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PORTUGAL AND SPAIN: CATCHING UP AND FALLING BEHIND. A COMPARATIVE ANALYSIS OF PRODUCTIVITY TRENDS AND THEIR CAUSES, 1980-2007

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Portugal and Spain: catching up and falling behind. A comparative analysis of productivity trends and their causes, 1980-2007

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Abstract

A number of studies in the literature have recently explored the causes behind the European productivity slowdown from the mid-1990s onwards and the correlative increase in the productivity gap between Europe and the United States (e.g., van Ark et al, 2008; Maudos et al, 2008; van Ark and Inklaar, 2005). Much less attention has been given, however, to the specific role of the EU peripheral countries in the process. In this paper we focus on the growth performances of two of such countries: Portugal and Spain. After a period of successful catch-up relative to the EU core, the two countries, which have a number of historical and economic features in common, have recently faced increasing difficulties in closing the gap to the EU. In the last decade, Spain has shown one of the worst productivity growth records among EU-members, whereas Portugal remained quite distant from European average productivity levels, and has increased the gap in per capita income levels. In this paper an attempt is made to shed light on the causes behind the overall disappointing performance of both countries, by focusing on the role of structural change on the process. An extensive literature, from both mainstream and more heterodox streams of research, suggests that sectoral specialization may have a major impact on productivity growth, by influencing the extent to which innovation and technological progress can be achieved. In order to account for these effects, an analysis of productivity trends both at the macroeconomic and industry levels of analysis is undertaken, using growth accounting and shift-share techniques. The analysis is based on data from the EU-KLEMS database for Spain and the EU-core, and on an update and refinement of Silva´s (2010) labor and multifactor productivity estimates for Portugal. By investigating the different sources of productivity growth between 1980 and 2007, it is argued that an important factor explaining the growth difficulties in both countries is related to their difficulties in promoting important changes in their economic structures. In particular, the recent deterioration of economic growth may be seen as reflecting their incapacity in making a strong leap towards a more 'modern' industry structure.

Keywords: Productivity, Economic growth, Structural change, Technology.

JEL-Codes: O47; O14; O57.

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1. Introduction

Spain and Portugal, two relative backward countries in 1970, experienced successful catch-up with the EU-core economies for most of the last 30 years of the 20th century. Although the two countries performed differently among themselves - Portugal per capita income and productivity levels were substantially below those of Spain -, the trends in comparative per capita income and labor productivity for both countries *vis-à-vis* the core EU countries followed a general pattern of convergence (cf. Figure 1 and Table 1). The rate at which convergence was made during this period was, however, relatively modest. Between 1970 and 2000, Spain and Portugal narrowed their per capita income gap relative to the EU-15 in only 8.2 and 11.3 p.p., respectively, and the corresponding figures regarding relative labor productivity levels were even lower, with Spain registering an increase in the gap with the EU (cf. Tables 1 and 2).

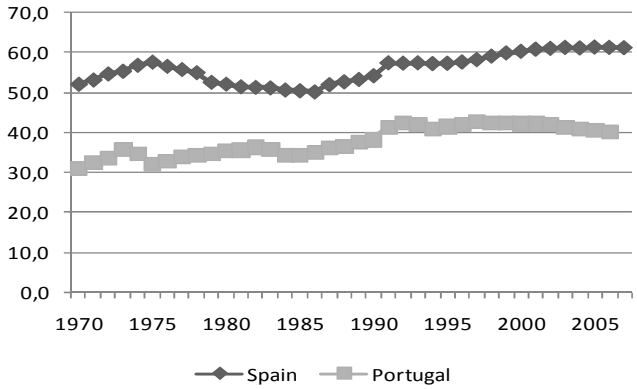


Fig. 1: Real VA per capita in Portugal and Spain, 1970-2007 (relative to the EU-15)

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009 and OECD labor force statistics.

The situation got worse from the late 1990s onwards. Real value added per head relative to the EU has practically stagnated in Spain since 1996, whereas in Portugal it has even declined, representing only 40 percent of the EU-15 level in 2006. Divergence has also occurred in labor productivity levels in both countries, which face serious competitiveness problems. The last ten years have been particularly harsh for Portugal and Spain: not only they have experienced slower growth, in line with many other European countries, but they have also increased the gap with the EU core. This constitutes a matter of deep concern for both countries, which are still at a considerable distance from the EU standards, and particularly for Portugal, which presents very low levels of labor productivity and per capita income.

Table 1: Relative levels of real VA per head and real VA per hour, 1970-2007 (EU-15 = 100)

	1970	1980	1990	2000	2007
VA per head					
Spain	52.2	52.3	54.3	60.4	61.3
Portugal	31.1	35.5	38.3	42.4	40.3[1]
VA per hour					
Spain	63.5	66.1	67.5	62.7	60.9
Portugal	23.9	25.3	31.0	34.1	33.2[1]

Note: 1) Reference year: 2006.

A number of studies in the literature have explored the reasons behind the slowdown of productivity growth in Europe since the mid-1990s, making use of an industry perspective (e.g., van Ark et al, 2008; Maudos et al., 2008; van Ark and Inklaar, 2005). The general conclusion drawn in these studies is that the slowdown in the European Union is mostly the result of slower productivity growth in market services, particularly in trade, finance, and business services. The investigation of the recent growth performance of the Southern periphery countries, and specifically of their difficulties in catching-up using such a perspective, has been, however, much less prolific. To our knowledge, only a few studies have approached the issue, focusing mainly on the cases of Spain and Italy, and following a methodology different from ours (c.f. Mas et al., 2008; Milana et al., 2008; Mas and Quesada, 2005). The analysis of the Portuguese experience has been almost entirely neglected, due in part to the absence of statistical data on capital and multifactor productivity trends at the industry level until very recently.[1]

In this paper an attempt is made to shed light on the matter, by focusing on the Spanish and Portuguese experiences and by stressing the role of structural change on the growth performance of both countries. Several studies in the literature, from both mainstream and more heterodox streams of research, have emphasized the importance of sectoral composition in productivity growth (e.g., Lucas, 1993; Grossman and Helpman, 1991; Freeman and Perez, 1988; Castellaci, 2007, Silva and Teixeira, 2011). Sectors differ in their productivity potential, depending on the scope for innovation and technological progress, and therefore specializing in high-tech sectors may generate an important productivity bonus. Moreover, the shift of resources from low-productivity to high productivity sectors may in itself represent a significant source of long-run productivity growth.

The investigation of the role of structural change in productivity growth is based on data from the EU-KLEMS database (November 2009 release) and on a refined and updated version of Silva's (2010) estimates of labor and multifactor productivity for Portugal. By investigating the different sources of productivity growth in the time period under study, it is argued that an important factor explaining the poor growth performance of both countries is related to their difficulties in promoting significant changes in their economic structures. In particular, the recent deterioration of economic growth may be seen as reflecting their incapacity in making a strong leap towards a more 'modern' industry structure.

The paper is organized as follows. The next section provides an overview of the growth performances of Portugal and Spain during the 1977-2007 period, and relates those experiences

[1] Recently, Silva (2010) has provided such estimates for the 1977-2003 period.

with the overall trends observed in the EU. It is shown that both countries experienced a stronger decline in labor productivity growth after 1995, which was mostly due to the deceleration of multifactor productivity growth. Section 3 provides an interpretation for the observed trends based on the role played by structural change, with a special focus being given to the changes observed in goods producing and market services industries. It is shown that despite the overall progress found, changes in the economic structure towards skill and technology-intensive sectors were relatively slow in both countries. Section 4 provides a tentative explanation for the relative persistency of a low-skill, low-tech bias in Portugal and Spain´s productive structures, exploring the role played by changes in trade patterns and by the characteristics of the workforce in both countries. The final section presents a brief summary and concludes.

2. Growth and productivity trends in Portugal and Spain: 1970-2007

A preliminary assessment of the factors explaining Portugal and Spain growth performances in the last 40 years can be made, by using the well-known accounting identity which relates per capita income with labor productivity, labor force participation rates and working hours per person employed (cf. Equation 1).

$$\frac{GVA}{POP} = \frac{GVA}{HOURS} \times \frac{HOURS}{EMP} \times \frac{EMP}{LF} \times \frac{LF}{POP} \quad (1)$$

In this expression, *GVA* stands for Gross Value Added, *POP* for total population, *HOURS* represents total hours worked, *EMP* is total employment and *LF* the country's labor force. Figures 2-5 depict the evolution of these variables for Portugal and Spain relative to EU-15 levels during the 1970-2007 span.

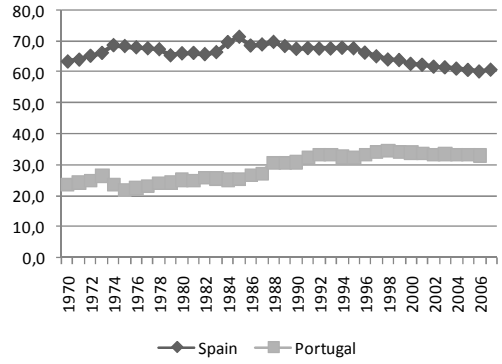


Fig. 2: Labour productivity (EU-15 = 100)

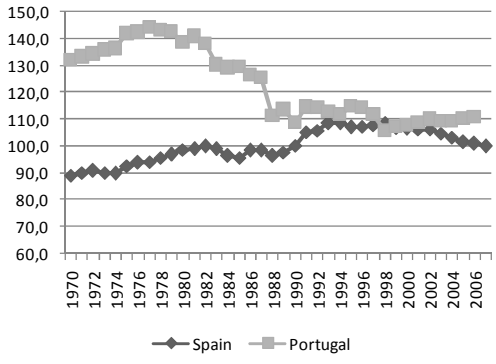


Fig. 3: Hours worked per employed person (EU-15 = 100)

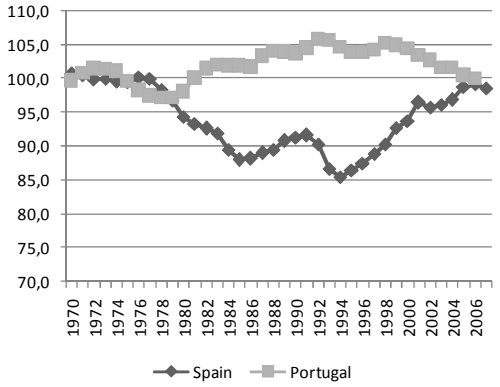


Fig. 4: Employment rate (EU-15 = 100)

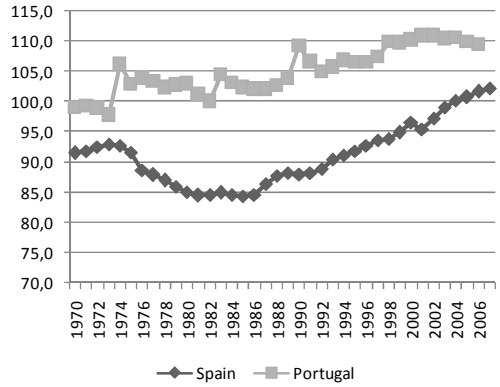


Fig. 5: Activity rate (EU-15 = 100)

Note: Author´s computations based on data from OECD labor force statistics and EU-KLEMS Database, Nov. 2009 release)

In the early 1970s Portugal and Spain had marked differences in labor productivity and in working hours per employed person, whereas differences in employment and activity rates were far more mitigated. During the period under study, important changes came into play. The 1980s witnessed an increasing divergence with respect to both employment and activity rates: In Spain there was a considerable decline in both variables after the massive destruction of employment following the oil shocks,[2] whereas in Portugal the opposite trends occurred. In the 1990s, however, these trends were reversed. In Spain there was rapid growth in the labor input, due to important labor market reforms,[3] whereas Portugal experienced a decline in its traditionally high (by EU standards) employment and activity rates. By 2004, both countries showed employment rates which were in line with the EU-15 level.

The evolution of labor productivity and hours worked by employed person, on the other hand, shows a global tendency of convergence between the two countries in the last 40 years. With respect to the latter, the wide differences observed in 1970 were substantially reduced. In line with Europe, Portugal witnessed a marked reduction in hours worked by employed person, which is nowadays only about 10 p.p. higher than the European level. In Spain, the opposite trend occurred, closing the gap with the EU-15 since 1990.

The difference between labor productivity levels was also reduced, even though it remains high in the more recent period. Indeed, from the inspection of Figures 2-5 it becomes clear that the main difference in per capita income levels between Portugal and Spain, and between each of these countries and the EU-15, is to be found in labor productivity levels, rather than in working hours or labor participation rates. Labor productivity has been the main determinant of per capita income differences, although its importance has varied over time (cf. Table 3). More precisely, the role played by labor productivity in explaining the Portuguese per capita income gap relative to

[2] The international crisis in the seventies had severe consequences in unemployment, which reached extremely high rates, especially among women and the youth (Mas et al, 2008).

[3] From the mid-1980s onwards, labour market reforms were implemented in Spain aimed at an increasing flexibility in hiring and dismissing employees, by introducing temporary work contracts. The increased flexibility was limited, however, to the new work contracts, without changing the conditions of already existing contracts, which led to the emergence of a dual labour market (cf. Mas et al, 2008, OECD, 2010b).

both Spain and the EU has been slightly reduced, whereas it increased with respect to the Spain-EU 15 gap.

Table 2: Relative importance of each component in real GVA per capita differences, 1970-2007

	1970	1980	1995	2000	2007
Spain - Portugal					
Labor productivity	188.5	247.4	225.0	171.7	139.6
Hours worked by employed person	-75.4	-88.0	-22.4	-3.6	-23.4
Employment rate	2.0	-9.9	-56.7	-30.6	-1.5
Activity rate	-15.1	-49.5	-45.9	-37.5	-14.7
Total difference	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
EU-15 - Spain					
Labor productivity	69.9	63.9	70.4	92.5	101.4
Hours worked by employed person	17.6	2.2	-12.1	-12.4	0.2
Employment rate	-1.2	8.9	26.3	12.9	2.9
Activity rate	13.6	25.0	15.4	7.0	-4.5
Total difference	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
EU-15 - Portugal					
Labor productivity	122.6	132.5	127.3	125.2	119.6
Hours worked by employed person	-23.7	-31.5	-15.9	-8.8	-11.0
Employment rate	0.2	1.9	-4.3	-5.1	0.8
Activity rate	0.9	-2.9	-7.1	-11.3	-9.4
Total difference	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: Author´s computations based on data from OECD labor force statistics and EU-KLEMS Database, (November 2009 release)

Table 3 provides further information on output and labor productivity growth in Portugal, Spain, and the EU core for the period after 1980.[4] Computations are based on the neoclassical growth accounting framework developed by Jorgenson and associates (Jorgenson and Griliches, 1967; Jorgenson, Gollop and Fraumeni, 1987, Jorgenson, 1995), under which output growth is decomposed into the contributions of inputs and productivity growth. The growth decompositions regarding Spain and the EU-10 are based on data from the November 2009 release of the EU-KLEMS database.[5] Because this database does not provide information on the capital input for Portugal, we update Silva's (2010) capital services series in order to perform the growth accounting exercise for the Portuguese case. Relative to the original estimates of Silva (2010), the new capital input series differ in a number of methodological aspects, which were implemented in order to get more precise estimates and achieve greater comparability with EU-KLEMS estimates.[6] Data on output growth and hours worked regarding Portugal are also taken from the EU-KLEMS database.

[4] The comparison relative to the EU is now restricted to the countries for which EU-KLEMS provides information on capital input and multifactor productivity growth rates. More precisely, the EU-10 acronym includes Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain and the United Kingdom.

[5] Available on line at http://www.euklems.net.

[6] The methodology used in the estimation of the capital input series is described in the Appendix. Volume indices of capital of capital services at the industry and macroeconomic levels are presented in Table A.1.

Table 3: Contributions to growth of real output and labor productivity growth, Spain, Portugal and EU-10, 1980-2007 (annual average growth rates in percentage points)

	Spain			Portugal			EU-10		
	1980-2007	1980-1995	1995-2007	1980-2006	1980-1995	1995-2006	1980-2007	1980-1995	1995-2007
Output	**2.9**	**2.5**	**3.5**	**2.5**	**2.7**	**2.4**	**2.2**	**2.2**	**2.2**
Hours worked	1.3	0.0	2.8	-0.6	-1.5	0.7	0.3	-0.2	0.8
Labor productivity	1.6	2.5	0.7	3.0	4.1	1.7	1.9	2.3	1.4
Contributions from:									
Labor composition	0.5	0.6	0.4	-	-	-	0.3	0.3	0.1
Capital deepening	1.2	1.4	0.9	1.6	1.9	1.1	1,0	1.1	0.9
TFP	0.0	0.5	-0.6	1.4	2.2	0.5	0.6	0.9	0.4

Sources: EU-KLEMS Database, Nov. 2009 and own calculations for Spain and EU-10; EU-KLEMS Database, Nov. 2009, INE and own calculations for Portugal. Numbers may not sum exactly due to rounding.

Annual average growth in real value added was slightly lower in Portugal relative to Spain between 1980 and 2007. The evolution in total hours worked in Spain reflects the aforementioned changes in employment and participation rates during the period under analysis. More precisely, the significant contribution of hours worked in total output growth reflects the fast employment creation observed since the mid-1990s, which reversed the overall tendency of decline experienced in the earlier decade and a half. In Portugal, on the other hand, the decrease in total hours worked reflects mostly the reduction in hours worked per employed person, which was about 40 p.p. higher than the EU core in the early 1980s and has declined until 1998, increasing slightly afterwards (cf. Figure 3).

During the period under study, labor productivity growth was higher in Portugal, but it is important to keep in mind that the country´s productivity levels were considerably below those of Spain. Both countries experienced a labor productivity slowdown from 1995 onwards, which has also occurred at the broad EU-10 level. The decline was, however, much higher in these countries: labor productivity growth fell 1.8 and 2.4 p.p. in Spain and Portugal, respectively (about 72 and 59%), whereas in the EU-10 the corresponding figure was of 0.9 p.p. (about 39%). Since 1995, the huge productivity gap between Portugal and the EU-10 has remained almost unaltered, whereas in Spain, slow labor productivity growth has led to increasing divergence with the European core.[7]

Table 3 shows that the main factors explaining the overall disappointing performance of both Spain and Portugal are not to be found in differences in the intensity of production factors. In Spain, both the contributions of labor composition changes and capital deepening to labor productivity growth were higher than in the EU over the entire period under study.[8] Because we do not have information on the skills composition of the labor force for Portugal, a comparison involving this factor cannot be undertaken, but the evidence presented elsewhere (e.g., Guichard and Larre, 2006) shows that there has been an increase in the share of high-skill workers in

[7] Table 1 shows a slight tendency of divergence in Portugal after 2000, but the comparison undertaken is made relative to the EU-15.

[8] With respect to labor composition changes, Spain has registered an important increase in the skills content of the workforce in the period under study, as a number of significant educational reforms have been undertaken. See Fuentes (2009) for an elaborate discussion on the matter.

Portugal as well.[9] Moreover, and similar to Spain, Portugal presents a higher contribution of capital deepening to labor productivity growth, which partly reflects the relative backwardness of both countries, and the corresponding increase in infrastructure investment that took place after Portugal and Spain's entry in the European Union in 1986.[10] The main factor explaining the slowdown in labor productivity in both countries and the higher difficulties in catching up is, therefore, in the contribution of multifactor productivity growth. Portugal, Spain and the EU experienced a decline in multifactor productivity growth since 1995, but in the former countries the decline was much more intense. In the European Union multifactor productivity growth fell 0.5 percentage points from 0.9 percent in 1980-1995 to 0.4 percent in 1995-2007, whereas in Portugal and Spain the declines in multifactor productivity growth were 1.7 and 1.1 percentage points, respectively. As a matter of fact, the annual average rate of multifactor productivity growth in Spain became negative after 1995.

In order to explain the disappointing performance of both countries, attention must be given therefore to the potential causes explaining the deterioration of productivity trends. Multifactor productivity is generally related to the overall efficiency of the production process and may be influenced by several factors, including the effects from pure technological change and innovation, changes in returns to scale, and organizational and managerial improvements.[11] As indicated earlier, the sectoral composition of the economy may have an important impact over these factors. Sectors differ in their scope for innovation, technological progress, and economies of scale, and therefore, the composition of the economy may influence significantly productivity outcomes.[12] The links between structure and productivity growth are investigated in the following section.

3. Explaining the decrease in productivity growth: the role of structural change

To assess the influence of structure on productivity growth, we need to move from the macroeconomic to the industry level of analysis, by investigating the role played by the different industry groups on the aggregate economy. Considering the breakdown of economic activity used in van Ark et al. (2008), we present in Table 4 the contributions of four major sectors to overall labor productivity growth (information and communication technology production, goods production, market services, and a group composed by non-market services and real estate activities).[13] Along with data for Portugal, Spain and the EU-10, Table 4 provides information regarding the US, which is usually taken as a standard for comparison in the studies focusing on

[9] Because labor composition changes are not taken into account in the computations regarding Portugal, TFP measures should be seen as upper bound estimates, relative to those presented for Spain and the EU.

[10] The relative deficit of infrastructure capital in both countries made them eligible for the Structural Funds and the Cohesion Fund, which materialized into important investment flows.

[11] As a residual measure, multifactor productivity also captures the influence of factors such as adjustment costs, scale and cyclical effects, as well as eventual measurement errors.

[12] High-tech and high-skill sectors may also have a positive impact over aggregate productivity growth by generating positive spillovers to the other branches of the economy. This effect, however, cannot be captured by growth accounting techniques.

[13] The ICT production sector includes the production of electrical machinery and telecommunication services; the goods production sector includes agriculture, mining, manufacturing (except electrical machinery), utilities and construction; the market services sector includes trade, hotels and restaurants, transport services, financial and business services, and social and personal services; and finally, non-market services include health and education services, along with public administration and defense.

the European productivity slowdown after 1995 (e.g., van Ark at al, 2008; Inklaar et al, 2008, Maudos et al, 2008).

Table 4: Major sector contribution to average annual labour productivity growth in total economy, 1980-2007 (annual average growth rates, in percentage points)

	Total economy	ICT Production	Goods production	Market services	Non-market serv. & RE	Reallocation
Portugal						
1980-1995	**4.1**	0.3	1.7	1.1	0.3	0.7
1995-2006	**1.7**	0.4	0.6	0.5	0.1	0.1
1980-2006	**3.0**	0.4	1.2	0.8	0.2	0.4
Spain						
1980-1995	**2.5**	0.2	1.8	0.4	0.1	0.1
1995-2007	**0.7**	0.2	0.1	0.4	0.1	-0.1
1980-2007	**1.6**	0.2	1.0	0.3	0.1	0.0
EU-10						
1980-1995	**2.3**	0.2	1.2	0.4	0.4	0,1
1995-2007	**1.4**	0.4	0.5	0.4	0.2	-0,1
1980-2007	**1.9**	0.4	1.0	0.4	0.3	-0,1
US						
1980-1995	**1.2**	0.3	0.5	0.5	-0.1	-0.1
1995-2007	**2.4**	1.2	0.3	1.1	0.1	-0.4
1980-2007	**1.7**	0.9	0.5	0.7	0.0	-0.4

Source: Author's calculations based on the EU-KLEMS Database, November. 2009 release. Data regarding the US are from the revised version of this database, released in June 2010. Numbers may not sum exactly due to rounding.

Table 4 shows that the main factor explaining the slowdown in labor productivity growth in Portugal, Spain and the EU-10 is in the strong decline of the contribution of the goods production industry group. This decline has not been compensated by an increase in the contributions of other industry groups, notably market services and ICT producing sectors, which have recently been the major sources of growth in faster growing economies (cf. van Ark et al, 2008; Jorgenson et al., 2005).

During the period under study, both Portugal and Spain have experienced a major shift of production and employment from the goods-producing industries towards services, in line with the broad European experience (e.g., Pilat et al, 2006). The share of labor input going to the goods production has declined by about 30% in both Portugal and Spain, and about 38% in the EU-10, following the global tertiarization trend (c.f. Table 5).[14] The decline in the contribution of the goods industry group to overall productivity growth in the more recent years was therefore somehow to be expected.

This decline was, however, notably higher in Spain and to a lesser extent, Portugal, countries in which the contribution of this group of industries was traditionally very important. Annual

[14] The decline in the labor share in the goods producing industry between 1980 and 2007 is due to the influence of two complementary factors: an absolute decline in the number of hours worked in that sector, and rapid employment creation in the services sector. It is worth mentioning, however, that whereas in Portugal there was a sustained decline in employment in the goods producing industry during the period under study, in the case of Spain, after a period of decline, the number of hours worked in this sector has increased consistently from 1994 onwards, being in 2007 only about 2% lower than in 1980.

average productivity growth in the goods production industry has declined by about 94% in Spain and 65% in Portugal, whereas in the EU the corresponding rate was of about 58% (cf. Table 5). Moreover, in Portugal the contribution of market services decreased considerably, which is at odds with the recent growth experience of faster growing economies, most notably the US (cf. Table 4), the United Kingdom or the Netherlands (c.f. van Ark et al, 2008; Inklaar et al, 2008). In Spain, the contribution of market services to overall labor productivity growth has remained unchanged, despite its growing importance in employment.

Table 5: Employment shares (hours worked) and labour productivity growth (annual average growth rates) in the industry groups, 1980-2007

	Portugal		Spain		EU-10	
	1980	**2006**	**1980**	**2007**	**1980**	**2007**
Employment (%)						
Goods production	57,2	40,6	49,7	34,1	43,5	27,0
ICT production	2,0	1,5	2,3	2,1	4,4	3,0
Market services	30,9	42.2	35,1	45,6	30,4	41,4
Non-market services and real estate	9,9	15.7	12,9	18,1	21,7	28,6
Labour productivity growth (%)						
Goods production	4,2	2,0	4,4	0,3	3,3	1,7
ICT production	8,4	8,5	5,2	3,2	5,1	6,8
Market services	3,4	1,4	1,1	0,7	1,4	1,2
Non-market services and real estate	1,4	0,3	0,3	0,4	1,4	0,6

Source: Author's calculations based on the EU-KLEMS Database, November. 2009 release.

To get a better grasp of the factors underlying the poor performance of the two Southern Europe countries, it seems thus necessary to study more in-depth the strong decline in productivity growth in the goods producing industry group, and at the same time, identify the causes explaining the relative weakness of both countries in the sectors which have been the major sources of growth in fast-growing countries in the more recent period, i.e., market services and ICT sectors. This analysis is performed in Sections 3.1. and 3.2..

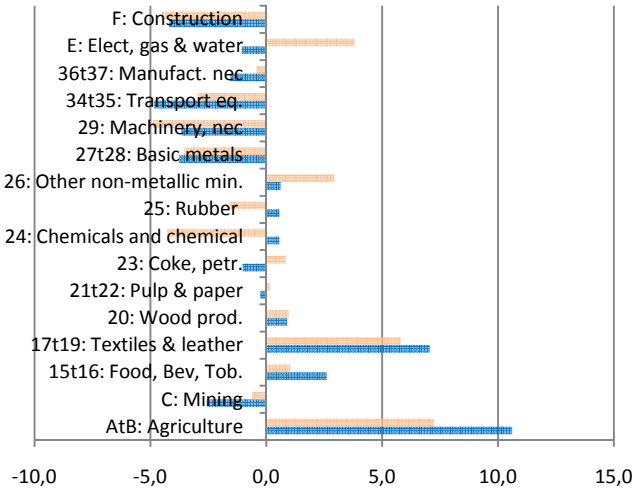
3.1. The goods producing industry group in Portugal and Spain: the persistence of a strong bias towards low-skill and low-tech activities

Figure 6 provides a detailed picture of the differences in the composition of the goods producing industry group in Portugal and Spain relative to the EU-10 in 1980 and 2007. Krugman specialization indices are also reported for both countries.[15]

The Krugman indices reveal that the differences in the production structures of goods producing industries in Portugal and Spain relative to the EU-10 have not been reduced during the 30-year period under analysis. Although some convergence has been reached in agriculture, as well as in other traditional industries such as textiles and food, beverages and tobacco, whose importance decreased consistently over time in both countries, an increasing divergence came into play in other sectors. In Portugal, the most notable changes took place in the utilities and other non-

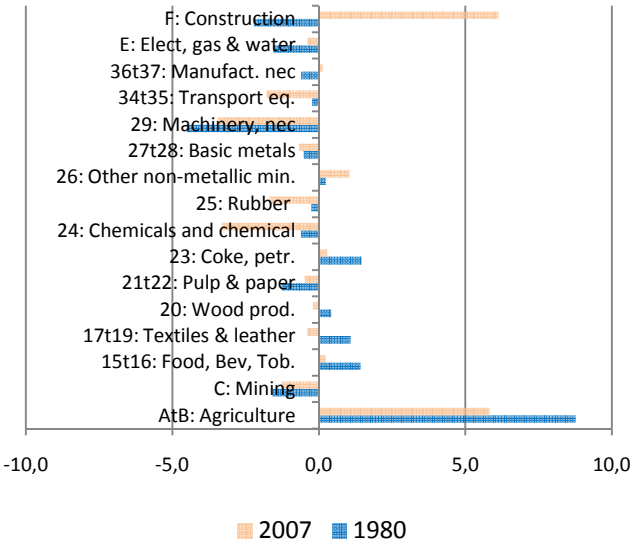
[15] The Krugman index is defined as $K_j(t) = \sum_i \left| S_j^i(t) - \bar{S}^i\ (t) \right|$, where $S_j^i(t)$ is the share of sector *i* in country *j* at time *t* based on gross value added at constant 1995 prices, and $\bar{S}^i\ (t)$ is the share of sector *i* in the EU-10.

metallic mineral products industries, which increased considerably their shares, whereas in Spain, a remarkable increase took place in construction, whose real GVA grew at an annual average rate of 5.7% between 1980 and 2007, and which now accounts for almost 30% of the total value added generated in the sector.



Portugal – EU-10

Krugman index: 1980: 0.46; 2006: 0.46



Spain – EU-10

Krugman index: 1980: 0.27; 2006: 0.27

Fig. 6: Gross value added shares in goods producing industries in Portugal and Spain (differences relative to the EU-10, GVA at constant 1995 prices)

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009

The comparison of productive structures in goods producing industries and of their changes over time indicates that a strong bias in low-skill and low-tech activities is still characteristic of Portugal and Spain productive specializations. In fact, the decay of agriculture was accompanied by the reinforcement of mostly low-tech and low-skill activities, whereas high-tech activities' shares, e.g. in chemicals and transport equipment industries, remained largely below EU levels. This point is further investigated in Table 6, which provides a comparison of the technology and skill contents of the goods producing industries in Portugal and Spain relative to the EU, based on the classification of industries developed by Peneder (2007) and Tidd et al. (2005).[16]

[16] Peneder's (2007) taxonomy classifies industries according to their educational workforce composition, distinguishing among seven categories, from very high to very low educational requirements. It combines educational attainment data, compiled in a collective effort coordinated by the National Institute of Economic and Social Research (NIESR), with industry data gathered from the OECD STAN database. The innovation taxonomy developed by Tidd et al. (2005) constitutes a refinement of Pavitt's original classification scheme (Pavitt, 1984) which includes the information-intensive category along with the former Pavitt categories: supplier-dominated, scale-intensive, science-based and specialized suppliers. These four categories establish a gradual scale of technological opportunities, identified with the number of significant innovations achieved: they are lowest in supplier-dominated firms, in which most of the technological advances come from suppliers of equipment and other inputs; they are relatively higher in scale-intensive firms, which develop investment and production activities in large-scale production systems and major sources of innovation come from production engineering departments and suppliers of specialized inputs; and finally, they are highest in science-based and in specialized supplier firms, the former

Table 6: Goods producing industries' shares in employment (hours worked) classified according to skill and innovation taxonomies

	Portugal		Spain		EU-10	
	1980	**2006**	**1980**	**2007**	**1980**	**2007**
Skill taxonomy (Peneder, 2007)						
Very Low (1)	58,0	46,0	45,4	20,4	32,4	19,9
Low (2)	29,6	40,2	34,6	59,2	38,2	50,9
(1) + (2)	**87,6**	**86,3**	**80,0**	**79,6**	**70,7**	**70,8**
Medium-low	3,6	4,5	4,7	5,3	5,1	6,3
Intermediate	5,7	6,4	7,6	8,5	14,8	14,3
Medium-high	3,1	2,9	7,7	6,7	9,4	8,6
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**
Innovation taxonomy (Tidd et al., 2005)						
Supplier-dominated	80,5	77,9	69,4	69,3	59,6	59,3
Scale-intensive	15,4	17,6	23,8	23,1	28,4	28,0
Specialised supplier	2,7	3,5	4,1	5,1	8,6	9,7
Science-based	1,4	1,0	2,7	2,5	3,4	3,1
Total	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**	**100,0**

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009.

Note: Peneder´s taxonomy classifies industry 34 as intermediate and industry 35 as medium-high skill. In the aggregation of the two industries we considered the medium-high skill classification.

Table 6 shows that the division of the goods producing industry group according to the selected taxonomies did not change much in Portugal and Spain during the whole period under study. With regard to the skills classification, the most important change took place within the broad low-skill group, with low-skill activities increasing their relevance in detriment of very low skill ones. The aggregate of very low and low skill industries remained, however, practically unchanged, and so was the skill gap relative to the EU. Medium-low and intermediate skill industries´ shares increased by a small amount, whereas medium-high industries employment shares registered a slight decline.

The analysis of the composition of the goods producing industry group according to the innovation taxonomy reveals furthermore that the greater reliance of both countries in supplier dominated industries, the industry group with fewer technological opportunities (cf. Tidd et al, 2005), was kept virtually intact. Science-based and specialised supplier industries, on the other hand, which are the top categories in Tidd et al. innovativeness scale, remained of little importance, and their distance relative to the EU stood unchanged. [17]

Looking at the average rates of labor productivity growth of the goods producing industries classified according to the aforementioned taxonomies (cf. Table 7) it can be seen furthermore that it was precisely in the industry groups more representative of Portugal and Spain's economic

characterized by high levels of in-house R&D and strong links with science, and the latter facing continuous pressures to improve efficiency on the part of their users. Table A.2 in the Appendix presents the classification of industries according to the selected taxonomies.

[17] The results are similar when using GVA shares instead, although a more significant decline is found with respect to low skill and supplier dominated industries in the Portuguese case (c.f. Table A.3 in the Appendix).

structures that the deceleration of productivity growth was more intense. This partially explains their poorer performance since 1995, despite the maintenance of relatively low levels of productivity and of a corresponding high potential for catching-up.

Table 7: Labour productivity growth in goods producing industries classified according to skill and technological characteristics, 1980-2007 (annual average growth rates, in percentage points)

	Portugal		Spain		EU-10	
	1980-1995	1995-2007	1980-1995	1995-2007	1980-1995	1995-2007
Skill taxonomy (Peneder, 2007)						
Very Low	5,0	0,7	5,8	2,1	4,7	2,3
Low	2,9	0,3	2,7	-1,4	1,8	0,5
Medium-low	3,6	1,1	3,5	1,2	2,6	2,6
Intermediate	4,4	4,1	4,2	1,8	3,5	2,2
Medium-high	3,5	7,1	4,1	0,9	4,9	3,0
Innovation taxonomy (Tidd et al., 2005)						
Supplier-dominated	4,7	0,4	4,6	0,1	3,1	1,2
Scale-intensive	3,9	4,1	3,6	1,0	3,2	1,9
Specialised supplier	0,2	3,2	4,2	0,9	3,2	2,5
Science-based	3,3	2,8	5,7	0,6	6,1	3,6

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009

Until 1995, low-skill activities, which are essentially characterized as supplier dominated in Tidd et al. (2005) taxonomy (c.f. Table A.2), benefited from intense productivity growth, particularly in Portugal and Spain. In these industries, increases in productivity stem mostly from the adoption of technology developed by supplier firms through the acquisition of equipment and inputs. The evidence presented in Table 7 seems to indicate that this source of productivity growth became less important in the more recent years. Some studies in the literature suggest precisely that after the ICT "revolution" of the 1980s and 1990s, it became more difficult to converge on the basis of mere imitation or diffusion, whereas innovation directly pursued by firms has increased its relative importance (e.g., Fagerberg and Verspagen, 2002). This seems to constitute a matter of deep concern in countries such as Portugal and Spain, where industries more prone to innovate have still relatively modest shares in total production and employment, and domestic innovation levels, proxied by patent counts are rather low (c.f. Pilat, 2005; Pilat et al, 2006).

The low importance of technologically advanced industries has also probably influenced negatively the two countries, by reducing the extent to which they could benefit from positive spillovers arising in these industries. [18] This explains, to some extent, the stronger deterioration of productivity growth in several industry groups considered, including in some cases high-skill and high-tech industries. Spain, in particular, shows productivity growth rates lower than the EU-10 in all groups of industries considered between 1995 and 2007, despite its relatively low productivity levels. This seems to indicate that along with structure, other forces have also played a role.

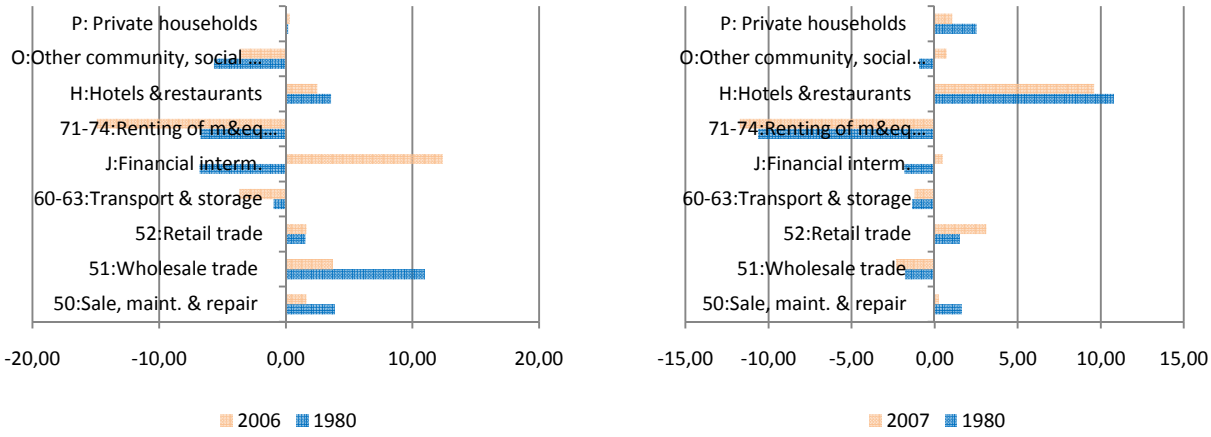
[18] Several studies show evidence of beneficial spillover effects from the technologically advanced industries to the rest of the economy during the period under analysis. See, for example, Silva and Teixeira (2011), Peneder (2003).

3.2. Market services and ICT production: weak sources of productivity growth

In contrast with other countries that have recently experienced fast labor productivity growth (e.g., the United States, Finland, the United Kingdom), in which growth has been mainly driven by market services and information and communication technology-producing sectors (cf. van Ark et al, 2008), in Portugal and Spain these sectors remained relatively weak sources of aggregate productivity growth.

The ICT producing industries group is relatively small in both countries, and for that reason its contribution to aggregate productivity growth is of little importance, despite the high rates of labor productivity achieved, particularly in Portugal (cf. Table 5). Market services, on the other hand, have become progressively more important over time, accounting for more than 40% of total employment and value added in both countries in the end of the period under analysis (cf. Table 5). In this case, the relatively small contribution to aggregate productivity growth found after 1995 is essentially the result of slow productivity growth.

Before proceeding with a more in-depth analysis of the productivity performance in market services industries in both countries, a simple comparison of Portugal and Spain's structures with the EU-10 might be useful. Figure 7 provides such a comparison, based on the industries' shares in real value added.



Portugal – EU-10

Krugman index: 1980: 0.40; 2006: 0.44

Spain – EU-10

Krugman index: 1980: 0.33; 2006: 0.31

Fig. 7: Gross value added shares in market services industries in Portugal and Spain (differences relative to the EU-10, GVA at constant 1995 prices)

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009

Figure 7 reveals the persistence of significant differences in Portugal and Spain´s structures in market services industries relative to the EU during the period under study. Distribution services remain more important in Portugal, especially wholesale trade, despite the convergence that has already been made. In Spain, considerable differences subsist with respect to hotel and restaurant services, which individually account for about 15% of real gross value added in market services.

The major source of divergence relative to the EU during the period under study is found, however, in business services, in the case of Spain, and in both financial and business services, in the case of Portugal. In the latter country, the period between 1980 and 2006 was marked by an impressive rise of the financial intermediation sector, which experienced extensive de-regulation, particularly after Portugal's entry in the EU (cf. Pinho, 1999; Tavares Moreira, 2000). In Spain there was also an increase in the importance of this sector, but to a much more limited extent. Regarding business services, both countries increased the gap relative to the EU, which is now of about 15 p.p. in Portugal and 12 p.p. in Spain. The relatively small size of business services is most likely related to the productive structures of both countries. As indicated earlier, the goods producing sector is still strongly biased towards low-skill and low-tech activities, which generate a lower demand for technical and organizational consultancy services. According to the available evidence (e.g., Peneder et al, 2003, Rubalcaba and Kox, 2007), business services have become increasingly important sources of innovation, product differentiation and productivity growth. Their modest importance in the case of Portugal and Spain may therefore convey an additional explanation for the stronger productivity growth deceleration in these countries.

We now turn to a more thorough investigation of the performance of market services industries by looking at the contribution of each sector to overall labor productivity growth. Following the standard practice in the literature, the analysis is undertaken considering separately three distinct groups of market services industries: distribution services, including wholesale and retail trade, transport and storage; finance and business services, including financial intermediation and the renting of machinery and equipment and other business activities; and finally, personal services, including hotels and restaurants, and community, social and personal services. Table 8 reports the results.[19]

[19] Table 8 follows closely van Ark et al (2008) description of results in order to facilitate comparison.

Table 8: Contributions of distribution, finance and business and personal services to aggregate market services labour productivity growth, 1980 - 2007 (annual average rates, in percentage points)

	Portugal		Spain		EU	
	1980-1995	1995-2006	1980-1995	1995-2007	1980-1995	1995-2007
Market services labour productivity	**3.4**	**1.3**	**1.1**	**0.7**	**1.5**	**1.2**
Distribution services contribution	**1.7**	**0.3**	**0.8**	**0.4**	**1.2**	**0.8**
from factor intensity growth	1.2	0.4	0.9	0.9	0.5	0.5
from multifactor productivity growth	0.5	-0.1	-0.1	-0.5	0.7	0.3
Finance and business services contribution	**0.3**	**1.1**	**-0.3**	**0.5**	**0.1**	**0.2**
from factor intensity growth	0.1	0.1	0.4	0.4	0.6	0.4
from multifactor productivity growth	0.1	0.9	-0.7	0.1	-0.4	-0.2
Personal services contribution	**0.5**	**-0.1**	**0.2**	**-0.2**	**0.0**	**-0.1**
from factor intensity growth	0.4	0.1	0.9	0.4	0.2	0.1
from multifactor productivity growth	0.1	-0.3	-0.7	-0.7	-0.2	-0.1
Contribution from labour reallocation	**0.9**	**0.1**	**0.3**	**0.1**	**0.3**	**0.2**

Sources: EU-KLEMS Database, Nov. 2009, INE and own calculations for Portugal; EU-KLEMS Database, Nov. 2009 and own calculations for Spain and EU-10. Numbers may not sum exactly due to rounding.

Notes: 1) The computation of multifactor productivity growth in Finance and business services industries in Portugal uses the capital input series described in Table A.1. Because these estimates put together finance, business services and real estate activities, we are implicitly assuming that the inclusion of real estate does not fundamentally influence the dynamics of capital services of the two other industry groups during the period under study. 2) Portuguese TFP measures should be seen as upper bound estimates, relative to those presented for Spain and the EU, since labor composition changes are not taken into account.

The evidence reported in Table 8 shows that the main factor accounting for the deterioration in market services labor productivity growth in Portugal, Spain and the EU is in the contribution of distribution services, which shows an impressive decline during the period under study. This decline was particularly acute in the case of Portugal, from 1.7 p.p. in 1980 to 0.3 p.p. in 2006, and to a lesser extent, in Spain, from 0.8 to 0.4 p.p., explaining therefore the greater fall of productivity growth in these two countries.

In all cases, the major source for this decline lies on the deterioration of multifactor productivity growth, although the variation in factor intensity has also played a part in the case of Portugal. It seems therefore that one of the key factors outlined in the literature to explain the rise in the productivity growth differential between Europe and the United States, that is, the inferior productivity performance in distributive trade in Europe (c.f. van Ark et al, 2008; Inklaar et al., 2008), may as well provide an explanation for the slower convergence of Portugal and Spain with the EU since 1995. The reasons usually pointed out to explain the poor performance of this sector in Europe seem also to be appropriate in this case. Portugal and Spain present a rather restrictive product market regulation, such as strong regulations in the retailing sector (cf. Conway et al., 2005; OECD, 2010a; OECD, 2010b), which are usually thought to limit firms in the ways they can innovate and improve processes, thus inhibiting productivity growth. Both countries present also

relatively strict employment protect legislation (e.g., Centeno et al., 2009; Alexandre et al., 2010; OECD, 2010b), which acts in a similar fashion.[20]

In contrast with the EU-10 experience, the contribution of financial and business sector evolved in a positive way in both countries, which reflected important gains in multifactor productivity growth. In both Portugal and Spain the financial intermediation sector has undergone a substantial transformation during the period under study, due to increased de-regulation and competition (cf., Pinho, 1999; Tavares Moreira, 2000; Vives, 1990; Kumbhakar and Lozano-Vivas, 2005), along with strong technological improvement from a massive increase in the use of information and communications technology. International comparisons on banking systems' efficiency show indeed that Portugal and Spain compare well with other European countries, in contrast with many other industrial branches, in which a strong productivity gap persists (e.g., Lozano-Vivas et al, 2002; Erber and Madlener, 2008).

4. Explaining the slow change towards a more "modern" productive structure

The discussion developed so far relied on two major points: first, describe the overall trends in productivity growth in Portugal and Spain and provide evidence regarding their greater difficulties in catching up to the European core after 1995; second, relate that evidence with the productive structure and, in particular, with some difficulties faced by both countries in promoting major changes towards high-skill and high tech-based activities. In the exposition, some elements explaining the relatively poor performance of both countries in some of the industries considered were pointed out, namely low innovation levels, extensive product and labor market regulation, but the sources underlying the main factor under analysis – slow structural change – were not investigated. We now go a step further in the explanation of the observed trends, exploring some of the possible factors influencing the slow change in the productive structures of both countries.

Structural change may be driven either by demand-side factors, such as changes in domestic demand and in the structure of exports, or by supply-side factors, such as the re-allocation of labor and capital to more efficient uses. We explore some of these factors, analyzing the transformations occurred in trade patterns, and addressing the role played by the workforce´s characteristics in both countries during the period under study.

In the last 30 years, an important movement of economic integration came into play in both countries. Portugal and Spain joined the EU in 1986, and have since then experienced increased integration of factor and product markets, with the construction of the Single Market and the inception of Economic and Monetary Union. The wide-reaching impact of such transformations has naturally had an impact on the sectoral composition of both economies. Economic theory does not provide, however, a clear-cut indication about the nature of that impact in countries' sectoral specializations. On the one hand, classical trade theory (i.e., Ricardo and Hecksher-Ohlin formulations) indicates that the removal of trade barriers may generate greater specialization motivated by countries' comparative advantage, leading in this way to an increase in inter-

[20] More restrictive labor regulation makes wages less responsive to labor market conditions and makes more difficult the integration of young people in the labor market. In the case of Portugal and Spain, the relative duality of labor markets (cf. Mas et al, 2008) may also have a negative effect on labor productivity by reducing the incentives of both individuals and firms to invest in human capital.

industry trade.[21] More recent contributions in the realm of international trade theory, involving imperfect competition (Krugman, 1980) and new economic geography models (e.g., Krugman, 1991; Fujita et al, 1999) suggest, however, that the impact of economic integration may be of a different kind. In a context marked by imperfect competition, the exploitation of scale economies by firms leads to the production of different varieties of similar products, which promotes intra-industry trade and may originate the convergence of productive structures across countries. Under "new economic geography" arguments, the joint influence of external economies and mechanisms of cumulative causation may, on the other hand, increase relative specialization between countries, but the global impact of greater integration is dependent upon the nature of the agglomeration forces at work. Economic integration allows for the exploitation of scale economies and lowers trade costs, which generate forces that encourage geographic clustering of economic activity, but that can materialize in either *overall clustering*, that is, some areas concentrate the most part of economic activity, while others are relatively empty (core-periphery model), or in alternative, *sectoral clustering* may emerge, in which each sector clusters in one region, but most regions get a cluster (e.g., Porter, 1990).

In order to analyze the changes occurred in the structure of exports in the two countries in the period under study, we report in Table 9 the classification of exports according to the two taxonomies used above. The reported evidence shows that there was a steady decrease in the share of low-skill and low-tech sectors in total exports during the period under study, and inversely, an increase in top categories' shares in both countries. A movement of general convergence with the EU-10 export structure came into place, with export shares above the EU average showing a downward movement, and export shares below the EU average experiencing the opposite trend in most of the industry groups considered. This notwithstanding, substantial differences remain in both countries' export structures relative to the EU-10. The share of very low skill exports is still about 3 times larger the EU-10 average in the case of Portugal and supplier-dominated industries' exports shares are twice the European level. In Spain, the shares of low-skill and low-tech activities are also considerably higher than the EU. Accordingly, the analysis of revealed comparative advantages on the basis of Balassa indices indicates that both countries are still more competitive in low-tech and low-skill products, while presenting a clear comparative disadvantage in high-skill and high-tech products.

The pattern of export specialization has been rather persistent over time in both countries, despite of the overall reduction of specialization observed. In their analysis of the distribution of Balassa indices covering 120 manufacturing products, Amador et al. (2007) find evidence of a relative similarity of the export specialization of the two countries in 1967 and 2004, which is more significant in the Portuguese case. The same study shows that about 50 per cent of the products which appear in the top rank of exports in both countries in 1967-1969 also appear in that position in 2000-2004. In both cases, all top 10 products in the two extreme periods have low technological content. In the case of Portugal, two sectors emerge as especially relevant in these

[21] Classical trade theory matches well the evolution observed in Portugal in the 1960s. Progressive trade liberalization related to the country's accession to the EFTA in 1960 was accompanied by a surge of labor-intensive export-oriented industries, exploring the relatively labor abundant nature of the Portuguese economy (Amador et al., 2007). In the case of Spain, on the other hand, the limited outward-orientation of the industrialization process during 1959-1975 implied a much more restricted impact of trade over the country's productive structure (Prados de la Escosura and Sanz, 1996).

rankings – manufacture of textiles, and manufacture of other non-metallic mineral products, which as indicated earlier are important sources of difference of the Portuguese economic structure relative to the EU.[22]

Table 9: Manufacturing exports by skill, innovation and technological intensity, 1980-2007 (shares in exports and Balassa indices)

	Export shares						Balassa indices[1]			
	Portugal		Spain		EU-10		Portugal		Spain	
	1980	2007	1980	2007	1980	2007	1980	2007	1980	2007
Skills										
Very low (1)	42,1	20,3	19,5	12,1	11,8	7,6	3,6	2,7	1,6	1,6
Low (2)	19,0	22,0	31,3	21,9	22,5	18,6	0,8	1,2	1,4	1,2
(1) + (2)	**61,1**	**42,2**	**50,8**	**34,0**	**34,3**	**26,3**	**1,8**	**1,6**	**1,5**	**1,3**
Medium-low	3,9	6,8	4,9	5,0	5,3	5,5	0,7	1,2	0,9	0,9
Medium	20,0	32,5	31,2	41,3	38,7	39,2	0,5	0,8	0,8	1,1
Medium-high (3)	14,3	16,7	12,0	19,1	20,0	26,4	0,7	0,6	0,6	0,7
High (4)	0,8	1,8	1,1	0,5	1,8	2,6	0,4	0,7	0,6	0,2
(3) + (4)	**15,0**	**18,4**	**13,1**	**19,6**	**21,7**	**29,1**	**0,7**	**0,6**	**0,6**	**0,7**
Innovation										
Supp.-dominated	51,6	26,0	25,5	16,4	17,9	12,9	2,9	2,0	1,4	1,3
Scale-intensive	30,3	41,8	49,7	52,7	45,2	41,5	0,7	1,0	1,1	1,3
Spec. supplier	8,2	18,6	14,5	13,1	20,8	25,1	0,4	0,7	0,7	0,5
Science-based	9,9	13,6	10,3	17,7	16,0	20,5	0,6	0,7	0,6	0,9

Source: CHELEM database and own calculations.

Notes: 1) The Balassa indices are computed as $B_{ij} = \frac{X_{ij}/X_i}{X_{EUj}/X_{EU}}$, where *X* represents exports of product *j* with origin in country *i*. and the EU-10 is taken as the reference area. 2) Computations comprise all sectors reported in CHELEM, including activities from agriculture, manufacturing and services.

It seems therefore that although there was convergence of the export structure of each country relative to the EU-10 average during the period under study, the pace at which it took place has been relatively slow. The potential role that economic integration could have had in reducing relative specialization seems to have been rather limited in practice, which provides an explanation for the slow transformation in economic structure observed.

A different source for the explanation of the difficulties in promoting a major leap towards a more modern economic structure, and which also conveys an explanation for the evolution in international trade patterns along classical theory lines is based on the characteristics of the labor force in both countries.

Between 1980 and 2007, important improvements in educational attainment have been accomplished in both Portugal and Spain, which faced very hard legacies from their dictatorship periods. School enrolment increased considerably with the lengthening of compulsory schooling in the two countries, the coverage of early childhood education and participation rates in tertiary

[22] Amador et al. (2007) computations show an impressive rise in the Balassa index regarding other non-metallic mineral products, from 1.8 in 1967-69 to 2.6 in 2000-04, which provides an explanation for the strong increase in this industry´s share in overall production.

education have risen markedly as well (Guichard and Larre, 2006; Fuentes, 2009). A relative shortage of human capital persists, however, and is particularly problematic in the case of Portugal. Portugal still presents one of the lowest qualified workforces in the OECD countries, ranking next to Turkey and Mexico. The situation of Spain is better in this domain, but the supply of unskilled workers remains very high, due in part to the influence of middle-age cohorts, but also to the maintenance of a large inflow of unskilled youth into the labor market (cf. Fuentes, 2009). In both countries, early drop out rates are among the highest rates in the EU, and OECD PISA comparisons of education outcomes ran in 2006 rank both countries below the average in all the three competencies assessed (science, mathematics and reading).

The relative low educational level of the population has inevitably an impact over the composition of economic activity. It explains to some extent why firms remain stuck in low-productivity activities and do not adopt more widely advanced technologies. As a matter of fact, a large supply of high-skill labor seems to be a prerequisite to promote significant structural change, by facilitating the adoption and creation of technology and stimulating innovation. In these terms, education influences structure, but the inverse relationship is plausible as well. Studies focusing on the relationship between education and employment (OECD, 2005), show that in some cases early drop out rates are motivated by the relative ease with which young, poorly qualified workers are able to get unskilled jobs. This has been the case in Portugal, where unemployment rates during most of the period under study were relatively low, and also in some regions in Spain, particularly those in which tourism has an important role in economic activity (cf. Fuentes, 2009). In this case, a vicious circle between low education attainment and low-tech industry structure may be in place, making it more difficult to implement the modernization of the economy and promote its adaptation to global competition.

The plentiful supply of unskilled workers has also a bearing in the maintenance of a strong comparative advantage in the low-technology industries mentioned above, and in the competitiveness problems faced by both countries.[23] In this respect, it is interesting to note that the major changes that took place in the 30-year span under analysis in both economies in the structure of goods producing industries occurred in relatively more sheltered activities. In the case of Portugal, that happened with respect to the broad utilities sector (electricity, gas and water supply), whereas in Spain, the largest increase was found in the construction sector. This may indicate that the harder difficulties imposed by the more intense competition from abroad were partly offset by turning to less exposed business areas in which the requirements in terms of labor skills were not too demanding, rather than by managing to solve the deeper roots of the competitiveness problems.

5. Conclusion

This paper provides an interpretation of productivity trends in Portugal and Spain between 1980 and 2007, based on an industry perspective. Both countries experienced a deceleration of productivity growth after 1995, in line with the broad European experience, but in the specific cases of Portugal and Spain the slowdown was more intense, leading to stagnation in the case of Portugal, and divergence, in the case of Spain. Growth accounting exercises showed that

[23] Both countries present a significant deficit in the trade balance over the whole period under study.

multifactor productivity growth was the main source of the productivity slowdown, declining considerably in both countries.

In order to provide an explanation for the declining productivity trends, an investigation of the role played by the different sectors on the aggregate economy was undertaken. The analysis of changes taking place within goods producing industries revealed that both countries, despite the differences among themselves, maintained a strong bias towards low-skill and low-tech activities. These were the industry groups more affected by the deceleration of productivity growth after 1995, which partly explains their poorer performances. Moreover, market services industries, which constituted a major source of growth in faster growing economies in recent years, were of little importance to growth in both countries after 1995. The major factor accounting for this outcome is in the weak performance of distribution services, which seems to be related with relatively strong product market regulation and labor market rigidity in both countries.

In the last part of the paper, the slow pace of change towards high-skill and high-technology industries was put under examination, focusing on the role played by economic integration, and the transformations operated in educational levels. Despite the changes occurred in the export structures of both countries, substantial differences remain relative to the European core in the more recent period. The potential role that economic integration could have had in reducing relative specialization seems to have been rather limited in practice, which provides an explanation for the slow transformation in economic structure. The still plentiful supply of low skill labor in both countries has also probably acted in the same way, despite the improvements achieved in education attainment.

The persistence of a strong bias towards low-skill and low-technology activities in both countries seems to constitute a matter of deep concern. Unlike many other European countries which faced a deceleration in productivity growth after 1995, Portugal and Spain (particularly the former) are still a long way from the technological frontier. The fact that, in such circumstances, they were not able to converge to the EU may indicate that the traditional catch-up model on the basis of the adoption of technology is no longer an option. Under the new growth paradigm stemming from the ICT revolution, domestic innovation seems to be the key in fostering economic growth. At this level, both countries lag considerably behind the EU and it is unlikely that some progress can be achieved without a profound change in the composition of the economy. In this context, policy measures aimed at fostering rapid change, by promoting and retaining high-skill labor, as well as policies directed to the increase of investment in innovation and R&D, including foreign direct investment, seem to be highly desirable.

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APPENDIX

Measurement of Capital Services Growth

Capital services were estimated using the method pioneered by the United States Bureau of Labor Statistics (BLS), described in detail in Silva (2010). Differently from Silva's original estimates, in the present case the geometric age-efficiency decline, rather than the hyperbolic profile was used, in order to get greater comparability with the EU-KLEMS' estimates. Depreciation rates were also taken from the EU-KLEMS database (November 2009 release). Because this database considers a larger number of assets than those available in the Portuguese National Accounts, in particular in the case of machinery and equipment, which is decomposed into four different assets (information technology equipment, communication technology equipment, other machinery and equipment and software), the depreciation rates used were obtained as the weighted average of the depreciation rates of the different assets, using as weights the shares of the assets in the total capital stock in Spain during the period under analysis.

Relative to Silva's (2010) estimates, there were also some refinements which were now made possible given the wider availability of data. First, the original computations regarding the 2001-2003 period were based on provisional data from INE, and now we were able to use the definite series and extend them to cover additionally the years between 2004 and 2006. Moreover, INE made some refinements in the more recent data and retropolated them with respect to the earlier period (from 1995 onwards), which led to some adjustments with the earlier series. The breaks in the 1980-1995 series, more precisely in 1988 and 1995, were solved by using the information contained in overlap years. Also, differently from Silva (2010), we used the deflators from INE by sector and asset type from 1995 onwards; for the earlier period, because that information is not available we consider the deflators differentiated only by asset type. Another refinement refers to the calculation of labour and capital shares in total income. In this case, the "mixed income" component was allocated to labour and capital shares, using data on employees and self-employed, as suggested in OECD (2001, p. 45). Capital input series were determined for the 26 sectors reported in Table A.1. The determination of capital services for higher level aggregates, such as the economy, was computed as follows:

$$\Delta lnK_t = \sum_i \overline{w}_{it}^K \Delta lnK_{it}$$

Where $\overline{w}_{it}^K$ is the period-average share of industry i in total economy capital compensation.

Table A.1: Volume index of capital services by sectors, Portugal (1980-2006)

	A+B	CA+CB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
1979	56,1	49,1	48,2	49,5	48,9	48,3	46,7	45,5	50,2	49,2	48,0	47,8	48,5
1980	63,2	54,9	50,1	50,6	53,3	51,6	47,4	44,0	52,8	54,0	49,3	50,6	51,1
1981	74,4	64,0	52,4	55,2	62,5	54,2	52,6	42,6	53,1	59,6	50,9	53,8	55,8
1982	79,2	75,6	54,9	58,5	67,3	54,2	55,8	40,7	54,6	65,0	57,0	58,4	61,7
1983	80,0	81,2	56,9	60,3	71,1	53,2	68,8	36,4	55,0	66,2	59,9	60,9	64,7
1984	80,4	83,1	58,2	61,1	74,2	51,0	69,0	32,6	55,2	67,7	60,6	59,9	68,3
1985	78,5	83,8	59,1	62,3	76,4	48,6	68,4	29,2	53,3	68,9	61,3	59,1	68,4
1986	77,7	83,1	60,5	64,7	80,6	48,2	70,3	27,1	51,2	70,9	63,8	57,0	68,3
1987	79,5	76,9	63,6	70,5	88,4	49,4	75,4	25,7	49,7	75,1	67,7	56,3	69,6
1988	95,4	83,4	64,7	76,4	91,7	48,4	83,0	24,7	48,9	78,5	71,8	60,6	71,8
1989	110,5	88,4	68,1	83,6	100,5	50,4	88,9	24,2	48,0	84,6	75,7	62,4	74,0
1990	111,3	91,7	71,5	89,9	110,0	51,5	95,5	27,3	46,7	89,9	81,6	67,2	76,8
1991	111,1	93,9	74,6	92,2	118,5	52,5	103,0	30,2	45,8	92,7	84,7	69,9	79,7
1992	105,3	89,4	76,1	91,6	118,5	51,1	102,9	48,3	45,1	93,2	86,3	69,7	80,4
1993	101,3	85,0	76,9	90,5	117,7	49,4	101,8	62,6	44,3	92,8	87,1	68,9	80,3
1994	100,1	81,7	78,2	89,4	115,7	48,2	101,3	63,0	43,5	92,0	87,3	68,4	80,6
1995	100,0	79,5	79,7	89,4	116,2	47,5	101,5	65,6	43,1	92,5	88,0	67,6	80,9
1996	101,8	80,0	82,6	89,5	117,7	48,0	104,3	61,1	42,8	94,4	88,9	66,5	81,8
1997	108,6	82,6	85,1	90,7	120,1	47,5	110,7	64,2	44,0	98,4	89,9	67,1	82,6
1998	95,9	84,8	88,0	92,8	123,4	47,8	116,6	59,6	44,8	102,7	91,4	68,2	85,2
1999	77,1	88,1	92,1	94,7	126,1	50,7	126,5	55,0	46,1	109,6	94,5	70,5	88,0
2000	76,2	91,1	96,7	96,6	131,1	56,1	137,0	54,7	47,1	118,4	98,5	74,5	90,0
2001	76,4	93,3	100,5	98,7	130,0	59,7	147,9	60,2	47,4	127,3	100,8	77,5	91,5
2002	71,7	88,9	105,0	97,1	125,8	62,8	155,3	50,8	48,3	135,5	102,6	78,2	91,7
2003	69,6	82,3	108,1	94,7	120,9	63,8	161,7	40,3	48,1	137,7	102,0	78,9	92,1
2004	68,1	77,4	111,1	91,9	115,9	63,4	166,2	37,5	47,9	140,8	103,2	80,6	91,9
2005	68,2	74,1	113,6	88,2	110,9	63,1	171,6	37,1	47,9	146,0	104,3	82,9	91,3
2006	67,4	72,8	115,8	84,3	106,1	62,2	175,7	36,5	47,9	149,8	105,5	85,2	90,2

Table A.1 (continued)

	DL	DM	DN	E	F	G	H	I	J+K	L	M	N	O	Economy
1979	49,3	48,5	48,4	48,4	46,3	48,1	48,7	47,9	48,0	48,6	49,8	49,1	49,7	**48,9**
1980	52,9	50,5	51,2	49,4	49,4	51,1	53,0	49,0	50,2	51,1	52,3	52,0	54,3	**50,9**
1981	58,5	56,2	53,7	49,2	53,9	53,9	55,6	50,6	52,6	54,4	55,1	57,5	58,3	**52,8**
1982	65,5	78,5	55,9	49,6	56,8	57,4	67,6	51,6	55,2	57,4	58,8	61,2	65,7	**55,9**
1983	69,5	80,3	56,4	50,7	54,7	59,7	73,0	54,0	57,1	59,8	61,9	63,1	69,8	**58,3**
1984	73,7	77,4	55,0	52,1	51,1	60,8	74,3	54,7	58,5	61,5	64,3	64,4	70,3	**59,3**
1985	74,5	75,2	52,7	59,7	49,0	61,2	75,5	54,1	61,4	65,6	68,7	67,1	71,9	**60,7**
1986	74,8	73,3	51,2	64,8	47,6	63,6	79,6	54,1	64,9	71,4	70,7	69,1	76,8	**62,7**
1987	76,8	74,2	51,2	72,9	48,9	68,6	85,1	55,8	69,1	77,4	76,7	71,8	84,2	**66,4**
1988	80,7	77,7	50,1	82,8	52,5	73,9	90,5	56,3	73,5	84,6	83,3	77,7	98,9	**69,9**
1989	84,0	80,7	51,1	88,3	57,2	80,0	102,1	56,5	78,4	91,8	89,4	69,7	112,6	**73,7**
1990	89,4	86,1	51,4	88,3	60,6	89,7	112,9	57,1	84,2	100,2	96,0	74,6	129,5	**78,6**
1991	95,0	95,3	51,5	86,7	65,8	100,0	126,5	57,2	89,9	109,5	104,8	82,4	151,1	**83,6**
1992	97,1	110,9	49,9	86,8	71,3	111,2	137,2	57,0	96,2	121,6	119,2	96,2	192,3	**87,9**
1993	98,0	123,1	48,0	86,6	75,1	119,7	145,5	56,6	101,5	132,4	131,4	106,8	224,8	**91,8**
1994	99,4	141,5	47,2	96,0	80,1	129,3	153,4	57,2	106,2	141,3	138,9	116,4	249,1	**95,9**
1995	101,0	159,6	46,8	101,0	85,2	139,8	167,7	58,0	110,0	152,2	150,3	126,9	305,6	**100,0**
1996	102,9	177,6	47,8	102,5	89,9	151,6	180,1	58,5	114,4	168,5	161,9	134,9	349,8	**104,4**
1997	106,5	193,2	48,4	110,6	95,8	163,6	194,5	59,7	119,5	184,4	178,3	146,8	394,6	**109,9**
1998	112,2	210,2	49,7	112,0	104,3	178,0	206,7	63,2	125,2	199,2	199,6	162,4	444,9	**116,2**
1999	117,5	226,5	52,1	120,6	112,1	192,3	223,2	66,0	131,0	216,6	246,7	180,7	489,5	**123,5**
2000	122,1	240,9	55,2	128,6	120,2	206,8	237,6	68,2	136,4	229,9	286,9	198,6	536,5	**130,4**
2001	126,9	255,6	56,3	134,0	123,5	218,5	249,4	70,8	141,5	243,4	311,7	213,7	588,1	**136,2**
2002	129,0	267,1	57,2	138,7	121,4	228,2	263,0	73,0	146,2	255,5	332,8	226,4	644,0	**141,3**
2003	131,3	274,1	56,7	144,8	118,0	235,8	269,1	74,7	150,0	266,5	343,5	237,2	690,6	**145,2**
2004	132,2	279,5	56,1	151,5	116,7	240,7	275,1	76,3	153,8	279,3	356,0	242,7	734,0	**148,7**
2005	132,3	288,1	56,0	162,3	113,9	245,8	280,6	77,9	157,1	290,1	366,3	248,4	771,9	**152,2**
2006	131,1	295,6	57,2	174,4	110,0	252,5	286,1	79,8	160,6	297,5	376,0	258,7	806,3	**156,1**

Table 1: Classification of sectors according to the selected taxonomies

	Industries	Peneder (2007)	Tidd et al. (2005)
01	Agriculture	Very low	Supplier-dominated
02	Forestry	Very low	Supplier-dominated
05	Fishing	Very low	Supplier-dominated
10-14	Mining and quarrying	Medium	Scale-intensive
15-16	Food, drink & tobacco	Low	Scale-intensive
17	Textiles	Very low	Supplier-dominated
18	Clothing	Very low	Supplier-dominated
19	Leather and footwear	Very low	Supplier-dominated
20	Wood & products of wood and cork	Very low	Supplier-dominated
21	Pulp, paper & paper products	Medium	Supplier-dominated
22	Printing & publishing	Medium	Supplier-dominated
23	Mineral oil refining, coke & nuclear fuel	Medium	Scale-intensive
24	Chemicals	Medium-high	Science-based
25	Rubber & plastics	Medium-low	Specialised supplier
26	Non-metallic mineral products	Low	Scale-intensive
27	Basic metals	Low	Scale-intensive
28	Fabricated metal products	Low	Scale-intensive
29	Mechanical engineering	Medium	Specialised supplier
30	Office machinery	High	Specialised supplier
313	Insulated wire	Medium	Specialised supplier
31-313	Other electrical machinery and apparatus nec	Medium	Science-based
321	Electronic valves and tubes	Medium-high	Specialised supplier
322	Telecommunication equipment	Medium-high	Specialised supplier
323	Radio and television receivers	Medium-high	Science-based
331	Scientific instruments	Medium-high	Specialised supplier
33-331	Other instruments	Medium-high	Specialised supplier
34	Motor vehicles	Medium	Scale-intensive
351	Building and repairing of ships and boats	Medium-high	Scale-intensive
353	Aircraft and spacecraft	Medium-high	Scale-intensive
352+359	Railroad equipment and transport equipment nec	Medium-high	Scale-intensive
36-37	Furniture, miscellaneous manufacturing; recycling	Medium-low	Supplier-dominated
40-41	Electricity, gas and water supply	Medium	Scale-intensive
45	Construction	Low	Supplier-dominated
50	Sale, maintenance and repair of motor vehicles and	Low	Information-intensive
51	Wholesale trade and commission trade, except of motor	Medium	Information-intensive
52	Retail trade, except of motor vehicles and motorcycles; repair	Medium-low	Information-intensive
55	Hotels & catering	Very low	Supplier-dominated
60	Inland transport	Medium-low	Information-intensive
61	Water transport	Medium-low	Information-intensive
62	Air transport	Medium-high	Information-intensive
63	Supporting and auxiliary transport activities; activities of travel	Medium	Supplier-dominated
64	Communications	Medium	Information-intensive
65	Financial intermediation, except insurance and pension	High	Information-intensive
66	Insurance and pension funding, except compulsory social	Medium-high	Information-intensive
67	Activities auxiliary to financial intermediation	Medium-high	Information-intensive
70	Real estate activities	Medium	Information-intensive
71	Renting of machinery and equipment	Medium	Information-intensive
72	Computer and related activities	Very high	Specialised supplier
73	Research and development	Very high	Specialised supplier
741-3	Legal, technical and advertising	High	Specialised supplier
749	Other business activities, nec	High	Information-intensive
75	Public administration and defence; compulsory social security	Medium-high	Non-market services
80	Education	Very high	Non-market services
85	Health and social work	Medium-high	Non-market services
90-93	Other community, social and personal services	Medium-high	Supplier-dominated
95	Private households with employed persons	Very low	Supplier-dominated
99	Extra-territorial organizations and bodies	Very high	Non-market services

Table A.3: Goods producing industries' shares in real GVA (1995 prices) classified according to skill and innovation taxonomies

	Portugal		Spain		EU-10	
	1980	**2006**	**1980**	**2007**	**1980**	**2007**
Skill taxonomy (Peneder, 2007)						
Very Low (1)	32,4	25,1	24,1	16,3	13,8	11,1
Low (2)	40,4	37,6	44,0	48,4	45,1	41,6
(1) + (2)	**72,8**	**62,7**	**68,1**	**64,7**	**58,9**	**52,7**
Medium-low	4,4	4,6	4,5	5,0	5,4	6,6
Intermediate	15,9	22,8	14,5	18,8	23,4	24,4
Medium-high	7,0	9,9	12,9	11,5	12,3	16,3
Total	**100**	**100**	**100**	**100**	**100**	**100**
Innovation taxonomy (Tidd et al., 2005)						
Supplier-dominated	58,4	50,6	52,0	52,3	45,8	41,3
Scale-intensive	29,5	40,3	38,8	36,2	39,5	38,8
Specialised supplier	6,8	5,4	5,1	6,7	9,9	11,9
Science-based	5,3	3,7	4,2	4,7	4,8	8,0
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Author´s computations based on data from the EU-KLEMS Database, Nov. 2009.

Note: Peneder´s taxonomy classifies industry 34 as intermediate and industry 35 as medium-high skill. In the aggregation of the two industries we considered the medium-high skill classification.

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