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The global decline in the labour income share: is capital the answer to Germany's current account surplus?

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Executive summary

THIS PAPER LINKS the major divergences between the three largest euro-area countries in terms of unit labour costs and current accounts, to the broader debate on labour income shares. We show that Germany, like the United States and Japan, has experienced a significant decline in the share of national income that goes to labour. At the same time, labour shares in France and Italy have increased since the beginning of monetary union, breaking a trend that had persisted for several decades. The capital intensity of production has increased much more significantly in France and Italy, while in Germany the capital-to-GDP ratio has stagnated and the net public capital stock has fallen. Our data suggests that capital and labour have been complements.

TO ADDRESS DIVERGENCES within the euro area, Germany will need to increase its capital stock. Our data suggests that by increasing it, simultaneously the labour income share will increase. Investment and raising the purchasing power of households (and reducing corporate savings) would contribute to a smaller current account surplus. Increasing labour market supply by adjusting labour market institutions that effectively exclude part of the population could be a complementary policy for France and Italy to pursue in order to narrow the gap with Germany.

OUR DATA INDICATES a genuine policy problem. At its core are different approaches to dealing with the impact on domestic labour markets of technological change and globalisation, and the effects of monetary union on capital allocation. Different approaches have led to a large and relatively persistent divergence that manifests itself in high structural unemployment in France and Italy and large current-account surpluses in Germany. Addressing this divergence remains the core challenge for euro-area policymakers.

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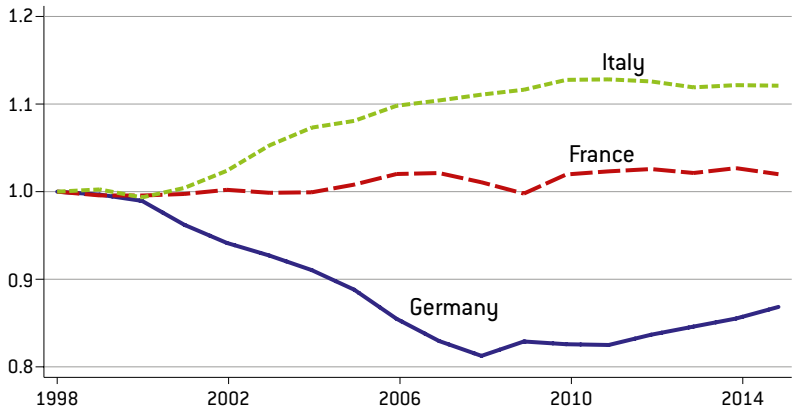
Introduction

There are two broad views of adjustment in Europe's economic and monetary union. The first is that the divergence of competitiveness in the euro area is the fault of the peripheral countries, which were guilty of *"losing their competitiveness simply by becoming too expensive"* prior to the crisis (Sinn, 2013). This view emphasises the capital inflows into the periphery countries and the resulting unsustainable property booms and other misallocations of capital, which in turn led to price increases and wages well beyond productivity. The second view puts the blame for the pre-crisis divergence primarily on Germany, arguing that German wage moderation triggered the divergence in current accounts and price competitiveness (Wren-Louis, 2015).

We analyse the problem of euro-area adjustment from a different angle, by looking at developments in the share of income that accrues to labour and in unit labour costs (ULCs), or the ratio of compensation per employee to output per person employed (see the next section). Instead of discussing the boom and bust experiences of Ireland, Greece, Spain and Portugal[1], which have been widely covered and are generally well understood, we focus on the big three countries: Germany, France and Italy.

Figure 1 shows that ULCs in the three economies diverged substantially in the pre-crisis years. But since the beginning of the crisis and in particular since 2011, a slow rebalancing has been visible. Nevertheless, the divergence between the ULCs of the three economies – and the related unemployment numbers –remains substantial.

Figure 1: ULC-based real effective exchange rates, selected countries relative to the euro area



Source: Bruegel calculations based on AMECO (ECFIN). Notes: The figure shows real effective exchange rates relative to the euro area based on unit labour costs (ULC deflated) indexed to 1998 levels.

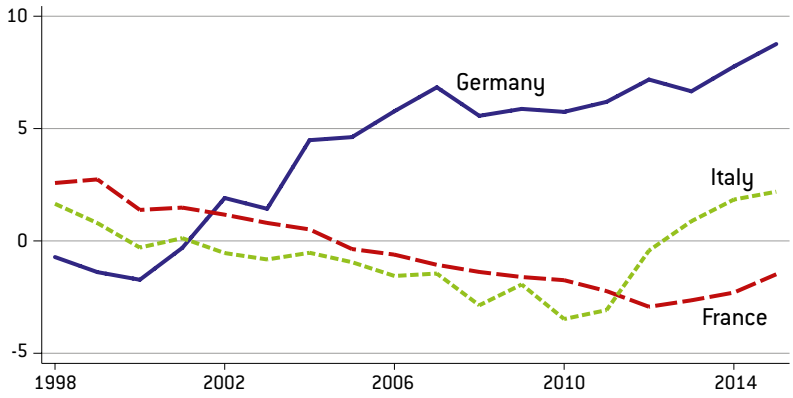
France and Italy have seen a gradual decline in their current accounts, while Germany's current account has gradually increased since the beginning of monetary union (Figure 2). Current account adjustment in France and Italy started only with the onset of the euro crisis, while in Germany the current account surplus continued to increase and is expected to remain high[2].

1 The four countries are relatively small economies compared to the rest of the euro area, together accounting for about 16 percent of euro-area GDP. Accordingly, they have pretty much adjusted unilaterally to the rest of the euro area. This adjustment has largely happened through unit labour costs (ULCs); see Figure A1. Unemployment increased significantly in all four countries during the adjustment, but employment is now recovering – though at different speeds. The correction in the countries' current account deficits resulted from cuts in imports and, in some countries, significant export booms.

2 AMECO (ECFIN) Database.

The divergences between the three euro-area countries have gone hand-in-hand with dramatically different performances. Germany has more than halved its unemployment rate since the advent of the euro, while France and Italy are now where they were when the euro was introduced, with unemployment at roughly 10 percent and 11.5 percent respectively (Eurostat, 2016). All European countries have lost global trade shares (in part because of the rise of China), but significant differences can be observed. Italy saw its foreign trade share[3] decrease by 39 percent between 1998 and 2015, while France's almost halved and Germany's decreased by only 20 percent. The contribution to output by manufacturing and other industrial sectors more generally has decreased substantially in France and Italy, while it has remained constant in Germany.

Figure 2: Current account balances (% of GDP)



Source: AMECO (ECFIN).

How can the divergences between the three economies be explained? We show that there has been a significant divergence in labour income shares, ie the percentage of national income accruing to labour (see Box 2 for an explanation of how the labour share is calculated). Germany's labour share closely tracks the global decline in labour shares. In contrast, France and Italy have defied the global trends since the beginning of monetary union and their labour income shares have even increased.

Different economic explanations have been proposed for these global developments. But to the best of our knowledge, very few papers have linked these developments to the debate on adjustment in Europe's monetary union[4]. Our evidence suggests that a relative scarcity of capital in Germany is the counterpart to the fall in the German labour share, and that capital and labour are complements and not substitutes in the major euro-area economies, a finding that is overwhelmingly supported by the empirical literature[5]. We also highlight different labour market institutions as explanatory factors for the divergence.

3 This number reflects a country's share of exports of goods in total world exports. Source: AMECO (ECFIN).

4 Felipe and Kumar (2011) is an exception.

5 As reviewed by Lawrence (2015), though contrary to Karabarbounis and Neiman (2015) and to Piketty and Zucman (2014).

Developments in productivity and compensation

Unit labour costs are computed as the ratio of compensation per employee to output per person employed[6]. To better understand ULC developments, we look at its two components separately: compensation and real productivity.

First, we address the choice of the appropriate deflator, which needs to be considered carefully and which depends on the research question. To get real labour productivity[7] we deflate gross value added (GVA) as a measure of output by its national GVA deflator. More difficult, however, is the choice of the deflator to identify real compensation. Many studies use the consumer price index (CPI): asking how many goods (and services) a worker can buy with her wage (to be precise, how many goods at constant prices). It might be interesting to look at things from the worker's perspective, but it would not be the right choice in our setting that looks at competitiveness or the decisions of companies to locate production in an integrated economic area[8]. We (i) want to compare the relative developments in productivity and compensation and, (ii), to incorporate the currency union aspect: in a currency union differences in inflation rates cannot be adjusted for via the exchange rate. We therefore (i) use the GVA deflator as a production-based deflator also for compensation figures, and (ii) employ the same euro-area GVA deflator for all countries. In doing so, we essentially remove the price increase that does not affect relative competitiveness. For robustness, we also include figures in the Appendix for which we used national GVA deflators for compensation.

Figure 3 shows the development of real productivity and real compensation per hour in France, Germany and Italy from the end of 1998, which marks the beginning of monetary union, to 2015, based on our measure. We look at the business sector[9] – for which compensation and labour productivity are better measured than for the whole economy (see for example OECD, 2012) – and the manufacturing sector as a proxy for sectors directly exposed to international competition.

A number of results are noteworthy[10]. In France, compensation increased somewhat relative to productivity during the Great Recession, but the relative development of compensation and productivity is balanced. In Italy and Germany, the gap has persistently widened. In Germany, productivity has moved well ahead of compensation, while in Italy compensation has substantially outpaced real labour productivity, which has been virtually flat since 2000[11].

Figure 4 shows the same variables as Figure 3, but uses national price deflators for compensation. It does not cover the implications for competitiveness because it disregards relative price developments as euro-area countries cannot adjust nominal exchange rates to differences in inflation rates. Nevertheless, Figure 4 gives interesting insights into within-country developments, which is important for the largely national wage negotiation process.

6 See Box 1 for more details on the computation of ULCs.

7 We are always referring to labour productivity when talking about productivity in general.

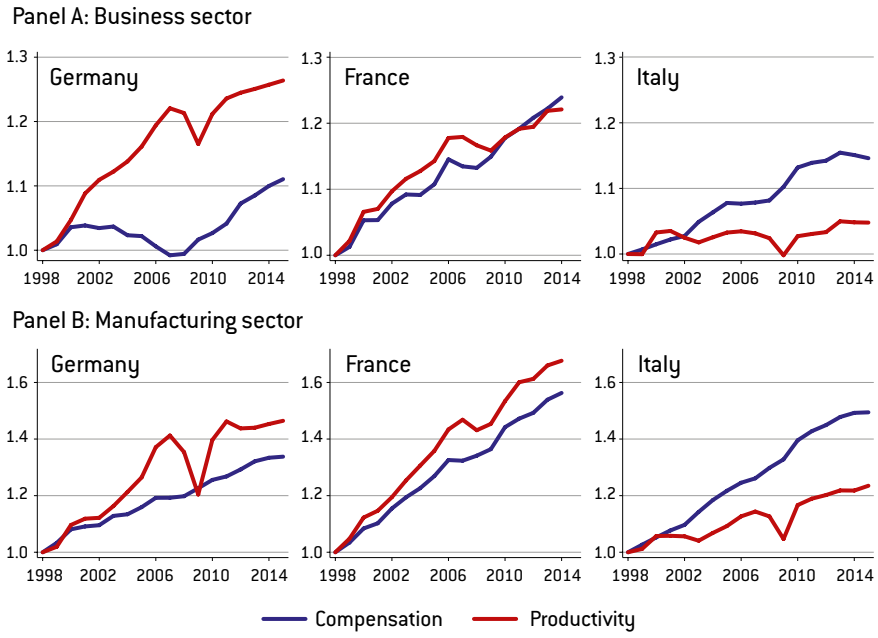
8 As the CPI generally rose more than the GVA deflator, if the CPI is only applied to compensation wrong conclusions might be reached because in that case compensation seems relatively flatter simply because price indices are different, rather than because nominal developments are different.

9 The business sector excludes sectors such as agriculture, public administration, and health services, see Appendix B for more details.

10 The results for Ireland, Spain, Greece and Portugal are in Appendix A. In Ireland, Spain and Greece, relative compensation rose beyond productivity until the onset of the financial crisis or even later – in the case of Greece it is visible that this development continued until the beginning of the European sovereign debt crisis. If we also include non-business sectors this development is even stronger, in particular in Greece. The countries have rebalanced substantially since (Figure A1). There remains an imbalance in terms of the general price level (Figure A2).

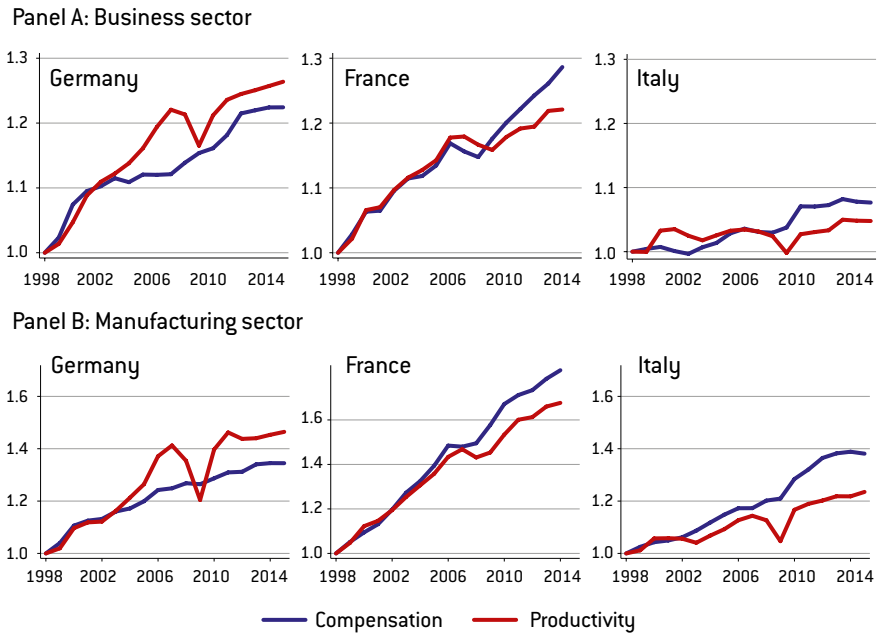
11 Panel B of Figure 4 also shows that relatively slowly-increasing compensation in Germany is not only a consequences of the inclusion of low-skilled workers, which is often referenced as a reason for real-wage stagnation or even decline (see Panel A), because the manufacturing sector also witnessed real wages falling short of productivity growth.

Figure 3: Productivity and compensation using the euro-area GVA deflator



Source: Bruegel based on Eurostat (National Accounts). Notes: Real productivity is GVA per hour worked deflated by national GVA deflator. Real compensation is hourly compensation of employees deflated by the euro area GVA deflator. All variables indexed to 1998 levels.

Figure 4: Productivity and compensation using national GVA deflators



Source: Bruegel based on Eurostat (National Accounts). Notes: Real productivity is GVA per hour worked deflated by national GVA deflator. Real compensation is hourly compensation of employees deflated by the euro area GVA deflator. All variables indexed to 1998 levels.

Measured in national prices, labour compensation in France has rushed ahead of productivity since the Great Recession. In Italy, after an initial increase in productivity, compensation has risen relatively more since about 2002. In Germany, productivity gains were only partially passed on through compensation after 2002, giving rise to a widening gap. The main reason why the gap looks smaller when looking at national deflators is that wages are a central driver for prices of domestically-produced goods. As a consequence, a country can run sub-

stantially higher inflation and wage rates than its euro-area neighbours, resulting in competitiveness losses without any substantial increase in the purchasing power of employees.

The labour share in euro-area countries

Developments in ULCs mirror developments in the labour share (see Box 1 for a mathematical explanation). Besides this purely mechanical link, it is interesting to note the role of the general price level, P (Box 1). If downward adjustments in ULCs are such that they are not reflected in downward adjustments in the general price level, labour's share of income is affected, which has distributional consequences and potentially affects aggregate demand and equality.

Box 1: The relationship between ULCs and labour share

ULCs and the labour share are connected through a simple identity, the implications of which are often forgotten when talking about competitiveness[12]: ULCs reflect the distribution of income between labour and capital. ULCs on the macro-level are calculated as the ratio of nominal compensation of employees and real labour productivity:

$$ULC := \frac{\frac{COMP}{EMPE}}{\frac{GVA/P}{EMP}} = \underbrace{\frac{\frac{COMP}{EMPE} * EMP}{GVA}}_{labour\ share} * P \qquad (1)$$

COMP: compensation of employees; EMP: number of employed persons; EMPE: number of employees; GVA: gross value added; P: Price level (GVA deflator)

Note that this way of estimating the labour share is used in Gollin (2002). We use a more refined method as explained in Box 2.

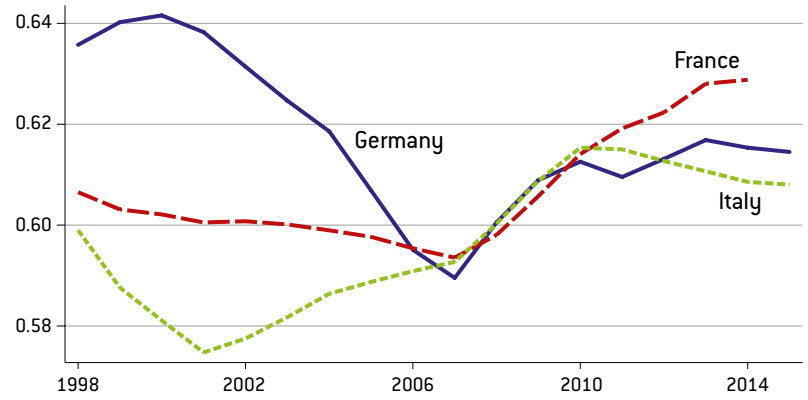
Also note that compensation is composed of wages and salary plus employers' contributions to social security. Persons employed (EMP) include both employees and the self-employed.

Figure 5 shows how the business sector labour share has developed in France, Germany and Italy. The picture is very similar to looking at the whole economy. With improvements in productivity only partially passed on to labour, the labour share in Germany fell up until the financial crisis, when it bounced back somewhat and levelled out. France's labour share started rising from 2008, while Italy has had a rather persistent rise since 2000, which holds true in particular for manufacturing and the industrial sectors more generally (Figure 6). The fact that the business sector labour share actually decreased slightly in France before 2008 also shows that compositional effects within the French economy obscured declining labour shares in some sectors. The general picture mirrors the development shown in Figure 1[13].

12 See Felipe and Kumar (2011).

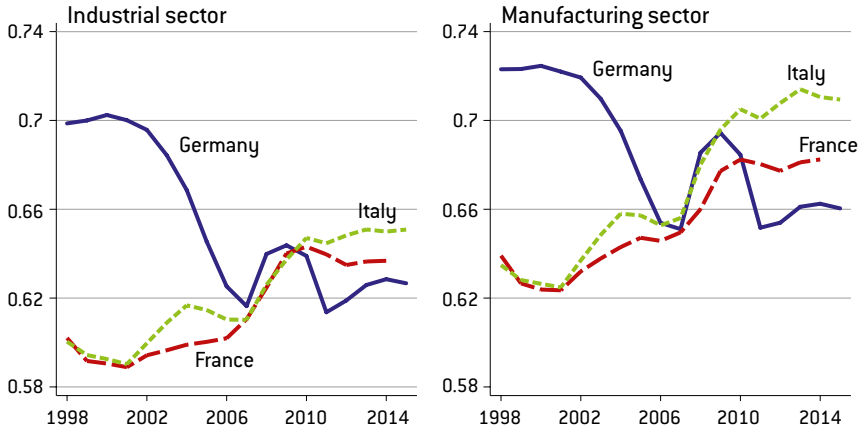
13 Labour shares are therefore sometimes referred to as real ULCs, though we prefer to use the term labour share as 'real ULCs' only makes sense because of the way ULCs are computed on the macro-level.

Figure 5: Labour shares in Germany, France, and Italy, business sector



Source: Bruegel based on Eurostat (National Accounts). Notes: The graphs are smoothed using a moving average with equal weights and a 3-year window.

Figure 6: Labour shares in Germany, France and Italy



Source: Bruegel based on Eurostat (National Accounts). Notes: The graphs are smoothed using a moving average with equal weights and a 3-year window. The industrial sector encompasses NACE codes B to E, while manufacturing corresponds to C, see Appendix B for details.

The global decline of the labour share

The labour share and in particular its global decline has been widely documented[14]. While the method for calculating it has certain shortcomings (Box 2), there seems to be a consensus for the general decline in the labour share.

The fall in the business sector labour share is visible in other major advanced countries. There has been much debate about its decline in the United States, in particular since the decline accelerated from 2000. In Japan the labour share declined continuously after 1980 and has levelled out somewhat since 2006. In the United Kingdom, the fall in the labour share has been visible only more recently. Strikingly, the fall the in the labour share in Germany is quite

14 See for example Karabarbounis and Neiman (2014) and OECD (2012, 2015) for a global analysis; Elsby et al (2013) for a discussion of the US labour share; and Arpaia et al (2009) for Europe.

comparable to the decline in the US, the UK and in Japan. The manufacturing sector paints a fairly similar picture, although with different labour share levels. The decline in the labour share is particularly dramatic in the US manufacturing sector[15]. In the US, Japan and Germany, productivity has grown well ahead of the growth of compensation (see Appendix A). Only in the UK does the trend seem to have been different, with compensation growing more quickly and falling only recently.

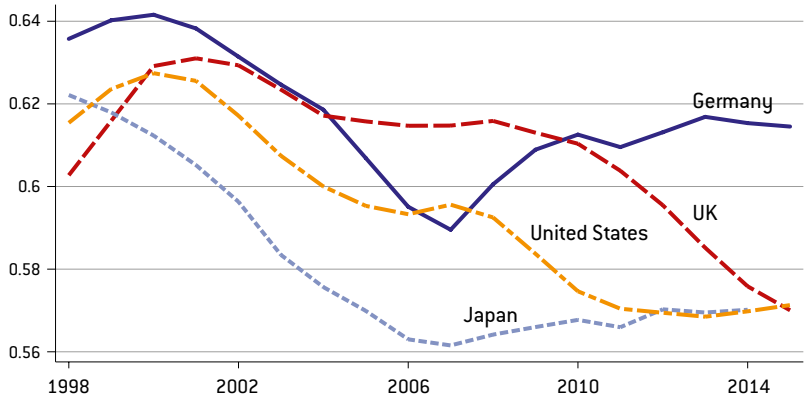
Box 2: Calculation of the labour share

The labour share reflects the share of total income – for which gross value added (GVA) is usually used, ie output minus intermediate inputs – that accrues to labour as a factor of production. Estimating requires assumptions to be made because employee compensation is the only unambiguous part of labour remuneration. The income of the self-employed is typically a mix of capital and labour income, which are not reported separately. In line with the literature, we assume that the hourly compensation of the self-employed is equal to that of employees[16]. We perform the calculation based on this assumption on the industry level and add up to arrive at total labour compensation. Its share in GVA is the labour share.

To put the calculation somewhat into perspective, however, Elsby *et al* (2013) show that this way of calculating the labour income of the self-employed overstates the fall in the US headline measure of the labour share and explains its decline by about one third.

It is also important to note that the labour share is about factor incomes: the share of income going to labour as an input to production. That does not necessarily reflect all income accruing to workers as they themselves can be owners of capital.

Figure 7: Labour shares in major advanced countries, business sector



Source: Bruegel based on Eurostat (National Accounts), Cabinet Office (National Accounts), BLS. Notes: The graphs are smoothed using an MA with equal weights and a 3-year window. The business sector corresponds to NACE codes B to N for EU countries, all industries for Japan (national accounts data), and the nonfarm-business sector for the USA, see Appendix B for more details.

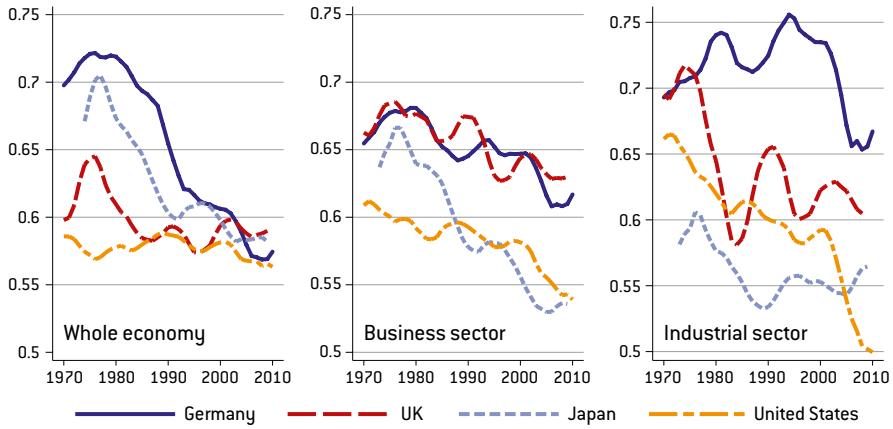
Figure 8 puts the discussion into a long-term perspective. It shows that fluctuations in the labour share are nothing unusual. Nevertheless, there is a clear downward trend visible

15 For more details on the data see Table B.1 in Appendix B, where the difference in levels between the US and other countries is shown.

16 For Japanese data in Figure 7 from the Japanese Cabinet Office we assumed that the annual compensation of the self-employed is equal to that of employees because of lack of data on hours worked by the two categories. This way of calculating the labour share was also used in a comprehensive study on labour share dynamics by Gollins (2002).

in the labour share of the business sector. The overall labour share might hide sector-specific changes. A clear example is the US, where the overall share has fallen since 2000 but is not at an all-time low, whereas it is at an all-time low for the business and industrial sectors[17]. In particular, in the industrial sector the labour share has been falling since about 2000, similar to that of Germany.

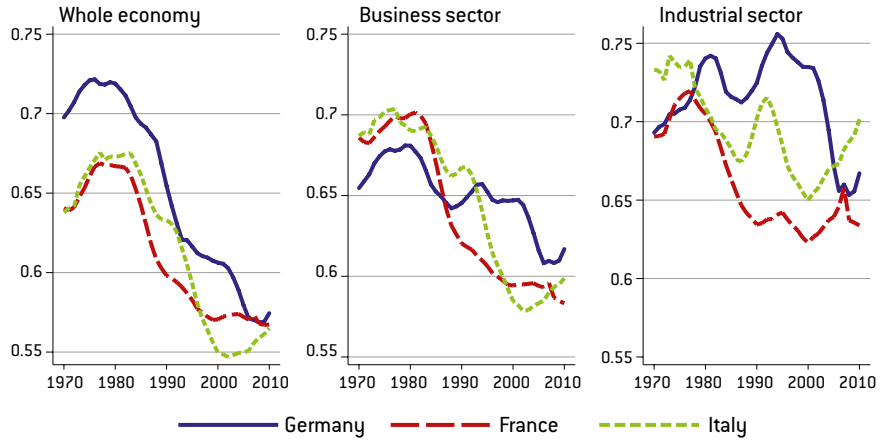
Figure 8: Labour shares since 1970 in Germany, Japan, the UK and the US



Source: Bruegel based on EU-KLEMS, World KLEMS. Notes: The graphs are smoothed using an MA with equal weights and a 5-year window. The business sector corresponds to NACE codes B to N for EU countries and Japan and codes C to K in World-KLEMS data for the USA. The industrial sector corresponds to NACE codes B to E for EU countries and Japan and C to E in World-KLEMS.

The long-term trends in Italy and France are comparable, but monetary union seems to constitute a break. Figure 9 shows that also in France and Italy, the labour shares have fallen, but since the beginning of the 2000s, the trend in both countries seems to have reversed. Germany has seen its labour share fall dramatically in the industry sector in particular, while in France and Italy it has increased.

Figure 9: Labour shares since 1970 in Germany, France and Italy



Source: Bruegel based on EU KLEMS.

17 Karabarbounis and Neiman (2014), Lawrence (2015) and OECD (2012) show that the falls in labour shares result from within-industry changes rather than compositional changes in the structure of the economy.

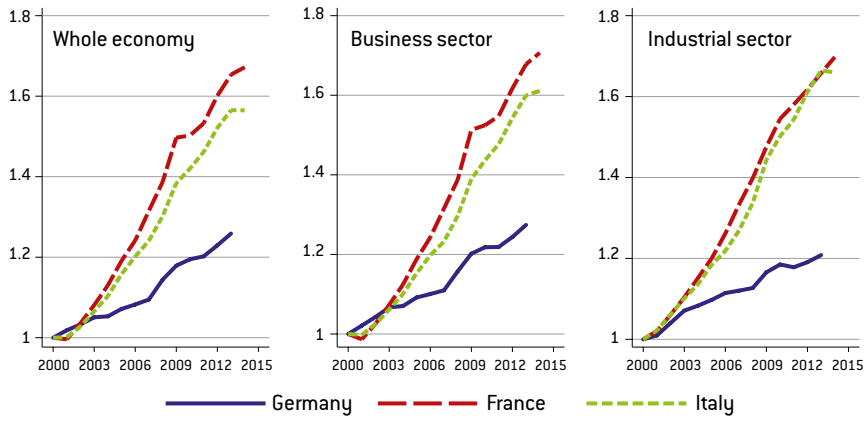
Explaining falling labour shares

Though the falling labour share around the world is well documented, there is no consensus on the reasons for its fall. Karabarbounis and Neiman (2015) link the global decline of the labour share to the global decline in the relative price of investment goods, and argue that this can explain about half of the fall. Their argument hinges on an estimation of the elasticity of substitution of labour and capital exceeding unity – in other words, that labour and capital are substitutes and production has shifted towards capital, which is the relatively cheaper input. Similarly, Piketty and Zucmann (2013) argue that the elasticity of substitution between capital and labour is greater than one. They find that capital-output ratios have increased substantially while the return to capital has fallen. However, the product of the two has increased, leading to a rising capital share. But Piketty and Zucmann (2013) suffers from methodological problems, as argued in detail by Rognlie (2014, 2015). In particular, Piketty and Zucmann (2013) measure capital at market value including capital gains, which should be excluded. Correcting for this mismeasurement would lead to an elasticity of substitution smaller than one. Lawrence (2015) concludes that the *"estimates by Piketty and Zucmann appear to rest on faulty data and back-of-the-envelope calculations rather than rigorous econometric analysis."* Most of the literature surveyed by Lawrence (2015) finds an elasticity of substitution between capital and labour that is smaller than one[18].

The insights from this literature can be applied to euro-area data. If Piketty and Zucmann were right, we would expect the capital-to-labour ratio to have increased particularly strongly in Germany, where the labour income share has fallen. In contrast, in Italy and France, where the labour income share has increased, we would expect the capital-labour ratio to fall or at least grow less strongly than in Germany.

Figure 10 shows the evidence on capital-labour ratios in the three economies in different sectors. The panels show the opposite of what Piketty and Zucmann's hypothesis would predict. The capital-labour ratio has increased much more significantly in France and in Italy than in Germany. That would be consistent with increasing labour shares in France and Italy and the falling labour share in Germany only if capital and labour are complements (ie an elasticity of substitution smaller than 1).

Figure 10: Capital-to-labour ratios, using chained-indexed capital stock, net



Source: Bruegel based on Eurostat. Notes: All variables are indexed to 2000 levels.

18 OECD (2012) surveys a number of other contributions that try to explain the decline of the labour share. Many studies point to increased capital intensity as the leading explanation. For this reasoning to make sense, however, capital and labour need to be substitutes, a claim usually rejected by evidence on the elasticity of substitution. Another potential explanation is offshoring of labour-intensive industries, which Elsby *et al* (2013) reference as the leading explanation for the recent decline in the labour share in the US.

Lawrence (2015) argues that the best way to explain the falling labour share in the US is labour-augmenting technical change, meaning that technological change increases the effective supply of labour because it increases the effectiveness of labour. An example would be a smartphone app that increases the efficiency of a worker. When *effective* labour increases more strongly than capital, the labour share would fall. Labour could *effectively* increase more strongly because of its greater efficiency, for example thanks to modern technology. That greater efficiency would not be measurable in simple counts of the number of people employed.

While our data are not an econometric test of whether capital and labour are substitutes or complements, they do raise significant questions on the validity of the hypothesis of Piketty and Zucmann. Our data also raise significant policy questions in terms of euro-area adjustment.

Conclusions

Our main new finding is that the decline in the labour share in Germany has been comparable with developments in peer industrial economies, in particular the US and Japan. In contrast, the labour shares in France and Italy have been increasing since the beginning of monetary union. Monetary union seems to constitute a structural break in the French and Italian data in that the previous decline in the labour share was halted.

We see three complementary forces behind this pattern of diverging labour shares and unit labour costs that is at the core of the divergences in the euro area. The first concerns the capital intensity of production, which increased much more strongly in France and Italy than in Germany. This result is consistent with capital and labour being complements rather than substitutes.

Second is the introduction of monetary union itself. *De facto*, monetary union eliminated risk differentiation across euro-area countries and as a result decreased the price of capital substantially in Italy and to some extent in France. Both countries gradually increased their current account deficits and became net capital importers. As a consequence, their capital stocks increased more strongly relative to Germany and their wage shares increased.

A third factor could be institutional factors affecting labour input and labour compensation. According to a measure used by Visser (2015), trade union power in Germany fell while it remained rather stable in France and Italy[19]. Another difference is that French wage bargaining is partially driven by the minimum wage (Avouyi-Dovi, 2011). In Italy, centralised wage bargaining in effect does not take into account geographical differences, possibly to the disadvantage of less-productive regions. Terzi (2016) concludes that this is the root of the discrepancy between wages and productivity in Italy. The number of strike days is another interesting measure: the number of days not worked because of strikes per 1,000 workers was

19 While wage bargaining is generally fairly centralised, regional differences are possible in Germany and the bargaining takes place predominantly at the sector level. As a result, sector-level agreements are usually applied unless company-level agreements lead to higher wage increases. Trades union participation has decreased substantially in all three countries in the past few decades, but the proportion of employees covered by collective bargaining agreements actually went down only in Germany (Visser, 2015). Specifically, trades union participation refers to the 'union density rate', which is net union membership as a proportion of wage and salary earners in employment. The proportion of employees covered by collective bargaining agreements refers to the proportion of all wage and salary earners with rights of bargaining, adjusted for some sectors excluded from right to bargain (the 'adjusted coverage rate'). In France and Italy virtually all employees are covered by collective bargaining agreements, irrespective of whether a particular individual is a union member (see for example Fabiani and Sabbatini, 2009)

79 in France in 2013, while it was less than 10 in Germany[20]. Moreover, in Germany, all social partners agreed to substantial wage moderation in the 2000s[21].

In addition, the Hartz labour market reforms in the early 2000s led to increases in the German labour force by increasing the pressure to take up work. An increase in the labour force would, all else being equal, lead to a falling labour share because it would reduce wages unless offset by a corresponding increase of capital. This effect does not take into account labour augmenting technical change, which might have been an additional factor increasing the *effective* labour supply.

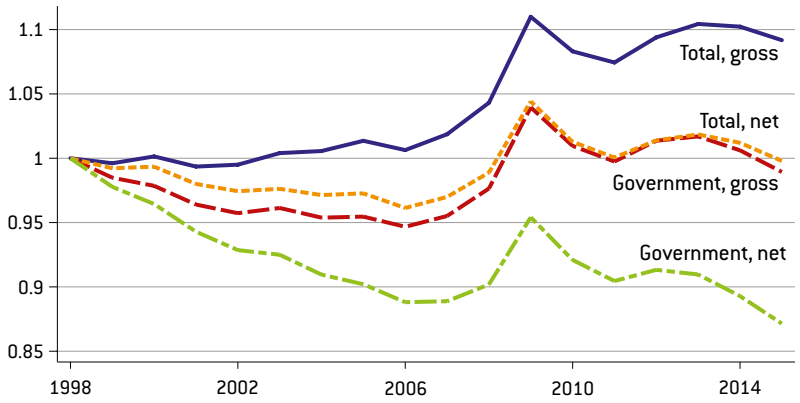
Policy implications

Our results are preliminary and will require further analysis. They suggest a two-fold strategy is needed to adjust the divergences in monetary union. First, to increase the labour share in Germany, Germany will need to increase its amount of capital.

Figure 11 shows that net public capital has been falling and the total net capital stock has not increased as a percentage of GDP. Germany urgently needs to define an investment strategy that will increase public investment.

In terms of private investment, it is well documented that German companies have reduced investment and increased savings, becoming net capital exporters (Figure A4). Anecdotal evidence confirms that German companies agree that the domestic capital stock is getting old, thereby adding less to the productivity of workers. One of the central policy questions is therefore how conditions for increasing private corporate investment can be improved.

Figure 11: Capital stock as a share of GDP, Germany



Source: Bruegel based on Destatis, Eurostat. Notes: All variables are indexed to 1998 levels.

Second, France and Italy will need to raise their labour market supplies by adjusting labour market institutions that effectively exclude parts of the working age population from active participation because of rigidities and insider protection. This is partly a question of labour market legislation and partly a question of the institutional structure of labour markets.

Our data indicates a genuine policy problem. At the core of the problem are different approaches to dealing with the impact of technological change and globalisation on domestic labour markets, and the effects of monetary union on capital allocation. Outside of a

20 Source: Dares, French Ministry of Labour and Employment.

21 For example, in an arrangement that started in 1998 under Chancellor Gerhard Schröder, the social partners agreed to, among other things, use productivity gains for employment creation. See https://www.blaetter.de/archiv/jahrgaenge/2000/februar/buendnis-fuer-arbeit-ausbildung-und-wettbewerbsfaehigkeit. Also, the use of escape clauses – allowing company-level agreements to be less favourable than sector-level ones – was much more common in Germany (Du Caju et al, 2008).

monetary union, those different approaches would have led to vastly different performances in terms of growth and productivity, but the nominal exchange rate would have corrected the macroeconomic disequilibria. Inside the monetary union, the different approaches have led to a large and relatively persistent divergence that manifests itself in high structural unemployment in France and Italy and large current-account surpluses in Germany. Addressing this divergence remains the core challenge for euro-area policymakers.

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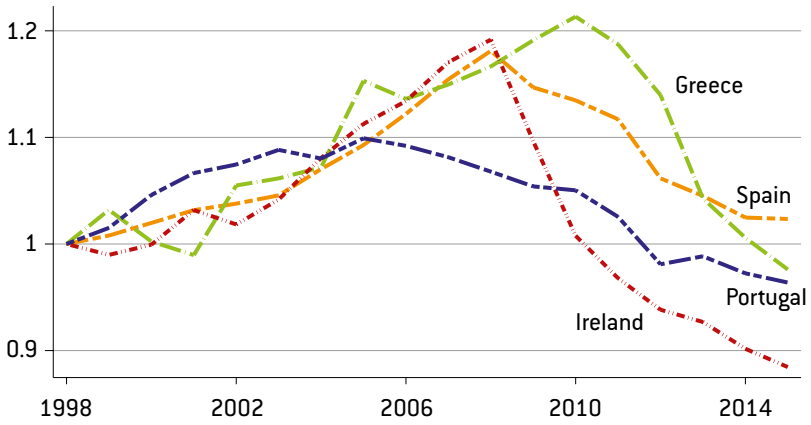
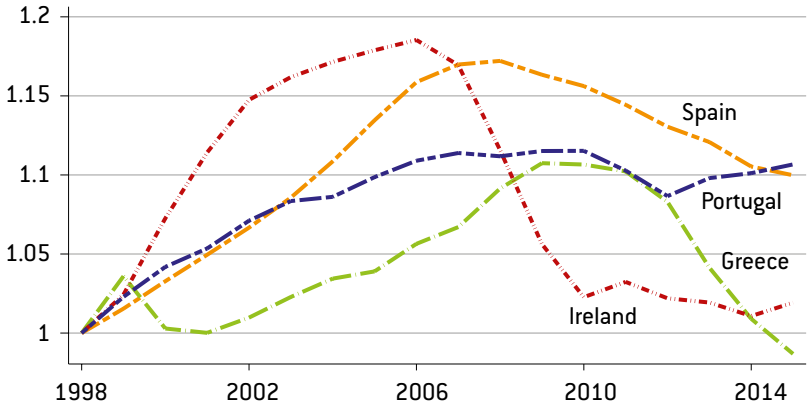
Appendix A

Figure A1: ULC-based real effective exchange rates relative to EA19



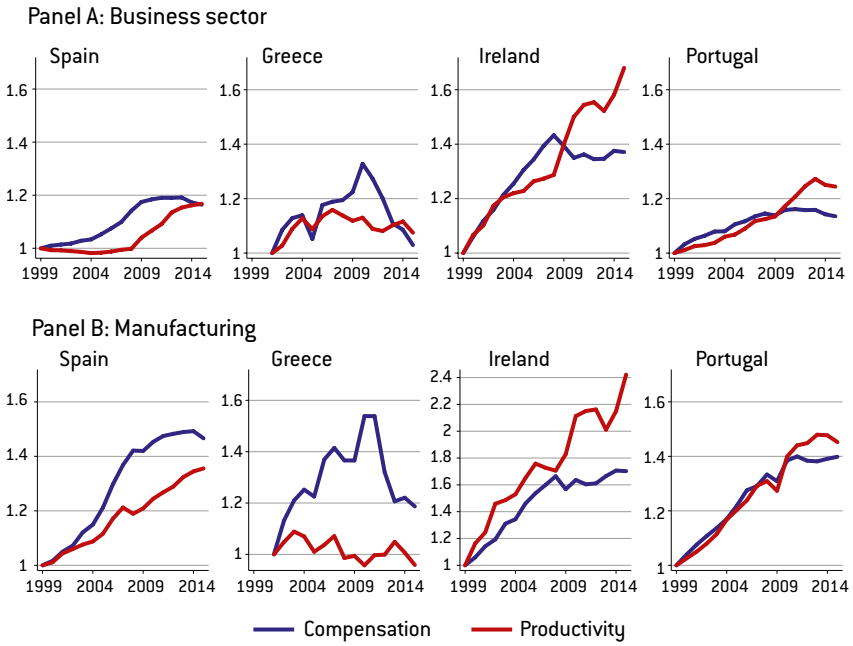
Source: Bruegel based on AMECO (ECFIN). Notes: The figure shows real effective exchange rates vis-à-vis EA19 countries based on unit labour costs (ULC deflated) indexed to 1998 levels.

Figure A2: GDP deflator-based real effective exchange rates relative to EA19



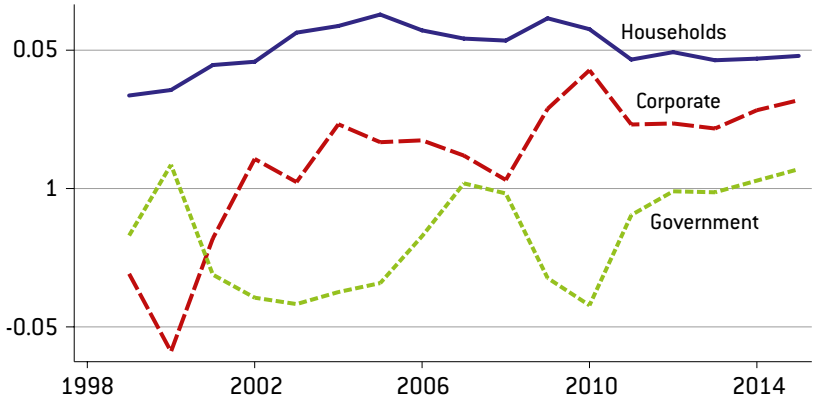
Source: Bruegel based on AMECO (ECFIN). Notes: The figure shows real effective exchange rates vis-à-vis EA19 countries based on the GDP deflator indexed to 1998 levels.

Figure A3: Productivity and compensation using euro-area GVA deflator



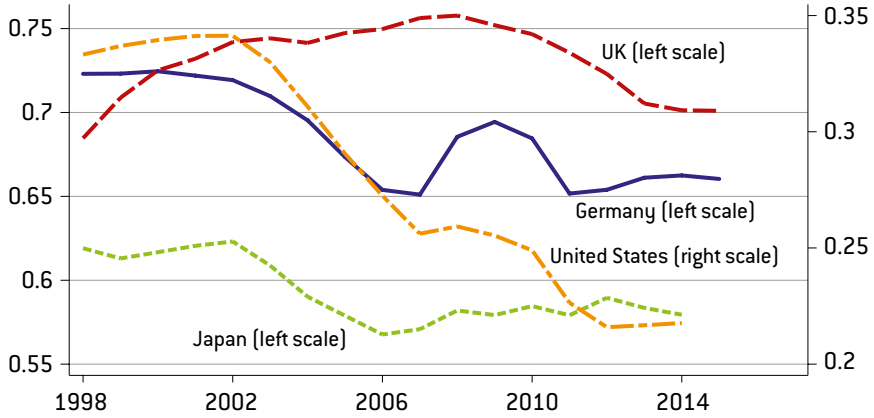
Source: Bruegel based on Eurostat (National Accounts). Notes: Real productivity is GVA per hour worked deflated by national GVA deflator. Real compensation is hourly compensation of employees deflated by the euro area GVA deflator. To avoid making a choice about which currency to use for the years before the respective introduction of the euro, which matters much more for these small countries than for the large three above, we index all variables to 1999 levels, and 2001 levels for Greece respectively. Also note the difference in scale for Ireland in Panel B. The business sector corresponds to NACE codes B to N, see Appendix B for details.

Figure A4: Net lending by sector (in percent of GDP), Germany



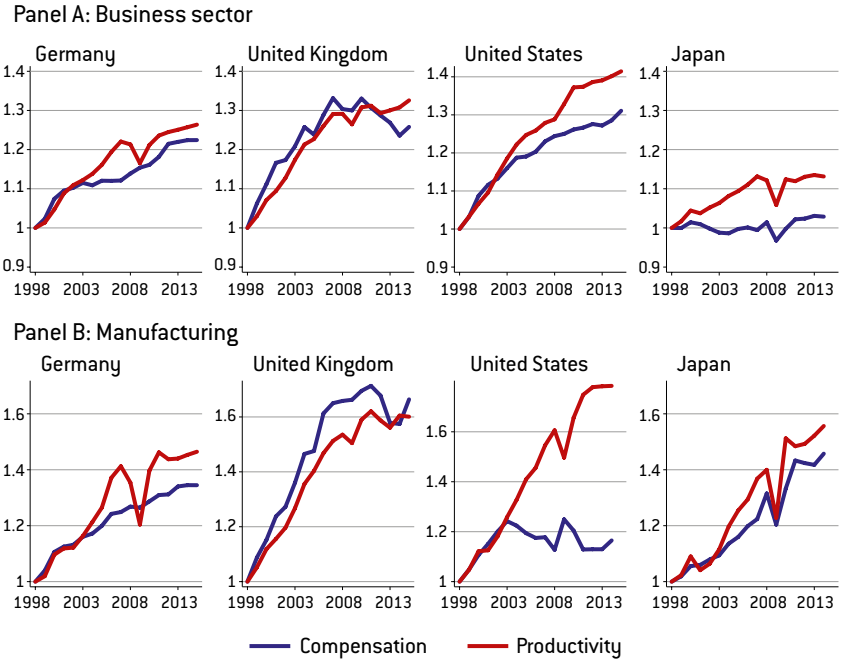
Source: Eurostat (National Accounts). Notes: The corporate sector encompasses the financial and non-financial sectors.

Figure A5: Labour shares in major advanced countries, manufacturing



Source: Bruegel based on Eurostat (National Accounts), Cabinet Office (National Accounts), BLS. Notes: The graphs are smoothed using an MA with equal weights and a 3-year window. See Appendix B for more details on the data.

Figure A6: Productivity and compensation



Source: Bruegel based on Eurostat (National Accounts), Cabinet Office (National Accounts), BLS. Notes: The graphs are smoothed using an MA with equal weights and a 3-year window. The business sector corresponds to NACE codes B to N for EU countries, all industries for Japan (national accounts data), and the nonfarm-business sector for the USA. See appendix B for more details on the data.

Appendix B

Table B1 provides information on sources we used to compute labour shares and measures of compensation and labour productivity.

Table B1: Sources

Source	Years and countries covered	Industry detail*	Notes
EU-KLEMS	1970 – 2010 (DEU, GBR), 1973 – 2009 (JPN)	18	See O'Mahony and Timmer (2009)
World KLEMS	1970 – 2010 (USA)	15	See Jorgenson et al (2012)
Eurostat	1998 – 2015	11	Implicit deflators are indexed to 2010
US Bureau of Labor Statistics (BLS)	1998 – 2013 (USA)	-	We use BLS's computations for the non-farm business and the manufacturing sector**
Cabinet Office	1998 – 2014 (JPN)	16	-

Notes: * Some sources may provide greater detail; we only list the number of industries effectively used. ** Note that their output measure is different from GVA. However, since the correlation between non-farm-non-government GVA data from the BEA and BLS data for the non-farm business sector, and the correlation between manufacturing GVA from the BEA and BLS data for the manufacturing sector is 99.9 and 96.8% respectively for the period covered and we are mainly interested in dynamics over time, we do not consider this an issue.

Table B2: NACE codes

Code	Description
A	agriculture, forestry and fishing
B	mining and quarrying
C	total manufacturing
D	electricity, gas, steam and air-conditioning supply
E	water supply, sewerage, waste management and remediation
F	construction
G	wholesale and retail trade; repair of motor vehicles and motorcycles
H	transportation and storage
I	accommodation and food service activities
J	information and communication
K	financial and insurance activities
L	real estate activities
M	professional, scientific and technical services
N	administrative and support service activities
O	public administration and defence; compulsory social security
P	education
Q	health and social work
R	arts, entertainment and recreation
S	other service activities
T	activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U	activities of extraterritorial organisations and bodies

Sources: Eurostat and O'Mahony and Timmer (2009).