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Employment Protection Legislation and Catching up

Ton van Schaik and Theo van de Klundert*

Department of Economics
Tilburg University
P.O. Box 90153
5000 LE Tilburg
The Netherlands

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For Peer Review

- Professor Emeritus of Empirical Macroeconomics and Professor Emeritus of Economics, Department of Economics, Tilburg University. E-mail corresponding author: Schaik@uvt.nl

Employment Protection Legislation and Catching-up

Abstract

After WW II productivity growth in Europe and Japan was driven by catching-up with the US. Institutions in Europe were different too and were well suited for economic growth through imitation and adaptation of the technology to local circumstances. Catching up is, however, a self-defeating process. It ends when the technology frontier is attained or when in case of conditional convergence institutions set a limit to the process of catching up. Once this situation is reached, the existing institutions may no longer be appropriate. Regression analysis on a panel of 21 OECD-countries reveals that employment protection legislations (EPL) had a positive impact on productivity growth in the period of rapid convergence in the sixties and seventies. However, from the eighties onwards the total effect of EPL on labour productivity growth was negative.

Keywords:

Extensive growth, intensive growth, catching-up, labour force participation, employment protection

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1 Introduction

The economic history of Europe after WW II differs from that in the US for two important reasons. First, Europe started with a backlog in terms of the productivity level (output per hour) and material welfare (output per capita). Second, the political climate in Europe differs from that in the US resulting in more regulation of markets. Economic institutions, formal as well as informal, vary across European nations, but in general there is more regulation in the product market, the capital market and the labour market than in the US.

Institutions matter for economic growth, but the key question is which institutions are appropriate under certain circumstances. For example, Eichengreen (2007) argues that institutions that were well suited for the golden age in Europe, based on catching up, were less conducive to innovation after the potential for imitation of the US vanished. Here, we intend to investigate this hypothesis by applying regression analysis for a panel of 21 OECD-countries, starting from 1960 onwards. Unfortunately, there are only long time series for a limited number of institutions. As a consequence, we have to restrict the analysis to the impact of labour market institutions over the period 1960-2005. Among these institutions Employment Protection Legislation (EPL) appears to be the dominant factor.

The plan of the paper is as follows. In Section 2 we compare the economic history of the EU-15 and the US on an aggregate level. Attention is given to the time paths of productivity, material welfare an labour participation (hours per capita). Following Dew-Becker and Gordon (2006) and OECD (2007b) it is argued that participation is negatively correlated with labour productivity.

In Section 3 we discuss the relationship between catching up and institutions from a theoretical perspective. As shown by Acemoglu, Aghion and Zilibotti (2002) countries on the technological frontier have to follow a different strategy at the firm level than countries that follow the leader at some distance. Whether the appropriate strategy is applied depends on institutions in the product market and the capital market. It can be argued that labour market institutions play

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a similar role. However, empirical results in the literature on the impact of EPL are mixed. The state of the art is summarized by Bassanini and Venn (2007, p. 12) concluding: “The existing cross-country evidence on the relationship between EPL and productivity growth is inconclusive”. An important reason for this is that there is no uniformity with respect to the composition of samples in terms of number of countries and period of estimation. Leaving countries out of the sample or introducing separate dummies for one or more countries is somewhat arbitrary.

Our own empirical research is presented in Section 4. Productivity growth is studied by running regressions for a panel of 21 OECD countries applying 5-year averages to eliminate short-run influences. Fixed country effects and time dummies are taken into account to allow for heterogeneity. It appears that EPL is significant and state dependent in accordance with the theory. In the course of time positive effects of EPL on labour productivity growth make room for a negative impact. The paper closes with conclusions.

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2 Economic growth in Europe and the US

The economic history of the US differs in a remarkable way from that of Europe. This can be illustrated by presenting time paths for output per hour (productivity), hours per capita (participation) and, combining these two, output per capita (welfare). In Figure 1 these aggregates are shown for the EU-15 relative to the levels in US for the period 1960-2005. The data are from Conference Board (2008). In 1960 European labour productivity was much lower than in the US. Thereafter there was a gradual increase in relative productivity that ended around 1995. In contrast, in 1960 labour force participation in Europe was substantially higher than in the US. In the course of time the relative participation rate shows a gradual decline that came to a halt around 1995. In the mid-1970s labour force participation in Europe became lower than that in the US, and in the 1990s relative positions in this respect have completely turned around as compared with the 1960s.

Figure 1 Output per hour (Y/H), hours per capita (H/N), and output per capita (Y/N) in the EU-15 relative to the US, 1960-2005

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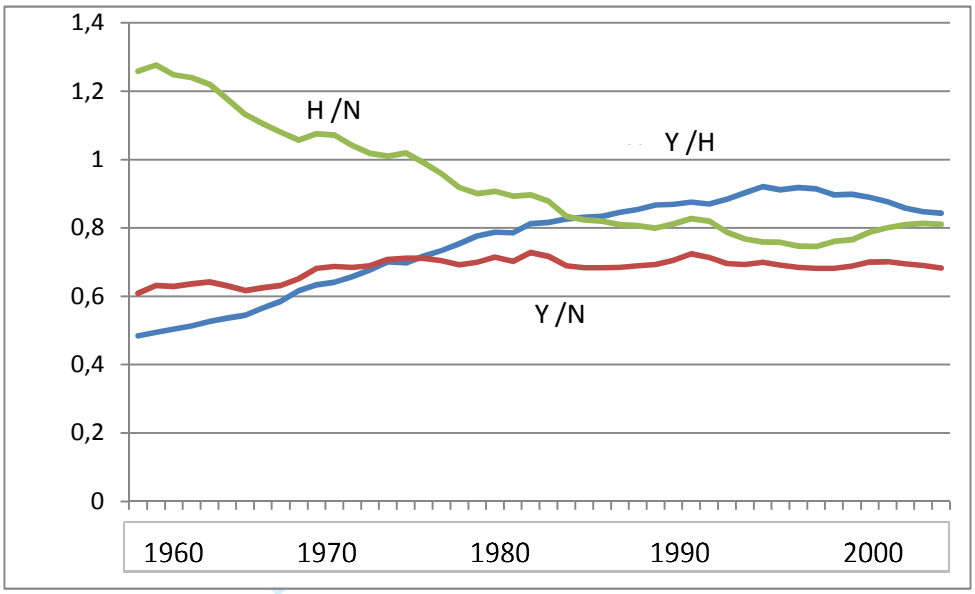

The implications of these developments for material welfare are straightforward. A relative increase in labour productivity raises welfare in Europe *vis-à-vis* the US. A relative decline in labour participation has the opposite effect. On balance output per capita increased in Europe *vis-à-vis* the US until the mid-seventies, and remained more or less constant afterwards (Y/N = H/N*Y/H).

Table 1 Output per hour (Y/H), hours per capita (H/N), and output per capita (Y/N) in the EU-15 and US (yearly percentage changes)*

	EU-15			US		
Period	Y/H	H/N	Y/N	Y/H	H/N	Y/N
1960-1965	5.3	-1.1	4.2	3.2	0.3	3.5
1965-1970	5.4	-1.5	3.9	2.0	0.3	2.3
1970-1975	4.0	-1.5	2.5	2.1	-0.5	1.6
1975-1980	3.5	-0.7	2.8	1.1	1.6	2.7
1980-1985	2.7	-1.4	1.3	1.6	0.6	2.2
1985-1990	2.2	0.8	3.0	1.3	1.0	2.3
1990-1995	2.3	-1.3	1.0	1.2	0	1.2
1995-2000	1.7	0.9	2.6	2.2	0.8	3.0

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2000-2005	1.1	0.1	1.2	2.4	-1.0	1.4

* Source: Conference Board (2008).

These developments are elucidated by the figures in Table 1, showing the growth rates of the variables in Figure 1 for the EU-15 and US separately. In order to trace accelerations and decelerations in the growth rates we consider 5-year averages. As can be seen, the EU-15 growth rate of output per hour shows a steady decline, whereas the development of the US growth rate of output per hour is U-shaped.

The good performance of the US economy in terms of productivity growth in the period 1960-1975 as compared to the period 1975-1995 is the result of efficient mass production inherited from the past (e.g. Nelson and Wright, 1992, Lazonick, 2009). In the course of time, however, the possibilities of further improvements along these lines petered out (cf. Gordon, 2004). This gave rise to a much discussed productivity slowdown that started in the mid-1970s and that lasted until the mid-1990s (cf. Dertouzos, Lester, and Solow, 1989).

The economic history of the European countries is quite different. The high growth rates of output per hour in the EU-15 in the 1960s and 1970s are the result of catching-up in a situation with a large technology backlog. As illustrated by Figure 1, in the beginning of the 1960s the European productivity level *vis-à-vis* the US was about 50%, but in the mid-1990s the backlog of Europe in terms of output per hour has decreased to only 10 percentage points. The age of mass production in Europe proceeded quickly and efficiently at the time when the peak in the US had already been reached. Catching-up is a matter of exhausting possibilities, which is reflected in the gradual decline of relative productivity increases. Eventually, the process of catching-up stopped raising questions about the appropriate institutional design as discussed in Eichengreen (2007).

Hours per capita in Europe declined until 1985, but in the second half of the 1980s and after 1995 the participation rate increased to a considerable extent. As a result the initial welfare backlog did not disappear completely, despite the long period of catching up in terms of output per hour. In 1960 the European level of material welfare *vis-à-vis* the US was 61%, and in 1970 it

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was 68%, but in 2005 the backlog of Europe in terms of output per capita was still 32 percentage points.

An increase in labour participation may induce a decline in labour productivity in the short run. The negative correlation between more hours and average labour productivity has been highlighted in several studies by OECD (2007a, 2007b). The impact on labour productivity resulting from more employment is in these studies referred to as a “composition effect”. The result follows from a downward sloping short-run labour demand curve. When hours increase the capital-labour ratio necessarily falls since capital cannot be adjusted instantaneously. Therefore, labour productivity declines. Moreover, an increase in hours may imply that less skilled and less experienced workers are hired (cf. Dew-Becker and Gordon, 2006). This also leads to a fall in labour productivity. In the long run these effects may vanish as the capital-labour ratio returns to its initial level and average experience of workers rises. However, as observed by Dew-Becker and Gordon (2008) there seems to be no long-run effects of employment on productivity.

Here we focus on explaining labour productivity growth, taking into account the following observations. First, we do not explain the rate of technological progress at the technology frontier, which is determined by the US economy. Second, we will apply panel data econometrics, because panel data as compared with simple cross section data give more information, more variability, less collinearity among the variables, more degrees of freedom and more efficiency (cf. Baltagi, 2008). To increase the degrees of freedom in the estimation procedure, next to the US and the EU-15 (leaving Luxembourg aside) the sample will be extended with six other OECD-countries (Australia, Canada, New Zealand, Norway, Japan and Switzerland). Third, as will be elaborated in the next section, convergence may be conditional, depending on the role of institutions in the process of economic growth.

3 Catching-up and institutions

In a seminal paper by Acemoglu, Aghion and Zilibotti (2002) it is argued that imitation and adaptation of new technologies to local circumstances flourishes under long-term relationships, with larger firms and experienced managers. Under such circumstances investment is more

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important than selection and the country has to apply an *investment-based* strategy. However, an economy that approaches the technology frontier has to switch to an *innovation-based* strategy with shorter relationships, younger firms and more selection of managers and activities.

An important lesson of the paper by Acemoglu, et al. (2002) is that institutions that are appropriate for a relatively backward economy, encouraging long-term relationships and greater investment, may be harmful for economies closer to the technology frontier. Therefore, a relatively backward economy that adopts these institutions must abandon them at some point in time to create an innovative climate, characterised by flexible markets and selection. Although Acemoglu, et al. (2002) emphasize the role played by product market conditions their ideas may be generalized to institutions in the labour and the capital market. This corresponds with the view presented in Eichengreen (2007). The author distinguishes *extensive growth*, based on capital formation and the existing technology, from *intensive growth*, which means growth through innovation. In the 1950's and 1960's Europe relied on extensive growth, but according to the author, somewhere in 1970's the European region had to switch to intensive growth. Such a switch was not self-evident: " The problem was that the institutions tailored to the needs of extensive growth were less suited to the challenges of intensive growth" (Eichengreen, 2007, p.6).

In this paper we want to focus on the impact of labour market institutions. As will be made clear below, in explaining productivity growth in different periods employment protection legislation (EPL) plays an important role. As acknowledged in the literature EPL may have positive as well as negative effects on productivity growth (e.g. Addison and Teixeira, 2004; Auer, Berg and Coulibaly, 2005; Bassanini, Nunziata and Venn, 2009). EPL may foster productivity growth because it motivates workers to share their ideas about possible improvements with the management of the firm. Moreover, if employment is secure work motivation and commitment of workers will be strong. Indeed, job-security is a precondition for high-performance work systems, implying a reorganization of work, away from the Taylorist model of direct supervision towards autonomous groups focusing on problem-solving and quality improvement (Auer, et al.,2005).

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EPL may also have negative effects on productivity growth, because it reduces the reallocation of labour from declining to expanding sectors and dampens job creation. EPL may also be in conflict with the need for greater flexibility in sectors producing new goods and services because of their more volatile demand. Nickell and Layard (1997) have countered that these effects may be offset by the existing turnover of workers. However, as argued by Addison and Teixeira (2004) their argument is unconvincing, because the reason why firing restrictions bind in reality is because some firms want to reduce employment by more than can be realized by waiting for quits.

The theoretical ambiguity with respect to the impact of EPL on productivity growth can be solved empirically by running regressions with productivity growth as the dependent variable and EPL and other (control) variables as independent variables applying pooled cross-section time series analysis on a macroeconomic level or using country-industry datasets. Here we follow a specific procedure inspired by the ideas of Acemoglu, et al. (2002) and Eichengreen (2007), discussed above. Our hypotheses, which have to be tested econometrically, read: (1) EPL has a positive impact on productivity growth during the process of catching-up when countries apply an investment-based strategy; (2) EPL has a negative impact on productivity growth when the potential to grow by imitation has petered out and countries have to apply an innovation-based strategy. Such a negative effect may possibly prevent full convergence.

4 Econometric results

4.1 Measurement

The influence of employment protection legislation (EPL) on productivity growth is analyzed by running regressions for a pool of 21 OECD countries over the period 1960-2005. Data sources for economic and institutional variables are presented in the Appendix. To eliminate short-run influences we again consider 5-years averages. This practice is not unusual in empirical growth literature (cf. Islam, 1995, Barro and Sala-i-Martin, 1995).

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Across-the-board, one could identify three phases in the development of employment protection. The first phase coincides with the Golden Age, i.e. the period 1950-1970, when there was a shortage of labour. The general attitude of OECD countries was then to secure low unemployment rates but no particular job protection. The rise in unemployment marks the beginning of a second phase in the seventies, where the quest for job protection legislation increased. The third phase began in the early eighties when labour market institutions, and in particular job protection legislation, were suspected to play an important role in rise of unemployment.

Table 2 describes the correlations between the seven variables of our sample. The first column shows that productivity growth is positively correlated with the investment rate and wage coordination. The high negative relation between productivity growth and the productivity ratio (CU) confirms the logic of the process of catching-up: when approaching the technological leader productivity growth slows down. As expected, productivity growth is negatively correlated with the growth rate of hours per capita. There is no correlation with EPL. There is also no correlation between EPL and the other economic variables (productivity ratio, investment rate and the growth rate of hours per capita). EPL is positively correlated with unemployment compensation and wage coordination. In other words, there is considerable multicollinearity in the labour market data. This problem can be tackled by clustering the individual indicators into one single measure, as for instance in Storm and Naastepad (2009). However, applying such composites makes it difficult to detect the impact of specific labour market institutions. Moreover, as we focus on the role of EPL with respect to productivity growth this is not the way to proceed.

Table 2 Pearson Correlations

	Y/H	CU	I/Y	EPL	UC	COOR	H/N
Y/H	1						
CU	-.67**	1					
I/Y	.34**	-.27**	1				
EPL	-.12	.08	-.06	1			
UC	-.36**	.41**	-.29**	.22**	1		
COOR	.27**	-.17*	.23**	.16*	.07	1	
H/N	-.48**	.24**	-.18*	.01	.14	-.17*	1

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Y/H = Output per hour (growth rate), CU = productivity ratio, I/Y = Investment rate, EPL = Index employment protection legislation, UC = Index unemployment compensation, COOR = Index wage coordination, H/N = Hours per capita (growth rate). The number of observations is 189 (21 countries and 9 five-year periods over 1960-2005). ** significant at the 99% confidence level, * 95% level (2-tailed).

Table 3 Regression of labour productivity growth

	(1)	(2)	(3)	(4)	(5)
Constant	-0.32 (0.66)	0.08 (0.18)	1.37 (2.38)**	2.47 (3.24)***	2.11 (2.27)**
Catching-up factor	-3.90 (11.65)***	-3.54 (10.05)***	-5.75 (11.41)***	-4.69 (6.67)***	-4.80 (6.89)***
Hours per capita (growth)		-0.50 (5.82)***	-0.29 (3.81)***	-0.36 (4.39)***	-0.36 (4.40)***
Investment rate	0.08 (3.75)***	0.06 (3.25)***	0.03 (1.15)	-0.00 (0.09)	0.01 (0.20)
Employment Protection Legislation					0.09 (0.48)
Unemployment compensation					0.02 (1.24)
Wage coordination					0.22 (0.86)
Time dummies	No	No	No	Yes	Yes
Fixed country effects	No	No	Yes	Yes	Yes
Number of observations	189	189	189	189	189
R-squared adjusted	0.53	0.62	0.75	0.77	0.77

White robust t-values between brackets: *** significant at the 99% confidence level, **95% level, *90% level (2-tailed)

Table 3 Regression of labour productivity growth (continued)

	(6)	(7)	(8)
Constant	2.21 (2.72)***	2.04 (10.51)***	2.00 (10.12)***
Catching-up factor	-4.12 (4.60)***	-3.81 (4.38)***	-4.09 (4.89)***
Hours per capita (growth)	-0.38 (4.23)***	-0.38 (4.38)***	-0.38 (4.49)***
Investment rate	-0.02 (0.56)		
Employment Protection Legislation:			
1960-2005	0.82 (1.75)*	0.74 (1.95)*	
1955-2000			0.95 (2.59)***
Additional effect 65-69	-0.32 (0.56)	-0.08 (0.21)	-0.05 (0.10)
Additional effect 70-74	-0.65 (1.31)	-0.67 (1.99)**	-0.66 (1.94)*
Additional effect 75-79	-0.37 (0.77)	-0.79 (2.19)**	-0.86 (2.38)**
Additional effect 80-84	-1.14 (2.23)**	-1.07 (2.76)***	-1.19 (3.10)***
Additional effect 85-89	-0.89 (1.67)*	-0.88 (2.26)**	-0.96 (2.49)**
Additional effect 90-94	-1.22 (2.31)**	-1.08 (2.60)***	-1.16 (3.86)***
Additional effect 95-99	-1.21 (2.11)**	-0.74 (1.82)*	-0.84 (2.12)**
Additional effect 00-04	-1.11 (1.94)*	-1.11 (2.56)**	-1.20 (3.82)***
Unemployment compensation 1960-2005:	0.01 (0.27)		

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Additional effect 65-69	-0.03 (0.41)		
Etc. (All absolute T-Ratios smaller than one)			
Wage coordination 1960-2005:	0.11 (0.33)		
Additional effect 65-69	0.24 (0.81)		
Etc. (All absolute T-ratios smaller than one)			
Fixed country effects	Yes	Yes	Yes
Number of observations	189	189	189
R-squared adjusted	0.78	0.78	0.78

White robust t-values between brackets: *** significant at the 99% confidence level, **95% level, *90% level (2-tailed)

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4.2 Estimation

Several OLS-regressions explaining productivity growth are shown in Table 3. As appears form the first column of the table, with a t-statistic of greater than 10, productivity growth can be explained to a large extent by the catching up of the OECD countries *vis-à-vis* the state of art in the US. The catching-up factor is defined as the log of the ratio of output per hour of a country and the level of this variable in the US at the beginning of every five-year period. The process of catching up is sustained by investment. However, as we shall see, this result depends on neglecting unobserved heterogeneity which can be captured by fixed country effects.

As observed in Section 2, an increase in hours per capita reduces productivity growth. This effect can be captured by introducing the growth rate of hours per capita as an explanatory variable. The second equation in Table 3 shows that this variable has the expected sign and is highly significant. OECD estimates (cf. Bassanini and Venn, 2007, p.7) suggest that the elasticity of labour productivity to hours-adjusted employment rates (total hours per capita) is in the range -0.4 to -0.9. Our estimates are at the lower end of this range. The magnitude of the estimates implies that if the composition effect was the only channel linking labour market policies to productivity, a policy reform that increases total hours per capita by 1% would reduce labour productivity by 0.5% and result in an overall increase in GDP per capita of 0.5%.

The introduction of fixed country effects in the third equation of Table 3 does not change the statistical results substantially, except for the investment rate which becomes insignificant. It

appears that nearly all fixed effects (not reported here) are negative and highly significant. The exception is the group of countries which attained the US productivity level around 1995 (Belgium, France, Germany, Italy, Netherlands and Norway.) For this group the fixed country effects are small and statistically insignificant. The outliers in the process of catching up are Greece, New Zealand and Portugal. This is confirmed by the relatively high negative values of the fixed effects of these countries.

Up till now non-observed heterogeneity appears to be quite large. Presumably the investment rate, which is insignificant in equation 3 (Table 3), does not contribute to the explanation of specific differences between countries in the process of catching up. This is confirmed by the fourth equation which adds time dummies to the equation. As a result the investment rate completely disappears as an explanatory variable. However, most fixed country effects have decreased in value and a number of them become statistically insignificant. In the periods 1980-84, 1990-94 and 2000-04 the time dummies are negative and significant. It should be noticed that these periods were characterized by worldwide recessions unveiling the negative effects of existing institutions on productivity growth.

Labour market institutions are added in equation 5 of Table 3. Compared with equation 4 the statistical results do not change substantially, because the institutions are statistically not significant. This result raises the question about the specification of the equation. As explained in Section 3 the role of institutions in the process of catching up might change in course of time. This hypotheses is tested in equation 6 of Table 3, where the time dummies are interacted with the institutions. For instance, the basic relationship between productivity growth and EPL over the whole period 1960-2005 is positive (+0.82). The additional effects are found by estimating the product of EPL and the time dummies. These effects are negative and significant from 1980 onwards. As a consequence the total effect of EPL on productivity growth becomes smaller in course of time and is ultimately negative. The introduction of time-variant effects of institutions implies that fixed country effects are small and statistically not significant with a few exceptions as an outlier. Presumably, allowing EPL to play a time-changing role in the process of catching up suffices to eliminate non-observed heterogeneity between countries.

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In equation 6 the investment rate, unemployment compensation and wage coordination are statistically not significant. Omitting these variables results in equation 7. In equation 8 we introduce a one-period lag with respect to employment protection, because it may be argued that changes in institutions take time to make their effects come through. This is confirmed by the estimations. In the equation 8 the impact of EPL and of the interaction of EPL with time dummies is stronger than in equation 7. It should be observed that in the equations 7 and 8 the negative additional effects of EPL on productivity growth are significant from 1970 onwards.

It is interesting to note that in the equations 7 and 8 the constant term has a high explanatory power for productivity growth with a t-statistic greater than 10. The value of the constant term equals the average growth rate of US labour productivity over 1960-2005, which in the process of catching up serves as a benchmark for other countries. The actual rate of growth deviates from the long run value of 2% by catching up, the impact of labour force participation and employment protection. This is illustrated by the decomposition in Table 4. The imputed values of the effects on productivity growth of catching-up, labour force participation and employment protection are based on equation 8 of Table 3.

In Table 4 all the countries are mentioned separately, but the 9 time periods are aggregated into the sub-periods 1960-1980 and 1980-2005. This enables us to sharply confront the economic performance of individual countries in the era of extensive growth and strong catching up in the sixties and seventies with their performance during the transition to the era of intensive growth and diminishing possibilities for catching up in the eighties and nineties.

The first column of Table 4 gives the natural rate of growth by adding the imputed potential for catching and the growth rate of the technology frontier of 2%. The natural rate of growth approaches 2% in the second sub-period for countries like Belgium, France, Germany, Italy, Netherlands and Norway which are then close to the technological frontier. The second column gives the actual rate of growth, which in most cases is lower than the natural rate of growth. The difference between the actual rate and the natural rate of growth is to a large extent caused by the imputed effects of the growth of hours per capita in the third column and employment protection legislation in the last column of Table 4. Most of the positive deviations

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are realized in the first sub-period, 1960-1980, when a reduction in labour market participation and positive effects from EPL boosted productivity growth in many countries. In the second sub-period, 1980-2005, things are different as the effect of EPL becomes negative and the contributions of changes in the participation rate are moderate. Italy is a striking example. In the sixties and seventies the difference between the actual growth rate and the natural rate amounts to 1.8 percentage points. Of this 1.6 percentage points are explained by reduced labour participation and the stimulating impact of EPL. In the sub-period 1980-2005 the actual growth rate falls short of the natural rate by 0.8 percentage points, most of which is explained by the labour market distortions related to EPL.

At this point of the analysis it comes as no surprise that the qualitative impact of EPL in all countries confirms the hypothesis formulated at the end of Section 3. However, what should be emphasized is that the quantitative effects on productivity growth are substantial. Although this mainly applies to the positive effects in the sub-period 1960-1980, the negative effects in the second sub-period 1980-2005 are non-negligible too.

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Table 4 Natural and actual rate of productivity growth and effects of hours per capita and employment protection (imputed values from equation 8 in Table 3)

Country	Period	Natural rate of growth (2 + catching-up)	Actual rate of productivity growth	Effect growth rate of hours per capita	Effect of Employment Protection
Australia	1960-1980	3.1	2.4	0	0
	1980-2005	2.9	1.7	-0.2	-0.1
Austria	1960-1980	4.7	5.3	0.5	0.2
	1980-2005	2.8	2.4	0.2	-0.3
Belgium	1960-1980	3.8	5.3	0.6	0.3
	1980-2005	2.0	1.8	0.0	-0.3
Canada	1960-1980	2.6	2.1	-0.4	0.1
	1980-2005	2.7	1.4	-0.1	-0.1
Denmark	1960-1980	3.6	3.4	0.2	0.4
	1980-2005	2.5	1.9	0.0	-0.2
Finland	1960-1980	5.2	4.4	0.3	0.1
	1980-2005	3.4	2.8	0.2	-0.2
France	1960-1980	3.8	4.5	0.3	0.2
	1980-2005	2.1	2.3	0.3	-0.3

Germany	1960-1980	3.8	4.5	0.5	0.7
	1980-2005	2.1	2.3	0.3	-0.3
Greece	1960-1980	6.4	6.8	0.5	1.0
	1980-2005	4.6	1.5	-0.2	-0.4
Ireland	1960-1980	5.9	4.9	0.5	0.1
	1980-2005	3.6	3.3	-0.5	-0.1
Italy	1960-1980	4.2	6.0	0.7	0.9
	1980-2005	2.3	1.5	0	-0.4
Japan	1960-1980	6.0	6.5	0.1	0.8
	1980-2005	3.7	2.5	0.2	-0.2
Netherlands	1960-1980	3.2	3.8	0.3	0.7
	1980-2005	2.2	1.8	0	-0.3
New Zealand	1960-1980	3.6	1.3	0	0.1
	1980-2005	3.9	1.5	0	-0.1
Norway	1960-1980	3.9	4.5	0.3	0.9
	1980-2005	2.1	2.6	0.1	-0.3
Portugal	1960-1980	6.7	5.4	0.1	0.1
	1980-2005	5.0	1.8	-0.2	-0.4
Spain	1960-1980	6.2	6.7	0.4	1.4
	1980-2005	3.4	1.8	-0.3	-0.3
Sweden	1960-1980	3.4	3.6	0.3	0.8
	1980-2005	2.8	1.7	0	-0.4
Switzerland	1960-1980	2.7	2.8	0.3	0.1
	1980-2005	2.6	0.9	0	-0.1
United Kingdom	1960-1980	4.0	3.2	0.4	0.1
	1980-2005	3.0	2.4	0.1	-0.2
United States	1960-1980	2.0	2.1	-0.2	0.1
	1980-2005	2.0	1.7	-0.1	0

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5 Conclusions

After WW II productivity growth in Europe and Japan was driven by catching-up with the US. In a number of European countries convergence to the technology frontier, determined by the US economy, was completed somewhere around 1995. Other countries also started at low relative productivity levels in 1960, but did not fully exploit their potential for catching up. In contrast to all the other countries Australia, Canada, New Zealand, and Switzerland started at high relative productivity levels in 1960, but did not succeed in substantially improving these levels.

As argued by Eichengreen (2007) institutions that are appropriate in the phase of catching up or extensive growth are less suited in the phase of intensive growth, which means growth through innovation. Theoretical support for this view is found in Acemoglu, Aghion and Zilibotti (2002). Although regulation in different markets is involved we focus on the impact of labour market institutions on productivity growth. The main reason for focusing on the labour market is that we need long time series for institutional variables to test the hypothesis formulated by Eichengreen (2007). Such long series are available for the labour market only.

The impact of labour market institutions on productivity growth is analyzed by running regressions for a panel of 21 OECD countries over the period 1960-2005. To eliminate short-run influences we consider 5-year averages, so that the number of observations amounts to 189. Productivity growth is explained by catching up, the investment rate and changes in hours per capita. However, if country and time dummies are introduced the influence of the investment rate vanishes. Institutional variables, like unemployment compensation, wage coordination and employment protection legislation (EPL) appear insignificant.

To test the hypotheses mentioned above we expand the equation to be estimated by introducing interaction terms combining time dummies and the institutional variables. This allows for a different impact of institutions in the nine sub-periods of the sample. The conclusion with respect to unemployment compensation and wage coordination is not changed. Both variables remain insignificant. However, the result with respect to EPL is spectacular. In the sixties the effect of EPL on productivity growth is positive and very significant. As time goes by and extensive growth becomes less dominant the impact of EPL diminishes and there is a reversion

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of sign from 1980 onwards. In the more recent period 1980-2005 EPL has a negative effect on productivity growth corresponding with the notion that intensive growth is stimulated by labour market flexibility.

The effect of EPL on the growth rate of individual countries varies a great deal as may be expected. The positive effect in the period 1960-1980 lies in the range of 0 to 1.4 percentage points. The negative effect in the sub-period 1980-2005 amounts to 0.25 percentage points on average. It should be stressed that the latter result is the net effect of still existing positive influences on worker motivation and commitment at the one hand and the negative aspects of hampering reallocation of labour and risk taking by firms at the other hand.

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Appendix

Data on labour market institutions EPL (index employment protection), UC (index unemployment compensation) and COOR (index wage coordination) are borrowed from Allard and Lindert (2006). The economic data Y (output), H (total annual hours worked), N (population) come from Conference Board and Groningen Growth and Development Centre (2008). The investment rate (I/Y) is from the Penn World Tables (PWT 6.2). The dataset and the figures of labour productivity in 20 individual countries relative to the US (1960-2005) are available on line.

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