been advocated, and their relevance has been tested in a growing number of empirical studies.

¹ Department of Economics, Finance and Statistics, University of Perugia, Italy. Correspondence address: mirella.damiani@gmail.com

² Department of Economics, Finance and Statistics, University of Perugia, Italy.

³ A first version of this paper was presented at the 10th Biannual Conference of the European Association for Comparative Economic Studies - EACES (Higher School of Economics, Moscow, August 28-30, 2008); we thank the discussants and participants to the conference for their useful comments. Special thanks to Valentina Tiecco for her competent and useful assistance.

Many investigations analyse the impact of these policies on employment and unemployment rates, or on unemployment inflows and outflows, but reserve less space for productivity growth. Conversely, the present paper examines the more controversial issue of the impact of labour institutions on productivity outcomes, only recently addressed by some country studies (Dew-Becker and Gordon, 2008), or industry-level cross-country research (Micco and Pages, 2006; Bassanini and Venn, 2007; Bassanini, Nunziata and Venn, 2009)⁴.

The expected impact of the role of labour market institutions on productivity is ambiguous and mainly related to restrictions on firing. Scarce attention is devoted to fixed-term contracts.

The deeper motives for promoting labour market flexibility are found in the theoretical literature on the potential costs of labour protection. Such protection, as argued by Hopenhayn and Rogerson (1993), perturbs the reallocation of resources from declining firms to more dynamic ones with above average productivity growth. In addition, these protective devices tend to alter the allocation of resources among sectors.

Economies with rigid labour markets manifest a distortion in their innovation activities, since they adopt mainly secondary innovations which determine a cost reduction in existing goods, but they do not experiment with primary innovations, such as those related to new products, characterised by higher returns but also higher variance (Saint Paul, 2002)⁵. Such economies, which are prevalent in Europe, show an international specialization in secure goods, at an advanced stage of their product life-cycle, and this contributes toward explaining why “Europe appears as less high tech than the United States” (Saint Paul, 2002, p. 376) and why it falls behind in terms of long-run productivity growth.

Other key channels able to explain unfavourable consequences are related to capital returns and worker effort. Returns of investment are lowered by job protection provisions, as shown by Bertola (1994). Analogous negative impacts are brought about by worker incentives since labour protection lowers the probabilities of layoffs for disciplinary reasons; under less threat of dismissal, opportunistic behaviour is encouraged (Boeri and Jimeno, 2005).

By contrast, theoretical arguments in favour of employee protection underline the positive effects on productivity of long-term relationships and incentives for workers to upgrade their skills. Two main channels might be advocated. First, labour policies may increase the stock of human capital through the promoting of training. Second, for a given stock of human capital, “policies that reduce social conflict might condition workers’ effort and their willingness.” (OECD, 2007, p.65)

⁴These recent works, which examine country and sectoral differentials, use a cross-country approach and verify differences across sectors with a ‘difference in difference’ method.

⁵As documented by Saint Paul (2002), “That Europe tends to innovate more in established products than in new ones is evident from the data. For example, in 1993 the US accounted for 54% of world patents in biotechnology, 51% in computers, and 32% in communication, versus 13%, 14% and 13%, respectively, for France plus Germany. By contrast, these two countries accounted for 25% of world patents in instruments, 25% in construction, and 52% in transportation, versus 6%, 5% and 3% for the US” (Saint-Paul, 2002, p.376).

In this vein, Nickell and Layard (1999) signal that employment protection has a positive effect, because it increases job tenure and stimulates on-the-job training. Belot, Boone and van Ours (2007) also highlight that, when effort and investments in human capital are non-contractible, employment protection solves hold-up problems; protection of this kind encourages employees to invest in match-specific human capital by increasing the probability of the survival of the match, and this beneficial effect is stronger in those sectors where firm specialization in competences is more important. However, there is a trade-off between these positive effects and the negative consequences of firing costs. In any case, there is a positive optimal level of employment protection. In addition, Wasmer (2002) shows that different levels of employment protection affect skills in different ways: low levels favour general portable skills, higher levels determine firm-specific skills.⁶

Institutional interactions are of strategical importance, some of which are related to the wage setting system. A limited discretionality of employers in wage setting lead them to adjust employment levels, and only protective provisions make union wage bargaining power effective; this explains why employment protection and unions are quite often complementary institutions, since binding rules on employment contracts may be useless if firms are free to adjust wages downwards (Boeri and Van Ours, 2008, chapter 13).

On the other hand, collective bargaining rules and sectoral agreements which generate low spreads between firms may prevent opportunistic behaviour by employers when on-the-job training is observable, but not verifiable. In such circumstances, workers may accept a wage cut with a promise of obtaining on-the-job training, but the firm has an incentive to renege on its promise and reaps some gains from cheap labour (Malcomson, 1999). Institutional constraints on wage setting, more enforceable if collective contracts are extended by law to third parties at national or sectoral level, thus impede hold-ups and generate the upgrading of skills⁷.

Other links with incentive schemes are provided by efficiency wage models. As shown by Güell (2000), the choice of fixed-term contracts is plausible in a context of efficiency wages, but only if there is a sufficiently high transformation rate of fixed-term contracts into permanent ones; otherwise, shirking is always strictly preferred. "The idea behind this is very simple: if a worker always becomes unemployed independently of the effort expended, there is no way to give incentives to the worker by paying him a higher wage" (Güell, 2000, p.10).

In a context of asymmetric information, other institutional complementarities occur and are related to the role of works councils and the presence of employees on supervisory boards. As shown by Freeman and Lazear (1994), management tends to use

⁶From a welfare point of view, under imperfect insurance markets, some components of firing costs, such as severance payments, may be justified when employees are risk-averse (Pissarides, 2001).

⁷In our analysis, we introduced an indicator for collective rules which takes into account whether the law extends collective contracts to third parties at national or sectoral level. Other wage constraints are represented by minimum wages. As is known, minimum wages improve incentives for investing in training, partly because they reduce demand for unskilled workers, who have greater incentives to invest in training to avoid unemployment. High unemployment benefits, however, may offset this effect by reducing the opportunity cost of remaining unemployed.

information strategically, declaring bad states of the firm to extract more effort from employees; in their turn, employees, knowing this, disregard management and rationally choose low-effort strategies⁸. Legal norms and elected works councils overcome this communication problem, as they provide more information, inducing more effort; Freeman and Lazear also argue that, by enhancing job security, employees attribute more importance to expected future profits, show greater loyalty, and invest more in firm-specific skills.

To sum up, this brief excursus demonstrates that multiple dimensions of labour regulation must be taken into account and that their impact helps to explain national and sectoral disparities in productivity growth.

In the present paper, we analyse these disparities in Europe and then focus on some driving forces such as flexible employment contracts and collective labour regulation to explain various patterns of multifactor productivity. As said above, other recent studies examine the influence of labour protection on productivity and focus most of their analysis on dismissal rules, with some extensions to other forms of regulation (see, for instance, Bassanini, Nunziata and Venn, 2009). The present paper does not consider rules on firing restrictions and mainly examines only those norms that increase *flexibility on the margin*; it focuses on those institutional devices which involve co-decision making and verifies the role of co-management when works councils and co-determination rules apply.

In order to obtain a comprehensive database, we considered two distinct 'areas' of labour regulation, employment laws and collective relations laws. As regards the first, we selected some of the indexes which summarise the regulation of allocation of labour inputs in the productive process: part-time, fixed-term contracts and hours worked.⁹ For the second area, collective relations, we included not only *payoff* rights, but also workers' *decision* rights, which may have some impact on productivity¹⁰. For instance, computing the presence of employees in worker councils or on boards of directors yields a more

⁸ This occurs when employees choose a high effort level only in bad states, when low effort does not allow firms to survive and workers rationally expect to lose their jobs. Vice-versa, in good states, they obtain higher utility with low-effort strategies.

⁹ The dataset used in our study includes some measures which reflect the binding rules governing individual labour contracts which do not exactly coincide with those provided by the OECD and specifically aimed at measuring employment protection. Note that, according to the OECD employment protection indicator (EPL index), the strictness of employment protection consists of three different summary indicators which refer, respectively, to regular employment, temporary employment and collective dismissals. A detailed description of the method adopted to obtain these three summary indicators is given in OECD (2004, Chapter 2). In our case, we include rules on part-time contracts and hours worked, which are not considered in the OECD EPL index.

¹⁰ Botero et al. (2004) index includes rights to unionise and to collective bargaining, but these are not the same features computed by the OECD indicator (i.e. trade union density, coverage by collective agreements, centralisation and co-ordination of wage bargaining). Conversely, Botero et al. (2004) index for union power takes into account information and decision rights of employees which are not included in the OECD indicator. The authors compare their database with that sponsored by other institutions, such as the OECD and World Bank, as follows: "What distinguishes our data from previous efforts is a combination of a significant coverage of countries and a comprehensive approach to labor market regulations" (p. 1341). For more details, see the Appendix of the present paper.

precise evaluation of arrangements that give a 'voice' to employees and which may represent additional channels influencing productivity¹¹.

The second set of information is on growth and is taken from the EU KLEMS Growth and Productivity Accounts. This database is the outcome of a research project, financed by the European Commission and aimed at analysing productivity in the European Union (Timmer et al., 2007). It allows a detailed analysis of European economies and explicitly considers important issues such as average skills of the labour force, capital services in information and communication technology, and their diversities across sectors and countries.

By merging statistical information made available by these two sets of databases, with additional data from EUROSTAT, as described in Section 2, we explore the potential impact of labour regulation on productivity performances for a sample of European Economy countries over the period 1995-2005.

The paper is organised as follows: Section 2 provides data description; Section 3 presents our main findings on country-sectoral growth differentials and labour arrangements; Section 4 offers econometric estimates; Section 5 concludes.

2. Data description

As mentioned above, our empirical investigation relies on several databases, EU KLEMS accounts, the indexes on employments laws and collective relations elaborated by Botero *et al.*(2004)¹², EUROSTAT and OECD databases.

The first step of our research involved matching them and achieving a disaggregated analysis at sector and country levels. First, the availability of data and the needs of a large and consistent sector-country profile led us to select only 16 countries out of the 27 European Union members and to re-arrange the NACE rev.1 sections into 8 industries. This made it possible to compare the following economies: Austria, Belgium, the Czech Republic, Denmark, Spain, Finland, France, Germany, Hungary, Ireland, Italy, the Netherlands, Portugal, Slovenia, Sweden, and the United Kingdom. This selection of countries was dictated by data availability and included two sets of countries: i) 13 Old Member States; ii) 3 New Member States. The second set is quite heterogeneous and comprises Hungary and the Czech Republic, two "market oriented" economies with some similarities to the Anglo Saxon countries, and Slovenia, a country which has adopted some of the institutions typical of the German model (European Commission, 2004)¹³.

¹¹A third indicator that measures various social security provisions, introduced by Botero et al. (2004), was not been included in our analysis.

¹² Botero et al. (2004) contributes to the growing literature which maintains the causality link between 'law and finance' and which supports the thesis that insufficient shareholder protection causes ownership concentration of low degrees of capitalization (La Porta et al., 1998). The legal origin hypothesis has recently been applied to labour regulation by Botero et al., (2004), whose main statement dictates that 'the historical origin of a country's laws shapes its regulation of labour and other markets' (Botero et al., 2004, p.1340). In our work, more than adopting these propositions, we simply use the database elaborated by this study.

¹³ Of the new Member States, Slovenia is one of the countries with above-average unionization levels, with a works council system, (replacing the former Yugoslavian model of worker self determination) and

The selected sectors consist of: 1) Primary Sector (agriculture, mining and quarrying), 2) Industry (manufacturing and energy sectors), 3) Construction, 4) Wholesale and Retail Trade, 5) Hotels and Restaurants, 6) Transport, Storage and Communications, 7) Financial Intermediation, Real Estate and Business Services, 8) Community, Social and Personal Services.

We drew the dependent variable of our econometric estimates, the Multi-Factor Productivity (MFP) growth, from the EU KLEMS database, which was extensively used in the study of van Ark *et al.* (2008). One of the main advantages offered by this database is the detailed breakdown of industries and service sectors and the decomposition of labour productivity; it is also worth noting that this decomposition was computed by considering differences in labour quality (high skilled, medium-skilled and low-skilled) and a full variety of asset types (distinction between *ICT* capital and *non-ICT* capital services). Other variables used in the descriptive analysis, see Section 3, value added and the contribution of inputs to growth, were also obtained from the EU KLEMS database.

Some explanatory variables of MFP, particularly those describing unmeasured innovative input and the quantitative dimension of labour market flexibility, were taken from the EUROSTAT database. More precisely: sectoral R&D expenses, standardised to value added, were used as a proxy of innovation¹⁴.

The set of variables related to labour arrangements and institutions consists of two main groups. The first, taken from the EUROSTAT database, includes the rate of change of employees with fixed-term and with part-time contracts and the rate of growth of weekly hours worked; all these variables offer a measure of the actual degree of labour flexibility changes.

The second group consists of two subgroups of labour regulation: employment laws and collective relations laws.

As regards employment laws, we considered the existence and cost of alternative arrangements to standard employment contracts, such as fixed-term and part-time contracts (extensive margin flexibility)¹⁵, and the cost of increasing the number of hours worked (intensive margin flexibility).¹⁶ In addition, we consider the *binding* role of these

with national cross sectors bargaining over pay and working conditions. At the same time, in Slovenia, new legislation has been introduced in 2003 “which seeks to regulate temporary agency work, increase the flexibility of the Slovenian labour market and provide adequate protection for temporary agency workers, increase the flexibility of the Slovenian labour market and provide adequate protection for temporary agency workers” (European Commission, 2004, p. 64) As a result, Slovenia recorded a more systematic use of such employment contracts.

¹⁴ Unfortunately, EUROSTAT data on R&D were not available for all 128 (16 countries time 8 sectors) sector-country observations.

¹⁵ More precisely, the existence and cost of part-time contracts were computed as the average of 1) a dummy variable equal to one, if part-time workers enjoy the mandatory benefits of full-time workers, 2) a dummy variable equal to one, if terminating part-time workers is at least as costly as terminating full-time workers. The existence and cost of fixed-term contracts were computed as the average of 1) a dummy variable equal to one, if fixed-term contracts were only allowed for fixed-term tasks and 2) the normalised maximum duration of fixed-term contracts.

¹⁶ Botero *et al.* (2004) computed the maximum number of “normal” hours of work per year in each country (excluding overtime, vacations, holidays, etc.). When the hours worked exceed this maximum, a

employment laws, which is obtained under the assumption that provisions regulating employment contracts are more stringent in those sectors where propensities to use flexible employment arrangements are higher. These propensities are in turn identified by the share of flexible arrangements (incidence of fixed-term and part-time contracts). Hence, we assumed that the protection of workers is more binding in those sectors where the proportions of fixed-term and part-time employees out of total employees are higher.

This methodology, following Bassanini and Venn (2007) and Bassanini, Nunziata and Venn (2009), provides a solution to the problem of labour market policies being typically defined at country level, whereas we wished to make comparisons at country and sector level. Along similar lines, we considered that, in each sector, the higher the actual increase of weekly hours worked, the more important the impact of related costs of increasing the number of hours worked¹⁷.

The second subgroup regards collective relation indexes: i) labour union power, which measures the statutory protection and bargaining power of unions¹⁸; ii) the collective disputes index, which refers to the protection of workers during collective disputes¹⁹. As regards the *binding* role of labour union power and collective disputes indicators, we weighted them at sectoral level, by considering the component of dependent employees respect to total employment and the share of employees involved in collective disputes.

Also, we collected the OECD database for Product Market Regulation, that measures the anti-competitive regulation (the direct and indirect impact of product market regulation on sectors of the economy that use the output of non-manufacturing sectors as intermediate inputs in the production process (Conway and Nicoletti, 2006). Unfortunately, this indicator is not available for the Eastern countries nor for all sectors considered in our analysis.

firm uses overtime. The cost of increasing hours worked is computed as the ratio of the final total wage bill to the initial one.

¹⁷ In our study the role of separation costs is only captured by sector and countries dummies.

¹⁸ This is computed as the average of the following seven dummy variables which are one: 1) if employees have the right to unionise, 2) if employees have the right to collective bargaining, 3) if employees have the legal duty to bargain with unions, 4) if collective contracts are extended to third parties by law, 5) if the law allows closed shops, 6) if workers, or unions, or both, have the right to appoint members to the Boards of Directors, 7) if workers' councils are mandated by law.

¹⁹ This indicator is computed as the average of the following eight dummy variables which are one: 1) if employer lockouts are illegal, 2) if workers have the right to industrial action, 3) if wildcat, political, and sympathy/solidarity/ secondary strikes are legal, 4) if there is no mandatory waiting period or notification requirement before strikes can occur, 5) if striking is legal even if there is a collective agreement in force, 6) if laws do not mandate conciliation procedures before a strike, 7) if third-party arbitration during a labour dispute is mandated by law, 8) if it is illegal to fire or replace striking workers.

3. Growth accounting in the European Economy: 1995-2005

3.1 The EU/US comparison

After the mid 1990s, the 15 European Union countries recorded a decline in productivity growth, from a previous average annual value of 2.4 percent, during the years 1973-1995, to 1.5 percent during the period 1995-2006. The slowdown seems even more remarkable in comparison with the American experience, where a reverse trend of acceleration was observable: in the US, average annual labour productivity passed from 1.2 percent in 1973-1995 to 2.3 percent from 1995 to 2006 (van Ark et al., 2008).

By definition, labour productivity is obtained from the difference between the rates of growth in output and labour input. From this accounting, the gap between Europe and the US was caused not only by a lower increase in real output, but also by an increase in the growth rates of total hours worked (from -0.4 in the years from 1974-1994 to +0.9 in 1995-2006). Conversely, the American economy registered a falling increase in hours worked, from +1.6 in the first period to +0.9 in the second.

The second finding deducible from growth accounting is related to the breakdown of labour productivity. By following Solow (1957) and making appropriate adjustments which take into account the heterogeneity of the labour force as well as the distinction between *ICT* and non-*ICT* capital per hour, one has the following:

$$\text{Labour Productivity} = \text{Labour Composition} + \text{ICT capital per hour} + \\ + \text{Non-ICT capital per hour} + \text{MFP}$$

where the last component, MFP, is multifactor productivity, the share of output growth not attributable to inputs. Applying these accounting rules and using the new EU KLEMS database, which makes it possible for the first time to detect the role of high-skilled labour and information and communications technology capital, van Ark *et al.*(2008) identified some crucial results.

Table 1: Labour productivity in the market economy: EU economies and the US, 1995-2004

	Labour Productivity	Labour composition	ICT cap. per hour	Non ICT capit. per hour	Multifactor productivity
	1=2+3+4+5	2	3	4	5
European Union	1.5	0.2	0.5	0.5	0.3
US	3.0	0.3	0.8	0.4	1.4
Standard Dev.	1.0	0.1	0.3	0.2	1.0

Source: EU KLEMS data base, van Ark *et al.*(2008, Table 4).

As Table 1 shows, neither a worsening in labour force skills (component 2) nor a decline in capital deepening (component 4) may be considered as determining factors in the slowdown of European productivity growth. On the contrary, the disappointing performances of the European countries were due above all to the lower growth of *ICT* investments and MFP.

In addition, it must be emphasised that a significant component of the productivity gap was attributable to the services sector. Indeed, at a sectoral level of analysis, the services sector, representing nearly half of the market economy, accounted for a large proportion of the productivity gap between Europe and the US.

However, an important question remains as to whether the European scenario is homogeneous or whether there are large variations between countries.

Table 2: Major sector contribution to average annual labour productivity growth: market economy, 1995-2004

	Market economy	ICT production	Goods production	Market services	Reallocation
European Union	1.5	0.5	0.8	0.5	-0.2
US	3.0	0.9	0.7	1.8	-0.3

Source: EU KLEMS data base, van Ark et al.(2008, Table 5)

3.2 European cross- country differentials

Our analysis offers some answers and provides a growth accounting for some of the countries belonging to the European Union from 1995 to 2005.

Table 3 provides a synthetic picture and shows: i) the growth rate of the GDP and its breakdown into hours and productivity growth; ii) the breakdown of productivity growth into its principal contributions²⁰.

Our main findings for EU13 show that the lowest position was occupied by Italy, in terms of growth of value added (column 1), mostly because of its collapse in productivity growth. It is followed by Germany where, however, the disappointing performance in output growth was primarily caused by a marked fall in hours worked. Conversely, at the top we find Finland and Spain, but here, too, the difference between the two economies is worthy of note since Finland recorded an acceleration in productivity gains, whereas Spain had extensive growth, as a consequence of the greater output contributed by the hours worked.

²⁰See Appendix, Figure A1 for hours and productivity growth by sector and country.

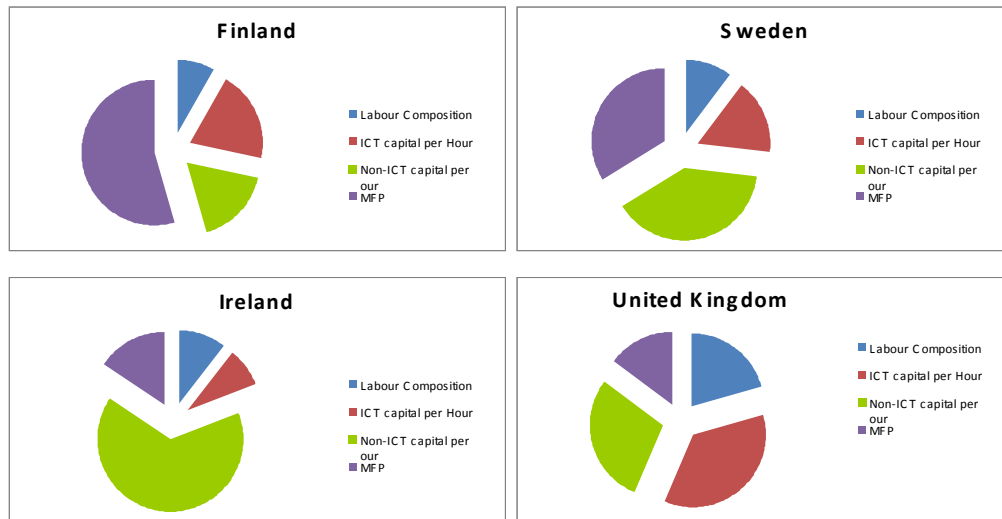
Table 3: Contributions to Growth in Real Value-Added: European Economy 1995-2005

	Growth rate of Value Added	Output contribution from		Labour productivity contributions from				
		Hours Worked	Labour Productivity	Labour Composition	ICT capital per Hour	NonICT capital per our	MFP	LP contributions from knowledge economy
Austria	2.19	0.45	1.74	0.25	0.47	0.42	0.60	1.31
Belgium	2.04	0.58	1.46	0.21	0.79	0.72	-0.26	0.74
Denmark	1.81	0.52	1.28	0.23	0.84	0.37	-0.17	0.90
Finland	3.42	0.79	2.63	0.22	0.52	0.46	1.43	2.17
France	2.09	0.24	1.84	0.37	0.30	0.57	0.60	1.27
Germany	1.32	-0.23	1.55	0.01	0.40	0.69	0.46	0.86
Ireland	7.26	1.94	5.31	0.55	0.46	3.47	0.82	1.84
Italy	1.18	0.55	0.64	0.17	0.25	0.68	-0.46	-0.04
Netherlands	2.51	0.64	1.87	0.35	0.55	0.51	0.45	1.36
Portugal	2.18	0.45	1.72	0.22	0.73	1.57	-0.80	0.15
Spain	3.44	1.96	1.48	0.43	0.42	1.42	-0.78	0.07
Sweden	2.87	0.19	2.67	0.27	0.44	1.04	0.91	1.62
United Kingdom	2.72	0.57	2.15	0.44	0.77	0.62	0.31	1.52
<i>Average (UE13)</i>	<i>2.69</i>	<i>0.67</i>	<i>2.0</i>	<i>0.2</i>	<i>0.54</i>	<i>0.96</i>	<i>0.2</i>	<i>1.06</i>
<i>Std. Dev. (UE13)</i>	<i>1.54</i>	<i>0.6</i>	<i>1.1</i>	<i>0.1</i>	<i>0.19</i>	<i>0.84</i>	<i>0.6</i>	<i>0.6</i>
Czech Republic	2.09	0.33	1.41	0.28	0.62	1.42	0.10	1.00
Hungary	4.21	0.27	3.92	0.68	0.27	0.30	2.67	3.62
Slovenia	3.88	-0.27	4.13	0.71	0.45	2.14	0.82	1.99
<i>Average (UE16)</i>	<i>2.83</i>	<i>0.52</i>	<i>2.30</i>	<i>0.34</i>	<i>0.52</i>	<i>1.03</i>	<i>0.42</i>	<i>1.28</i>
<i>Std. Dev.(UE16)</i>	<i>1.42</i>	<i>0.63</i>	<i>1.18</i>	<i>0.18</i>	<i>0.18</i>	<i>0.81</i>	<i>0.84</i>	<i>0.88</i>

Source: our elaborations on EU KLEMS database.

Table 3 shows that the slow productivity growth of the old member states of the European Union, below 2 percent, is a widespread phenomenon, with some notable exceptions, two in Northern Continental Europe, Finland and Sweden, and two in the Anglo-Saxon economies, Ireland and the UK.

In addition, in the same group of four successful cases, the differentials in contribution to growth are impressive. Focusing on these countries and considering the importance of the various components, we have the situation illustrated in Figure 1.

Figure 1: Contributions to labour productivity growth, 1995-2005

Source: our elaborations on EU KLEMS database.

The four cases tell different stories. In Ireland, a significant increase in substitution of capital for labour and processes of deepening in (non-*ICT*) capital intensity are recorded. Similar measures characterised the mid-1970s to the late 1980s when, on average, European countries engaged catching-up with the US. For the other Anglo-Saxon country, the UK, two components of the knowledge economy (high quality of the labour workforce and capital *ICT* services) contribute to an important extent. Lastly, the Northern countries, and Finland in particular, were the only economies in Europe which showed the indubitable incidence of multifactor productivity growth.

It can be argued that the very different starting points reached in 1995 by the various EU member countries (with some economies with a level of development and innovative capabilities not very distant from the US, and others which lie behind) may play an important role.

One expected hypothesis is that a traditional catch-up pattern explains productivity growth within EU economies, and that this process is more evident in a disaggregation by broad sectors. The present analysis reveals that, in each industry, higher labour productivity growth is recorded in those countries with lower levels of efficiency, the result of adaptation and imitation of foreign technology. But a simple graphical representation (Figure 2) shows that a negative correlation between levels and growth rates, and therefore a catch up process, is significant only in two sectors: i) Wholesale and Retail Trade; ii) and Financial Intermediation, Real Estate and Business Services, with a coefficient of correlation in both cases around -0.45 and significant at the 10% level.

To sum up, even if the question of the differential initial conditions remains and deserves further research, a preliminary analysis, based on simple correlations between levels and growth of labour efficiency, shows weak associations. These results are consistent with those obtained by Bassanini, Nunziata and Venn: the authors, addressing the role of firing restrictions on MFP growth, find “no evidence that these

regulatory restrictions affect the technological catch-up with the industry productivity frontier. On the contrary, their impact does not appear to vary significantly with the distance to the frontier or across different types of institutional frameworks” (p. 392).

Table 3 also summarises contributions to labour productivity growth, which reveal cross-country diversities. To better evaluate the relative importance of the various components, we computed their percentage contributions to labour productivity, as shown in Table 4.

Table 4: Contributions to labour productivity growth in European Economy, 1995-2005

	Labour Composition	ICT capital per Hour	Non-ICT capital per our	MFP
Austria	14.47	26.85	24.29	34.39
Belgium	14.27	54.57	49.28	-18.12
Denmark	18.29	66.03	29.13	-13.45
Finland	8.38	19.83	17.35	54.45
France	20.17	16.33	30.88	32.62
Germany	0.36	25.82	44.33	29.49
Ireland	10.44	8.68	65.35	15.52
Italy	26.26	39.70	106.42	-72.37
Netherlands	18.94	29.61	27.40	24.04
Portugal	12.82	42.64	91.02	-46.47
Spain	29.25	28.00	95.43	-52.68
Sweden	10.27	16.58	39.14	34.02
United Kingdom	20.45	35.84	29.07	14.64
<i>Average (UE13)</i>	<i>15.72</i>	<i>31.58</i>	<i>49.93</i>	<i>2.77</i>
<i>Std. Dev. (UE13)</i>	<i>7.71</i>	<i>16.11</i>	<i>29.99</i>	<i>39.64</i>
Czech Republic	11.71	25.51	58.76	4.02
Hungary	17.21	6.88	7.74	68.17
Slovenia	17.22	10.95	51.87	19.97
<i>Average (UE16)</i>	<i>15.66</i>	<i>28.36</i>	<i>47.97</i>	<i>8.01</i>
<i>Std. Dev.(UE16)</i>	<i>6.99</i>	<i>16.37</i>	<i>28.97</i>	<i>39.15</i>

Source: our elaborations on EU KLEMS database

The first result is that the main difference arising in the EU-US comparison and attributable to MFP (see Table 1), is confirmed in the intra-European context: the main disparity in labor productivity growth between individual European economies is to be found not in differences in the intensity of the production factors, but in multifactor productivity. Indeed, the standard deviation of MFP (39.15%) is quite larger than that of the contribution of labour composition (6.99%) or of capital deepening ICT (16.37%) (see Table 4).

This motivates to extend the analysis of MFP in terms of country-sectoral differentials.

3.3 Multifactor productivity growth: national/sectoral differentials

Multifactor productivity growth measures the efficiency improvements in the use of inputs; in other terms, it measures the reduction in input costs to produce a given

amount of output. This measure reflects disembodied technical changes, i.e., those changes not embodied in the quality of inputs.

More precisely, MFP growth ($\Delta \ln A$) is calculated as the real growth of output minus a weighted growth of inputs:

$$\Delta \ln A_{ij} = \Delta \ln Y_{ijt} - \bar{v}_{ijt}^X \Delta \ln X_{ijt} - \bar{v}_{ijt}^K \Delta \ln K_{ijt} - \bar{v}_{ijt}^L \Delta \ln L_{ijt} \quad (1)$$

where $\Delta \ln Y_{ijt}$, $\Delta \ln X_{ijt}$, $\Delta \ln K_{ijt}$ and $\Delta \ln L_{ijt}$ denote, respectively, the growth of output (Y), intermediate inputs (X), capital (K) and labour (L) in country i and sector j , between $t-1$ and t , while \bar{v}_{ijt}^X , \bar{v}_{ijt}^K and \bar{v}_{ijt}^L are the two period average shares of inputs, X, K and L, respectively, on total output.

As clearly described by Inklaar *et al.* (2008, p. 148-149), many factors may cause changes in MFP, since this residual measure includes pure technological change, organizational improvements and effects from unmeasured output and inputs that could be captured by R&D expenses. Hence, in addition to technical innovation, there are i) effects due to organisational and institutional changes, ii) shifts in returns to scale, iii) any other deviations from competitive assumptions of equalities between prices and marginal costs; iv) all computing errors due to the existence of unmeasured inputs.

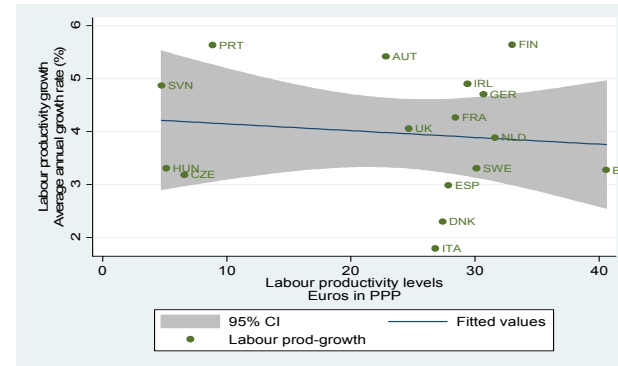
All these effects may have different impacts at country and sectoral level, as shown in Figure 3. The first result is that the main difference arising in the EU-US comparison and attributable to MFP (see Table 1), is confirmed in the intra-European context: the main disparity in labor productivity growth between individual European economies is to be found not in differences in the intensity of the production factors, but in multifactor productivity. Indeed, the standard deviation of MFP (39.15%) is quite larger than that of the contribution of labour composition (6.99%) or of capital deepening ICT (16.37%) (see Table 4). Substantial differentials also arise at country-sectoral level.

Figure 2: Labour productivity: levels and growth rates (Average annual growth rate 1995-2005)

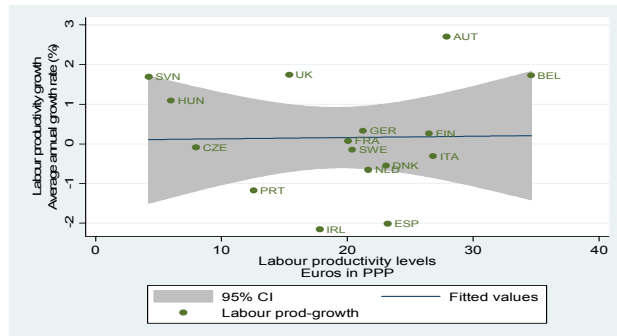
Primary Sectors (Agriculture and Mining) $corr = -0.29$



Industry (Manufacturing and Energy sectors) $corr = -0.12$



Constructions $corr = 0.01$



Wholesale and Retail trade $corr = -0.45^*$

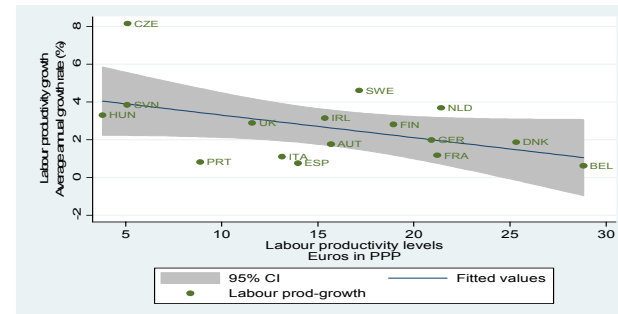
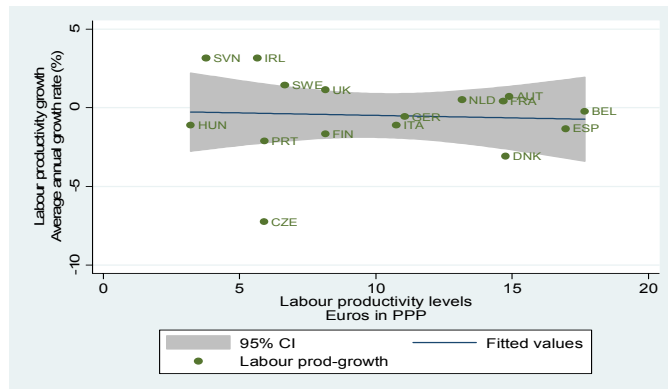
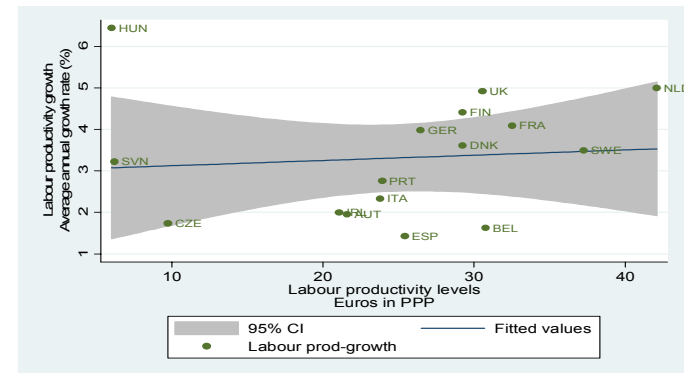


Figure 2 (Continued) : Labour productivity: levels and growth rates (Average annual growth rate 1995-2005)

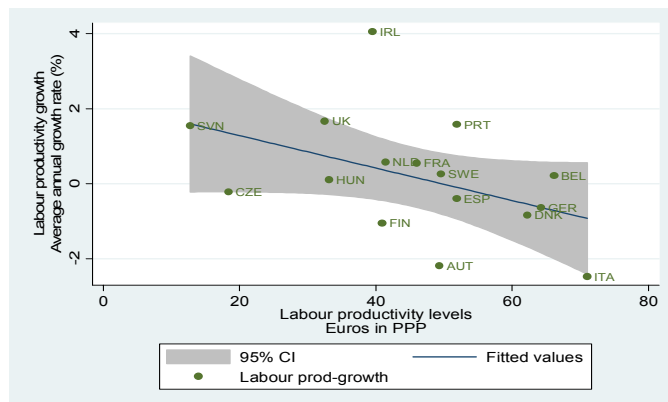
Hotels and Restaurants corr=-0.06



Transport, Storage and Communications corr=0.08



*Financial Intermediation, Real Estate and Business Services corr=-0.44**



Community Social and Personal Services corr=-0.49

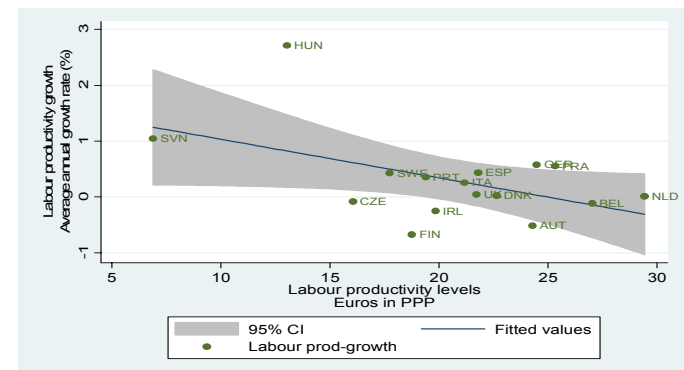
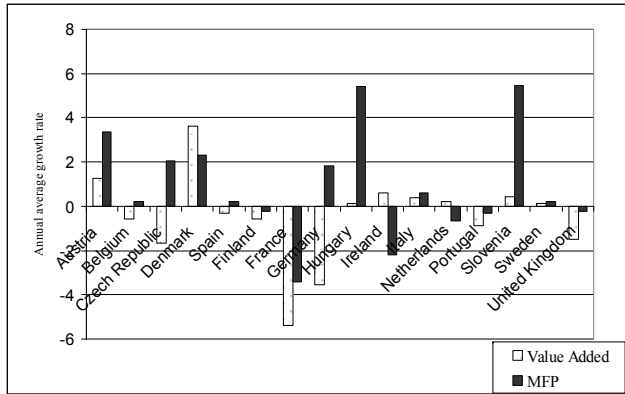
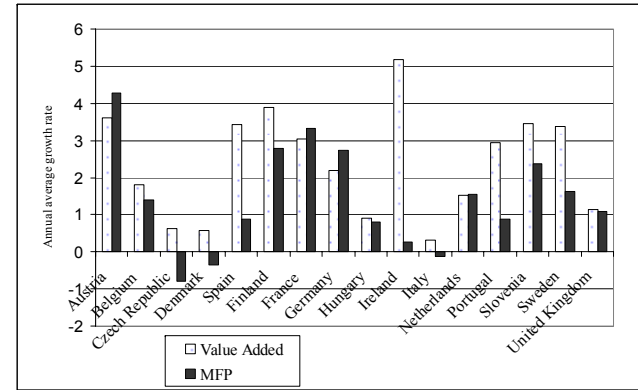


Figure 3: Contributions of MFP to growth of sectoral added value European Economy 1995-2005

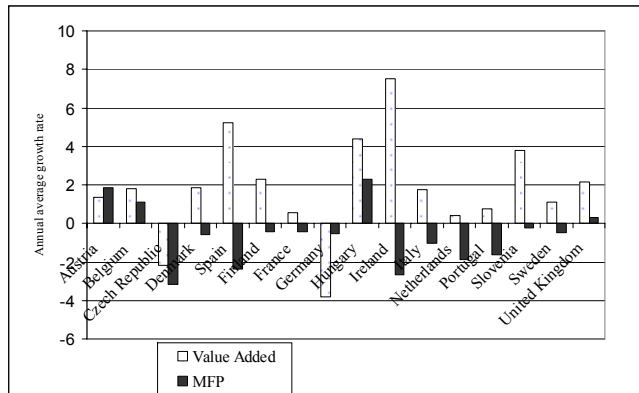
Primary Sectors (Agriculture and Mining)



Industry (Manufacturing and Energy sectors)



Constructions



Wholesale and Retail trade

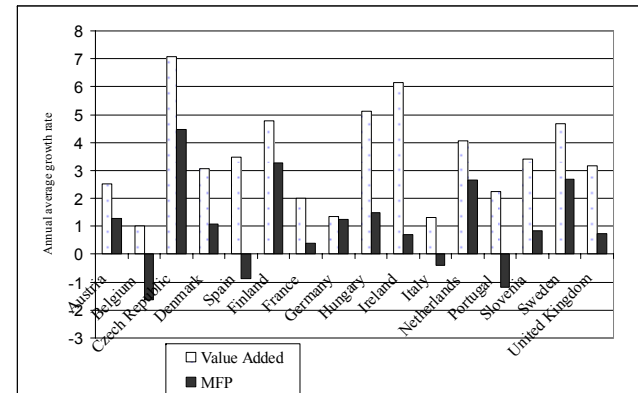
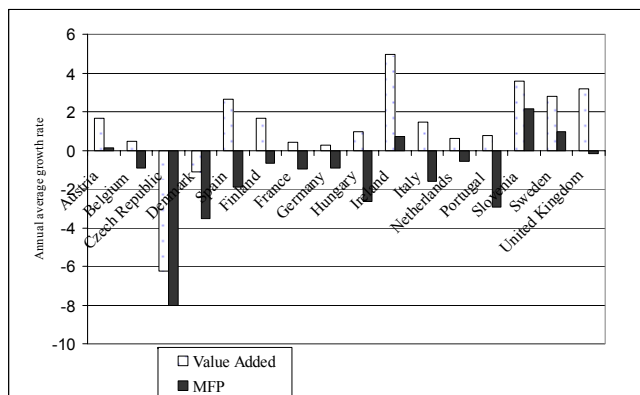
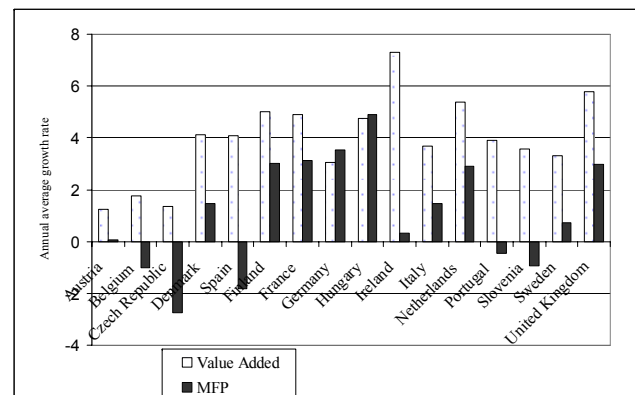


Figure 3 (Continued) : Contributions of MFP to growth of sectoral added value European Economy 1995-2005

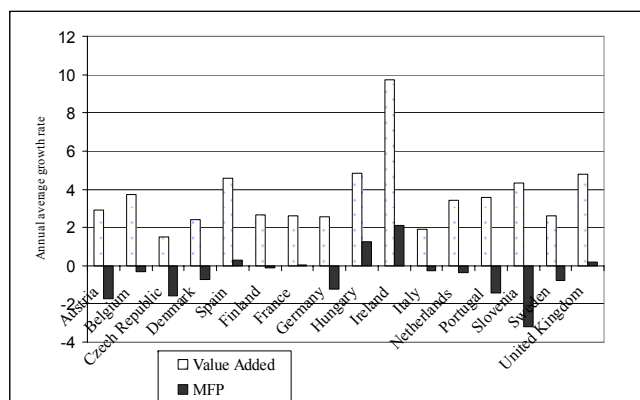
Hotels and Restaurants



Transport, Storage and Communications



Financial Intermediation, Real Estate and Business Services



Community Social and Personal Services

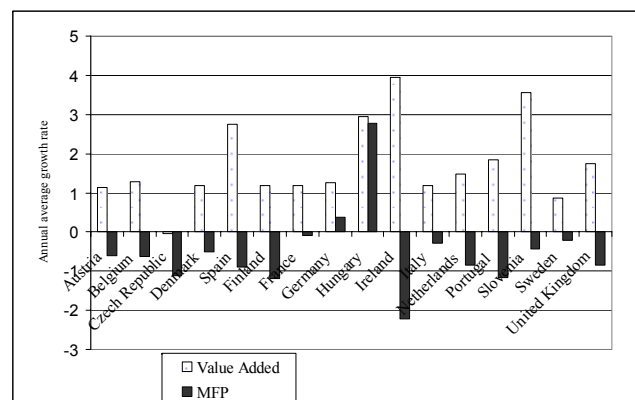
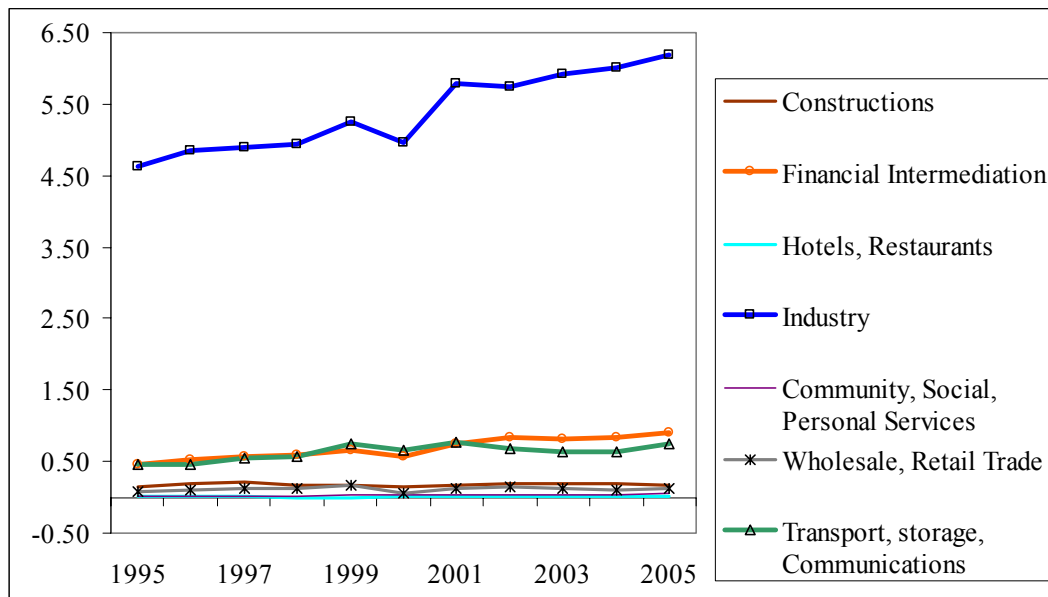


Figure 4: R&D 1995-2005 in EU countries (percentages of sectoral value added)



Source: our elaborations on EUROSTAT. Of our sample of 16 EU countries Austria, Hungary, Portugal and Slovenia are not included

One general finding, common to almost all the countries, is the positive change of MFP in Industry, i.e. in manufacturing and energy sectors (as shown in Figure 3). For a plausible explanation one has to recall that MFP, as a residual measure, includes measurement errors, and R&D and other intangible assets are the more prominent examples causing statistical errors when computing inputs. This component, as shown in Figure 4, has a great importance in industry and it is worth noting that, on average, in EU12, its cumulated growth over the decade is of more than 30%.

A second finding concerns the positive contribution of MFP to productivity growth in the Wholesale and Retail sector. One likely explanation, as stressed in van Ark *et al.* (2008), is that the ample diffusion of chain stores and inventory systems applied to the trade sector are prominent examples of sectors where returns to scale, as already observed for the American economy (Foster *et al.*, 2006), have played a significant role and explain faster growth in MFP.

Good performances have also been found in Transport, Storage and Communications. One reason for this finding concerns the role of deregulation and of changes in entry barriers, since the removal of restrictions encourages innovation and promotes growth (Aghion and Griffith, 2005). These impacts had been empirically tested by Nicoletti and Scarpetta (2003), who examined the role of entry liberalization in market services and found a spill-over positive effect on manufacturing, but, unexpectedly, no benefits in services.

These paradoxical results may be due to some statistical problems since in Europe deregulations have been introduced in different times in different industries, but their aggregation in broad sectors does not permit to isolate the single institutional innovation

and causes an insufficient change over time of the explanatory variables which represent these innovations. Inklaar *et al.* (2008) signal that moving to a more detailed analysis for individual service sectors is convenient since it overcomes these problems; in particular, for Post and Telecommunications, the authors document that the effect of barriers to entry has a negative and significant impact on MFP growth, whereas no significant effects are detected for Transport and Storage. An explanation offered is “that the change in barriers to entry for the post telecommunication services was so strong that its effects became identifiable through the general noise in the data, while this was not the case in transport” (Inklaar *et al.*, 2008, p. 167). In our study, where the two sectors (Transport and Storage and Post and Telecommunications) are not considered separately, we simply find, on average, good results in terms of MFP growth in various countries, as shown in Figure 3.

Performances recorded in other services, such as hotels and restaurants or financial sectors, are more disappointing. In these cases, some failures due to the increasing use of fixed-terms contracts may have been some of those organisational and institutional changes behind the MFP patterns. This point is examined in the next section.

3.4 MFP and labour regulation

When looking at the above growth accounts from the perspective of labour utilisation and regulation, we focus on the summed contributions of distinct groups of factors: i) diffusion of fixed-term, of part-time contracts and of overtime; ii) regulation and restrictions of these arrangements; iii) other forms of labour protection related to collective relations.

3.4.1 Employment contracts

Fixed-term contracts

In the case of rigid regulations for permanent employees, fixed-term contracts play the role of ‘buffer stock’; their importance is thus conditioned by several crucial factors such as the role of firing and hiring costs, volatility of labour demand along the business cycle, elasticity of substitution between permanent and temporary workers, and relative wages of permanent and fixed-term employees²¹.

The diffusion of fixed-term contracts in some European countries has generated increasing interest, and the main theoretical predictions concern the labour demand effects of these contracts, as recently seen in Blanchard and Landier (2002); Cahuc and Postel-Vinay (2002); Goux *et al.* (2001)²². However, as mentioned in Section 1, the related implications on productivity are less well explored²³.

²¹ Boeri and Garibaldi (2007) examine the Italian experience in the period 1995-2000 and focus on the “honeymoon effect” of labour market reforms, aimed at allowing some flexibility by implementing reforms at the margin, i.e., those involving fixed-term contracts but not open-end contracts. For the Italian case, other evidence is obtained by examining the role of exemption clauses exonerating small firms from job security norms (see Schivardi and Torrini, 2008).

²² This literature shows that, in terms of labour demand, the discounted present value of a permanent contract with respect to a fixed-term one is affected, among other variables, by the separation rate,

The spread of fixed-term contracts may exert on productivity two probable, but opposite, effects, as reviewed in Bassanini and Venn (2007). On one hand, they favour all reallocation processes triggered by shocks in technology or demand which call for faster adaptation and job changes. They may also have an incentive effect, under the assumption that fixed-term workers intend to obtain permanent positions; hence, these arrangements may be screen devices to select new employees, and are thus “potential ‘stepping stones’ to generally preferable permanent jobs” (Engellandt and Riphahn, 2004, p. 2).

On the other hand, fixed-term contracts reduce training motivations for workers and firms and discourage investments in firm-specific human capital. This issue has not received robust empirical support, since at country level, if one excludes Spain, there are no significant correlations between the percentage of workers on temporary contracts and training activities, as shown by Bassanini *et al.*(2005).²⁴ In addition, restrictions on the types of jobs for which these contracts are permitted, such as rules that limit these contracts to seasonal or occasional activities, or rules for their allowed duration, may influence their impacts. Within sectoral analysis, the effects of fixed-term contracts may be positive in the case of industries with a higher layoff propensity, but less beneficial when firms can restructure through internal adjustments (Bassanini and Venn, 2007).

This is a matter for further investigation applying econometric estimates. Some evidence, in any case, is important.

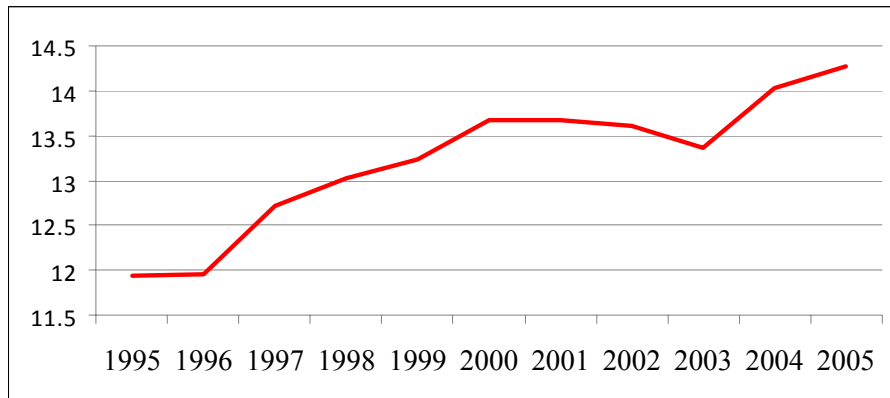
First, it is interesting to examine the increasing share of fixed-term contracts over the period 1995-2005 in the full sample of 16 countries of our database (Figure 5). The lowest values are recorded in the UK, the highest are recorded in Spain (Figure 6) which, conversely, has the lowest proportion of part-time contracts (Table 5). The sector with the highest share of fixed-term contracts is a service sector, i.e., Hotels and Restaurants (Figure 7).

hiring and firing costs, and the probability for the firm of replacing its workforce (see Garibaldi, 2006, chapter 4).

²³ Analysis of employment protection on productivity has been considered by Autor *et al.* (2007). This study examines the impact of dismissal costs on distorting production choices and thus on productivity, by considering the adoption of wrongful discharge protection by US state courts from the late 1970s to the early 1990s.

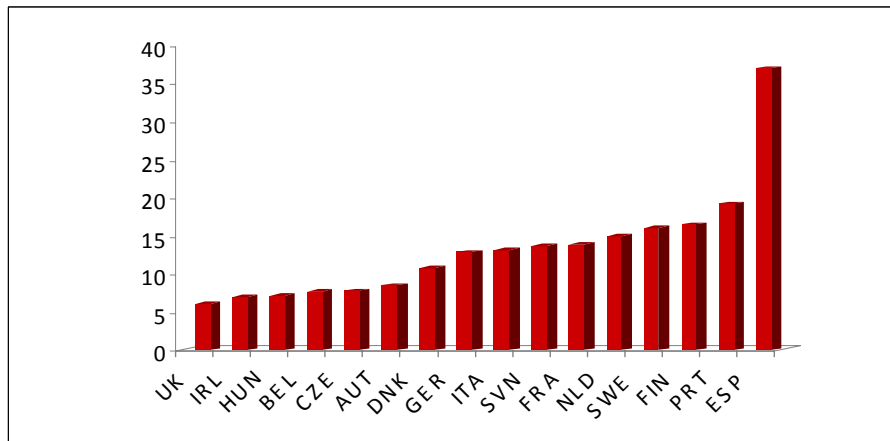
²⁴ The absence of a significant correlation is obtained “if we exclude the case of Spain - an obvious outlier because of the very high share of temporary labour - countries with a similar share of temporary workers have vastly different levels of training participation.” (Bassanini *et al.*, 2005, p.7). For Spain, the probability of receiving on-the-job training in 1999 was 22% lower for workers with fixed-term contracts than for workers with open-end contracts (Dolado *et al.*, 2002).

Figure 5: Evolution of proportions of fixed-term contracts - 16 European countries, 1995-2005



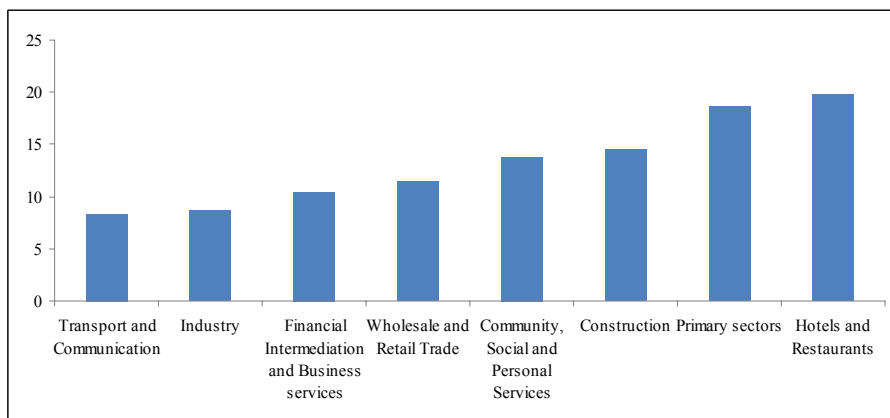
Source: our elaborations on EUROSTAT

Figure 6: Proportions of fixed-term by countries (average values 1995-2005)



Source: our elaborations on EUROSTAT

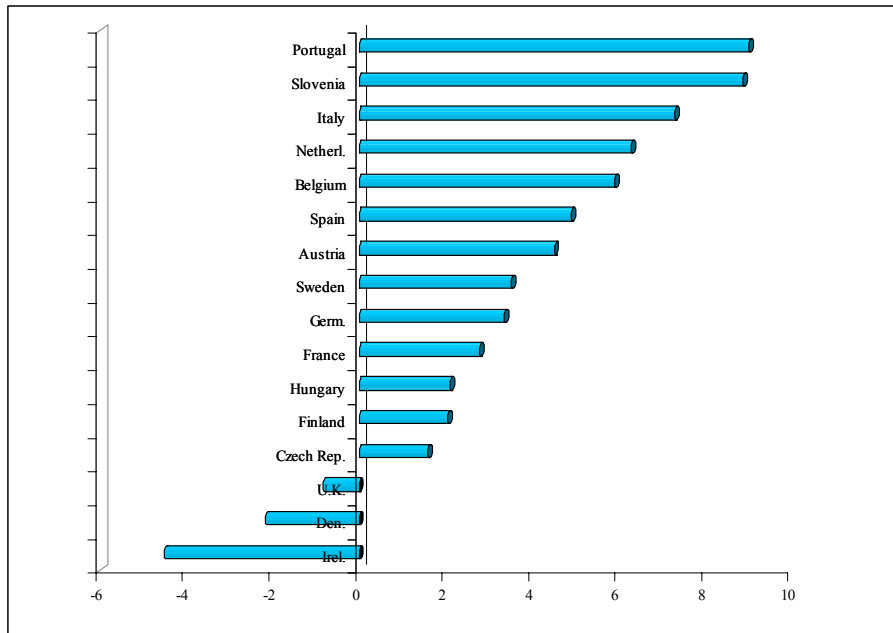
Figure 7: Proportions of fixed-term contracts by sectors (16 European countries, average values 1995-2005)



Source: our elaborations on EUROSTAT

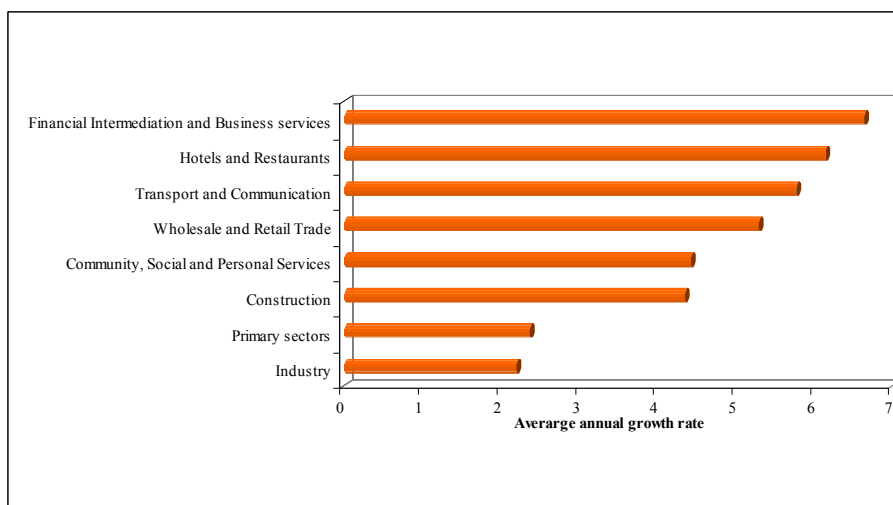
A description of the evolutionary trends is offered by fixed-term contract growth by country and sector. Figure 8 shows the falling diffusion of these labour arrangements in Anglo-Saxon economies, whereas they have increasing importance in services, at sectoral level. (Figure 9). For Hotels and Restaurants, which shows the highest incidence of fixed-term contracts, the acceleration over the period 1995-2005 was remarkable, with cumulative growth of more than 70% (Figure 10).

Figure 8: Growth of fixed-term contracts by countries (average annual rate of changes, 1995-2005)

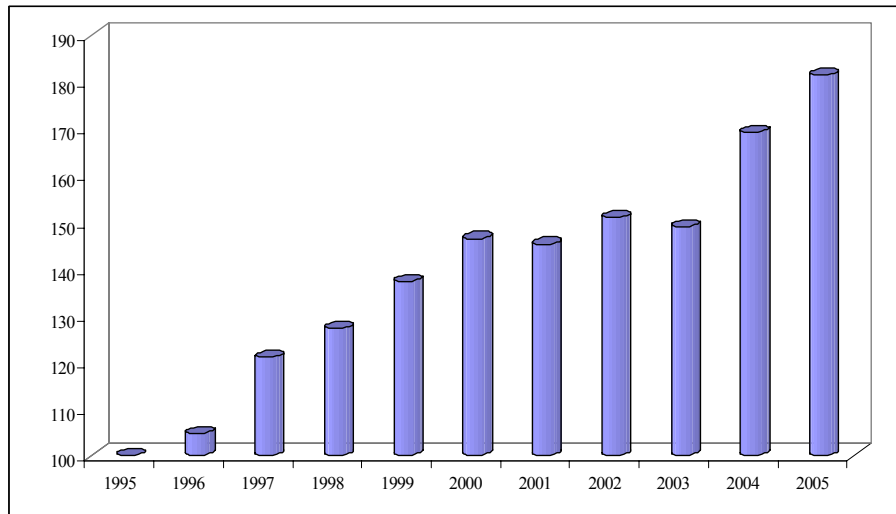


Source: our elaborations on EUROSTAT

Figure 9: Growth of fixed-term contracts by sectors (average annual rate of changes, 1995-2005)



Source: our elaborations on EUROSTAT

Figure 10: Growth of fixed-term contracts in hotels and restaurants sector

Source: our elaborations on EUROSTAT

Part-time contracts

The reasons explaining the lower productivity of part-time workers with respect to full-time ones are examined in OECD (1999). First of all, they have high job turnover which lowers incentives for firms to provide training, and lower levels of compensation, which make it more difficult for part-time workers to finance training themselves. Indeed, “in most countries, well over one-half of them have job tenures of less than five years, while the opposite is true for full-timers. Also, at least in European Union countries for which data are available, “the average incidence of training for part-timers, *relative* to full timers, is around 70 per cent for men and 60 per cent for women. Most of these differences remain after controlling for the lower educational attainment and lower job tenure of part-time workers, and the fact that they tend to be found in smaller establishments, different sectors and have a different age structure from full-time workers. (OECD, 1999, p.22)

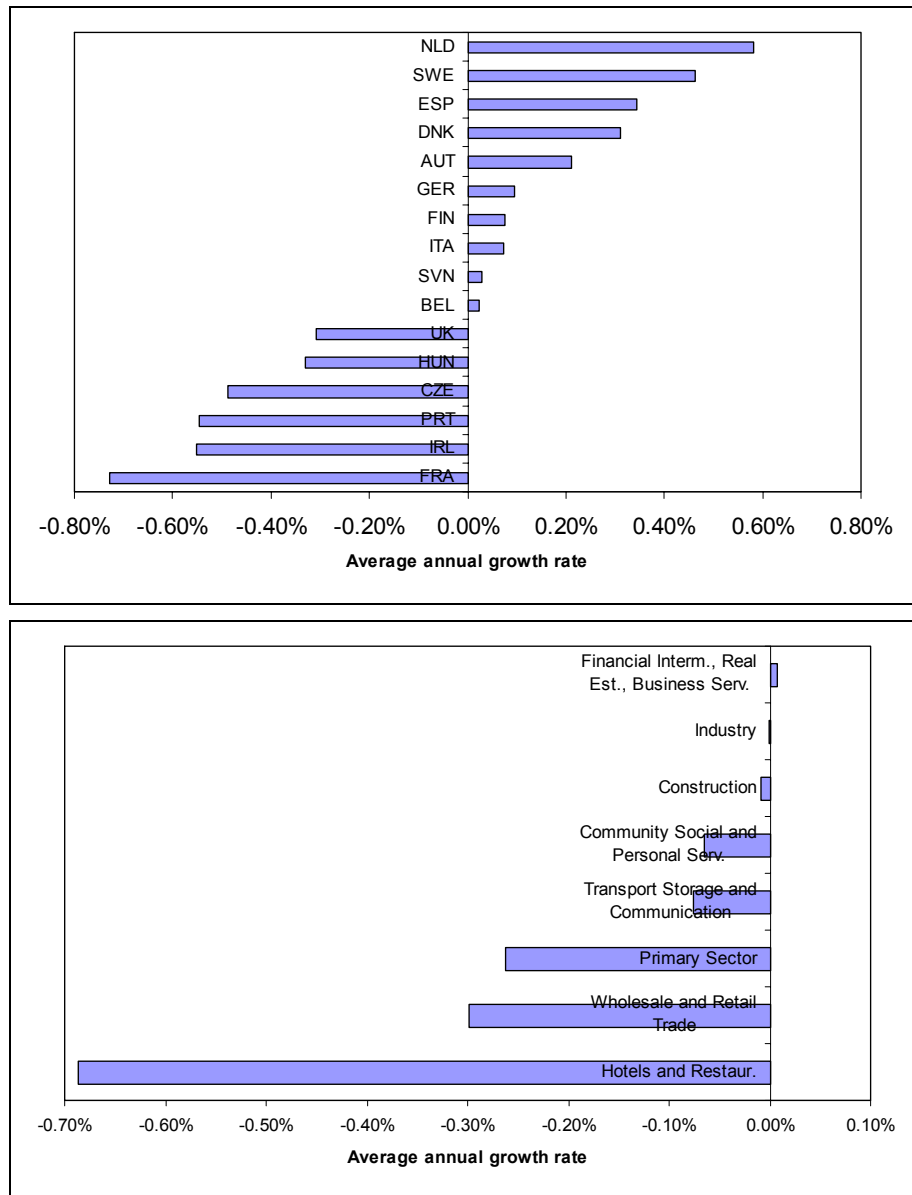
Other explanations include minimum levels of set-time required for individual tasks, which turn out to be a drawback for the efficiency of part-time workers. However, these negative effects are less significant when part-time contracts are not related to the quality of part-time compared with full-time jobs, but to adverse cyclical conditions. Other important factors concern preferences and attitudes for part-time workers and their differentials by gender, since the voluntary choice of this type of contract may weaken the causal link between these arrangements and efficiency²⁵.

Hours worked

As mentioned above, hours worked in the European Union rose rapidly after 1995, and this change, by simple accounting, had a *direct* negative impact on per hour value-added growth. However, moving beyond the simple growth accounting, we need to explore the *indirect* economic impact of hours worked on productivity.

²⁵ See also EUROSTAT (1997) which focuses on part-time arrangements in the European Union.

Figure 11: Weekly hours worked by country and sector in EU countries, average annual growth rates 1995-2005



Source: our elaborations on EUROSTAT data.

One suggested hypothesis is the existence of a negative correlation between the growth rates of labour utilisation and labour productivity. For instance, Dew-Becker and Gordon (2008) found that an increase in total hours per capita of 1% will reduce labour productivity by 0.7% and within Europe, the countries with largest increases in hours also experienced the largest decelerations in productivity growth and comparable findings are obtained by other studies, surveyed in OECD (2007).

A plausible interpretation is that an increase of work intensity may cause diminishing returns when it is obtained with longer hours of work, mainly offered by less skilled employees and whose competences are less firm-specific. Also, an increase

of labour utilisation may concern worse jobs and tasks of inferior quality. In those cases, the 'composition effect' of employment or deterioration of quality of jobs may cause an overall shift towards worse productivity outcomes.

A simple graphical representation of weekly hours worked by country and sectors is offered by Figure 11.

A summary of fixed-term and part time contracts, weekly hours worked by countries is given in Table 5.

Table 5: Fixed-term, part-time contracts, weekly hours worked

	Growth rate of fixed-term contracts	Growth rate of part-time contracts	Growth rate of average number of weekly hours of work	Share of workers with fixed-term contract out total workers	Share of part-time workers out total workers	Growth rate of average number of weekly hours of work
Austria	4.52	4.81	0.21	8.05	17.12	0.21
Belgium	5.92	5.64	0.02	8.17	17.70	0.02
Denmark	-2.15	1.48	0.31	9.94	21.43	0.31
Finland	2.04	3.46	0.08	17.29	12.29	0.08
France	2.79	2.12	-0.73	13.91	16.62	-0.73
Germany	3.36	4.69	0.09	12.59	19.62	0.09
Ireland	-4.51	8.32	-0.55	6.02	14.28	-0.55
Italy	7.31	8.03	0.07	10.33	8.79	0.07
Netherlands	6.29	3.89	0.58	13.15	41.53	0.58
Portugal	9.01	5.25	-0.55	18.18	9.86	-0.55
Spain	4.90	8.92	0.34	34.54	8.60	0.34
Sweden	3.53	0.41	0.46	14.91	23.00	0.46
United Kingdom	-0.82	1.34	-0.31	6.46	25.06	-0.31
UE13	3.25	4.49	0.00	13.35	18.15	0.00
Czech Republic	1.58	0.02	-0.49	8.06	5.21	-0.49
Hungary	2.10	-0.17	-0.33	6.85	3.55	-0.33
Slovenia	8.87	-0.16	0.03	13.79	7.15	0.03

Source: our elaborations on EUROSTAT data

3.4.2 Labour collective relations

We mentioned above the role of restrictions on employment contracts, but other institutions, related to labour collective relations, are likely to have impacts on productivity growth.

A parallel dimension of industrial relations climate concerns bargaining governability, as measured by our collective relation indexes. It can be assumed that in coordinate market economies, extensive relational and long terms contracts entail more reliance on collaborative relationship and on the exchange of private information.

Hence, labour regulation may favour and amplify the potentialities and fruitful effects of investments in intangible assets and of R&D efforts.

We utilize additional indexes for collective rules that discipline unionized actions²⁶. Indeed, workers' position inside the firm is dependent on those provisions that regulate hiring, working time and dismissal conditions (summed up into an employment laws index), but also on employees' contractual strength, empowered by collective actions (synthesized by a collective relations laws index).

In a recent survey, Freeman (2007, p.1) identifies "three ways in which institutions affect economic performance: by altering incentives, by facilitating efficient bargaining, and by increasing information, communication, and trust". Far from offering a detailed description of the multiple channels that can produce these impacts, it must be recalled that a "two faces approach", originally proposed by Freeman and Medoff (1984) for the role of unions, and recently reassessed by Bertola (2008), might be advocated.²⁷

Labour market regulation offers remedies for market imperfections, as regards provisions of insurance, job seeking and training incentives. Hence, the *good* face emphasizes that labour protection, through collective bargaining and provisions that favour long-term relations encourage firm specific human capital investments and stimulate growth²⁸.

Other arrangements, such as legal institutions of codetermination, giving 'voice' to employees, as explained in Section 1, enhance the efficiency of the firm by permitting the flows of communications between management and workers (Freeman and Lazaar, 1995).

The "bad" face proposes the opposite thesis: labour interventions obstruct the free labour market functioning, foster rent seeking, disturb efficient reallocation processes, and generate worse labour market outcomes. Benefits of labour regulation are thus counterbalanced by costs; for instance, as stressed by Hopenhayn and Rogerson (1993), employment protection prevents reallocation of labour and thus reduces efficiency. In our perspective, we ask whether labour institutions, by improving the functioning of labour markets, end to favouring productivity growth. Some evidence is shown in the next subsection.

From the collective relations laws we selected, as mentioned in Section 2, two indicators: the labour union power and a collective disputes index. A summary of European employment laws and collective relations laws considered in our estimates are reported in Table 6.

As one can see, according to the union power index, the polarization in Europe between opposite situations, as those represented, for instance, by UK and Germany

²⁶ Finally, a third indicator that measures various social security provisions has been introduced in the study of Botero et al. (2004).

²⁷ For the debate on institutions and labour market flexibility, see Nickell and Layard (1999).

²⁸ The degree of bargaining centralisation is also a relevant factor; as stressed by Bartelsman et al. (2004) "In decentralised wage-bargaining systems workers can appropriate a large part of the rents generated by successful innovations, thereby reducing incentives to innovate in the first place. The risk of hold-up can be partly mitigated when bargaining occurs at the national level (or at the industry level but with economy-wide co-ordination) and pins down a general frame for the wage schedule" (p.89).

clearly reflects some well-known differences between distinct regimes of institutional labour arrangements which a huge literature has compared in many surveys.

For instance, in Germany, reforms have been carried out by unions, employers' associations, firms, works councils, without a significant role for legal interventions.

Internal restructuring has been obtained via flexible working times and labour mobility negotiated with unions, with company-level pacts, adopted in nearly half of the largest German companies. Half of these pacts, have been *productivity pacts*, aimed at adjusting working conditions, and involving "the extension of working hours (in most cases without wage compensation), measures against absenteeism, changes in work organization" (Hassel and Rehder, 2001).

Table 6: Labour regulation in European economies

	Protection of fixed-term contracts	Protection of part-time contracts	Cost of increasing hours worked	Labour union power	Protection of workers during collective disputes
13 Old member states					
Austria	0,00	1,00	1,00	0,43	0,29
Belgium	0,50	1,00	1,00	0,43	0,42
Denmark	0,00	1,00	1,00	0,71	0,13
Finland	0,69	1,00	1,00	0,43	0,21
France	0,88	0,50	1,00	0,67	0,67
Germany	0,50	1,00	1,00	0,71	0,50
Ireland	0,00	1,00	0,04	0,43	0,50
Italy	0,94	0,50	1,00	0,43	0,83
Netherlands	0,00	1,00	1,00	0,43	0,50
Portugal	0,81	1,00	1,00	0,71	0,58
Spain	1,00	0,81	1,00	0,71	0,46
Sweden	0,44	1,00	1,00	0,62	0,46
United Kingdom	0,00	1,00	0,00	0,00	0,38
UE13	0,44	0,91	0,85	0,52	0,46
3 New Member States					
Czech Republic	0,00	0,00	1,00	0,43	0,43
Hungary	0,19	1,00	0,28	0,71	0,50
Slovenia	0,38	1,00	1,00	0,43	0,54

* Higher values correspond to more extensive legal protection of workers

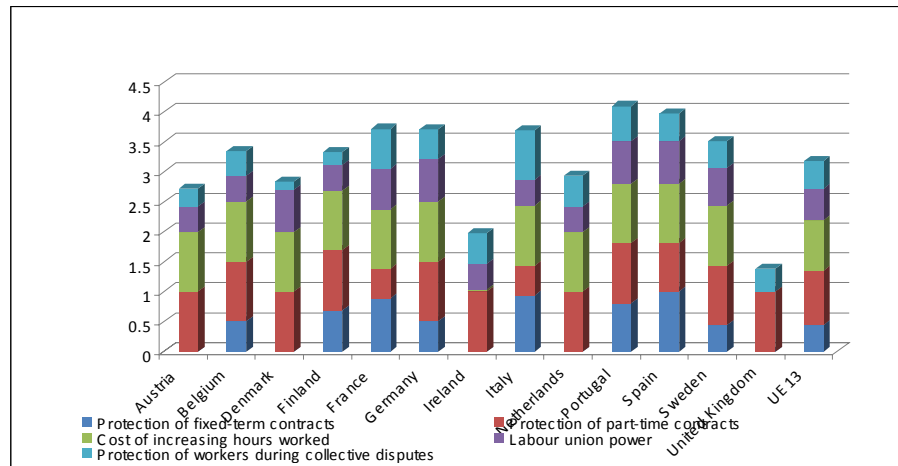
Source: our elaborations on EUROSTAT and Botero et al. (2004) databases.

The German restructuring process, "has entailed increased consensus-based decision making in firms with works council chairs playing a greater role in co-management" (Carlin and Soskice, 2007, p. 4). These changes do not apply in the UK, featuring liberalizing economic reforms.

For the full sample of the sixteen economies considered, Table 6 and Figure 12 provide two main results. First, there are substantial differentials between European economies in the labour regulation of employment contracts and collective relations rules, with Portugal and Spain showing the highest protection and the UK the lowest.

Second, there is also substantial disparity in the composition of this regulation; for instance, the rigidity of fixed-term contract legislation is higher in France, Italy and Spain, which have the most stringent regulations; conversely a Nordic country like Sweden, which permits freer use of fixed-term contracts, has clearly defined rules for collective relations and more stringent provisions for part-time contracts.

Figure 12: Summary index of Labour Regulation and its components



Source: Botero et al.(2004).

However, the measure of protection of workers confirms that European capitalism is quite heterogeneous in terms of labour regulation.

Additional issues concern institutional interactions between employment regulation and other provisions, such as those governing wage setting. As known, employment protection increases the bargaining power of insiders, but reduces their fallback option because it lowers the probability of being re-employed for unemployed workers, with an ambiguous final effect on wage outcomes (Boeri and Van Ours, 2008, chapter 10).

In our context, in which some causal links between institutional complementarities and MFP differentials are examined, these general assumptions need to be further explored.

4. Econometric results

The present section is devoted to estimate the main determinants of MFP growth over the period 1995-2005, and to explain sectoral-countries differentials. As briefly mentioned above, in addition to technical innovation, other explanatory variables must to be taken into account: organisational and institutional changes and unmeasured inputs (see the Appendix, Table A1, for a more detailed description of variables).

The focus of the following investigation is distinguishing, among these variables, three different sets which can capture the role of some of these driving forces.

The first group refers to organizational variables in labour relationship measured by the growth rates of fixed term contracts, of part time contracts, and of costs of increasing hours worked (extensive and intensive margin labour utilisation). The second group concerns institutional variables related to labour protection of these arrangements and to collective relations, such as union power and protection of workers during collective disputes (see Appendix for a full description of this database). As mentioned above we also control for Product Market Regulation. The third determinant of MFP, captured by a single explanatory variable, refers to one of the main components of unmeasured inputs, i.e. R&D expenses.

In order to analyse the impact on MFP (disaggregated at sectoral level) of labour protection laws (available at country level), we assumed that the difference in MFP growth between any pair of industries is equal to the expected value (E) of a function of labour protection measures (LP), multiplied by a function g of the difference between the labour flexibility propensities of the two industries²⁹:

$$E[\Delta \ln MFP_{ikt} - \Delta \ln MFP_{iht}] = f(LP_{it}^z g(\Lambda_{ikt}^z - \Lambda_{iht}^z)) \quad (2)$$

where MFP_{ikt} denotes Multifactor productivity in industry j , country i and time t ; k , and h index the pair of industries; z indexes labour regulation measures; Λ indexes the size of the labour flexibility component which is protected (share of fixed-term and part-time contracts out of total employment, growth rate of increasing hours worked, share of employees out of total employment, share of workers involved in industrial disputes).

We also assumed that f is linear and g is an identity function $g(x) = x$. In addition, our linear regression model included other organisational variables captured by the growth rate of fixed-term and part-time contracts, and innovation proxied by $R\&D$. These last variables are taken at sector-country level and also work as controls. Thus, we estimated the following equation:

$$\Delta \ln MFP_{st} = \Lambda_{ijt}^z LP_{it}^z + OV_{st}^n + R \& D_{st} + PMR_{st} + D_{st} + D_{it} + \varepsilon_{st} \quad (3)$$

where $s = 128$ sector-country units (16 countries x 8 sectors); $t = 1995, \dots, 2005$; $i = 16$ countries; $j = 8$ sectors; $z = 1, \dots, 5$ (protection of fixed-term contracts, part-time, costs of increasing hours worked, union power, collective disputes). We also included unmeasured innovative inputs (captured by R&D), a control for product market

²⁹We omitted the change in LP over time (included by Bassanini, Nunziata and Venn, 2009, p.14). This omission is explained by two main reasons. First, some of our labour regulation measures (those related to collective relations) did not change over the short period examined here. Second, change rates in labour protection, as used by Bassanini, Nunziata and Venn (2009), showed little variability and their relative estimated coefficients were always non significant in the regressions performed.

regulation (PMR_{st}) at sectoral level, D_{st} , industry-by-time dummies, and D_{it} , country-by-time dummies to control for highly sector-specific factors (and for their changes over the period) which have probably influenced *MFP* growth and which cannot be captured by means of the labour policy control variables included in our analysis. More precisely, industry-by-time dummies are an important control since sectors are intrinsically characterised by different degrees of volatility (Micco and Pages, 2006) and industries may be “in different stages of their life-cycle and exposed to different global demand dynamics. For instance, ICT-producing industries have experienced substantially faster-than-average productivity growth in most countries in recent years.” (Bassanini, Nunziata and Venn, 2009, p. 364)

Country-by-time dummies allow to control for all aggregate effects, not included in the specification; among others, *country-specific* business cycle may affect both the use of flexible arrangements and TFP growth.

In addition, by including country-by-time dummies, we also control for other crucial factors, such as those country policy initiatives more or less oriented at creating a ‘dynamic knowledge-based economy’. These country differentials have been recently stressed by van Ark et al. (2008, p. 42), who note that “Even though most European countries have begun to make changes to institutional arrangements that increase flexibility and competitiveness in labor and product markets, such changes vary greatly across countries”. Along the same lines, for the service sector, Inklaar et al. (2008), *confirm* country differentials, with some Nordic European economies, comparable to the US, while others, such as Italy and Spain, lie behind.

A further aspect captured by country-time dummies is represented by the effects of BCE monetary policies and macroeconomic constraints imposed by the Maastricht parameters; this *common* setting has had *differential* country effects, imposing deflationary costs on those EU economies with higher public debts and causing detrimental effects on their productivity growth.

Product market regulatory environments tend to be associated with restrictive regulations in labour markets³⁰ and should be included as determinants of MFP. Note, however, that sectoral-country indicators for product markets restrictive regulations are not available at the same sectoral level of disaggregation as other employment protection measures and their inclusion reduces the number of observations (see Table 7, last column).³¹

It should be noted that specific tests stressed both heteroskedasticity across panels and autocorrelation within panels and for this reason we fitted panel-data linear model

³⁰ Nicoletti et al. (2001) for the OECD countries found that the indicators for product and labour market restrictive regulations were closely associated, with a statistical correlation of 0.73, significant at the 1% level.

³¹ For instance, for non manufacturing sectors, OECD Indicators of Regulation were calculated for 41 ISIC rev3 sectors in 21 OECD countries over the period 1975 to 2003. These aggregations must be reclassified to match them with non manufacturing sectors included in our database and obtained from the NACE rev.1 sections. Matching these indexes is an issue for future research.

by using the feasible generalized least squares method³². The results obtained are shown in Table 7.

The results obtained confirm not only the positive strategical role of R&D, but also the negative impact of fixed-term arrangements which tend to discourage training and the acquisition of firm-specific skills. Conversely, in those sectors-countries where the magnitude of fixed-term contracts is significant, stricter regulation of this contractual form influences MFP positively (see the coefficient of the interaction term “protection of fixed-term contracts x proportion of fixed-term contracts”). In other words, labour provisions for the protection of fixed-term contracts may offset the negative effects deriving from a pure increase in such arrangements, reversing the pattern of slow accumulation of job-related training associated with short-term positions.³³

By contrast, positive but no significant effects are obtained for part-time occupations and, after all, as emphasised in OECD (1999, p. 21), “There are few theoretical reasons to expect the productivity per hour of a part-time worker to be lower than the productivity of a full-time worker, other things being equal”.

The role of growth rates of annual averages of actual weekly hours and of their costs, turn out to be non-significant.

Product market regulation has the expected sign, but is not significant; this result, obtained as said above, with a lower number of observations, deserves further investigations.

The role of regulation of collective relations and of union power seems ambiguous and confirms that the ‘good’ and ‘bad’ face of these provisions balance each other, with offsetting effects.

The impact of defensive clauses in confrontational environments, as measured by the protection of workers during collective disputes, and union power, an index that sums up various institutional devices, likely encourage pro-productivity practices, but also reinforce workers rent seeking behaviour, with inconclusive results. This outcome calls for deeper inquiry and a finer distinction between payoffs rights (wage bargaining) and decision rights (co-determination and workers councils) and their impacts on productivity performances.

³² All estimations are performed by means of STATA 10. Routines adopted, preliminary and post-estimation tests are available upon request.

³³ As said above (Section 1, note 8), the dataset used in our study for labour employment regulation, aimed at estimating its influence on organizational changes and MFP, does not exactly coincide with the OECD EPL index. However, for the component present in both datasets, fixed-term contract regulation, the correlation is very high ($r=0.81$). The main difference is that the OECD index includes the maximum number of successive contracts, and uses a different weighting procedure and different cardinal summary values. In any case, the inclusion of the OECD indicator in econometric estimates does not alter our main findings. All estimates are available upon request.

Table 7: Labour market protection and MFP at country-sector level (panel data fitted with Feasible Generalised Least Squares)

Obs.	924	924	924	924	600
Groups	84	84	84	84	60
Dependent Variable: MFP (growth rate)	1	2	3	4	5
Explanatory variables					
Organizational variables					
Growth of fixed -term contracts	-0.009* (0.005)	-0.014** (0.006)	-0.015*** (0.006)	-0.015*** (0.006)	-0.017** (0.007)
Growth of part-time contracts	0.002 (0.005)	0.002 (0.005)	0.003 (0.005)	0.003 (0.005)	0.001 (0.006)
Cost of increasing hours worked * growth of weekly hours worked				-0,0048 (0,032)	-0.042 (0.043)
Institutional variables					
Protection of fixed-term Contracts x Proportion of fixed term contracts		0.157** (0,083)	0.190** (0,084)	0.182** (0,085)	0.101 (0.101)
Protection of part-time contracts x Proportion of part-time contracts		0.006 (0,055)	-0.009 (0,056)	-0.027 (0,057)	0.068 (0.082)
Union Power x %employees out of total employment			0.062 (0.064)	0.069 (0.064)	-0.087 (0.068)
Collective disputes x % employees involved in disputes					0.002 (0.003)
Product Market Regulation					-0.076 (0.889)
Unmeasured inputs					
R&D	0.433* (0.242)	0.442** (0.245)	0.445* (0.245)	0.421** (0.240)	0.163 (0.247)
Sector-by-Year dummies	Yes	Yes	Yes	Yes	Yes
Country-by-Year dummies	Yes	Yes	Yes	Yes	Yes
Constant	100.883*** (4.398)	93.851*** (3.118)	89.965*** (5.150)	102.770*** (3.533)	102.030* (4.133)
Wald chi2	1216.48	1183.30	1253.04	1256.85	1193.64
Prob > chi2	0.00	0.00	0.00	0.00	0.00

5. Conclusions

Cross-national diversities are numerous and still play a key role, notwithstanding the manifest converging in a ‘market’ direction. Fundamental questions remain, as to the depth of their differentials in terms of growth and whether the so-called “market reliant countries” are more successful in terms of productivity performances.

Although more research is needed to explore this issue, some preliminary findings have been obtained. First of all, there is a large variation in labour productivity and its components across European economies. A major portion of these differentials are found in multifactor productivity, while labour composition has played a minor role (as shown in Table 4). We find that, since 1995, European countries have not followed similar patterns of growth and further heterogeneity is caused by sectoral diversities: between-sector gaps are crucial and the worst performances of multifactor productivity are recorded in some service sectors (see Figure 3). As recalled by van Ark *et al.* (2008), Baumol spoke about the “cost disease of the service sector”, a sector which is inherently labour-intensive. Nevertheless, it is still not clear whether costs and magnitudes of this disease are uniform in all countries and we have still to ascertain which labour institutions are performing better.

Our empirical estimates offer some answers: it seems likely that shorter term jobs and lower employment tenures discourage investments in skills, while labour regulation, which sustain long term relationships, may present some advantages and would seem to be preferable to short-term arrangements in collaborative relations and bargaining governability (see Table 5).

These findings appear to confirm other recent studies, such as Dew-Becker and Gordon (2008), which show that within Europe a reduction in employment protection caused a decline in productivity growth, offsetting the benefit of higher employment. The present study, which includes the sectoral dimension, shows that in labour intensive sectors, and where propensities to use flexible labour arrangements are higher, some forms of labour regulation mitigate the perverse effects of these arrangements on MFP.

These results require additional support from further research and could be fruitfully enriched by the use of a more dimensional perspective. It should be borne in mind that the four better performers of our sample (Ireland, UK, Finland and Sweden) belong to different varieties of capitalism and have neither the same market-reliant arrangements, nor the same sectoral fields of specialisation. In an enlarged perspective, complementarities in labour, financial and product market regulation should be taken into account with the intent, above all, of discovering their impact on growth. The present study is only a first step in this direction.

References

- Aghion P., Griffith R. (2005), *Competition and Growth, Reconciling Theory and Evidence*, Cambridge, MA, MIT Press.
- Autor D.H., Kerr W.R., Kugler A.D. (2007), 'Do Employment Protections Reduce Productivity? Evidence from U.S. States', *Economic Journal*, **117**, 189-217.
- Bartelsman E., Bassanini A., Haltiwanger J., Jarmin R., Scarpetta S. and Schank T. (2004), 'The Spread Of Ict And Productivity Growth. Is Europe Really Lagging Behind In The New Economy?', *The ICT Revolution*, Cohen *et al*, Oxford, Oxford University Press, 1-140.
- Bassanini A. *et al.* (2005), 'Workplace Training in Europe', *IZA Working Papers*, **1640**
- Bassanini A., Nunziata L., Venn D. (2009), 'Job Protection Legislation and Productivity Growth in OECD Countries', *Economic Policy*, **24**, 349-402.
- Bassanini A. and Venn D. (2007), 'Assessing the impact of labour market policies on productivity: a difference-in-differences approach', *OECD Social, Employment and Migration Working Paper*, OECD, Paris.
- Belot M., J. Boone and van Ours J.C. (2007), 'Welfare-Improving Employment Protection', *Economica*, **74**, 381-396.
- Bertola G. (1994), 'Flexibility, Investment, and Growth', *Journal of Monetary Economics*, **34**, 215-238.
- Bertola G. (2008), *Labor Market Regulation: motives, measures, effects*, mimeo.
- Blanchard O., Landier A., (2002), 'The Perverse Effects of Partial Labour Market Reforms: Fixed Duration Contracts in France', *Economic Journal*, **112**, 214 -244.
- Boeri T., Garibaldi P. (2007), 'Two Tier Reforms Of Employment Protection: A Honeymoon Effect?', *Economic Journal*, **117**, 357-385.
- Boeri T., Jimeno J. (2005), 'The effects of employment protection: Learning from variable enforcement', *European Economic Review*, **49**, 2057-2077.
- Boeri T., van Ours J. (2008), *The Economics of Imperfect Labor Markets*, Princeton, Princeton University Press.
- Botero J. C. *et al.* (2002), 'The Regulation of Labor', *Quarterly Journal of Economics*, **119**, 1339-1382.
- Cahuc P., Postel-Vinay F. (2002), 'Temporary jobs, Employment Protection, and Labor Market Performance', *Labour Economics*, **9**, 63-91.
- Carlin W., Soskice D. (2007), 'Reforms, Macroeconomic Policy and Economic Performance in Germany', *CEPR Discussion Paper*, **6415**.
- Conway P., Nicoletti G. (2006), 'Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights', *OECD Economics Department Working Paper*, **530**.
- Dew-Becker I., Gordon R.J. (2008), 'The Role of Labor Market Changes in the Slowdown of European Productivity Growth', *NBER Working Paper*, **13840**.
- Dolado J.J., Garcia-Serrano C., Jimeno J. F. (2002), 'Drawing Lessons from the Boom of Temporary Jobs in Spain', *Economic Journal*, **112**, 270- 295.
- Engellandt A., Riphahn R. (2004), 'Temporary Contracts and Employee Effort', *CEPR Discussion Paper*, **4178**.
- European Commission (2004), *Industrial Relations in Europe*, European Commission Directorate-General for Employment and Social Affairs, Unit D, Brussels.
-

- EUROSTAT (1997), 'Part-Time Work in the European Union', *Statistics in Focus*, **13**, Statistical Office of the European Communities, Luxembourg.
- Freeman R.B. (2007), 'Labour market institutions around the world', *NBER Working Papers*, **13242**.
- Freeman R. B., Lazear E. P. (1995), 'An economic analysis of works councils', *Works Councils: Consultation, Representation, Cooperation*, Rogers J. and Streeck W. (eds.), Chicago, University of Chicago Press for NBER, 27-50.
- Freeman R.B., Medoff J.M. (1984), *What do unions do?*, New York, Basic Books.
- Foster L., Haltiwanger J., Krizan C.J. (2006), 'Market Selection, Reallocation and Restructuring in the US Retail Trade Sector in the 1990s', *Review of Economics and Statistics*, **88**, 748-758.
- Garibaldi P., (2006), *Personnel Economics in Imperfect Labour Markets*, Oxford, Oxford University Press.
- Goux D., Maurin E., Pauchet M. (2001), 'Fixed-term contracts and the dynamics of labour demand', *European Economic Review*, **45**, 533-552.
- Güell M. (2000), 'Fixed-term contracts and unemployment: an efficiency wage analysis', University of Princeton, *IRS working paper*, **433**.
- Hassel A., Rehder B. (2001), 'Institutional Change in the German Wage Bargaining System- The Role of Big Companies', *MPIFG Working Paper*, **01/9**.
- Hopenhayn H., Rogerson R. (1993), 'Job Turnover and Policy Evaluation: A General Equilibrium Analysis', *Journal of Political Economy*, **101**, 915-938.
- Krueger A. (1991), 'The Evolution of Unjust-Dismisal Legislation in the United States', *Industrial and Labor Relations Review*, **44**, 644-660.
- Inklaar R., Timmer M.P., van Ark B., (2008), 'Market services productivity across Europe and the US', *Economic Policy*, **53**, 139-194
- La Porta R. *et al.* (1998), 'Law and Finance', *Journal of Political Economy*, **106**, 1113-1155.
- La Porta R., De Silanes F., Shleifer A., (1999), 'Corporate ownership around the world', *The Journal of Finance*, **54**, 471-517.
- Malcomson J. (1999), 'Individual Employment Contracts', *Handbook of Labor Economics*, Ashenfelter O. and Card D. (eds.), Amsterdam. North Holland
- Micco A., Pages C. (2006), 'The Economic Effects of Employment Protection: Evidence from International Industry-Level Data', *IZA Discussion Paper*, **2433**.
- Nicoletti G. *et al.* (2001), 'Interactions between product and labour market regulations: Do they affect employment? Evidence from OECD countries', OECD, *Economics Department Working Papers*, **312**.
- Nicoletti, G., Scarpetta S. (2003), 'Regulation, Productivity, and Growth, OECD Evidence', *Economic Policy*, **36**, 9-72.
- Nickell, S.J., Layard R. (1999): 'Labour market institutions and economic performance', *Handbook of Labor Economics*, Ashenfelter O. and Card D. (eds.), Amsterdam: North-Holland.
- OECD (1999), *Employment Outlook*, Paris.
- OECD (2004), *Employment Outlook*, Paris.
- OECD (2007), 'More Jobs but less productive? The impact of labour market policies on productivity' (Chapter 2), in *Employment Outlook, Wired at* http://www.oecd.org/els/employment_outlook/2007>
- Pissarides C. (2001), 'Employment Protection', *Labour Economics*, **8**, 131-159.
- Saint-Paul G. (2002), 'Employment Protection, International Specialization, and Innovation', *European Economic Review*, **46**, 375-395.

Schivardi F., Torrini R. (2008), 'Identifying the effects of firing restrictions through size-contingent differences in regulation', *Labour Economics*, **15**, 482-511.

Solow R. (1957), 'Technical Change and the Aggregate Production Function', *Review of Economics and Statistics*, **39**, 312-320.

Timmer M., van Moergastel T., Stuivenwold E. (2007), *EU KLEMS growth and productivity accounts*, Groningen Growth and Development Centre

van Ark B., O'Mahony M., Timmer M.P., (2008) 'The productivity gap between Europe and the United States: trends and causes', *Journal of Economic Perspectives*, **22**, 25-44.

Wasmer E. (2002), 'Interpreting Europe and US labour market differences: the specificity of human capital investments', *IZA Discussion Paper*, **549**

APPENDIX

FIGURE A.1: Labour productivity (hourly) and hours worked by sector (Average annual growth rate 1995-2005)

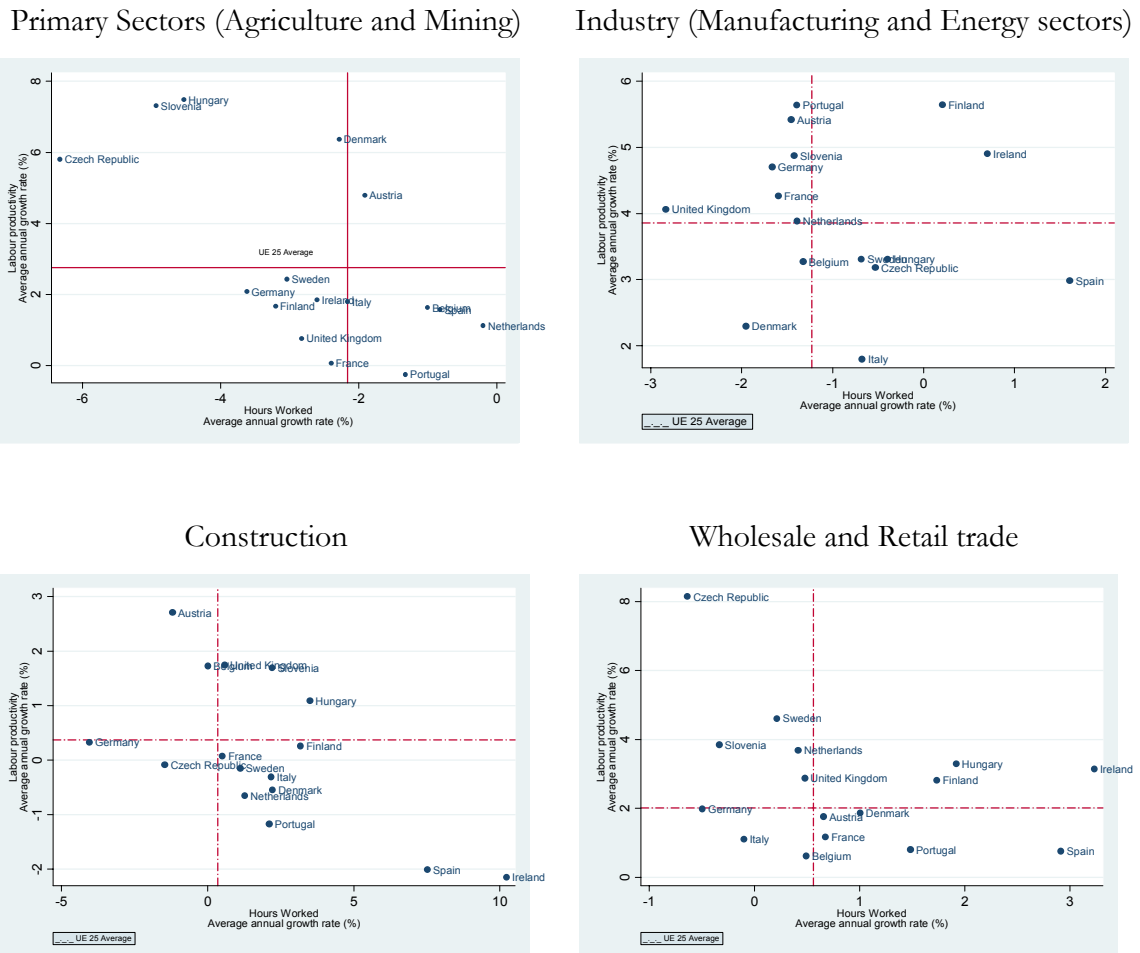
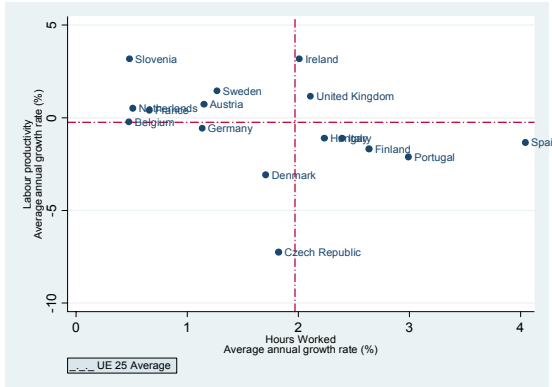
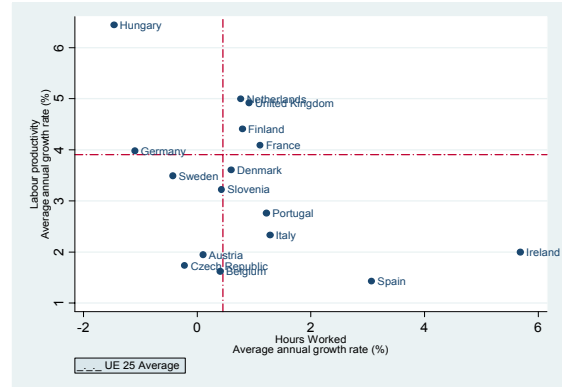


FIGURE A.1: Labour productivity (hourly) and hours worked by sectors (Average annual growth rate 1995-2005) (continued)

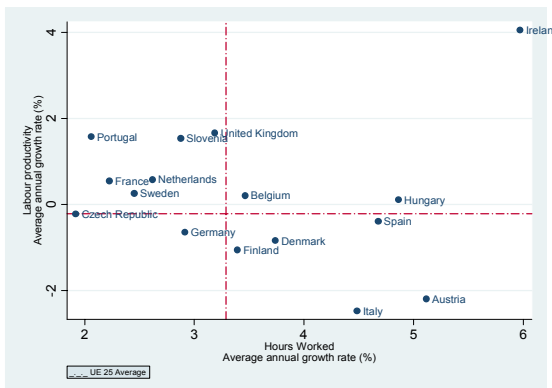
Hotels and Restaurants



Transport, Storage and Communications



Financial Intermediation, Real Estate and Business Services



Community Social and Personal Services

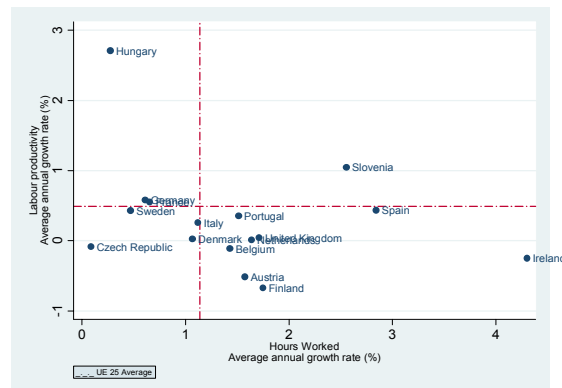


Table A1: Description of variables

	MFP (growth rate)	Growth rate of Total Factor Productivity (sectoral-country data) Source: EU KLEMS database
	Fixed-term Contracts (growth rate)	Growth rate of Fixed-Term Contracts (sectoral-country data) Source: EUROSTAT
	Part-time contracts (growth rate)	Growth rate of Part-Time Contracts (sectoral-country data) Source: EUROSTAT
	Hours worked (growth rate)	Growth of weekly hours worked (sectoral-country data) Source: EUROSTAT
Organisational variables	Protection of fixed-term contracts	Protection of fixed-term contracts: Degree of protection of fixed-term contracts x proportion of fixed-term contracts Degree of protection of fixed-term contracts (country data): It measures the cost of fixed-term contracts, computed as the average of two variables. The first one is equal one if fixed-term contracts are allowed only: (1) for jobs that are temporary by nature; (2) for temporary vacancies to replace a permanent worker in maternity or sickness leave; (3) for training contracts; (4) for seasonal work; and/or (5) if the law expressly states that the will of the parties involved in the contract is not a good enough reason for entering into a fixed-term contract. Equals zero otherwise. The second variable is the normalised maximum duration of fixed-term contracts. Source: laws of each country, elaborations of Botero <i>et al.</i> (2004) Proportion of fixed-term contracts: Incidence of workers with fixed-term contracts on total employment Source: EUROSTAT
	Protection of part-time contracts	Protection of Part-Time contracts: Degree of protection of part-time contracts x proportion of part-time contracts Degree of protection of part-time contracts (country data): It measures the existence and cost of part-time contracts computed as the average of 1) a dummy variable equal to one, if part-time workers enjoy the mandatory benefits of full-time workers, 2) a dummy variable equal to one, if terminating part-time workers is at least as costly as terminating full-time workers. Source: laws of each country, elaborations of Botero <i>et al.</i> (2004) Proportion of part-time contracts (sectoral-country data): Incidence of workers with part-time contracts on total employment Source: EUROSTAT
Institutional variables	Cost of increasing hours worked	Cost of Overtime x Growth of weekly hours worked: Cost of overtime (country data): The cost of overtime measures the cost of increasing hours worked obtained by calculating the “normal” hours of work per year in each country (excluding overtime, vacations, holidays, etc.). When the hours worked exceed this maximum, a firm uses overtime. Source: laws of each country, elaborations of Botero <i>et al.</i> (2004) Growth of weekly hours worked (sectoral-country data): Source: EUROSTAT

	<p>Union Power Index</p>	<p>Degree of protection and bargaining power of unions x proportion of employees</p> <p>Degree of protection and bargaining power of unions (country data):</p> <p>It is computed as the average of the following seven dummy variables which are one: 1) if employees have the right to unionise, 2) if employees have the right to collective bargaining, 3) if employees have the legal duty to bargain with unions, 4) if collective contracts are extended to third parties by law, 5) if the law allows closed shops, 6) if workers, or unions, or both, have the right to appoint members to the Boards of Directors, 7) if workers' councils are mandated by law.</p> <p>Source: laws of each country, elaborations of Botero <i>et al.</i>(2004)</p> <p>Proportion of employees (sectoral-country data):</p> <p>Incidence of employees on total employment</p> <p>Source: EUROSTAT</p>
	<p>Collective disputes Index</p>	<p>Protection of workers during collective disputes:</p> <p>Protection of collective disputes x proportion of workers involved in collective disputes</p> <p>Protection of collective disputes (country data):</p> <p>This indicator is computed as the average of the following eight dummy variables which are one: 1) if employer lockouts are illegal, 2) if workers have the right to industrial action, 3) if wildcat, political, and sympathy/solidarity/ secondary strikes are legal, 4) if there is no mandatory waiting period or notification requirement before strikes can occur, 5) if striking is legal even if there is a collective agreement in force, 6) if laws do not mandate conciliation procedures before a strike, 7) if third-party arbitration during a labour dispute is mandated by law, 8) if it is illegal to fire or replace striking workers.</p> <p>Source: laws of each country, elaborations of Botero <i>et al.</i>(2004)</p> <p><i>Proportion of workers involved in collective disputes</i> (sectoral-country data)</p> <p>Incidence of workers involved in collective disputes on total employment</p> <p>Source: EUROSTAT</p>
<p>Unmeasured Inputs (TEC)</p>	<p>R&D</p>	<p>Sectoral R&D expenses standardised to value added</p> <p>Source: EUROSTAT</p>