2.
Sectoral equilibrium wages

In the previous section we introduced the theoretical concept of the equilibrium wage as the wage level that would allow the return on capital in a country to be equal to the EMU average. We also showed evidence based on aggregate data in order to highlight the additional information provided by the levels of our measure with regard to the standard indicators, which assess only the competitive performance over time. In this section, we enter into the core of the report and show how the competitiveness of the different branches of the economy can be described and analysed by using our definition of competitiveness; that is, the gap between actual and equilibrium wages.

Analyses at sectoral level find the main constraint in the availability of a comprehensive dataset for all sectors over a fairly long time period. A major effort has been made to collect and assemble data from different sources in order to calculate the measure described in section 1 for a period including also the years following the global financial crisis. The description of the construction of the database is provided in section 2.1. The next step is to provide a description of the evolution of the different sectors in terms of shares in value added and specialisation with regard to the European average and compare such evolution with that of our competitiveness measure in order to identify a possible relationship between sectoral competitiveness and the dynamics of specialisation in production and trade. This evidence is provided in sections 2.2 and 2.3. At this stage, we pay particular attention to two issues: first, the use of average wage per person employed versus wage per hour worked (section 2.4); second, the role of the relative average capital efficiencies of the countries with regard to the European average (section 2.5). Finally, in section 2.6 we test the performance of our indicator in explaining

changes in the sectoral composition of value added against the standard measure of cost competitiveness, namely unit labour costs.

2.1 The data set

We collected data at NACE (rev.2) level for the major 14 EU member states, namely: the euro area as a whole – Austria, Belgium, Germany, Spain, Estonia, Finland, France, Greece, Ireland, Italy, Netherland, Portugal, Slovakia and Slovenia. The sectoral breakdown originally included 38 sectors but due to missing data for some disaggregated sectors, in particular in services, we aggregated some branches to obtain a final breakdown of 30 sectors (see Appendix Figure A4.1), with 13 manufacturing industries, 12 service activities, two primary sectors, construction and utilities (electricity, gas and water). The time span covers the period 1995–2012.

We collected wage data (average compensation per employee) and a number of variables in order to build the equilibrium wage as defined in equation (5). Labour productivity is defined as the ratio of GDP at constant prices and employment; as measure of price dynamics, we use the GDP deflator. These data are from the Eurostat National Accounts Database.

In order to calculate the return on capital for each sector we use the sectoral capital stock provided by the OECD-STAN database, which contains data for 13 European countries from the end of the 1990s to 2011. The countries for which sectoral capital stock data are available are shown in Table 4. In order to maximise the coherence between OECD and Eurostat data, we used the former and calculated the capital stock by multiplying the capital output ratio derived from OECD by the Eurostat's real GDP series.

For some countries (see Table 3), the data coverage of capital stock data does not include the years since the crisis. For this reason, and in order to obtain data for the following period matching wage data, we integrated the dataset by using an econometric procedure. More specifically, we took data for gross fixed capital formation and consumption of fixed capital, both available from the Eurostat Database, and applied a recursive regression approach where the capital stock at time t is estimated for each country using the following equation:

$$(10) \qquad logK_{i,t} = \alpha + \rho K_{i,t-1} + \beta_1 logGFCF_{i,t} + \beta_2 logCFC_{i,t} + \beta_3 logGDP_{i,t} + \gamma_i + \theta_t + \varepsilon_{i,t}$$

Where K is the capital stock at constant prices, *GFCF* is gross fixed investment, *CFC* is the consumption of fixed capital and *GDP* is Gross Domestic Product. The model is estimated though the two-way fixed effects estimator (FE) where Υ and Θ represent the individual and time specific fixed effects. The capital stock is obtained by estimating equation (10) recursively and by using in each step the forecast capital stock of the first missing period. The capital stock at current prices is then obtained by multiplying the series at constant prices by the price deflator of the Gross Fixed Capital Formation. Table 4 shows the data coverage and the years for which econometric estimates were used.

Table 3 **Summary of capital stock data availability and imputation**

	Classification	Data coverage	Imputation
Austria	Nace Rev-3	1995–2007	2008–2012
Belgium	Nace Rev-4	1995–2011	2012
Czech Republic	Nace Rev-4	1995–2011	2012
Denmark	Nace Rev-4	1995–2012	None
Finland	Nace Rev-4	1995–2011	2012
France	Nace Rev-3	1995–2008	2009–2012
Germany	Nace Rev-4	1995–2010	2011–2012
Italy	Nace Rev-3	1995–2007	2008–2012
Netherlands	Nace Rev-4	1995–2011	2012
Poland	Nace Rev-3	2004–2008	2009–2012
Norway	Nace Rev-4	1995–2011	2012
Spain	Nace Rev-3	2000–2009	2010–2012
UK	Nace Rev-3	1995–2008	2009–2012

Source: OECD STAN and authors' elaboration.

The use of capital stock data from OECD, as well as the imputation procedure return satisfactory results. This can be verified in particular by looking at the estimates of the equilibrium wage (Appendix 2) and capital productivity (Appendix 4) for the total economy, which return similar results to those shown in section 1. There are, however, some discrepancies between the totals calculated using AMECO data and those obtained by merging OECD and Eurostat data. This is due in part to the fact that we are using different sources and in part to the occasional use of econometric estimates to replace missing real data. An additional source of discrepancy comes from the fact that the European averages are calculated using only the 12 European countries for which data were available, namely, eight euro area countries and four EU countries not belonging to the EA18, whereas data shown in the previous chapter use the EA18 averages to calculate the benchmark return on capital.

2.2 Some descriptive evidence

In order to understand the importance of the different sectors in European countries, a broad picture is reported in Table 4, which gives the sectoral distribution of value added according to the standard division between manufacturing, services, construction and other sectors (including agriculture, mining and quarrying, electricity, gas and water supply). The main difference between countries lies in the high importance of the manufacturing sector in Germany, Austria and in the central and eastern European member states (Slovenia and Slovakia), where the share is above 20 per cent. These countries form the main production network of the European Union because of their strong vertical linkages. A distinguishing feature of some countries was the high share of construction in GDP before the crisis, due to the development of real estate bubbles, especially in Spain and Ireland, and the catch up process in most of the New Member States. In many cases this has changed since the global financial crisis.

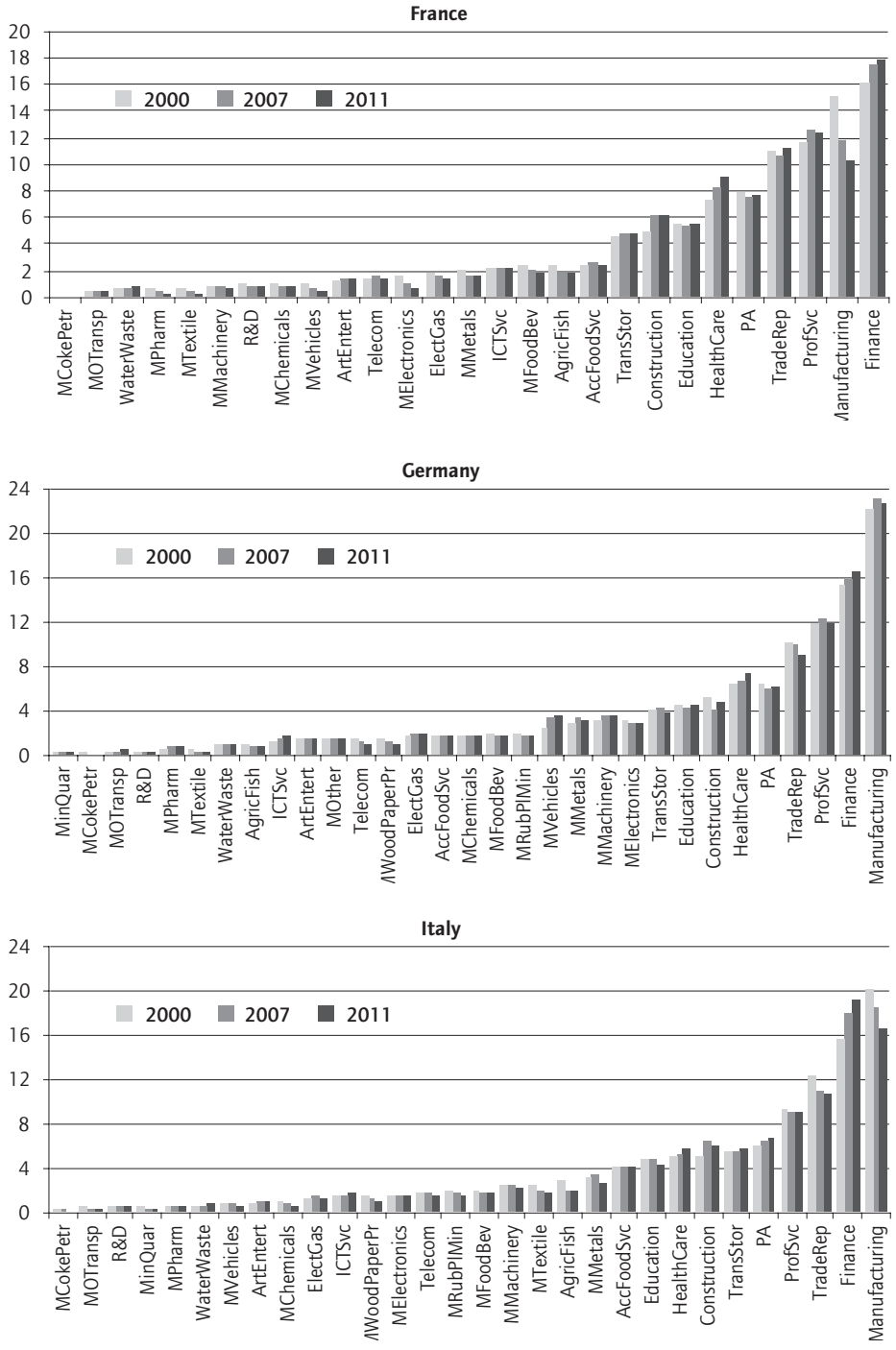
Table 4 **Economic structure for the macro-sectors (%)**

	2007				2012			
	Manuf.	Serv.	Constr.	Other	Manuf.	Serv.	Constr.	Other
Belgium	17.0	73.9	5.4	3.7	14.5	76.2	5.7	3.5
Germany	23.3	68.8	3.9	4.1	22.6	68.4	4.5	4.4
Estonia	15.9	65.7	10.6	7.7	16.1	67.0	7.5	9.4
Greece	9.2	76.6	6.8	7.3	8.1	82.5	2.6	6.8
Spain	13.5	71.1	10.1	5.3	12.1	76.2	5.8	6.0
France	12.7	77.1	6.1	4.1	11.4	78.2	6.1	4.3
Italy	17.7	71.4	6.0	4.9	15.0	74.2	5.5	5.3
Latvia	11.5	72.0	9.7	6.8	12.9	72.5	6.1	8.5
Lithuania	17.7	63.2	11.2	7.9	20.7	64.9	5.9	8.5
Luxembourg	9.3	83.0	5.5	2.2	5.6	86.1	5.5	2.9
Netherlands	13.3	74.4	5.6	6.7	12.2	75.9	4.8	7.1
Austria	20.5	67.6	6.9	5.1	18.7	70.0	6.2	5.1
Poland	18.8	63.7	7.7	9.8	18.0	63.9	7.6	10.5
Portugal	14.1	73.3	6.8	5.8	14.1	73.3	6.8	5.8
Slovenia	23.3	62.7	8.0	6.0	21.6	66.1	5.8	6.5
Slovakia	23.2	57.9	8.3	10.6	21.0	61.1	8.9	9.0
Finland	25.3	62.3	6.7	5.7	16.9	70.2	6.6	6.3

Source: Authors' elaboration on Eurostat.

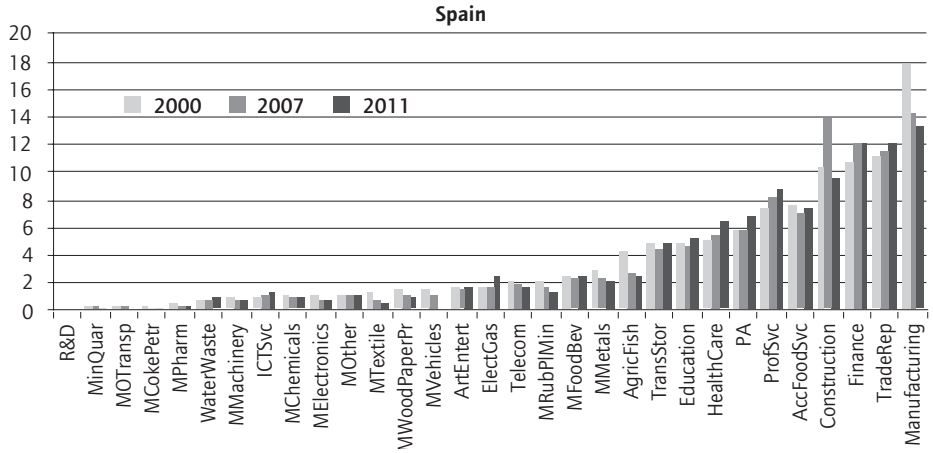
A more detailed picture comes from the sectoral distribution of value added (Figures 4a-4b). We have ordered the importance of the 30 sectors for each country according to their shares in value added in percentage terms. In the main countries of the euro area, finance, trade and professional services account for the highest share of value added. This is true in particular in France where the three sectors account for almost 40 per cent of GDP and manufacturing experienced a strong fall in relative terms between 2000 and 2008. In the other three countries manufacturing is more important and it has kept its share basically constant in Germany and Italy. In Spain the construction sector, even after the bursting of the real estate bubble, accounts for 10 per cent of GDP. Among manufacturing industries, we can see the strong importance of food and beverages in France and Spain, electronics and machinery in Germany, metals and textiles in Italy and Spain.

Figure 4a **Distribution of value added in the main EMU countries**[1]



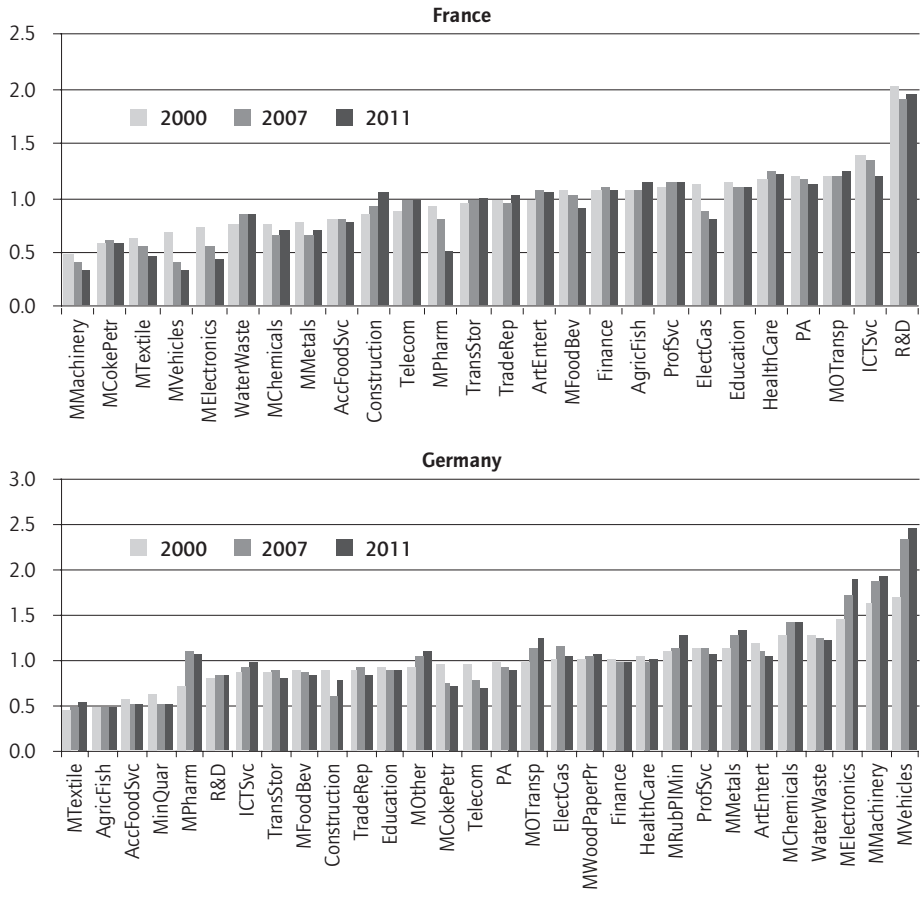
1. For the abbreviations of the sectors, please consult the list at page 142.

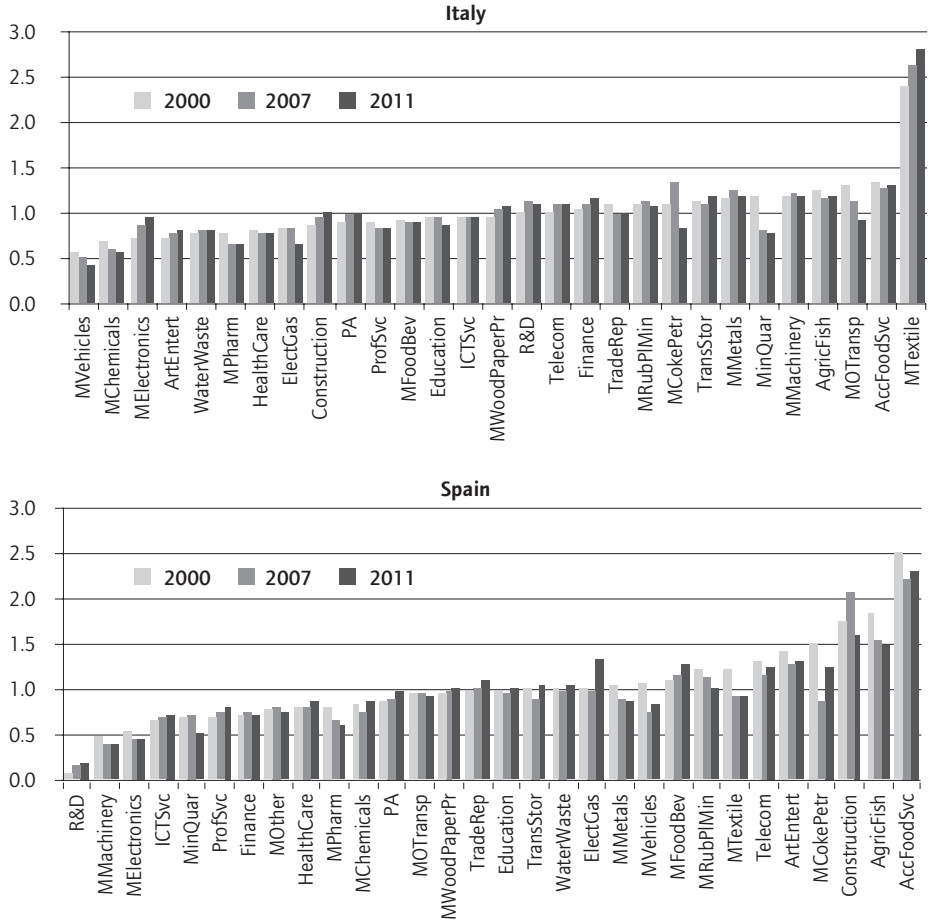
Figure 4b **Distribution of value added in the main EMU countries**



Source: Authors' elaboration on Eurostat.

Figure 5 **Specialisation indexes for the main EMU countries**

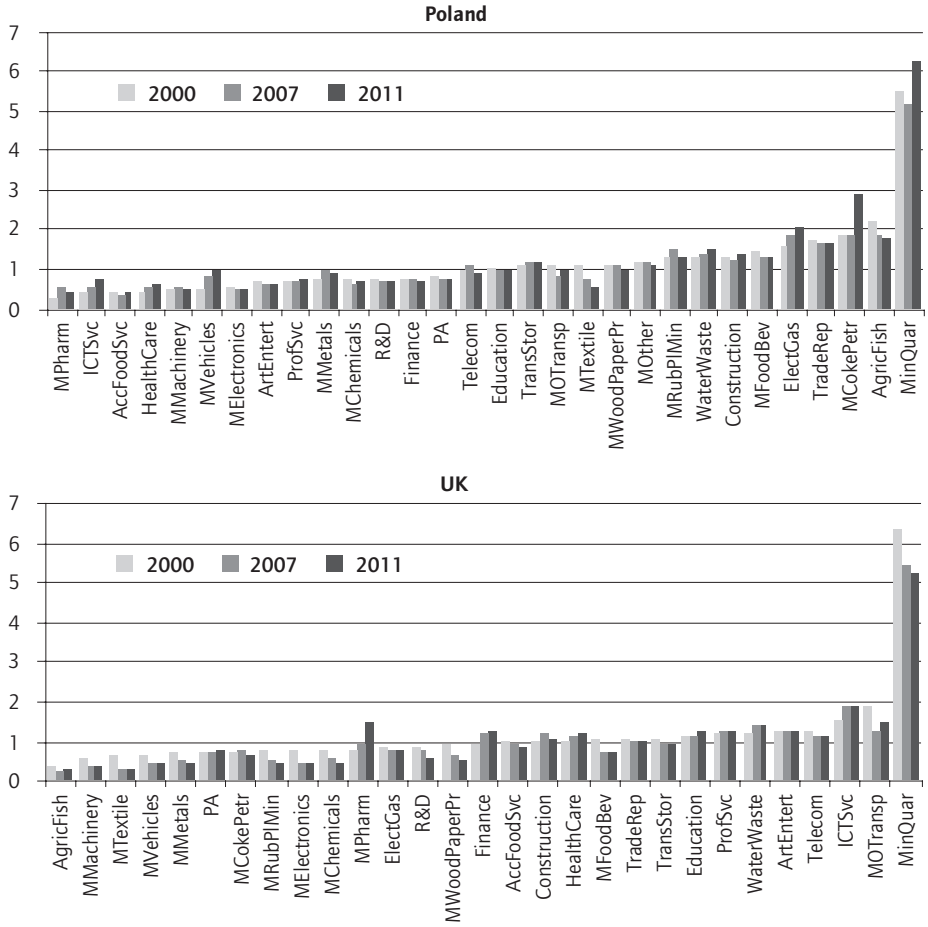




Source: Authors' elaboration on Eurostat.

The previous figures indicate that there are different specialisation patterns among the main EMU countries. This is made clearer in Figures 5 and 6, in which we show an index of specialisation as the share of sectors in different countries with regard to the euro area average. A value above 1 indicates specialisation, whereas values below 1 indicate that the country is less specialised in a specific sector. France is relatively specialised in R&D, ICT services, health, education and other transport equipment (mainly aircraft), whereas it is less oriented toward textiles, machinery and motor vehicles. The latter two are the sectors in which Germany is mostly specialised. The Italian economy is traditionally specialised in textiles and has further increased its specialisation over the past decade, although due to the development of outsourcing and increasing competition from low-wage countries, the share of this industry fell in Italy, as well as in the rest of Europe. Other important industries are mechanical engineering and food and beverages. Interestingly, Italy is least specialised in the manufacturing of motor vehicles and has experienced a further de-specialisation over time. Tourism, construction and agriculture are the main strength of the Spanish model, whereas we see a below average importance of high tech manufacturing (machinery and electronics) and knowledge-intensive services.

Figure 6 **Specialisation indexes for Poland and the United Kingdom**



Source: Own elaboration on Eurostat.

Turning to the main EU countries outside the EMU (Figure 6), Poland is highly specialised in the primary sector and especially in mining and quarrying and the energy sector, as well as in low tech branches, such as food and beverages and trade and repairs. On the other side, the country is least specialised in some high tech branches, such as pharmaceuticals, ICT services and machinery. The production of motor vehicles is becoming increasingly important, reaching an index value of 1 in 2011 from 0.5 in 2000. The main changes over time are the loss of importance of the textile industry and the increased specialisation in mining, coke and petroleum products, electricity and gas. Finally, in the United Kingdom, mining and quarrying is the branch with the highest value in the specialisation index, although its level fell from 2000 to 2011. The weight of finance is above the European average, although less than one might expect. The manufacturing of other transport equipment and ICT services are also highly represented in the country. Most of the other services show an index of around 1, whereas the country appears to be unspecialised in manufacturing. Over time, the most significant changes are the increased

specialisation in pharmaceuticals, for which the index doubled from 2000 and 2011, and in finance. The major loss of specialisation is recorded for chemicals, electronics, food and beverages and R&D.

To sum up, the evolution of relative specialisation indicates that France is becoming a post-industrial country, specialising in knowledge-intensive services, which might justify the loss of importance of manufacturing. This dynamic appears similar to that of the United Kingdom. Germany is specialised in medium and high tech manufacturing, whereas services – especially knowledge-intensive ones – are of much lower importance. Italy seems to be maintaining its traditional model based on the principle 'Made in Italy' and on capital-intensive manufacturing. Spain is more intensively specialised in non-tradables, whereas knowledge-intensive services are of little importance. Hence, while Germany and France seem to show models that might compete successfully in the world economy, the two southern European countries – especially Spain – would have to change their production structure in order to face the competition of both advanced and emerging economies. Among the latter, the role of Poland as supplier of low-tech and resource-intensive goods is dominant.

This preliminary evidence does not, however, say much about the real competitiveness of the sectors in which the countries are specialised. More detailed conclusions can be drawn from the joint analysis of wage development and profitability of the different industries by using the definition of equilibrium wages in section 1.

2.3 Sectoral equilibrium wages

The next step is the calculation of sectoral equilibrium wages. The relative figures for the countries with available data for the capital stock are reported in the Appendix 1. Each figure reports data for 28 sectors, for manufacturing as a whole and for the total economy. We exclude only some small sectors whose dynamics are not related to those of wages and competitiveness as we define it. In some cases, we exclude also the manufacturing of coke and petroleum products and of mining and quarrying, because they are dependent mainly on factor endowment and international prices of commodities. We already stressed that due to the discrepancies in the data sources there are some slight differences with regard to the aggregate measures calculated using AMECO, but the overall picture is unchanged.

In each figure we report the dynamics of actual wages (compensation per employee) and two equilibrium measures. We use alternatively the *aggregate return* for the euro area capital stock and the *sector-specific return* on capital in the euro area. These two equilibrium levels indicate whether the actual wage level in a given sector is competitive with regard to the euro area as a whole, or only with regard to the sector itself. Competitiveness relative to the euro area ought to attract investment and accelerate growth at the expense of other sectors. Lack of competitiveness within a sector would cause delocalisation and outsourcing within a given industry. The number beside the sector name in the title of each chart reports the sector's average share in value added in order to give an indication of its relative importance.

Competitiveness is often related to labour market flexibility. There are many measures for estimating such flexibility, but one of them is the wage spread between sectors. This can be measured by the coefficient of variation across sectoral wages (see Table 5).[2] We have ordered wage flexibility by the size of the coefficient and it appears that the northern Scandinavian countries have the most uniform wage levels across sectors, while the Anglo-Saxon-leaning economies have wider wage spreads. While this form of wage flexibility is uncorrelated with the wage gap levels in Table 5,[3] it is interesting that countries that have been more successful in coming out of the crisis – such as the United Kingdom, Denmark, Germany and the Netherlands – have increased their sectoral wage differentials, while the less successful countries (Spain, Belgium, France) have reduced these differences. In Germany the greater sectoral wage variety increased with the Hartz reforms. Some service sectors have seized on the low contractual power of 'self-employed' workers with atypical wage contracts and lower or no union coverage.

Table 5 **Coefficient of variation of wages across sectors**

	2000	2007	2011
Finland	0.2	0.22	0.23
Denmark	0.22	0.26	0.3
Norway	0.29	0.30	0.33
Italy	0.32	0.34	0.34
Poland		0.39	0.34
Czech Republic	0.33	0.35	0.35
Germany	0.34	0.4	0.42
Austria	0.47	0.43	0.43
Spain	0.52	0.58	0.43
France	0.42	0.44	0.43
Netherlands	0.38	0.41	0.43
Belgium	0.44	0.51	0.48
Estonia	0.43	0.54	0.59
UK	0.90	1.24	1.66

Source: Authors' elaboration on Eurostat data.

We can summarise the main evidence on sectoral actual and equilibrium wages as follows. In **Germany** (Figure A1.7) wages became undervalued around 2007, but the competitive advantage in manufacturing started already at the end of the 1990s and continued to improve over the whole period due to moderate wage increases relative to the growth of equilibrium wages. Such a gain is common to most of German manufacturing sectors, in particular the medium-high tech ones. Lower gains are recorded in the food and textile industries and in the manufacturing of transport equipment. As for the service sector, the picture is partially reversed: there is a competitive advantage only in telecommunications (from 2005), trade and repairs (from 2003) and professional services, while strong disadvantages exist in transports, finance, education, arts and entertainments and – since 2001 – in ICT services.

2. The coefficient of variation is the ratio between the sectoral standard deviation and the average wage.
3. The coefficient of correlation is –0.016.

This picture is in line with many explanations for German competitiveness. Manufacturing has benefitted from fairly centralised wage bargaining, which has ensured that wages grow at similar rates across the economy, while capital productivity varies substantially between sectors. Skill biased technical change and outsourcing have increased the average efficiency of the capital stock in manufacturing (see section 2.4), while the service sector has created low wage/low value-added jobs (the mini-jobs) in sectors with low productivity increases.

For **Italy** (Figure A1.8) we have already documented the constant aggregate competitive loss from the mid-1990s to 2012. In manufacturing the country experienced a similar loss, but its wages are only slightly overvalued with regard to the average return on capital, while losing substantially in terms of sector-specific return on capital. This dynamic is common to most manufacturing industry and it is due mainly to the weakness of capital productivity and the consequential reduction of equilibrium wages starting in the past few years. The manufacturing of transport equipment has been most affected, together with wood and paper and rubber and plastic products. Electronics, and to a lesser extent textiles, retain a certain degree of competitiveness with regard to sector-specific return on capital. As for the service sector, there is a competitive advantage in health and care, arts and entertainments, finance and transport, while a strong overvaluation affects professional services and almost an equilibrium, although only with regard to sector-specific return on capital, in R&D activities.

France (Figure A1.6) experienced a moderate undervaluation due to its '*franc fort*' policies in the 1990s, but this advantage had been constantly eroded up to the global financial crisis. In manufacturing there is still a competitive advantage, although actual wage dynamics, in particular after the introduction of the euro, have been more pronounced than that of equilibrium wages. The advantage is eroding in particular in the pharmaceutical industry and in machinery. The reduction of equilibrium wages is due in particular to the low capital productivity (see Figure A2.7). Unfortunately, due to missing data for the capital stock, we do not have a complete picture of manufacturing industry.

Utilities and constructions are also undervalued, whereas in services we observe a mixed situation. On one hand, we observe a strong and increasing overvaluation in finance and professional services, which account for almost 30 per cent of GDP; on the other hand, telecommunications, trade and repairs, as well as health care are still highly competitive. The remaining sectors had a position between these two extremes, particularly R&D, tourism and education.

The **Spanish** case is peculiar (Figure A1.12). On average, the country has been strongly overvalued over the whole period. Manufacturing was overvalued with regard to its specific return on capital, whereas it is still undervalued with regard to the euro average because of the high overvaluation in services. The pattern in manufacturing is common to most industries, while the most recent data indicate a gain in the chemical industry and mixed dynamics in machinery, although both sectors are relatively small. Utilities still seem to be competitive, and so is construction. Some services, such as tourism (accommodation and food services),

followed by education and health care are also undervalued, whereas the remaining branches show a strong and increasing overvaluation. Given the high share of immigrant labour, one would expect the competitiveness in construction and tourism to be based on low-skilled low-wage migrant workers.

Among the other euro area countries, the **Netherlands'** (Figure A1.8) total economy is slightly overvalued but the manufacturing sector has become undervalued after the global financial crisis due in particular to motor vehicles, machinery, textile and chemicals. In services – except for finance and R&D – we observe a general undervaluation, in particular in trade, tourism, telecommunications and professional services. Austria is close to Germany in terms of competitive dynamics, with an undervalued manufacturing sector.

Calculating equilibrium wages for non-euro area countries involves the exchange rate. As a consequence, actual and equilibrium wages, expressed in euros, are more volatile (but note that **Denmark** has fixed its exchange rate to the euro, although the relationship between the wage series remains stable). The wage gap will be affected only to the degree that currency devaluations generate higher exports with larger profit content. Thus, the greater volatility of equilibrium wages in the **United Kingdom** (Figure A1.12) reflects movements in the exchange rate with the euro. Manufacturing is in equilibrium with regard to its specific return on capital, but in general we see a close correlation between equilibrium and actual wages and similar tendencies in most of the sector, with both measures falling from the second half of the past decade due probably to exchange rate appreciation. It is worth mentioning that transport and storage became overvalued after the introduction of the euro, whereas the financial sector became undervalued after the global financial crisis.

In the member states of central and eastern Europe, we lack data on capital stock, which prevents us from calculating sectoral equilibrium wages, except for the **Czech Republic** and **Poland**. The former, with few exceptions, shows similar levels and growth rates in actual and equilibrium wages, remaining consequently close to the equilibrium. Motor vehicles, a sector that has attracted a lot of German outsourcing investment, appears to be the most competitive industry; among services, ICT and professional services are undervalued, whereas finance is strongly overvalued. Poland is strongly undervalued in manufacturing and in most service activities. The main exception is in the primary sector, which accounts for more than 4 per cent of GDP and is strongly overvalued.

To sum up, the dynamics of equilibrium wages and the implied wage gap seem to reflect in part the pattern of sectoral specialisation, in particular for Germany, Italy and Spain whereas for France such an association is not clear on a descriptive level. More information will come from the econometric analysis at the end of the chapter.

2.4 Compensation per employee or compensation per hours worked?

In all the previous analyses, equilibrium wages were calculated by using the average compensation *per employee* as a benchmark because that allows us to maximise the data coverage. The main drawback is that it can hide movements in the number of hours worked per employee. Several factors affect the difference between the evolution of the number of employed persons and that of hours worked. First of all, it does not take into account the role of part-time workers, whose numbers have increased over time, making the number of employees a poor indicator for the amount of labour used in production. Other problems related to this measure are, on one hand, the reduction in working time which has taken place in most advanced countries since the mid-1990s and, on the other, the use of short-run automatic stabilisers such as the Cassa Integrazione Guadagni in Italy and short-time working in Germany. The latter was particularly important during the global financial crisis. Some countries also used it to reduce the social costs of the recession in the European sovereign debt crisis. Statistically, this means that employment calculated in terms of persons did not fall as much as the number of hours worked because workers in these programmes appear to be employed but with fewer or zero hours worked. At the same time, labour remuneration is not counted as a 'wage' but as a state social benefit. Both factors induce distortions in the calculation of average wages and of the actual use of labour. This problem shows up mainly in the service sector where flexible working contracts are common, whereas in manufacturing employment tends to be in the permanent full-time contract form. The figures in Annex 3 show actual and equilibrium wages for selected countries based on hours worked. As we can see, the data confirm that the differences between the two measures are fairly small in manufacturing, whereas in the service sector, some branches show significant divergences between the two measures. This is true in particular in health care services, trade and repairs, education and professional services, whereas in other branches such as public administration, R&D and telecommunications the differences between the two measures are relatively small.

Overall, then, we can conclude that the use of data based on the number of persons employed does not cause major biases in the analysis when we consider the manufacturing sector. In the case of services, by contrast, the approximation is less precise. For this reason, we will show them in the following chapter as a robustness check when the data availability allows us to run the econometric analyses with hourly measures.

2.5 Capital prices and capital productivity

Our theory explains that equilibrium wages and competitiveness are strongly influenced by the average efficiency of capital (ACE) stocks. In Figures 7 to 9 we show the decomposition of the relative ACE effect, as described in equation (6), for the main sectors of the member state economies during the periods 1999–2007 and

2008–2011.[4] Each variable is expressed in such a way that an *increase* leads to an increase in the relative ACE component and, hence, to a *reduction* in equilibrium wages. The macro-sectors are: agriculture, mining and quarrying (AMQ), construction (Constr), electricity, gas and water supply (EGW), manufacturing (Manuf) and services (Serv). Due to missing data for some service activities, the aggregation of the five macro-sectors might lead to slightly different results with regard to the data for the total economy.

Figure 7 shows the decomposition for the four biggest members of the euro area. In **France** the total effect was slightly positive (below 1 per cent) between 1999 and 2007, with the main contributions coming from the primary sector, services and manufacturing. In the latter, the positive GDP deflator effect ($p_€ - p$) has been almost entirely compensated by the negative effect of capital accumulation. Similar dynamics are shown for EGW, while in agriculture the relative growth effect ($y_€ - y$) added to this pattern, resulting in a total effect of around 3.5 per cent. In the service sector, all variations are fairly small but positive except for the inflation effect. Between 2008 and 2011 the overall relative ACE effect for the total economy was close to 2 per cent, due mainly to the dynamics of manufacturing and services. In the latter, the negative effects of GDP growth and prices are more than compensated by capital accumulation and capital prices. In manufacturing, both price and growth dynamics contributed to push the relative ACE up (and the equilibrium wage down), while capital accumulation exerted the opposite effect. Similar dynamics are observed in the primary sector, while in construction the relatively low growth was compensated by price dynamics. Finally, in the EGW sector the relative ACE went down, and the equilibrium wage up, due to the combined effect of GDP growth and capital accumulation.

In **Germany**, the total ACE effect has been slightly negative (and therefore increasing equilibrium wages). Before the crisis, this development was driven largely by real and nominal effects of capital accumulation, while since 2008 GDP growth has been the main driver of competitive gains. Only the primary sector shows the opposite dynamics. It is worth noting that the composite effect has been more important in construction and manufacturing, where competitiveness improved the most – that is, equilibrium wages went up – whereas in services the change was almost nil. Since the crisis, the overall ACE effect has been slightly negative but relatively small in the two main macro-sectors of manufacturing and services. In the primary sector, too, the overall ACE effect was null as a result of opposite changes in the growth effect (+7 per cent) and in price dynamics (–7.5 per cent). The construction sector shows a strong negative impact due to both GDP and price growth. Thus, the German story is one of supply-side transformation during the Schröder years and demand-side improvements during the Merkel years.

In **Italy**, we can observe positive ACE dynamics and deteriorating equilibrium wages everywhere, except for EGW, up to the global crisis. The main cause of this result

4. In the Appendix 2 we show detailed sectoral data. For each figure, we show three series: the relative capital productivity and the relative price indexes for GDP and capital goods. In all series, the numerator is given by the EU value so that an increase implies lower growth with respect to the EU.

is the relative growth effect which has been particularly strong in manufacturing. In construction, the effect of capital accumulation more than compensated the negative output effect. Between 2008 and 2011 the overall effect for the total economy was close to zero mainly because of a 2 per cent increase in manufacturing and a 1 per cent reduction in services. In all macro-sectors capital accumulation and the GDP deflator had a negative impact, whereas output growth and capital prices had an opposite effect. This leads to the conclusion that recession and austerity have harmed Italy's competitiveness.

In **Spain**, the total ACE effect between 2000 and 2007 was 2 per cent, driving equilibrium wages down. This effect was driven mainly by capital accumulation and capital prices, in particular in the service sector and construction. In the latter, the effect is null due to the negative impact of output volumes and prices. The total effect between 2008 and 2011 was still slightly positive due to the contribution of construction and manufacturing. In both cases, the growth effect played the major role. In services, both GDP and capital prices pushed the overall effect to slightly negative values, although capital accumulation partly counterbalanced the result.

Among the other EMU countries (Figure 8), **Austria** experienced a strong reduction in relative ACE and improved equilibrium wages in the manufacturing sector due to capital prices and output growth, while in construction and utilities the negative impact was due mainly to capital accumulation. Thus, manufacturing competitiveness improved overall. The change in services was almost null, while the primary sector drove equilibrium wages down. In the post-Lehman period, the total effect was small everywhere as a result mainly of opposite dynamics in relative capital prices (positive), on one hand, and capital accumulation as well as GDP prices (negative) on the other.

In **Belgium, Finland** and the **Netherlands** the total effect for the overall economy was also relatively small in both periods due primarily to the dynamics in the service sector. In **Belgium**, the primary sector experienced a strong positive ACE effect in both periods due to output growth, whereas in the construction sector it increased strongly, essentially due to the relative capital accumulation effect. In **Finland**, it is interesting to observe that relative growth in manufacturing pushed the ACE effect down before the crisis, whereas this effect reversed in the following period.

Outside the non-Euro Area the United Kingdom and the Czech Republic and Poland are the most dynamic economies (Figure 9). In the **Czech Republic**, the ACE effect for the total economy was strongly negative (–3 per cent) before the crisis, mainly due to the relative price dynamics in all sectors but manufacturing. In the latter, relative output growth pushed down the overall effect. The following period seems to show a continuation of the previous dynamics in terms of price effects but this time the relative GDP deflator was not strong enough to counterbalance the positive impact of capital prices and output growth.

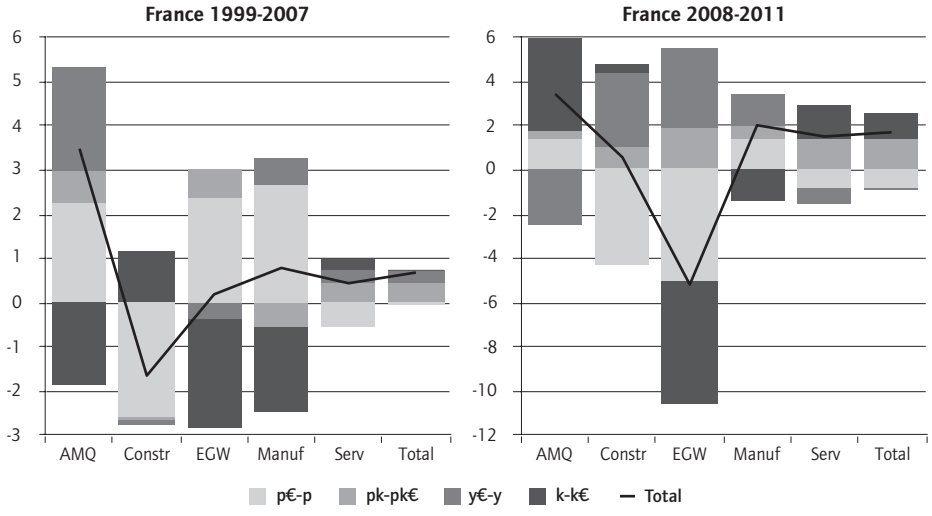
In **Poland**, too, the growth effect was the main driver for manufacturing up to 2007, whereas capital accumulation in the service sector partially compensated this result. After the crisis, capital accumulation became the main force in pushing up

the relative ACE in services and construction, whereas in manufacturing its effect was negative and reinforced by the high real growth.

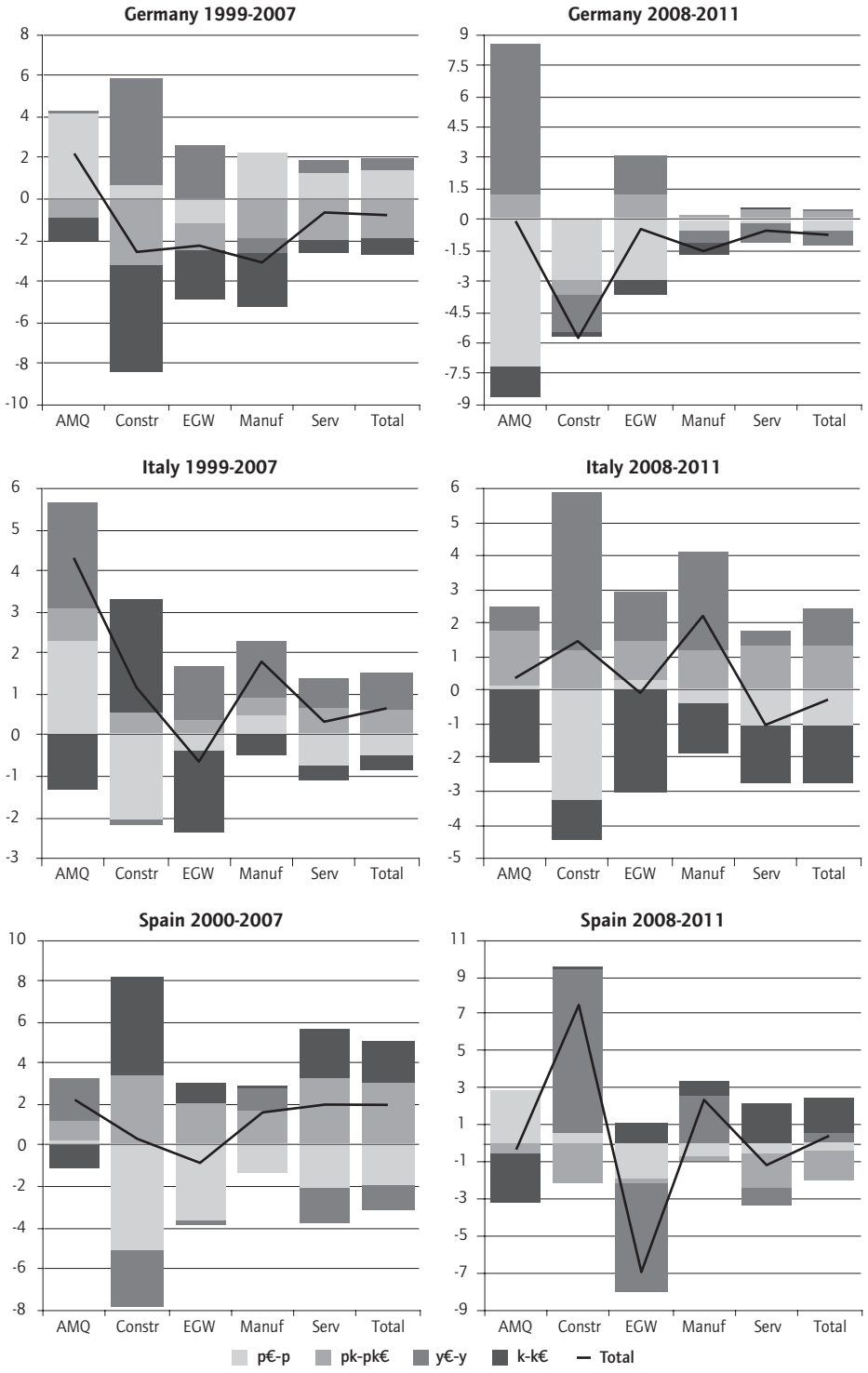
Lastly, in the **United Kingdom** the total effect was very small everywhere except for the primary sector and construction until 2007. After that, the relative ACE fell in total by approximately 4 per cent, driven everywhere by capital accumulation and capital prices, especially in manufacturing and construction. The relative price effect, driven also by the exchange rate dynamics, counterbalanced the effect of the price of capital goods in services and, to a lower extent, in construction. This explains the United Kingdom's improvement in competitiveness.

Summing up, the sectoral dynamics of the relative ACE provides an interesting explanation for the competitiveness gain in terms of rising equilibrium wages in the manufacturing sector before the global financial crisis. In Germany, Austria and the Netherlands this effect is driven essentially by capital accumulation, whereas in the two central and eastern European countries the catching-up in terms of output growth can explain the result. After the crisis, the overall change was fairly low and with less significant sectoral differences. The service sector does not seem to be particularly affected by important changes in both periods. Important exceptions are, in any case, the post-crisis effect in Italy and Poland. In the former, services partially counterbalanced the disappointing performance of the other sectors, driven by capital accumulation.

Figure 7 **Decomposition of the relative ACE effect in the main euro area countries**[5]

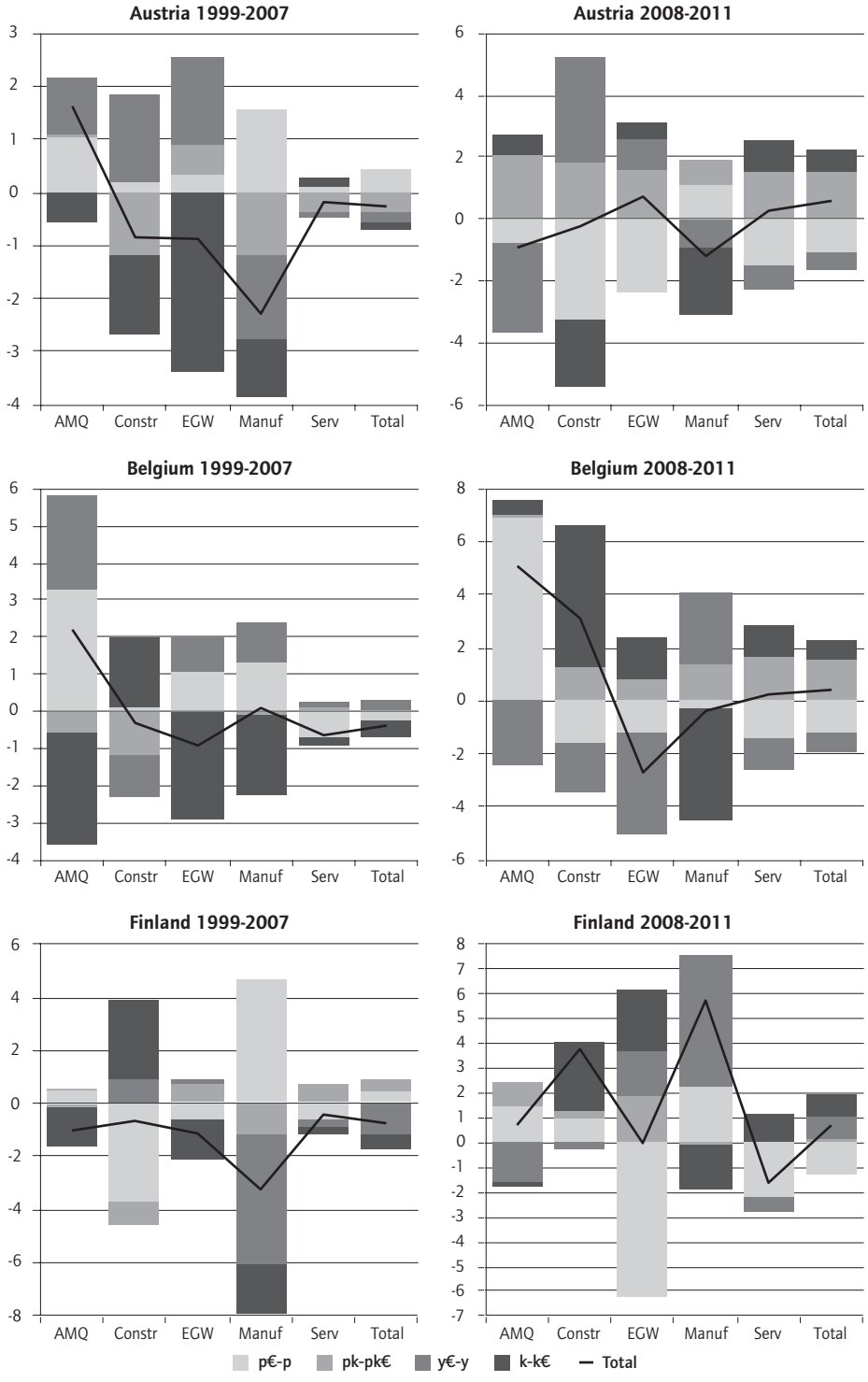


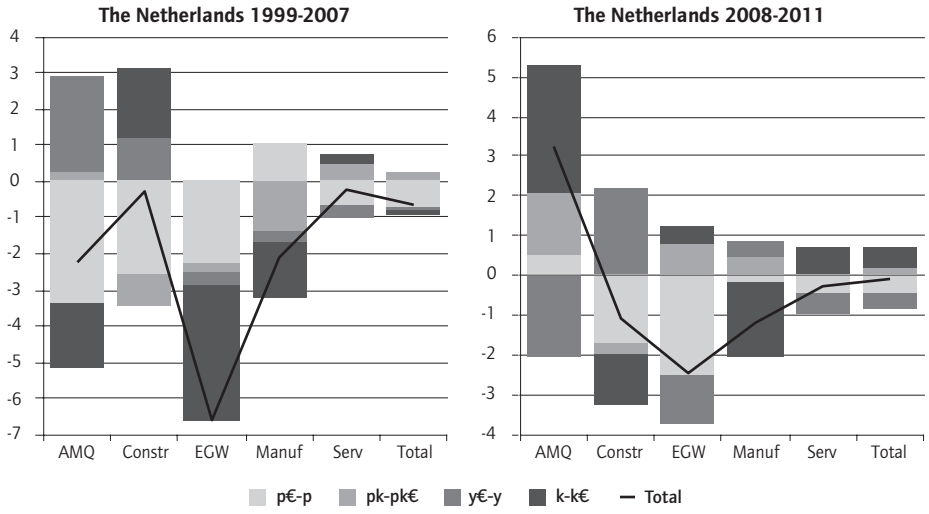
5. A positive increase in the ACE effect lowers the equilibrium wage



Source: Authors' elaboration on Eurostat and OECD data.

Figure 8 **Decomposition of the relative ACE effect in selected euro area countries**





Source: Authors' elaboration on Eurostat and OECD data.

Figure 9 **Decomposition of the relative ACE effect in the Czech Republic, Poland and United Kingdom**

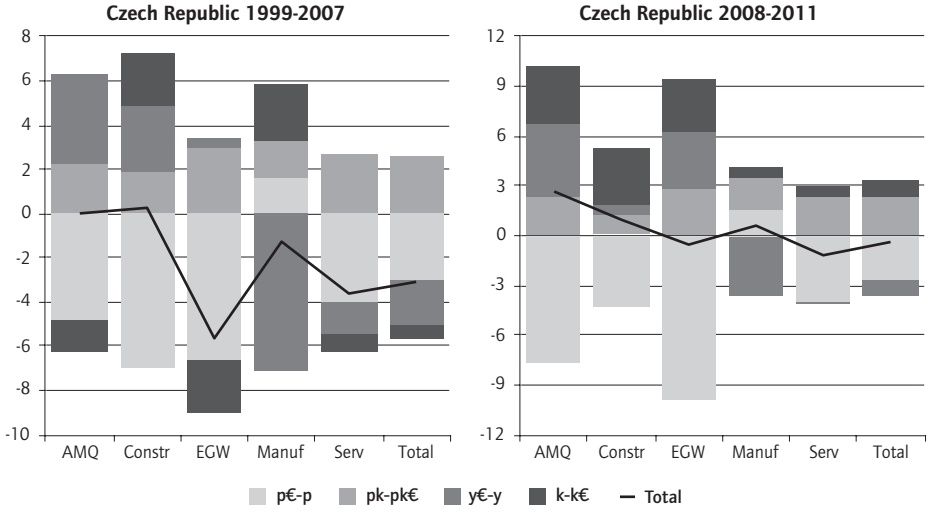
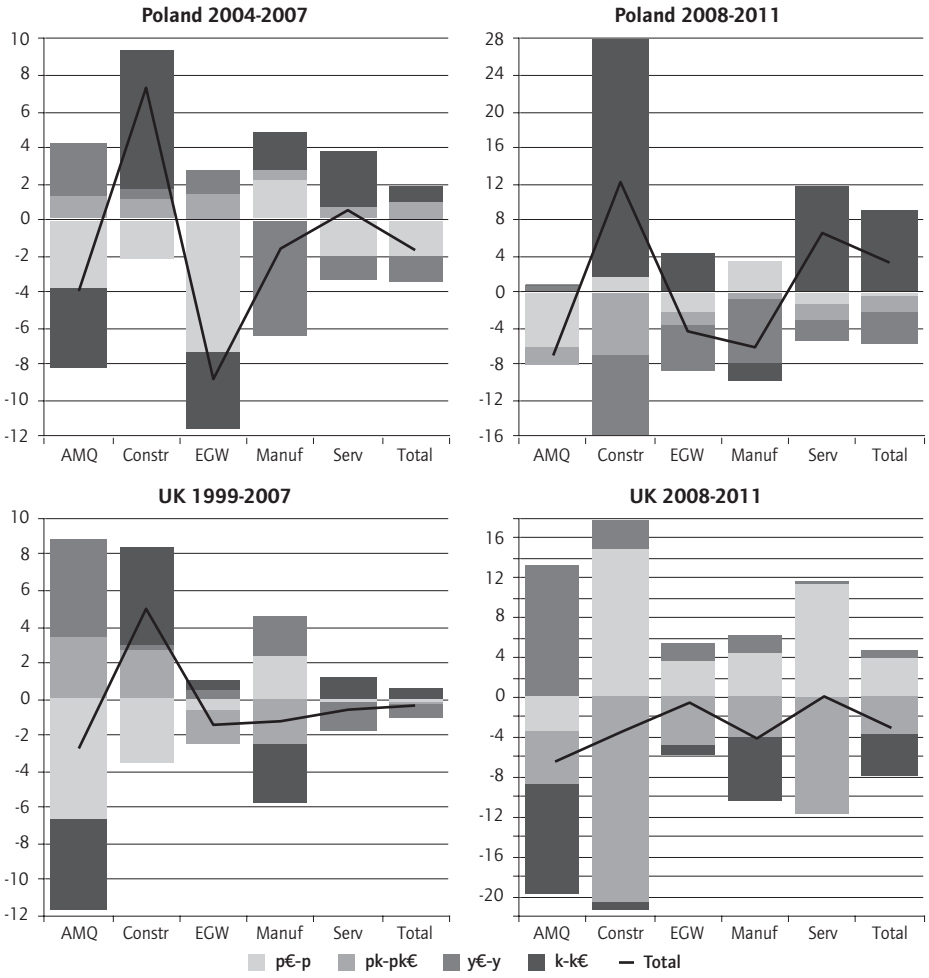


Figure 9 **Decomposition of the relative ACE effect in the Czech Republic, Poland and United Kingdom (cont.)**



Source: Authors' elaboration on Eurostat and OECD data.

2.6 Sectoral shifts and competitiveness: comparing equilibrium wages and unit labour costs

In this final part of section 2 we wish to compare the performance of our measure of competitiveness based on the wage gap, with the traditional measure of competitiveness at sectoral level, that is unit labour costs. Unit labour costs are the standard indicators for measuring the relative competitiveness of industries or countries. The OECD provides a full set of statistics related to the cost of labour and they are used to build a measure of real effective exchange rates.[6]

6. See OECD System of Unit Labour Cost Indicators, available at: http://stats.oecd.org/mei/default.asp?rev=3.

As pointed out in the introduction, comparing absolute developments of unit labour costs in different countries with regard to the EU average benchmark is not a suitable method. For this reason, we now compare our measure of equilibrium wages (using the EU average return on capital as benchmark) with relative nominal and real unit labour costs, expressed as a ratio to the EU average. We wish to test which of the two indexes can best explain changes in the sectoral shares of value added (see section 2.2). To do so, we use a simple regression equation of the following form:

$$\Delta VAsh_{i,t}^{k} = \alpha + \beta \Delta X_{i,t}^{k} + \varepsilon_{i,t} \quad (11)$$

The variable X represents one of the measures of competitiveness, that is equilibrium wages (Weq), the implied competitiveness indicator (Comp=$W-Weq$) and the relative nominal ULC (ULCrel). We do not use the relative real unit labour costs as it is not a proper measure of competitiveness for countries in a monetary union. As explained by Peeters and den Reijer (2012), in a currency union internal devaluation is the standard way to restore competitiveness in terms of unit labour costs.

We use absolute changes in equilibrium wages instead of logs in order to make it more directly comparable with relative unit labour cost indicators, but the differences between the different forms of the variable are negligible. The above specification is estimated separately for each country using a panel of sectors i over time t (t = 1995, …,2011). As for the estimation technique, we tested different models and found that neither random nor sectoral fixed effects are significant; similar conclusions apply to the significance of time-specific dummies. Hence we use a simple pooled OLS where the presence of heteroscedasticity and cross correlation among panels is addressed by using panel corrected standard errors (Greene 2012).

The results are shown in Table 6 for the eight countries with a full data set. For all specifications we used the same sample size in order to exclude the possibility that differences in the results are due to the different data coverage of the explanatory variables. The coefficients are expressed in standardised terms in order to allow a direct comparison among the estimates. As we can clearly see, equilibrium wages and the competitive indicator are significant determinants of the changes in the share of value added for all countries, whereas nominal unit labour costs are insignificant in Spain and France and in general have a lower explanatory power in terms of R^2. The differences between the explanatory power of equilibrium wages and our competitiveness indicator are largely insignificant, which might be because nominal wage dynamics present a drift and do not react to changes in relative productivity.

Looking at the coefficients, the higher impacts are found in Finland and the Netherlands, where a standard deviation increase in equilibrium wages is associated with a change in the sector's share by half a standard deviation. In Germany and Italy, the impact is slightly below 0.4, whereas in the remaining countries it is much lower and the explanatory power is rather low, suggesting that other factors played a major role in determining the sectoral recomposition of value added.

As a robustness check, we replicated the previous estimates using hourly measures of equilibrium wages, competitiveness and unit labour costs. As we can see in Table 7, the results are practically unchanged in terms of significance and also the relative size of the impacts among countries is, in most of the cases, similar between the two specifications.

Thus, we can summarise the test results as follows: **while there is no large difference between our equilibrium wage and the wage gap, both these indicators clearly provide greater insights and more information than unit labour cost indicators, which are usually used in competitiveness assessments.**

Table 6 **Estimation results for the relationship between changes in the sectoral shares in value added and competitiveness**

Dependent variable: change in the sectoral shares in total value added (ΔVA_share)								
	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(Weq)	0.379***	0.390***	0.123***	0.171***	0.508***	0.272***	0.328***	0.491***
	[10.018]	[6.510]	[4.168]	[4.731]	[13.877]	[9.289]	[10.832]	[7.387]
R^2w	0.144	0.153	0.015	0.029	0.258	0.074	0.107	0.242
RMSE	0.125	0.17	0.221	0.148	0.173	0.123	0.138	0.25
Wald	100.4	42.4	17.4	22.4	192.6	86.3	117.3	54.6
N	464	480	295	384	464	480	464	464
	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(Comp)	–.365***	–.370***	–0.118***	–0.167***	–0.507***	–0.269***	–0.314***	–0.402***
	[–9.918]	[–6.422]	[–4.180]	[–4.688]	[–13.891]	[–9.401]	[–10.820]	[–7.236]
R^2w	0.134	0.138	0.014	0.028	0.258	0.073	0.099	0.232
RMSE	0.126	0.172	0.221	0.148	0.173	0.123	0.139	0.252
Wald	98.4	41.2	17.5	22	193	88.4	117.1	52.4
N	464	480	295	384	464	480	464	464
	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(ULCrel)	–0.125**	–0.273***	–0.049	–0.039	–0.168***	–0.298***	–0.188***	–0.283***
	[–3.092]	[–6.072]	[–0.906]	[–1.112]	[–7.339]	[–7.882]	[–5.729]	[–5.142]
R^2w	0.016	0.075	0.002	0.002	0.028	0.062	0.035	0.08
RMSE	0.134	0.178	0.223	0.15	0.198	0.124	0.143	0.275
Wald	9.6	36.9	0.8	1.2	53.9	62.1	32.8	26.4
N	464	480	295	384	464	480	464	464

Notes: * Significant at 10% level; ** significant at 5% level; *** significant at 1% level; R2w = within groups R squared; RMSE = Root Mean Square Error.

Table 7 **Estimation results for the relationship between changes in the sectoral shares in value added and competitiveness (hourly wage data)**

	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(Weq_h)	0.218***	0.427***	0.282***	0.329***	0.317***	0.349***	0.368***	0.919***
	[5.302]	[10.553]	[4.338]	[5.456]	[6.992]	[8.830]	[5.710]	[9.359]
R2w	0.11	0.155	0.033	0.135	0.148	0.187	0.154	0.272
RMSE	0.131	0.144	0.225	0.124	0.182	0.112	0.134	0.235
Wald	28.1	111.4	18.8	29.8	48.9	78	32.6	87.6
N	428	416	261	366	440	460	318	448
	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(Comp_h)	–0.230***	–0.416***	–0.288***	–0.318***	–0.319***	–0.343***	–0.349***	–0.874***
	[–5.345]	[–10.775]	[–5.066]	[–5.318]	[–7.027]	[–8.790]	[–5.855]	[–8.635]
R2w	0.115	0.148	0.035	0.129	0.148	0.186	0.148	0.254
RMSE	0.131	0.144	0.224	0.124	0.182	0.112	0.135	0.238
Wald	28.6	116.1	25.7	28.3	49.4	77.3	34.3	74.6
N	428	416	261	366	440	460	318	448
	ITA	DE	ESP	FR	NL	AUT	BEL	FIN
Δ(ULCrel_h)	–0.297**	–0.276***	–0.303	–0.049	–0.384***	–0.319***	–0.509***	–0.961***
	[–2.546]	[–5.590]	[–1.446]	[–0.472]	[–6.206]	[–8.565]	[–7.238]	[-5.370]
R2w	0.013	0.052	0.003	0.001	0.029	0.071	0.067	0.094
RMSE	0.138	0.152	0.228	0.133	0.194	0.12	0.141	0.262
Wald	6.5	31.2	2.1	0.2	38.5	73.4	52.4	28.8
N	428	416	261	366	440	460	318	448

Notes: * Significant at 10% level; ** significant at 5% level; *** significant at 1% level; R2w = within groups R squared; RMSE = Root Mean Square Error.