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Market services labour productivity growth in three small European countries: Austria, Belgium and the Netherlands

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Abstract – In order to improve our understanding of the divergent evolutions that recently emerged between European countries in terms of labour productivity, this paper compares the labour productivity growth of three small open European countries: Austria, Belgium and the Netherlands. The analysis focuses on market services as they are the most important single factor that is responsible for the divergences. The comparison shows that, while Austria and Belgium recorded a decrease in their productivity growth between 1995 and 2004, the Netherlands followed the American pattern and has recorded an increase in their growth rate since 1995. The decomposition of labour productivity growth makes it possible to underline the important role played by total factor productivity (TFP) in the Dutch upsurge in productivity growth. The breakdown of the data by industry shows the importance of the Distribution sector in the Dutch performance. The growth of TFP observed in the Distribution sector is then linked to different potential determinants: ICT accumulation and use, labour qualifications, R&D and innovation and regulations.

Jel Classification - O30, O47, O57.

Keywords – Market services, Labour productivity, Determinants of TFP.

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1. Introduction

The launch of the Lisbon strategy in 2000 was strongly motivated by the observation of a declining trend in European labour productivity growth over the preceding decade. As US productivity growth accelerated after 1995, this divergent evolution indicates that, after a process of catching up to the US productivity level that started after the World War II, the European productivity levels ceased to converge to the US level after 1995. The widening gap in productivity performance was first attributed to a differential in the productivity growth of ICT producer industries and later to divergences in productivity growth of ICT user industries and particularly in ICT user market services[1].

However, this average European evolution does not necessarily apply to all European countries considered individually. The second half of the nineties was also a period of increasing divergences in productivity growth patterns inside the European Union. The productivity performances of the Scandinavian countries are, for example, in line with those of America but are far from the Spanish or Italian evolutions.

The main objective of this paper is to compare the evolution of labour productivity growth in three small open European countries: Austria, Belgium and the Netherlands. The analysis focuses on market services as they are the most important single factor in the divergences in labour productivity growth with the US. The study uses the March 2007 release of the EUKLEMS database, which is the first data set to present homogeneous variables on growth and productivity for European countries and the US. This EUKLEMS database offers the main advantage of providing a better measure of capital input by calculating capital services rather than capital stocks.

The paper is structured in two parts: the first is devoted to a detailed analysis of the evolution of labour productivity in market services in the three countries and the second is dedicated to a preliminary study of the potential determinants of the TFP growth, which appears in the first part of the paper, playing an important role in the divergences in labour productivity.

[1] For a recent detailed analysis see van Ark, O'Mahony and Ypma (2007).

2. Productivity in market services

2.1. General assessment

During recent decades, market services have increased their economic importance in most industrialised countries. They have played a growing role in terms of value added and job creation. The EUKLEMS database provides valuable data for measuring this evolution for a sub-sector, market services excluding Post and telecommunication, called 'market services' hereafter, which includes the sectors with NACE code G, H, I (without Post and telecommunication (60 to 63)), J, K (without Real estate activities (71 to 74)), O and P. Post and telecommunication are removed from market services because these industries are aggregated with others to constitute the sub-sector 'ICT producer sector'. The development of this sub-sector is mainly influenced by its own factors, such as technological progress, which are not necessary present for other market services. Real estate activities are considered as non-market services given the difficulties in correctly measuring the output of this industry.

The increase in the relative importance of market services in total number of persons engaged in the three small European countries and in the US is illustrated by Table 1. Although this increasing trend is common to all studied countries, it is more perceptible in the US and in the Netherlands. A comparable picture emerges from Table 2 where the relative importance of market services is measured in terms of value added at constant prices for the whole economy. The Netherlands has again recorded an evolution closer to that of the US.

Table 1 - Relative importance of market services in total number of persons engaged *(%)*

	1970	2004
Austria	24.9	42.4
Belgium	34.1	45.7
The Netherlands	39.3	51.6
United States	40.2	51.9

Source: Own calculations with EUKLEMS database.

Table 2 - Relative importance of market services in total real value added *(%)*

	1970	2004
Austria	32.8	39.2
Belgium	41.4	39.6
The Netherlands	39.5	43.0
United States	28.3	41.7

Source: own calculations with EUKLEMS database.

However, market services have traditionally had less impressive performance in terms of productivity growth. As illustrated by Table 3, this characteristic better describes European services than American ones. During the most recent period, 1995-2004, labour productivity growth in market services decreased in the EU15 overall, Austria and Belgium but increased rapidly in the US and, at a slower pace, in the Netherlands.

Table 3 - Labour productivity growth in market services *(average annual growth rate, %)*

	US	EU15	Austria	Belgium	The Netherlands
1975-1985	n.a.	1.71	2.04	1.65	1.49
1985-1995	1.42	1.67	2.08	1.08	0.28
1995-2004	3.21	0.87	0.49	0.97	1.93

Source: Own calculations with EUKLEMS database.

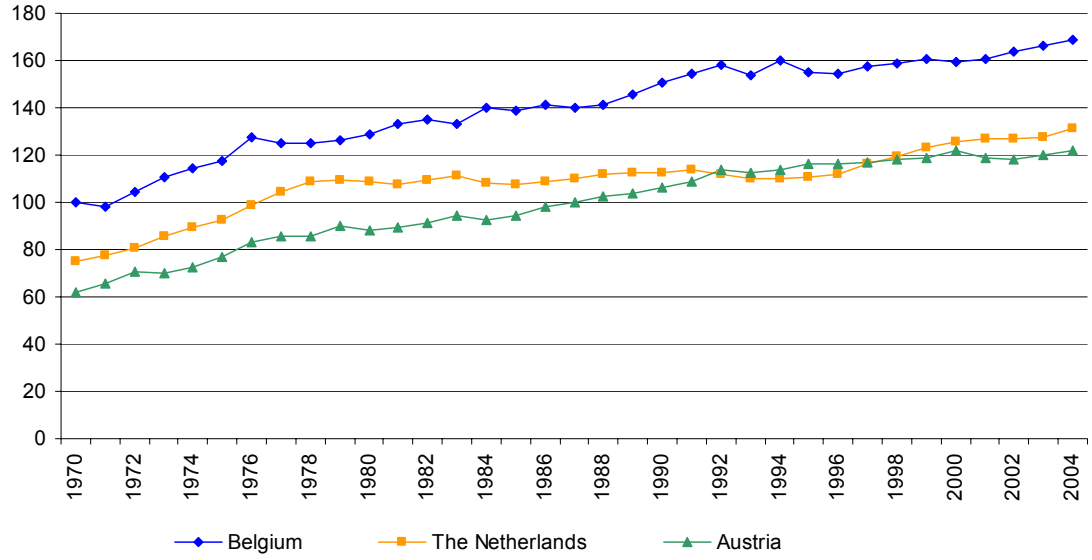
The different productivity growth rates between countries could be linked to differences in levels of productivity. Productivity level comparisons have to be considered with caution as they are subject to more measurement uncertainty than comparisons of growth rates. Moreover, differences in aggregated productivity levels may reflect differences in industry mix. They also have to be interpreted in a broader context by taking into account differences in the intensity of labour utilisation (working hours per head of population)[2].

Traditionally, Belgium is known for its high level of observed productivity. It could be therefore easier for the Netherlands and Austria to record higher productivity growth rates than for Belgium (β convergence in the catching-up theory[3]). However, as illustrated by Graph 1 on the levels of productivity in market services, this explanation applies only partly to the current situation. The differences in the level of productivity between the three countries have been marked since the beginning of the period. But the catching-up effect, measured by the decrease in differences in levels, has only occurred in the Netherlands since 1996. Moreover, this effect is only visible in the Dutch case and not in that of Austrian. Therefore, it could be inferred that specific evolutions in the Dutch economy at least partly explain the better productivity growth performance.

[2] Cette (2005) shows that by estimating returns to hours worked and the employment rate it is possible to calculate structural hourly productivity, i.e. the productivity level assuming the hours worked and the employment rate are constant. By comparing this structural hourly productivity levels for the main industrialised countries, i.e. productivity levels based on the assumption that hours worked and the employment rate are the same as in the US, he shows that only Norway maintains a productivity level above that of the US. Unfortunately, this exercise did not include Belgium and Austria. Dolman, Parham and Zheng (2007) calculated structural productivity levels after adjustments for difference in labour utilisation, assuming the long-run productivity elasticities to employment rates and hours worked per employed person reported in Berlorgey, Lecat and Maury (2006), for most of OECD countries for the year 2002. Austria, the Netherlands and Belgium exhibited a quasi-identical level of structural productivity that was slightly below that of the US and with a Belgian productivity level slightly below those of the two neighboring countries.

[3] Two useful measures of convergence are commonly referred to as sigma convergence (σ) and beta convergence (β). Sigma convergence refers to a decline in the dispersion of countries' productivity levels. Beta convergence refers to productivity growing faster in countries with initially lower productivity levels. The speed of convergence measures the rate at which these initial productivity gaps are closed.

Graph 1 - Labour productivity level in market services – 1970 Belgian level = 100



Source: Own calculations with EUKLEMS database.

2.2. Productivity growth decomposition

To better understand these performances, it is useful to observe each component of labour productivity growth estimated from the growth accounting decomposition framework. Four determinants of productivity can be identified in this framework: labour composition, ICT capital deepening, non ICT capital deepening and TFP. This decomposition, estimated over the periods 1985-1994 and 1995-2004, is given in Table 4. It allows the common evolutions and divergences between the three small European countries and the US to be underlined.

The labour composition effect decreased in all of them, leading to the conclusion that the improvement in labour quality was lower during the second period, in contrast to that observed for the US. The ICT capital deepening contribution increased and became larger than NICT capital deepening, underlying the fact that ICT capital accumulation also occurred rapidly in the services sector. However, in comparison to the evolution of American ICT and NICT capital deepening, the spread of new technologies was much faster in the US than in the three European countries. In Austria and Belgium, TFP contribution decreased sharply (Austria) or was constantly negative (Belgium). The US and the Netherlands, on the other hand, recorded a large increase in the TFP contribution during the most recent period. During this period, TFP growth accounted for 54% of Dutch labour productivity growth, which is an even larger percentage than the 45% observed for the US.

Table 4 - Labour productivity decomposition for market services *(average annual growth rate, %)*

Country	Period	Total	Labour composition	NICT Capital deepening	ICT Capital deepening	TFP
Austria	1985-1995	2.08	0.37	0.42	0.41	0.88
	1995-2004	0.49	0.17	-0.02	0.75	-0.42
Belgium	1985-1995	1.08	0.41	0.40	0.70	-0.43
	1995-2004	0.97	0.22	0.21	0.80	-0.27
The Netherlands	1985-1995	0.28	0.20	0.04	0.49	-0.44
	1995-2004	1.93	0.07	0.08	0.74	1.04
US	1985-1995	1.42	0.34	0.20	0.62	0.26
	1995-2004	3.21	0.40	0.34	1.04	1.43

Source: Own calculations with EUKLEMS database.

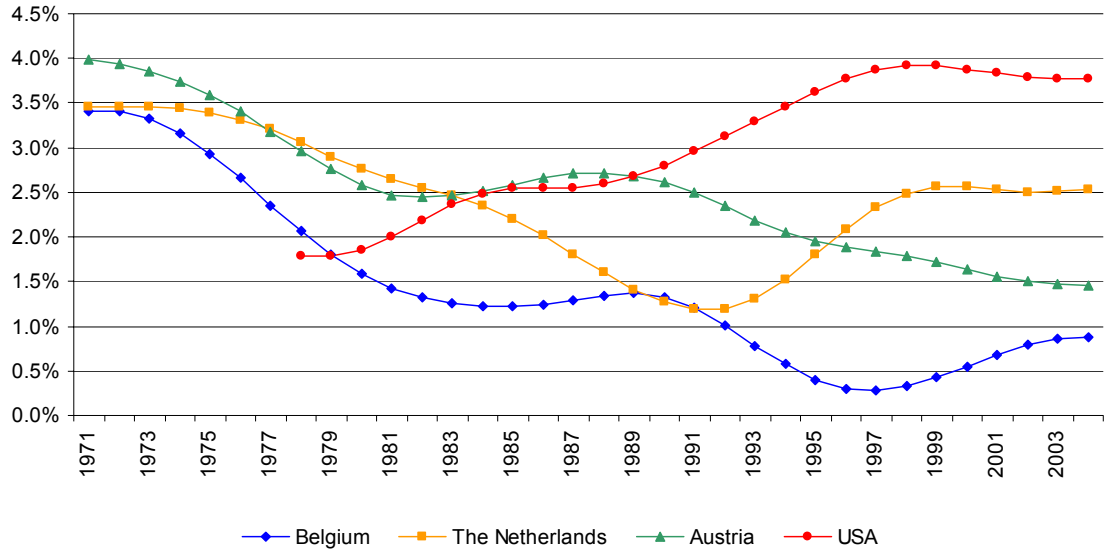
Table 4 clearly illustrates that the divergences in labour productivity growth observed between Belgium and the Netherlands over the most recent period, 1995-2004, was exclusively due to TFP evolution.

Therefore, it is instructive to identify which industries are the main drivers of the upsurge in Dutch productivity and TFP growth.

2.3. Within market services

Three main market services industries are identified in the EUKLEMS database: Distribution[4], Finance and business services[5] and Personal services[6]. The breakdown of the data by industry reveals that the acceleration of labour productivity growth in the US and the Netherlands is due to these three industries. However, during the most recent decade, these countries recorded a particularly high labour productivity growth in Distribution in comparison to Austria and Belgium, as illustrated by Graph 2, which gives the trends in labour productivity growth obtained by the Hodrick-Prescot filtered series (with the lambda parameter set to 1).

Graph 2 - Growth rate of labour productivity (HP filtered) – Distribution sector



Source: Own calculations with EUKLEMS database.

The confirmation of the role played by Distribution in the labour productivity growth of market services is also given by the contribution of the three main industries to labour productivity growth in market services, estimated by weighting the labour productivity growth of each industry by its average share in total nominal gross value added of market services (EUKLEMS approach). The results show that the contribution of Distribution to labour productivity growth in Dutch market services increased substantially during the most recent period. During this period, 71% of the labour productivity growth in the Dutch market services sector came from labour productivity growth in Distribution. This strong contribution of Distribution is mainly due to Wholesale and retail trade (50 to 52), and in particular to Wholesale trade and commission trade (51). By contrast, the contribution of the Distribution sector to the labour productivity

4 NACE codes G (50 to 52) and I without post and telecommunication (60 to 63) (see Annex 1 for a description of NACE codes).

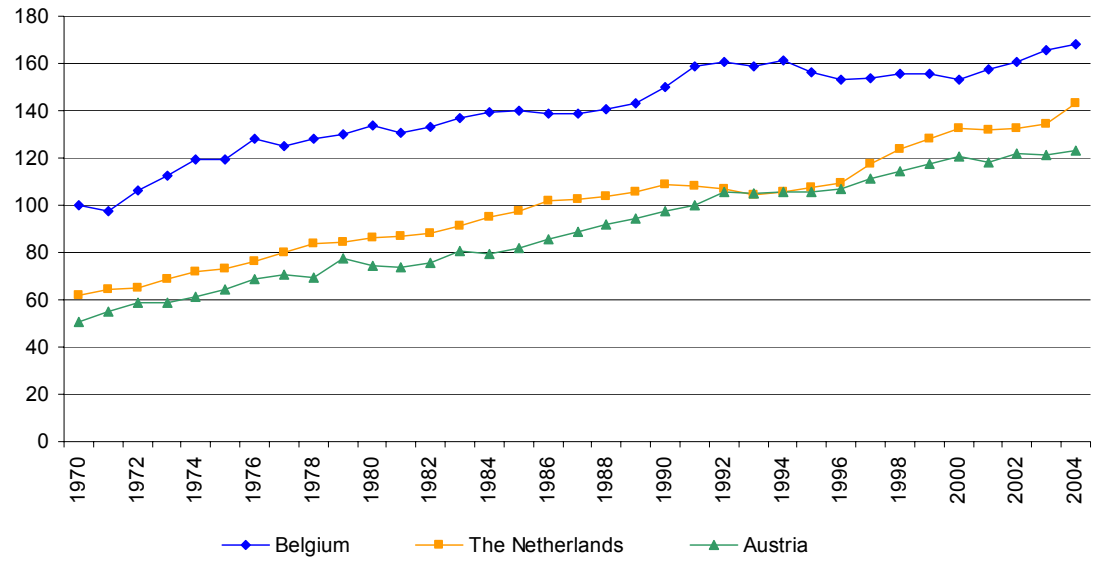
5 NACE codes J (65 to 67) and K without real estate activities (71 to 74) (see Annex 1 for a description of NACE codes).

6 NACE codes H (55), O (90 to 93) and P (95) (see Annex 1 for a description of NACE codes).

growth of market services decreased in Belgium and Austria over the most recent period. In Belgium, this lower contribution of Distribution was due to a strong deterioration of the contribution of the Transport and storage industry (60 to 63), which even became slightly negative. The improvement in the contribution of the Wholesale and retail trade during the most recent period did not fully compensate for the negative impact of the Transport and storage industry. In Austria, the lower contribution of the Distribution sector was due to a lower contribution from the Trade industry and the Transport and storage industry.

In the Distribution sector too, the different productivity growth rates between the three countries could be linked to differences in levels of productivity. As illustrated by Graph 3, which shows the levels of productivity in the Distribution sector, the catching-up explanation only partly applies to the current situation of this sector. Indeed two questions remain unanswered: first, why did the catching-up process only begin in 1996 and second, why has it been much stronger in the Dutch case than in that of Austria? Therefore, it could be inferred that specific evolutions in the Dutch Distribution sector at least partly explain the observed upsurge in productivity growth rates.

Graph 3 - Labour productivity level in the Distribution services



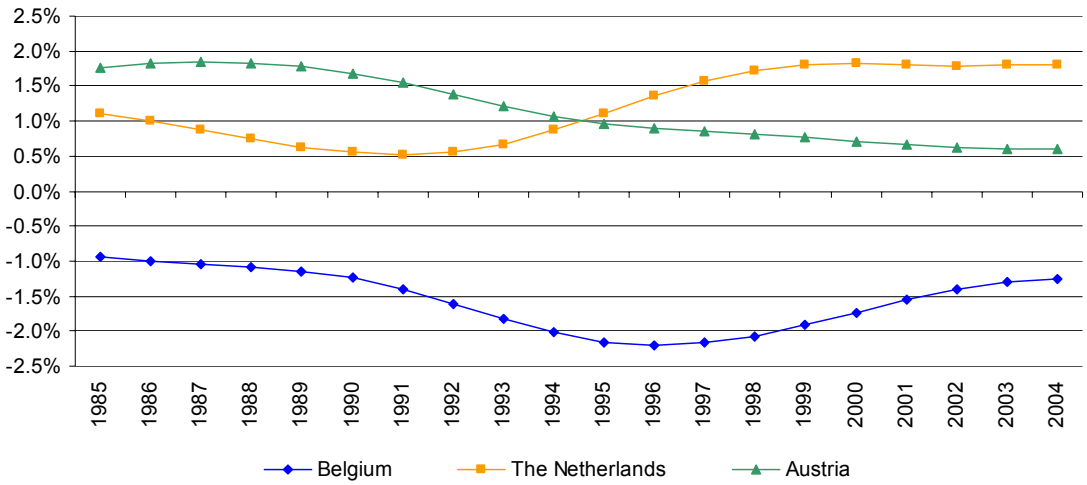
Source: Own calculations with EUKLEMS database.

Having identified Distribution as the main contributor to the Dutch labour productivity growth in market services, it is useful to go further by identifying which component of labour productivity growth in Distribution explains this good performance.

2.4. Inside the Distribution sector

As illustrated by Graph 4, which gives the Hodrick-Prescott filtered series, the major driver of labour productivity growth in the Dutch Distribution industry is TFP growth.

Graph 4 - TFP growth in the Distribution sector (HP filtered)



Source: Own calculations with EUKLEMS database.

TFP growth in the Dutch Distribution sector accounted for 95% of the TFP growth of the market services sector over the period 1995-2004. This good performance was mainly due to Wholesale trade, which recorded an increase in its TFP at an average annual rate of 3.9%, and to Sale, maintenance and repair of motor vehicles, with an average annual TFP growth rate of 3.0% over 1995-2004 (see Table 5).

Table 5 - TFP growth in Distribution – 1995-2004 *(average annual growth rate, %)*

	Belgium	The Netherlands	Austria
Distribution	-1.37	2.31	0.87
- Trade	-0.91	2.85	1.25
- Sale, maintenance and repair of motor vehicles	-2.03	2.99	0.06
- Wholesale trade	-1.20	3.92	1.66
- Retail trade	-0.01	0.76	1.14
- Transport and storage	-2.48	0.81	-0.14

Source: Own calculations with EUKLEMS database.

During the same period, TFP growth in the Belgian Distribution sector was negative, mainly influenced by the negative evolution of TFP in Transport and storage. In the trade sub-sector, Sale, maintenance and repair of motor vehicles and Wholesale trade recorded the worst evolutions. Austrian TFP performances are in the middle of the panel. Transport and storage recorded a decrease in TFP, while Trade made a positive contribution to the TFP growth of the Austrian Distribution sector, mainly due to a TFP increase in Wholesale and Retail trade.

3. Determinants of TFP evolution

From the first section, it emerges that the crucial point to understand is why TFP in Distribution (especially in the Wholesale trade) has increased in the Netherlands much faster than in the two other countries. TFP growth measures the change in output that cannot be explained by changes in inputs. It captures anything that changes the relation between measured input and measured output. Excluding measurement errors, TFP growth indicates the rate at which the production function improves over time. While the neo-classical model predicts that at long-run equilibrium this growth rate is exogenous, during the transitory period TFP growth can be affected by many factors linked to the framework conditions or innovation capabilities of the economy[7]. The main factors explored in this section are: ICT accumulation and use, labour force qualifications, R&D and innovation efforts, and degree of competition in Distribution.

3.1. Difference in ICT accumulation or use?

Production and diffusion of ICT can affect labour productivity growth through three main channels (Jorgenson (2001)). First, in response to the fast decline in quality-adjusted ICT prices, businesses invest massively in ICT, which contributes to labour productivity growth through increased ICT capital deepening. Second, technological progress in ICT stimulates growth of TFP in ICT-producing sectors, and hence of aggregate TFP. Third, investment in ICT may accelerate TFP growth in the ICT-using sector. This last channel, however, remains controversial and difficult to measure empirically. Indeed, these productivity gains occur progressively and under the condition that the firms' organisation is suitable for this technology. Integration of ICT in the production process requires firms to be able to mobilise qualified human resources with adequate skills (OECD (2004)).

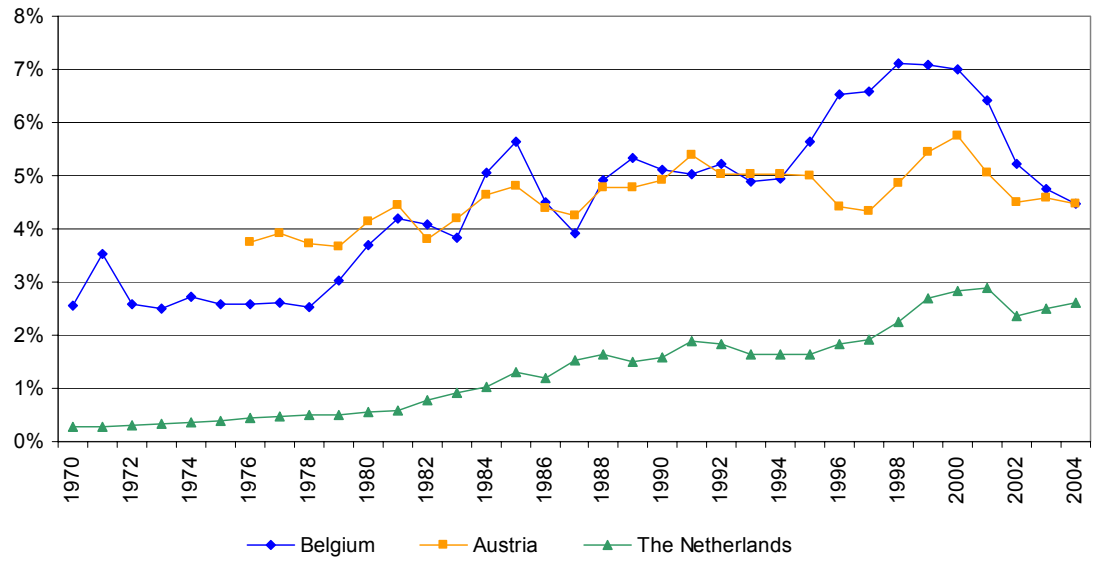
Graph 5 shows that the three countries had a more or less similar growth in their ICT intensity (measured as the share of nominal value added devoted to ICT investment) in the Distribution sector over the whole period, but recorded different levels of intensity. In the mid-seventies, ICT intensity reached 3.8% in Austria, 2.6% in Belgium and only 0.4% in the Netherlands. At the end the period, in 2004, ICT intensity reached 4.5% in Austria and in Belgium and 2.6% in the Netherlands. The gap between the three countries reduced at the end of the period under consideration due to a stronger decrease in ICT intensity in Belgium and in Austria than in the Netherlands. Furthermore, indicators available on ICT use in businesses in the Distribution sector do not reveal a more advanced position for the Netherlands relative to Belgium and Austria. The growth of ICT investment in the Distribution sector contributes to labour productivity growth in this sector mainly via the increase in capital deepening.

[7] For a comprehensive analysis of these factors see OECD (2007).

Measuring the role of ICT in the TFP growth in the Distribution sector of the three countries is broadly more complicated, given the unclear empirical relation between these variables. Van Leeuwen and van der Wiel (2003) analyse the extent to which ICT spillovers matter to the TFP growth of firms in the services sector in the Netherlands and find that ICT spillovers can be an important source of TFP growth in ICT-using industries. Rincon and Vecchi (2004) add that in the ICT spillovers framework "the more we invest in ICT, the more we learn about their potential applications, which make it possible to re-organise production in a more efficient way".

The existence of ICT spillovers means that the TFP growth of a sector can be affected by ICT investments in other sectors. TFP growth in the Distribution sector could be influenced by ICT investment in the other market services. At the beginning of the seventies, Belgium recorded an ICT intensity in the other market services sector[8] above the ICT intensity observed in Austria and in the Netherlands. However, over the period considered, the Netherlands experienced a growth of their ICT intensity that was higher than the growth observed in Belgium, closing the gap between the two countries in 1993. Since 1993, ICT intensity has had a stronger increase in Belgium than in the Netherlands.

Graph 5 - Nominal ICT investment *(in % of nominal value added)* **– Distribution sector (G and I)**



Source: EUKLEMS database

Remark: The distribution sector is defined as G+I due to data availability.

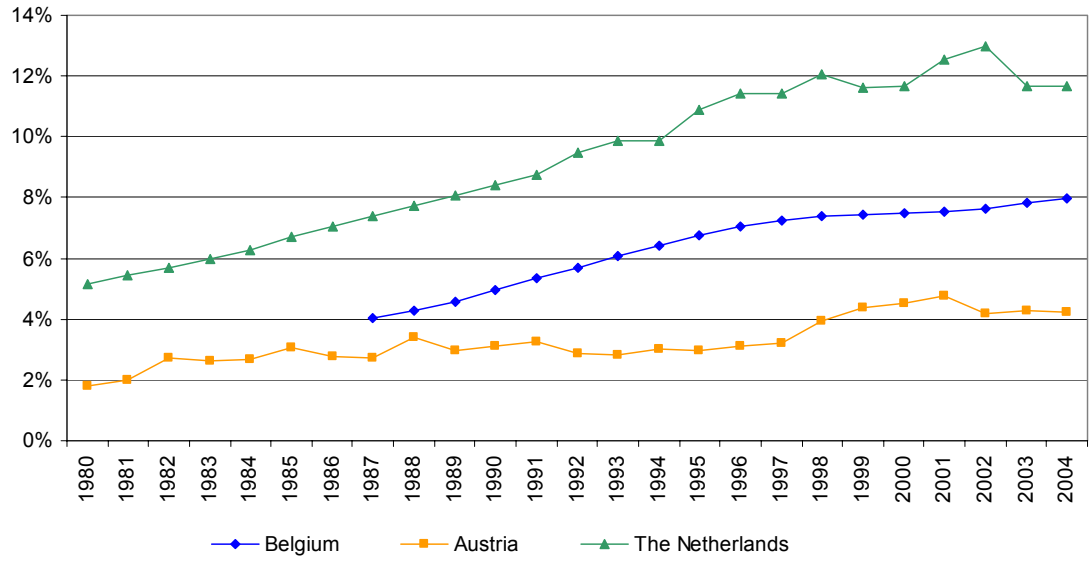
In conclusion, neither ICT accumulation nor ICT use provide per se a straightforward explanation of the differences in TFP growth in the Distribution sector between the three countries studied.

[8] Due to data availability, the market services sector contains the Post and telecommunication sector and Real estate activities.

3.2. Difference in labour qualifications or skills?

The improvement in labour quality, corresponding to a shift in hours worked toward groups with higher skills, contributes directly to labour productivity growth via the labour composition effect previously identified in the growth accounting decomposition. However, a high level of qualification of the labour force is also a factor supporting TFP growth, allowing a better combination of factors of production in a period of rapid quality improvement in capital. In the market services of the three countries, the hours worked by high-skilled persons engaged in total hours increased over the whole period, but at different rates, increasing the gap between the three countries. In the Distribution sector, the share of hours worked by high-skilled persons engaged in total hours worked reached, in 2004, 11.7% in the Netherlands, 8.0% in Belgium and 4.3% in Austria (see Graph 6). The share of high-skilled hours was, in fact, higher in the Netherlands than in Belgium and in Austria over the whole period and in the three main sectors of market services. This high share of high-skilled hours worked can sustain technological progress and innovation and accelerate the diffusion and use of new technologies in the Netherlands. The share of high-skilled hours worked observed in Belgium was also constantly higher than the share observed in Austria.

Graph 6 - Hours worked by high-skilled persons engaged *(share in total hours worked)* **– Distribution sector**

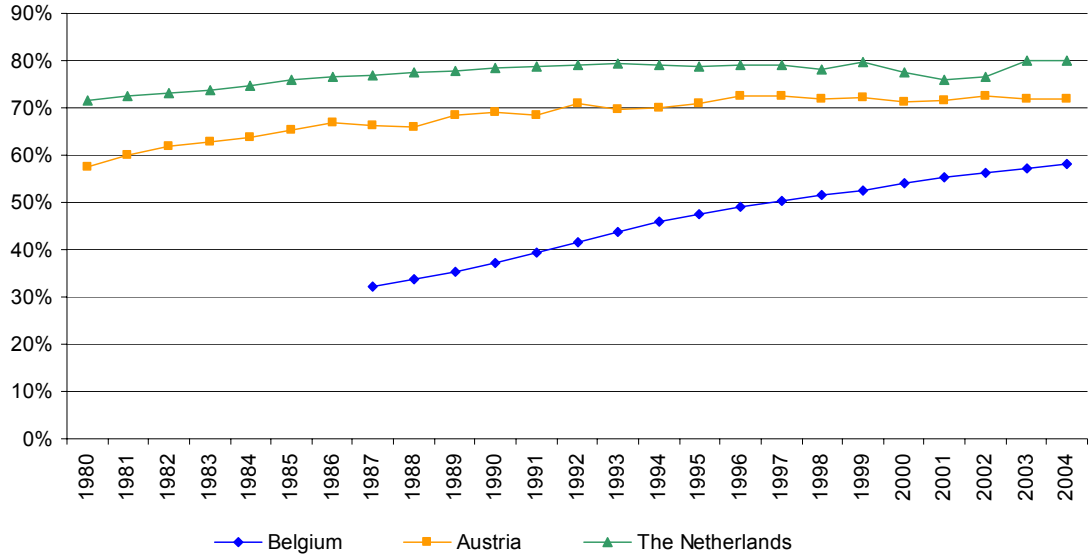


Source: EUKLEMS database.

The labour force of market services in the three countries is composed for the most part by medium-skilled persons. In the Distribution sector, the share of hours worked by medium-skilled persons engaged in total hours worked reached, in 2004, 80.1% in the Netherlands, 71.7% in Austria and 58.1% in Belgium (see Graph 7). Over the whole period, the hours worked by medium-skilled persons engaged in total hours worked in the Distribution sector increased in the

three countries, but at different rates. The growth rate was significantly stronger in Belgium than in the two other countries, as Belgium principally had a low-skilled labour force at the beginning of the period considered. In 2004, the share of hours worked by low-skilled persons was always higher in Belgium (34.0% of total hours worked) than in the Netherlands (8.2%) and Austria (24.0%), despite a significant improvement in the level of qualification of the labour force.

Graph 7 - Hours worked by medium-skilled persons engaged *(share in total hours)* **– Distribution sector**



Source: EUKLEMS database.

In conclusion, the higher proportion of high-skilled persons engaged in the Dutch Distribution sector could partly explain the better performance of this sector in terms of labour productivity and TFP as high-skilled workers are one of the factors facilitating the adoption of new technologies and, in particular, the efficient adoption of ICT.

3.3. Difference in R&D and innovation?

Innovation is widely recognised as a major source of long-run economic growth. Different types of innovation exist, which can have an effect on economic performance in several ways. Innovations introduced in the production process or in the organisation (disembodied technological progress) will generate economic growth mainly by their effect on TFP growth (Romer 1990). Indeed, this type of innovation allows improvements to the efficiency with which both labour and capital inputs are used to produce output. The innovation capability of a country or a sector is frequently approximated by the more easily measurable notion of R&D expenditure. Indeed, innovation depends largely on the level of R&D activities, even if R&D is not the only source of innovation, in particular in services activities, where innovation seems principally non-technological.

The relationship between total factor productivity growth and R&D stock or R&D intensity has been the subject of a great number of economic studies. The majority of these studies found a strong and significant link between R&D and productivity growth. In his survey of the literature, Nadiri (1993) concludes that the elasticity of TFP to R&D stock is situated between 0.08 and 0.30 at the industry level[9]. Productivity growth is not only linked to the growth of domestic R&D stock, but also to the level of the stock. Indeed, according to Aghion and Howitt (1992), growth is generated by a random sequence of innovations produced by research activities that depend on the labour devoted to these activities. The arrival rate of innovations is determined by a Poisson-process. Consequently, the amount of R&D activities achieved has an influence on the probability of innovations, which in turn generate productivity growth.

R&D activities performed in a country, a sector or a firm, have an impact not only on the country/sector/firm's productivity but also on the productivity of other countries/sectors/firms. This existence of international and national R&D externalities, widely recognised in the literature, rests on the quasi-public good character of knowledge. These externalities, usually known under the term 'spillovers'[10], can be of two types: rent spillovers and knowledge spillovers (Griliches (1979)). The first category reflects incomplete price adjustments for quality improvements in intermediate inputs, preventing the complete appropriation of the innovation rent by the innovator, due to imperfectly monopolistic pricing arising from competition. These kinds of spillovers are therefore embodied in economic transactions, such as the purchase of intermediate inputs or investment goods. The second category is due to transfers of ideas and knowledge from one industry to another. Poor patent protection, the inability to keep innovations secret, reverse engineering, technical meeting and mobility of (R&D) personnel are possible channels of knowledge spillovers.

The ability of a firm to capture these spillovers depends on its own level of R&D activities. This idea is developed by Cohen and Levinthal (1989), who established the concept of the "two faces

[9] The regression of the change in TFP on R&D intensity (relative to output) provides an estimate of the rate of return of R&D.

[10] For an econometric estimation of national and international R&D spillovers see van Pottelsberge and Guellec (2001).

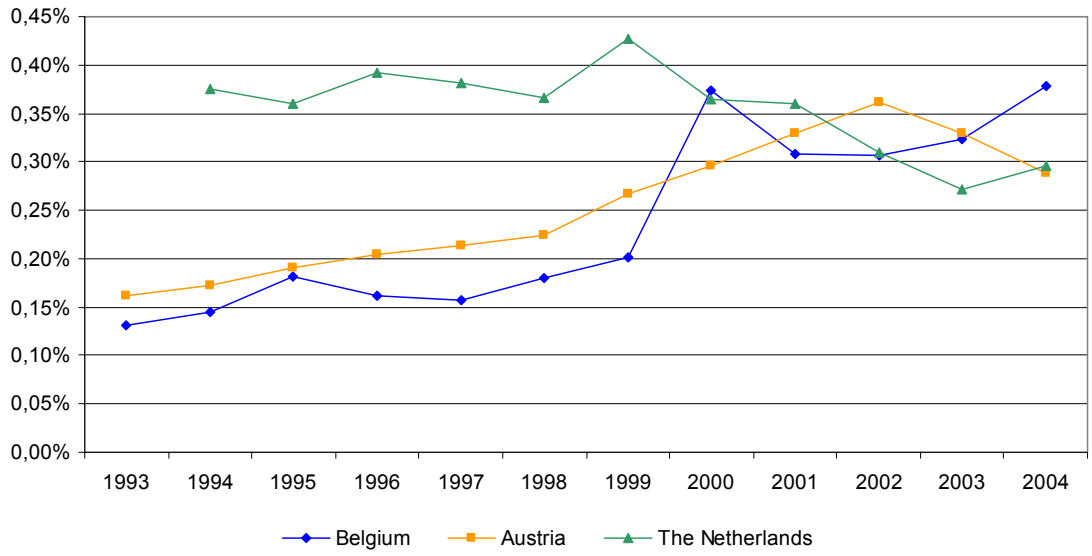
of R&D". R&D activities play two roles: on the one hand, R&D activities generate innovations, on the other hand R&D improves the ability of a firm to identify, assimilate and exploit outside knowledge. Cohen and Levinthal (1989) label this capability the learning or absorptive capacity of the firm. The absorptive capacity is largely a function of the firm's level of prior knowledge. This relationship between own R&D level and impact of R&D spillovers on productivity growth was established empirically in several studies (see Van Reenen et al. (2000)[11], Grünfeld (2002), Poldahl (2006)).

In 2004, the three countries reached quite different R&D intensities: total R&D expenditure reached 1.88% of GDP in Belgium, 1.78% in the Netherlands and 2.23% in Austria. The allocation of total R&D expenditure by sector of performance (Business enterprises, Government, Private non-profit sector, Higher Education sector) and by industry also varies from one country to another. In 1993, R&D intensity of the three countries in the market services sector was relatively similar and was about 0.30% of value added. Over the whole period available, each country experienced an increase in its intensity, on average, but to a different extent. Austria recorded a much stronger increase in its R&D expenditure than Belgium and the Netherlands, which recorded a stagnation as from 1998. This stronger increase recorded by Austria in the market services sector is due to a stronger growth of its R&D intensity in the Business enterprises sector and to a stronger concentration of its R&D effort in the services sector than was observed in the two other countries. In 2004, the R&D expenditure of the market services sector reached 1.05% of value added in Austria, 0.53% in Belgium and 0.46% in the Netherlands. The Finance and business sector, more intensive in R&D than the Distribution sector in the three countries, played a major role in the R&D profile of the market services sector.

Contrary to what is observed in the market services sector as a whole and in the Finance and business sector, R&D expenditure in the Distribution sector was significantly higher in the Netherlands than in Belgium and in Austria from the beginning of the period until 2000. The level achieved by the Netherlands over these years is explained by the investment in R&D of two sectors, Wholesale and retail trade and Transport and storage industry. This high level of R&D intensity may have influenced TFP growth in recent years, as a lag of several years usually exists between R&D activities and their impact on TFP. However, the Netherlands has recorded a stagnation of its intensity since 1994, while Belgium and Austria have had a strong increase, reducing the gap between the three countries. This strong increase may also influence TFP growth in Belgium and in Austria. In 2004, R&D expenditure of the Distribution sector reached 0.38% of value added in Belgium, which was above the intensity of the two other countries, which reached about 0.30%.

[11] Cited in Poldahl (2006).

Graph 8 - R&D intensity of the Distribution sector *(R&D expenditure in % of value added)*



Source: OECD, Eurostat and EUKLEMS databases.

Remarks: - Official data for AU in 1993, 1998, 2002 and 2004. Linear estimation between these years.
- The distribution sector is defined as G+I due to data availability.

R&D is a possible source of innovation, but it is not the only source, especially in the services sector, where many businesses that do not have an R&D department are innovative. The fourth Community Innovation Survey (CIS 4) provides the percentage of enterprises with innovation activities (product or process innovation) in 2004 in the different industries. According to this survey, Austria and Belgium are particularly innovative in the entire services sector compared to the Netherlands. Results from the CIS 3 covering the year 2000 show that, for the Distribution sector, the highest rate of innovative businesses is in Belgium, then in the Netherlands and finally in Austria. Since 2000 (CIS 3), the percentage of enterprises with innovation activities in the Distribution sector has increased in Belgium and in Austria. Results from CIS 3 are, however, not completely comparable with the results from the CIS 4.

Table 6 - Percentage of enterprises with innovation activities in 2004 (CIS 4)

	BE	NL	AU
Market services	45.3%	29.2%	47.9%
Distribution	42.0%	25.0%	41.4%
Finance and Business	57.8%	42.4%	64.4%

Source: Eurostat, CIS4.

Remark: Due to data availability, the services sector is reduced to sections NACE I, J and divisions NACE 51, 72, 74.2 and 74.3.

Table 7 gives the percentage of businesses with/without innovation activities that introduced an organisational innovation in 2004. Once again, Austria and Belgium are more innovative than the Netherlands.

Table 7 - Percentage of businesses with organisational innovation in 2004 (CIS 4)

	BE	NL	AU
Businesses with innovation activities			
Market services	61.4%	49.2%	76.0%
Distribution	57.0%	46.2%	72.3%
Finance and Business	73.4%	54.8%	82.1%
Non-innovative businesses			
Market services	20.1%	17.2%	29.6%
Distribution	17.9%	16.4%	26.4%
Finance and Business	31.8%	20.7%	42.9%

Source: Eurostat, CIS4.

Remark: Due to data availability, services sector is reduced to sections NACE I, J and divisions NACE 51, 72, 74.2 and 74.3.

In conclusion, larger R&D expenditure of the Dutch Distribution sector at the beginning of the considered period could partly explain a better performance in terms of TFP and hence labour productivity growth. However, an increase in R&D efforts in the two other countries during the same period could lead to an improvement in their future labour productivity growth rate.

3.4. Differences in competition pressures?

Theoretically, competition may increase productivity through two channels. First, competition may stimulate productivity directly by pushing firms to reduce the X-inefficiency to avoid bankruptcy. Second, competition may increase productivity through its positive effects on innovation. Firms may increase their innovative effort to escape from fiercer competitive pressures. However, the opposite effect is also possible as firms may reduce their innovative effort in the case of increased competitive pressures because their gain from innovation will then become too low (Schumpeter effect). Aghion et al (2005) suggest that the combination of both effect results in an inverted U-shaped relationship between the degree of competition and innovation. Vandenbussche et al. (2006) propose a distinction between innovation and imitation when studying the impact of competition. Growth-enhancing policies may change if countries move closer to the technological frontier. A stringent protection of intellectual property can be more important for productivity growth in countries close to the frontier that are more heavily engaged in innovation rather than imitation.

Although it is difficult to classify markets according to the strength of market forces, mark-ups are frequently used to gauge market power and thus competitive pressures. Unfortunately, mark-up estimates at industry level are not broadly available. In its 2005 publication, the OECD applied Roger's method to calculate mark-ups on average costs with industry-level data for 17 countries that cover the period 1975-2002 in both manufacturing and non-manufacturing sectors. The results for Non-manufacturing, which excludes Construction, Real estate activities and Personal services, showed that mark-ups were the highest in Austria, reaching 28%, followed by the Netherlands with 24% and Belgium with 20%. However, the differences between these

countries were not statistically significant. It is therefore useful to look at other indicators of competition.

Overly stringent product market regulations can be one of these indicators as it has an impact on the strength of competition in domestic markets, either by exerting direct control on economic activities or by maintaining high barriers to trade, foreign direct investment and entry into domestic markets (Maher and Wise, 2005).

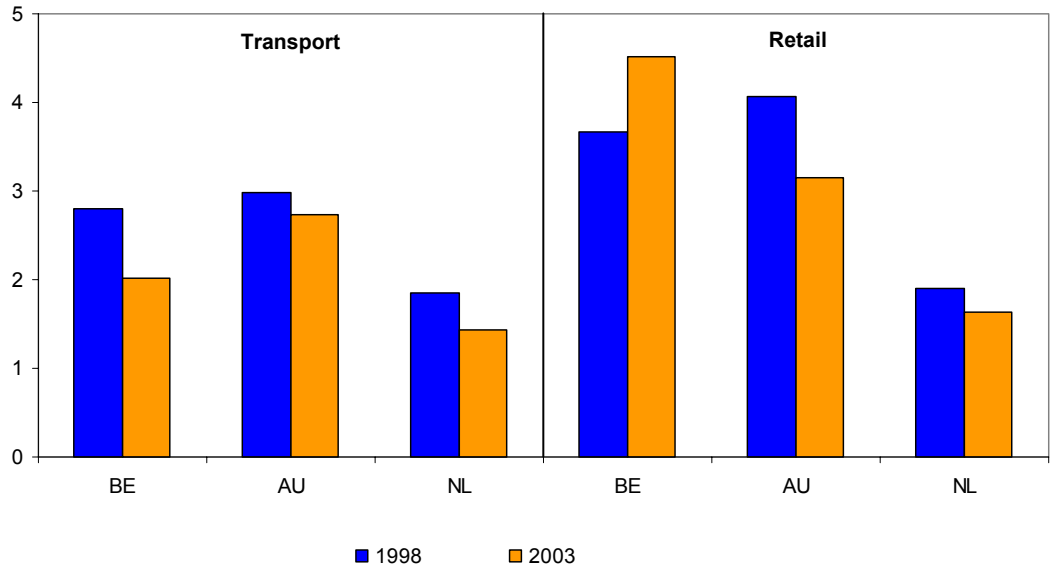
Product markets were largely liberalised in recent years in OECD countries. However, differences in regulation still persist across countries and sectors, which can influence productivity growth. Competition-retraining regulations can have a negative impact on productivity growth due to the fact that they slow down the diffusion of new innovations through at least two channels. First, these regulations reduce investment in ICT (Conway et al 2006). Second, they slow down the diffusion of foreign technology through foreign direct investment (OECD 2007). Nicoletti and Scarpetta (2005) analyse possible links between product market regulation and TFP growth in the OECD area over the past two decades. Their results suggest that lower barriers to trade and less regulation seem to have increased the level and the rate of growth of productivity by stimulating business investment and promoting innovation and technological catch-up. OECD (2007) underlines that since the mid-1990s, labour productivity has accelerated in lightly-regulated economies but either accelerated more slowly or decelerated in highly-regulated countries. On the dynamic side, Griffith et al. (2006) present results which suggest that product market reforms have led to increased competition which in turn have positively impacted the incentives to innovate. They find that intensifying competition tends to increase R&D investment but mainly through increased innovative activity by incumbents rather than new entrants.

Graph 9 gives an indicator for each of the three countries of product market regulation in two industries in the Distribution sector: Transport and Retail trade. The indicator takes a value between 0 – the least restrictive regulation - and 6 - the most restrictive regulation. In the two sectors, the Netherlands is the country with the least restrictive regulation[12]. This less restrictive regulation may have had a positive impact on the Dutch productivity growth as it reinforced competition and led firms to reduce X-inefficiency and therefore increase their TFP. Moreover starting in 1996 with the adoption of MDW-project[13], Dutch regulation in retail trade became less restrictive, as opposed to the evolution observed in Belgium. If the liberalisation of the Dutch retail trade has gone hand in hand with an increase in competition and if the sector is on the ascending part of the inverted-U shaped relation between competition and innovation, this liberalisation may have led to more innovation and therefore stimulated TFP growth for Dutch retailers.

[12] See Annex 2 for information about the construction of the indicator.

[13] For an explanation of the different steps in the regulatory reform of the Dutch retail sector and of its impact on productivity, see Creusen (2006).

Graph 9 - Indicator of product market regulation
(scale of the indicator is 0-6: from least to most restrictive of competition)



Source: OECD International Regulation Database.

The strictness of regulation is not the only element determining the degree of competition reached in a specific market. However, when this indicator is taken into account, the Dutch Retail and Transport sectors seem to benefit from a more favorable regulatory environment than the regulatory environment of these two sectors in Belgium and Austria. Moreover, the evolution of the regulatory environment is also more favorable to productivity as it has become less fierce than that observed in Belgium.

4. Conclusions

The comparison of labour productivity growth in market services in three small European countries, Austria, Belgium and the Netherlands, brings important divergences to light. While Austria and Belgium recorded a decrease in their productivity growth between 1995 and 2004, the Netherlands followed a pattern that was also observed in the US, and has recorded an increase in its growth rate since 1995.

The decomposition of labour productivity growth allows the important role played by TFP in the Dutch upsurge in productivity growth to be underlined. The decomposition between the main industries shows the prime importance of the Distribution sector in the Dutch performance.

To try to explain the larger increase in TFP in the Dutch Distribution sector, different potential factors have been taken into consideration: ICT accumulation and use, labour qualifications, R&D and innovation and regulations. The comparison between the three countries provides the insights that the Dutch performance is better in terms of labour force qualification, R&D efforts at the beginning of the period, and regulatory environment.

This paper constitutes a first step to better understanding why divergent evolutions have recently emerged between European countries in terms of labour productivity. It underlines the importance of labour qualifications, R&D efforts and competition in promoting TFP and labour productivity growth. This analysis has to be extended by more detailed study at industry level to allow a better understanding of the various channels through which these factors influence the evolution of productivity. This is a necessary step for providing efficient economic policy recommendations.

5. References

Aghion, P., Bloom, N., Bundell, R., Griffith R. and Howitt, P., 2005, "Competition and innovation: an inverted-U relationship", The Quarterly Journal of Economics, MIT Press, 120(2), pp. 701-728.

Aghion, P. and Howitt, P., 1992, "A Model of Growth Through Creative Destruction", Econometrica, Vol. 60, No. 2, pp. 323-351, March.

Cette, G., 2005, "Are productivity levels higher in Some European countries than in the United States?", International Productivity Monitor, n°10, Spring.

Cohen, W. M. and Levinthal, D.A., 1989, "Innovation and Learning: Two faces of R&D", Economics Journal 99, pp. 569-596.

Conway, P., de Rosa, D., Nicoletti, G. and Steiner, F., 2006, "Regulation, competition and productivity convergence", OECD Economics Department working paper, n° 509.

Creusen, H, Vroomen, B., van der Wiel, H. and Kuypers, F., 2006, "Dutch retail trade on the rise? Relation between competition, innovation and productivity", CPB Netherlands Bureau for Economic Policy Analysis, CPB document No 137, December.

Dolman, B., Praham, D. and Zheng, S., 2007, "Can Australia match US productivity performance?", Staff working paper, Australia Productivity Commission, March.

Griffith, R., Harrison, R. and Simpson, H., 2006, "The link between product market reform, innovation and EU macroeconomic performance", European Economy Economic Paper n° 243.

Griliches Z., 1979, "Issues in assessing the contribution of Research and Development to Productivity Growth", Bell Journals of Economics, 10, pp. 92-116.

Grünfeld, L.A., 2002, "International R&D Spillovers and the Effect of Absorptive Capacity – An empirical Study", NUPI [630] Paper.

Jorgenson, D.W., 2001, "Information Technology and the US Economy", American Economic Review, n°1, pp. 1-32.

Maher, M. and Wise, M., 2005, "Product market competition and economic performance in the United Kingdom", OECD Economics Department Working Paper n° 433, ECO/WKP(2005)20.

Nadiri, M.I., 1993, "Innovations and technological spillovers", NBER Working Paper, n°4423.

Nicoletti, G. and Scarpetta, S., 2005, "Regulation and economic performance: Product market reforms and productivity in the OECD", OECD Economics Department working paper, n°460.

OECD, 2002, "Economic Outlook", n°72, Paris.

OECD, 2004, "The Economic Impact of ICT, Measurement, evidence and implications".

OECD, 2005, "Product Market Competition in OECD countries: A synthesis", OECD Economics Department, ECO/CPE/WP1(2005)17.

OECD, 2007, "Economic Policy Reforms: Going for Growth 2007".

Poldahl, A., 2006, "The two faces of R&D: Do firm's absorptive capacities matter?", Örebro University, ESI, Working Paper n°1.

Rincon, A. and Vecchi, M., 2004, "The dynamic impact of ICT spillovers on companies' productivity performance", National Institute of Economic and Social Research, November.

Romer, P.M., 1990, "Endogenous Technical Change", Journal of Political Economy 98, pp. 71-102.

van Ark, B., O'Mahony, M., and Ypma, G., 2007, "The EUKLEMS Productivity Report, Issue n°1", Brussels.

Vandenbussche, J., Aghion, P. and Meghir, C., 2006, "Growth distance to frontier and composition of human capital", Journal of Economic Growth, 11, pp. 97-127.

van Leeuwen, G. and van der Wiel, H., 2003, "Do ICT spillovers matter ? Evidence from Dutch firm-level data", CPB Discussion Paper, n°26, November.

van Pottelsberghe B., Guellec D., 2001, "R&D and productivity growth - Panel data analysis of 16 OECD countries", OECD Economic Studies, 33.

6. Annex

6.1. Description of the sectors

NACE Code A31	Description	NACE Code A60
AA	Agriculture, hunting and forestry	01-02
BB	Fishing	05
CA	Mining and quarrying of energy producing materials	10-12
CB	Mining and quarrying except energy producing materials	13-14
DA	Food products, beverages and tobacco	15-16
DB	Textiles and textile products	17-18
DC	Leather and leather products	19
DD	Wood and wood products	20
DE	Pulp, paper and paper products; publishing and printing	21-22
DF	Coke, refined petroleum products and nuclear fuel	23
DG	Chemicals, chemical products and man-made fibres	24
DH	Rubber and plastic products	25
DI	Other non metallic mineral products	26
DJ	Basic metals and fabricated metal products	27-28
DK	Machinery and equipment n.e.c.	29
DL	Electrical and optical equipment	30-33
DM	Transport equipment	34-35
DN	Manufacturing n.e.c.	36
EE	Electricity, gas and water supply	40-41
FF	Construction	45
GG	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	50-52
HH	Hotel and restaurant	55
II	Transport, storage and communication	60-64
JJ	Financial intermediation	65-67
KK	Real estate, renting and business activities	70-74
LL	Public administration and defence, compulsory social security	75
MM	Education	80
NN	Health and social work	85
OO	Other community, social and personal service activities	90-93
PP	Private households with employed persons	95
QQ	Extra-territorial organisations and bodies	99

6.2. Construction of the indicators of regulation

The indicators of regulation used in this paper come from the *OECD International Regulation Database*. These data have been collected from a wide variety of sources, including publications of the OECD and a range of other institutions and the *OECD Regulatory Indicators Questionnaire*.

The regulatory data are converted into sectoral indicators of product market regulation by using a set of weights for the different themes. In each theme, several questions are taken into account, with a numerical value being assigned to each of the possible replies.

The weights used for the construction of the indicator of retail distribution are as follows: retail distribution = 0.20*registration in commercial register + 0.16*licenses or permits needed to engage in commercial activity + 0.16*specific regulation of large outlets + 0.17*protection of existing firms + 0.10*regulation of shop opening hours + 0.20*price controls.

For the transport sector, the indicator used in this working paper is an unweighted average of the indicators observed in three industries: air passenger transport, rail transport and road freight. The weights used for the rail transport are: 0.25*entry regulation + 0.25*public ownership + 0.25*market structure + 0.25*vertical separation. The weights used for the passenger air transport are: 0.5*entry regulation + 0.5*public ownership. The weight used for the road freight are: 0.5*entry regulation + 0.5*price controls.