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**Research Report**

## Wage growth dispersion across the euro area countries - some stylised facts

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EUROPEAN CENTRAL BANK

EUROSYSTEM

**OCCASIONAL PAPER SERIES**

**NO 90 / JULY 2008**

**WAGE GROWTH DISPERSION  
ACROSS THE EURO  
AREA COUNTRIES**

**SOME STYLISED FACTS**

by Malin Andersson, Arne Gieseck,  
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## SOME STYLISTED FACTS<sup>1</sup>

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Nick Vidalis



In 2008 all ECB publications feature a motif taken from the €10 banknote.

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## ABSTRACT

This study presents some stylised facts on wage growth differentials across the euro area countries in the years before and in the first eight years after the introduction of Economic and Monetary Union (EMU) in 1999. The study shows that wage growth dispersion, i.e. the degree of difference in wage growth at a given point in time, has been on a clear downward trend since the early 1980s. However, wage growth dispersion across the euro area countries still appears to be higher than the degree of wage growth dispersion within West Germany, the United States, Italy and Spain.

Differences in wage growth rates between individual euro area countries and the euro area in the years before and in the first eight years after the introduction of EMU appear to be positively related to the respective differences between their Harmonised Index of Consumer Prices (HICP) inflation and average HICP inflation in the euro area. Conversely, relative wage growth differentials across euro area countries have been somewhat unrelated to relative productivity growth differentials. Some countries combine positive wage growth differentials and negative productivity growth differentials vis-à-vis the euro area average over an extended period – and hence positive unit labour cost growth differentials. These countries run the risk of accumulating competitiveness losses and it is therefore a challenge to ensure that the necessary adjustment mechanisms operate fully, in the sense that wage developments are sufficiently flexible and reflect productivity developments. Wage growth persistence within individual euro area countries – largely reflecting inflation persistence and certain institutional factors – might also have contributed somewhat to wage growth differentials across the euro area countries. Moreover, wage level convergence has also played a role in explaining wage growth patterns in the 1980s and the 1990s. However, since 1999, the link between the initial compensation level and the subsequent growth rate of compensation per employee appears barely significant.

The study also shows a limited co-movement of wage growth across countries, even in the context of a high degree of business cycle synchronisation seen in the last few years. This suggests that the impact on wage growth of country-specific developments across euro area countries has been larger than the impact of common cyclical developments and external shocks. This could reflect the normal and desirable working of adjustment mechanisms, which – in an optimally functioning currency union with synchronised business cycles – would take place via price and cost and wage developments. On the other hand, structural impediments, for example a relatively low degree of openness in domestically-oriented sectors in some countries, might prevent a stronger link between the degree of synchronisation of wage growth rates and business cycles.

Key words: cross-country wage dispersion, wage and productivity levels across countries and sectors. JEL: E24, E31, C10.

## EXECUTIVE SUMMARY

Wage growth differentials are a desirable feature of a well-functioning economy. Such differentials are necessary in order to reflect differences in local labour market conditions, “catching-up” factors, and diverse productivity developments across sectors and regions. In the context of a monetary union and in the absence of adjustment via exchange rate changes, nominal wages also serve as an important vehicle for adjustment via the competitiveness channel.

The objective of this study is to look at some important aspects of nominal wage dynamics in the euro area, as nominal wages appear to have contributed significantly to differences in unit labour cost developments across countries. The study analyses wage growth differentials by considering both the dispersion of wage growth rates across the euro area countries, i.e. the degree of difference in wage growth rates at a given point in time, and by assessing the degree of synchronisation of wage growth across the euro area countries, i.e. the degree of co-movement of wage growth rates over a certain period of time. Moreover, the study presents evidence on wage level developments across the euro area countries, as wage growth differentials might be attributable to catching-up processes in some countries.

The key findings of this study are the following:

- The dispersion of wage growth per employee and per hour across the euro area countries was on a clear downward trend during the 1980s and the early 1990s. Since about 1993, however, most measures suggest that wage growth dispersion has fluctuated within a relatively narrow range. Wage growth dispersion exhibited a similar picture in all main sectors (except agriculture) across the euro area countries, but cross-country wage growth dispersion at the sectoral level was larger and its evolution less stable than wage growth dispersion in the total economy.
- The current degree of wage growth dispersion across the euro area countries appears to be higher than the degree of wage growth dispersion within West Germany, the United States, Italy and Spain. The lower degree of dispersion of wage developments within the benchmark economies might be attributable to a much more advanced convergence process fostered by long histories of a shared currency and a higher degree of economic integration, especially labour mobility, inside the four benchmark areas than within the euro area, as well as lower inflation dispersion in the benchmark areas.
- The decline in wage growth dispersion in the euro area does not stem from lower wage growth differences for some outliers with respect to the euro area average but can be related to declining differentials in most euro area countries. Taking into account the adjustment process in Germany, following unification, the persistence of wage growth differentials across euro area countries appears to be comparable to that in the benchmark areas.
- Certain longer-term factors appear to be behind wage growth differentials among the euro area countries. Differences in wage growth rates between individual euro area countries and the euro area appear to be positively related to the respective differences between their HICP inflation and average HICP inflation in the euro area. Conversely, relative wage growth differentials across euro area countries have largely been unrelated to and are generally higher than relative productivity growth differentials. Although for a number of countries the relative wage and productivity growth differentials appear to be small, countries that combine positive wage growth differentials and negative productivity growth differentials vis-à-vis the euro area average over an extended period – and hence positive unit labour cost growth differentials – run the risk of accumulating losses in competitiveness. It is therefore a challenge for those countries

- in which relative wage developments exceed relative productivity developments to ensure that the necessary adjustment mechanisms operate fully, in the sense that wage developments are sufficiently flexible and reflect productivity developments. Wage growth persistence within individual euro area countries – largely reflecting inflation persistence and certain institutional factors, such as indexation and multi-year contracts – might also have contributed, to some extent, to wage growth differentials across the euro area countries.
- Wage level convergence, albeit still far from being complete, has played a role in explaining wage growth patterns during the 1980s and the 1990s. In this period, growth in compensation per employee had indeed been visibly slower in countries with high initial levels of compensation, while a higher rate of wage growth had been observed in countries with initially low compensation per employee levels. However, in the period after the inception of EMU, the link between the initial compensation level in 1999 and the subsequent average growth rate of compensation per employee appears barely significant. This seems to imply that some convergence of wage levels took place before 1999, bolstered by the completion of the Single Market, while it came broadly to a halt after the inception of Stage 3 of EMU. As wage level convergence is far from complete, it may continue to be a factor behind wage growth dispersion within the euro area for the foreseeable future.
  - The modest decline in the dispersion of wage levels was in line with a modest decline in the dispersion of productivity levels between 1993 and 2006. However, for certain individual euro area countries – both for the total economy as well as for their individual sectors – the developments in relative wage levels have not always followed the developments in relative productivity levels.
  - Turning to the analysis of wage growth synchronisation, the cross-correlation analysis suggests that there are no significant co-movements in wage developments within the euro area. In particular, the rather high and stable degree of business cycle synchronisation seen in recent years does not seem to have coincided with a similar degree of wage growth synchronisation. This suggests that, while the presence of common shocks might have played a role in the synchronisation of business cycles across euro area countries, wage growth remains dominated by country-specific factors. A low degree of wage growth synchronisation and a loose link to more synchronised business cycles might, in fact, be desirable, as in an optimal currency union with synchronised business cycles, adjustment to shocks would take place via relative price and cost changes. On the other hand, structural reasons, related for example to a low degree of competition and a relatively low degree of openness in domestically-oriented sectors in some countries, might also prevent a stronger link between the degree of synchronisation of wage growth rates and business cycle synchronisation in these sectors. This might be considered a potential source for concern, in particular to the extent that such factors prevent relative wage growth developments to follow relative productivity developments.



## I INTRODUCTION

Wage growth differentials are a desirable feature of a well-functioning economy. Such differentials are necessary in order to reflect differences in local labour market conditions, “catching-up” factors, and diverse productivity developments across regions. In the context of a monetary union and in the absence of adjustment via nominal exchange rate changes, nominal wages also serve as an important vehicle for adjustment via the competitiveness channel.

In the run up to EMU, there was widespread concern amongst policymakers that significant rigidities and other shortcomings in the wage formation processes across the euro area countries could seriously impair the efficient working of EMU.<sup>1</sup> One reason for concern was that excessive nominal wage increases in some euro area countries, particularly in the larger euro area countries, could provoke a tightening of monetary conditions with possibly adverse effects on growth and employment in the entire monetary union. Another concern was that large and persistent positive nominal wage growth differentials, which do not reflect productivity differentials across countries, could lead to substantial increases in unit labour costs in some euro area countries. With nominal exchange rate devaluation no longer being an option, substantial and persistent unit labour cost growth would cause severe losses in competitiveness with adverse repercussions for economic activity and employment in some euro area countries. In particular, it was feared that substantial and persistent above-average unit labour cost growth would ultimately translate into deteriorating labour market conditions in these euro area countries, requiring painful adjustment thereafter.

Several years after the start of the third stage of EMU, the debate on wage growth differentials within EMU is still ongoing, in the light of relatively high and persistent wage growth in some euro area countries and more modest wage developments in some other countries.<sup>2</sup> Indeed, in an environment of relatively small differences

in productivity growth rates across countries, persistent nominal wage growth differences have led to considerably diverse cumulated unit labour cost developments. These differences have, in turn, contributed to significant differentials in competitiveness developments and in inflation<sup>3</sup>, with repercussions for economic activity and employment over time.

Monetary policy is conducted by the Governing Council of the ECB with the primary objective of maintaining price stability in the euro area as a whole. Monetary policy cannot therefore address differences in wage growth or other country-specific economic developments. However, it is necessary for the European Central Bank (ECB) to assess the underlying causes of such wage differentials, as this is key to better understanding euro area wage developments and it facilitates the identification of structural barriers that may hamper macroeconomic adjustments in the euro area.

Against this general background, this study presents some stylised facts on nominal wage differentials across the euro area countries. The objective is to quantify the heterogeneity of wage growth and wage levels from a cross-country standpoint using standard measures for dispersion and synchronisation and to discuss the factors which may be behind these differentials from a cross-country point of view. The study takes a strictly factual approach and does not aim at a normative assessment of wage growth heterogeneity across euro area countries. Moreover, the study is entirely based on a cross-country approach, and it does not consider the working of adjustment processes of individual countries via nominal wages. The study starts with an analysis of the dispersion of wage growth, i.e. the degree of difference in wage growth at a given point in time, across the euro area countries both overall and at the sectoral level. The study then moves on to assess the dispersion of wage levels across the euro area countries, since differences in wage levels could be seen as one major driving factor

1 See European Commission (1990).

2 See European Commission (2006a), pp. 79-108.

3 See ECB (2005), pp. 61-77.

behind wage growth dispersion. Finally, the study presents evidence on the degree of synchronisation of wage growth within the euro area, i.e. the degree of co-movement of wage growth across countries over a certain period of time.

The wage concept used in this study is that of nominal compensation per employee, i.e. overall compensation paid by employers. Apart from negotiated wages, the concept of compensation per employee also includes wage drift and social security contributions. The concept of compensation per employee is a convenient choice for international comparisons owing to the availability of related data and its similar definition across countries, as opposed to other “narrower” wage concepts where the definitions may differ substantially from one country to the other. In what follows, the words “wage” and “compensation per employee” will be used interchangeably.

Nominal wages play an important role in the assessment of macroeconomic developments in a number of ways. From a business cycle perspective, nominal wages are a key factor driving income growth and distribution. Nominal wage developments also play an important role in shaping the path of overall economic activity, inflation and employment. While the latter variables may also exert an important impact on nominal wage developments, nominal wages can be regarded as a relatively “exogenous” variable as they are mainly determined in wage negotiations which might or might not take into account other economic relationships. From a cross-country point of view and compared with other benchmark areas, nominal wages are the main driving force behind the dispersion of unit labour cost developments in an environment of relatively modest divergence in productivity growth. In the context of monetary union and the absence of exchange rates as the traditional “bailout”, nominal wages serve as a key instrument for adjustment via the competitiveness channel and play an important role in the analysis of competitiveness developments across the euro area countries. Thus, nominal wages are the

starting point when considering unit labour cost and real wage developments.

With respect to the question of whether to consider wages per hour or per person, economic theory would suggest a focus on wages per hour worked as the most accurate measure of labour costs. However, empirical work has shown that both measures provide useful information on wage developments. While in past decades, wages in terms of persons could have been considered as a rather good approximation of wages per hour worked, in more recent times this might not be the case. In fact, one of the key stylised facts of the euro area’s labour markets is that the annual average working time per worker has declined substantially across the euro area countries over the last 25 years.<sup>4</sup> This is attributable to the increased use of part-time working arrangements, which is often related to the greater number of women entering the labour market, to institutional factors such as tax wedges which create disincentives to work, or to specific policy measures including changes in working time regulations, such as the introduction of the 35 hour week in France and recent labour market reforms in Germany and Italy.<sup>5</sup> As was the case in France, the decline in working time has often been accompanied by increasing hourly compensation in order to broadly maintain monthly compensation levels.<sup>6</sup> Against this background, results will be presented as far as possible on the basis of data for both compensation per employee and compensation per hour.

The following analysis is backward looking and is built as far as possible on data covering the 12 countries that joined EMU before 2006.<sup>7</sup> Our data requirements in terms of frequency,

4 For a detailed discussion see Leiner-Killinger et al. (2005).

5 Specifically, the introduction of very flexible employment contracts in Italy had the effect of triggering a strong increase of “part-time” workers, thus creating a significant gap between the growth rate of employees measured in heads and that of total hours worked.

6 See ECB (2006), pp. 43-44.

7 Due to limited availability of data, Malta, Cyprus and Slovenia are not included in the analysis. However, Annex 2 shows that from 1996 onwards, the inclusion of these countries does not affect the main conclusions of the analysis.

sample length and degree of sectoral disaggregation required the use of various databases. National account data (ESA2000) of compensation per employee are available for all euro area countries at an annual frequency. However, when the analysis requires the use of quarterly information, data limitations necessitate the use of a euro area aggregate (EA8) on the basis of only eight countries, encompassing Germany, France, Italy, Spain, the Netherlands, Belgium, Austria and Finland. The national account data cover the total economy and the six largest sectors (agriculture, industry excluding construction, construction, trade and transport, financial intermediation, and other services). However, national statistical offices in most euro area countries have not or have only recently started to collect data on the number of hours worked, in annual and quarterly terms. To overcome this limitation of national accounts, the EU KLEMS database compiled by the Groningen Growth and Development Centre (GGDB) has been utilised to enlarge the available information set.<sup>8</sup> In particular, these alternative sources allow for an analysis of wage dispersion in terms of hours worked across the various euro area countries and across a large number of sectors. This data currently extend only up to 2004. Given the difficulties in evaluating the reliability of hours worked, which are not included in the “official”, i.e. national statistical office databases, this paper will, in general, put more emphasis on the results found in terms of persons.

With respect to the starting date of the data sample, while the data are available from 1980 onwards, the following analysis is mainly focused on the period from 1993 to 2006. From 1993, bilateral exchange rates of the 12 countries which had adopted the single currency before 2006 were either factually fixed or fluctuated within a relatively narrow band, roughly allowing for the hypothesis that nominal wages – and not exchange rate movements – was the key variable determining relative unit labour cost developments across euro area countries. Finally, all data used in this study are denominated in euro using the respective

irrevocable conversion rates. This means that exchange rate movements across euro area countries do not have any impact on the growth rates or levels shown in this study.

<sup>8</sup> For details on the databases and the sectoral disaggregation, see Annex 1.

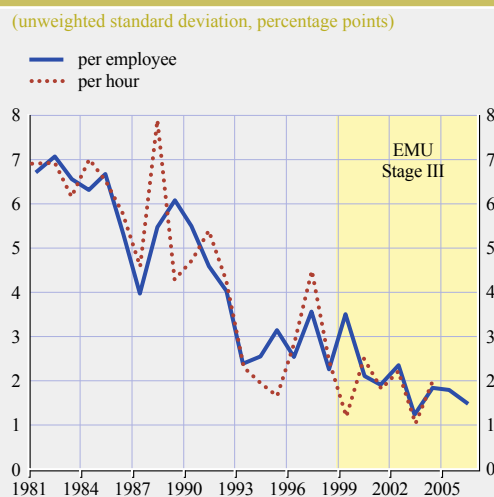
## 2 DISPERSION IN WAGE GROWTH RATES ACROSS EURO AREA COUNTRIES OVER TIME

This chapter assesses the degree of dispersion in nominal wage growth rates across the euro area countries over time. The analysis is conducted by measuring wages both in terms of persons (employees) and per hour worked for the total economy and for the six main sectors. A number of references can be used to assess the current degree of wage growth dispersion. In this chapter, a historical benchmarking exercise will be carried out which allows changes in wage growth dispersion over time across the euro area countries to be assessed. A particular focus will be the comparison of wage growth dispersion since the start of EMU against that during the pre-EMU period.

From a historical perspective, as can be seen in Chart 1, the *dispersion of annual wage growth rates per employee* across the 12 euro area countries, as measured by the unweighted standard deviation, has been on a clear downward trend since the early 1980s. The unweighted standard deviation fell from an average of 6.0 percentage points in the 1980s to about 3.4 percentage points during the 1990s, and has thereafter declined further to historically low levels, averaging just 2.0 percentage points during the period 1999 to 2006. *Dispersion of wage growth per hour* across the euro area countries declined broadly in line with dispersion of wage growth per employee.

It is important to note that most of the decline in wage growth dispersion occurred during the 1980s and early 1990s, i.e. the period during which the option of bilateral exchange rate adjustments was in principle still available but less and less used as more countries entered the ERM and as exchange rate movements in the ERM were more limited. The decline in nominal wage growth dispersion during that period accompanied a similar decline in inflation dispersion, which will be discussed further in Chapter 5. Since the early 1990s, however, the degree of wage growth dispersion fluctuated within a relatively narrow band, and the slope of the downward trend eased substantially.

Chart 1 Dispersion of compensation growth across the euro area countries



Sources: Own computations based on Eurostat, European Commission and EU KLEMS data.

The analysis so far was based on the unweighted standard deviation, which gives equal importance to all euro area countries in such a fact-finding analysis. However, as the monetary policy of the ECB is geared to the euro area as a whole, weighted measures of wage growth dispersion might also provide relevant information.<sup>9</sup> As can be seen in Chart 2 below, wage growth dispersion in weighted terms (as measured by the weighted standard deviation) has been clearly lower than the unweighted measure during the 1990s and the early 2000s. This implies a larger degree of wage growth dispersion stemming from the smaller euro area countries during that period. While the unweighted standard deviation for wages per worker exhibits some downward trend since 1993, the weighted measures show some fluctuations within a relatively narrow horizontal band. This again suggests that wage growth differentials stemming from smaller euro area countries have declined over time.

The standard deviation is only a summary indicator of the statistical distribution of a

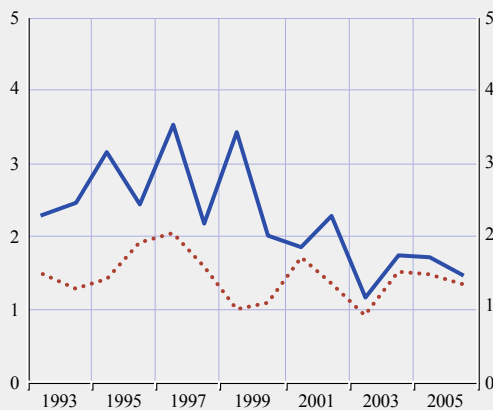
<sup>9</sup> See Annex 3 for an overview of additional dispersion measures. For a discussion of the advantages and disadvantages of various dispersion measures see also Benalal et al. (2006), pp. 9-10.

Chart 2 Dispersion in compensation growth in the total economy, unweighted and weighted measures

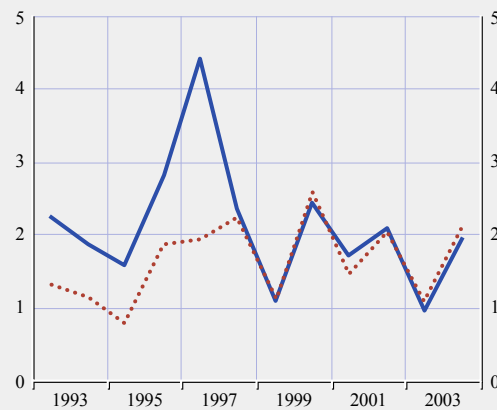
(percentage points)

— unweighted SD-EA  
 ..... weighted SD-EA

a) Per employee



b) Per hour



Sources: Own computations based on (a) Eurostat and European Commission data and on (b) EU KLEMS data.  
 Note: SD = standard deviation.

series – in this case wage growth rates across the euro area countries. Focusing only on the standard deviation may therefore conceal important information. For example, it might be relevant to complement the information provided by the standard deviation with the

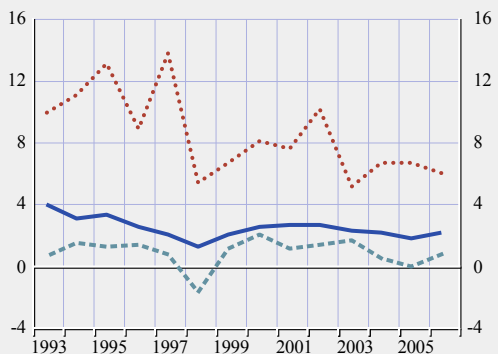
average, as well as the maximum and minimum growth rates. The positioning of the average wage growth rate between the minimum and maximum growth rates would indicate whether a certain degree of dispersion relates to the underperformance or over-performance

Chart 3 Euro area compensation growth and the maximum and minimum growth rates across the euro area countries

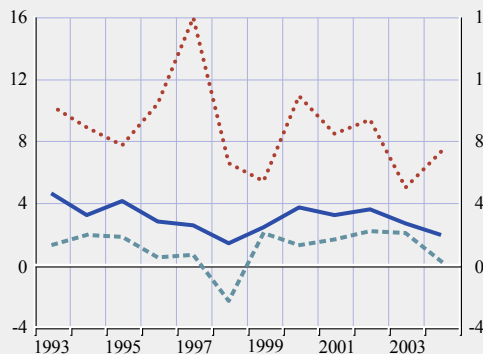
(percentage changes)

— EA  
 ..... maximum  
 - - - - - minimum

a) Per employee



b) Per hour



Sources: Own computations based on European Commission and EU KLEMS data.

**Table 1 Dispersion in compensation per employee growth across euro area countries by sector**

(unweighted standard deviation; percentage points)

	Total economy	Agriculture	Industry excluding construction	Construction	Trade and transport	Financial intermediation	Other services
1993-1995	2.7	-	-	-	-	-	-
1996-1998	2.7	5.0	2.7	3.6	3.1	3.8	3.7
1999-2002	2.0	5.7	1.9	3.1	1.8	2.8	2.4
2003-2005	1.5	4.1	1.6	2.0	1.8	1.7	1.7

Source: Own computations based on Eurostat data. The choice of the periods captures the path of wage growth dispersion before and after the start of EMU.

of the largest countries. Indeed, as can be seen in Chart 3, the average euro area growth rate has over the full horizon been relatively close to the lowest wage growth rate across the 12 euro area countries. This confirms persistently low wage growth in some large euro area countries, while some smaller euro area countries seem to have experienced more dynamic wage developments.

The decline in dispersion of wage growth at the total economy level can be related to declining dispersion of wage growth in all major sectors.<sup>10</sup> Looking at the six main sectors of the total economy – agriculture, industry excluding construction, construction, trade and transport, financial intermediation, and other services – dispersion of wage growth has declined in all sectors since the early 1990s (Table 1 and Table 2). However, it is worth noting that cross-country wage growth dispersion at the sectoral level is larger and its evolution less stable than in the total economy, regardless of whether expressed in compensation per hour worked or

per employee.<sup>11</sup> This evidence on sectoral wage differentiation partly explains why it was considered necessary to provide sectoral information in this study. Among the six main sectors, wage growth dispersion has, overall, been the highest in the agricultural sector, which might be attributable to the large structural differences in that sector across countries reflected in different combinations of factor inputs.

In sum, the dispersion of wage growth per employee and per hour across the euro area countries was on a clear downward trend during the 1980s and the early 1990s. Since about 1993, however, most measures suggest that wage growth dispersion has fluctuated within a relatively narrow range. Wage growth dispersion exhibited a similar picture in all main sectors (except agriculture) across the euro

<sup>10</sup> On sectoral wage diversity in the euro area see Genre et al (2005).

<sup>11</sup> See Annex 3 for additional charts on the sectoral evolution of dispersion across sectors.

**Table 2 Dispersion in compensation per hour worked growth across euro area countries by sector**

(unweighted standard deviation; percentage points)

	Total economy	Agriculture	Industry excluding construction	Construction	Trade and transport	Financial intermediation	Other services
1993-1995	1.9	10.9	3.1	3.2	2.7	2.8	2.3
1996-1998	3.2	3.6	4.6	4.3	3.5	4.0	4.2
1999-2002	1.8	4.6	2.8	2.8	1.9	2.5	2.3
2003-2004	1.4	4.3	2.0	2.9	1.7	2.4	1.7

Source: Own computations based on EU KLEMS data. The choice of the periods captures the path of wage growth dispersion before and after the start of EMU.

area countries, but cross-country wage growth dispersion at the sectoral level was larger and its evolution less stable than wage growth dispersion in the total economy. The following chapters analyse these findings from various perspectives in order to assess the current degree of wage differentiation across the euro area countries.

## 2 DISPERSION IN WAGE GROWTH RATES ACROSS EURO AREA COUNTRIES OVER TIME

### 3 WAGE GROWTH DISPERSION IN THE EURO AREA COMPARED TO THAT IN SELECTED BENCHMARK AREAS

This section analyses dispersion in wage growth developments among regions in the United States, West Germany,<sup>12</sup> Italy and Spain, in order to provide an “external” benchmark for assessing the degree of wage growth dispersion within the euro area. Wage growth dispersion in these benchmark areas is expressed in terms of unweighted standard deviations.

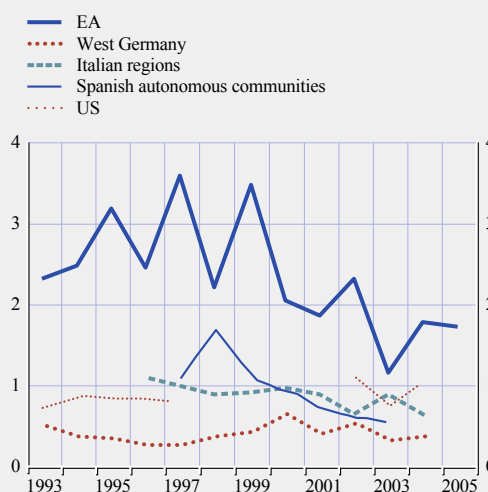
As can be seen in Chart 4, the degree of dispersion of compensation per employee growth across the euro area countries has generally been substantially higher than that in the benchmark areas. While wage growth dispersion has been relatively similar among the US regions, West German states, the Italian regions and the Spanish autonomous communities, wage growth dispersion across the euro area countries remains higher. It is also interesting to note that wage growth dispersion in the benchmark areas has been remarkably stable over time, while wage growth dispersion across euro area countries followed a weak but continuous downward trend.

It should be pointed out, however, that a number of technical and statistical caveats apply when comparing wage growth dispersion in the euro area with that in certain individual countries. Among others, these caveats include different computational methods of different statistical institutes, as well as the different numbers and sizes of the geographical entities considered.<sup>13</sup>

More fundamentally, in making such a comparison, it is implicitly assumed that the euro area in its entirety could be seen as a country like each of the benchmark areas. On this assumption, wage growth dispersion in the euro area could in the longer term be expected to converge towards the level recorded in the benchmark areas. A number of factors should be borne in mind when considering the higher degree of wage dispersion of wage growth in the euro area.

Chart 4 Dispersion in compensation per employee growth in benchmark areas

(unweighted standard deviation; percentage points)



Sources: Own computations based on European Commission, Eurostat data and data from the national statistical institutes of Germany (DESTATIS), Spain (INE), Italy (ISTAT), United States (Bureau of Economic Analysis).

First, while the regions within the benchmark areas have shared a common currency for many decades, if not centuries, euro area countries have done so for only a few years so far. To the extent that one would expect a single currency and the absence of the exchange rate “bailout” to foster nominal wage growth convergence via an increased awareness of wage-setting parties to safeguard competitiveness, such a process should at this stage be much more advanced in the benchmark areas than in the euro area.

Second, while economic integration within the euro area has made progress during the past decades, the level of integration within the benchmark areas should still be much higher. One area where economic integration appears to be less advanced within the euro area concerns cross-border labour mobility. In theory, high

<sup>12</sup> The analysis focuses on the former West German Länder excluding Berlin. This constitutes a more meaningful benchmark than the whole of Germany, as the dispersion measures for West Germany excluding Berlin are to a lesser extent affected by the distortions of the German unification process.

<sup>13</sup> For a review of the caveats on the analysis of benchmark areas see Section 1.1.1 in Benalal et al. (2006).



labour mobility would tend to dampen wage growth dispersion in two ways. First, in the longer term, in areas characterised by a high degree of labour mobility, labour would tend to move to regions with higher wage levels and away from regions with lower wage levels. This process would eventually trigger an equalisation of wage levels across regions. A lower degree of dispersion in wage levels would, in turn, lead to lower wage growth dispersion, in the absence of regional-specific shocks to prices or productivity. Second, in response to a shock, labour mobility would tend to mitigate the impact on wage growth in the affected region and hence on wage growth divergence. If a region were hit by an adverse shock on activity, the higher the degree of labour mobility, the more the decline in the labour demand would be matched by a decline in the labour force via a net outflow of workers, limiting the impact on wage developments.

Detailed and comparable data on labour mobility are difficult to obtain and they should be interpreted with caution.<sup>14</sup> Available empirical evidence<sup>15</sup> suggests, however, a rather limited labour mobility in the euro area in comparison with the United States, implying that the channels towards lower wage growth dispersion across euro area countries have not been operating at the same speed as across US regions. Indeed, as will be shown in more detail in Chapter 6 below, dispersion of wage levels has been and remains much larger across the euro area countries than across regions in the benchmark areas. Moreover, empirical studies have shown that employees in the euro area tend to leave the labour force in response to a decline in labour demand in their region rather than migrate to another region or country.<sup>16</sup> There are many reasons behind the low labour mobility across the euro area countries. Linguistic, cultural, legal and other differences across countries and the costs involved in moving residence may play a role.<sup>17</sup> As the process aimed at removing the artificial barriers to labour mobility across (and within) euro area countries – such as differences in tax and social security systems, residence restrictions,

nationality limitations on recruitment in the public sector, inflexible housing market, etc. – is likely to be slow, labour market mobility is likely to remain too limited to induce a rapid equalisation of wage levels or wage developments across countries. In this regard, limited labour mobility will remain an important factor behind ongoing dispersion in wage growth and levels within the euro area.

Third, an important institutional aspect of the euro area concerns the wage bargaining system. While the three benchmark euro area countries feature a high degree of centralisation of wage bargaining and/or coordination of wage bargaining, this is almost non-existent at the euro area level and in the United States. Coordination efforts across the euro area countries and supranational wage norms<sup>18</sup> by which trade unions could commit to seeking wage increases that cover inflation and take into account productivity gains/losses, have to date mainly led to an exchange of information, including sometimes the participation of foreign observers in wage negotiations.<sup>19</sup>

A higher degree of centralisation of wage bargaining might not be a recommended option for the euro area as a whole given its costs. In particular, wage bargaining centralisation reduces the degree of differentiation of wages according to local labour market conditions as well as productivity and competitiveness developments – and this might imply that the response to asymmetric shocks is hindered. A flexible response of wages to such shocks,

14 Cross-country comparisons of migration should be interpreted with caution as they depend upon the size of the regions considered. The smaller the size of the region, the larger *ceteris paribus* is the size of measured migration or commuting flows.

15 See OECD (2005), pp. 77-95, for data on migration and commuting within euro area countries and other OECD countries. For more evidence, see European Commission (2002a).

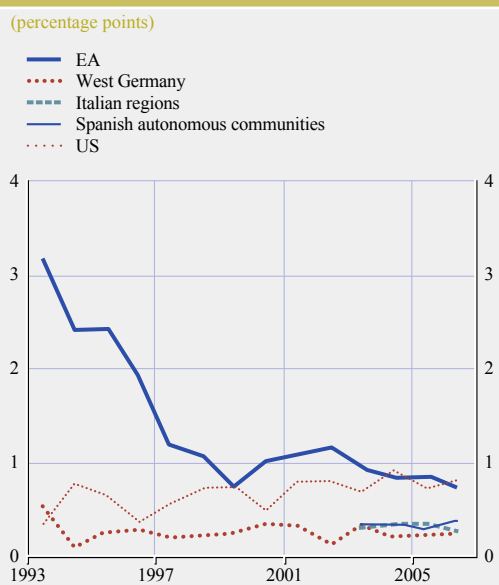
16 For an overview, see OECD (2005), p. 92.

17 As references on this topic, see Blanchard et al. (1992); Obstfeld et al. (1998) and Heinz et al. (2006).

18 Among the sectoral trade union federations, the European Metalworkers' Federation (EMF) has been the first to establish a coordination rule; some other industry federations have followed.

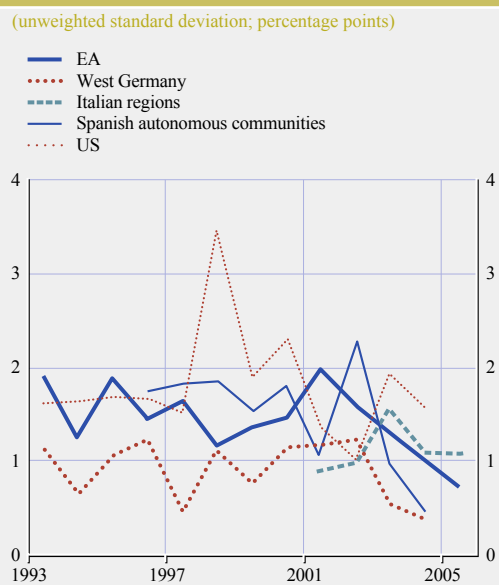
19 For an overview see Dufresne et al. (2002).

**Chart 5 Dispersion in inflation in benchmark areas**



Sources: Own computations based on European Commission, Eurostat data and data from the national statistical institutes of Germany (DESTATIS), Spain (INE), Italy (ISTAT), United States (Bureau of Economic Analysis).  
Note: Spanish and Italian data are available from 2003 only.

**Chart 6 Dispersion in productivity growth in benchmark areas**



Sources: Own computations based on European Commission, Eurostat data and data from the national statistical institutes of Germany (DESTATIS), Spain (INE), Italy (ISTAT), United States (Bureau of Economic Analysis).  
Note: Spanish and Italian data are available from 1996 and 2001, respectively.

which would be prevented by a high degree of wage bargaining centralisation, would be even more important in a situation where labour mobility is low.

Fourth, the higher degree of dispersion of wage developments within the euro area with respect to the four benchmark areas might also be attributable to macroeconomic factors. The developments of wage dispersion in the euro area and in the benchmark regions seem to be partly related to the evolution of inflation divergence (Chart 5).<sup>20</sup> While inflation dispersion across regions in West Germany, Italy, Spain and across 14 US Metropolitan Statistical areas was basically flat during the exhibited period, dispersion in euro area inflation fell considerably in the 1990s and has thereafter been roughly stable. Interestingly, inflation dispersion across the West German, Spanish and Italian regions has been notably lower than that in the euro area and the United States in the same period.

Finally, the pattern of the dispersion of wage growth across euro area countries does not appear to be related to that of productivity differentials. As Chart 6 shows, productivity differentials across the euro area countries have been relatively stable between 1993 and 2001, while they have been trending downward since then. Productivity differentials across the euro area countries have broadly matched the differentials recorded in the benchmark areas.

To sum up, the current degree of wage growth dispersion across the euro area countries appears to be higher compared with the degree of wage growth dispersion within West Germany, the United States, Italy and Spain. The lower degree of dispersion of wage developments within the four benchmark areas might be attributable to a much more advanced

<sup>20</sup> For a review of the caveats on the analysis of benchmark areas see Section 1.1.1 in Benalal et al. (2006).

convergence process fostered by long histories of a shared currency, as well as a higher degree of economic integration, especially labour mobility, and lower inflation dispersion in the benchmark areas. In this respect, further labour market reforms aimed at facilitating labour mobility via commuting and/or migration would be an important step towards improving the capacity of euro area countries to adjust to shocks and eventually towards lower dispersion in wage levels and their growth rates.

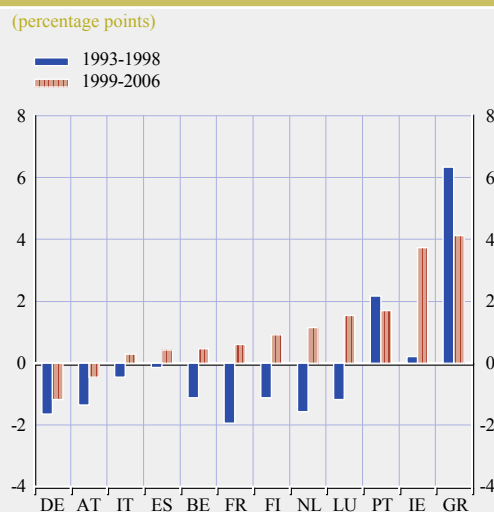
#### 4 COUNTRY DEVELOPMENTS BEHIND EURO AREA WAGE GROWTH DISPERSION

This chapter investigates which euro area countries have mainly contributed to the evolution of wage growth dispersion. In particular, the question of whether wages in some countries have grown at rates persistently above or below the euro area average is addressed.

Comparing the periods before 1999 and afterwards, as can be seen from Chart 7, the differences of annual average growth rates of compensation per employee in euro area countries relative to the euro area average have declined across many euro area countries. In other words, the decline in wage growth dispersion in the euro area between the periods 1993-1998 and 1999-2006 does not stem from lower wage growth differences for some outliers with respect to the euro area average, but can be related to declining differentials in most euro area countries (Chart 7). Between the period 1993-1998 and the period 1999-2006, the decline in dispersion of wage growth rates appears to stem from Germany, Austria, France, Belgium, the Netherlands, Portugal and Greece, while wage growth differentials with respect to the euro area average increased, albeit from low levels, in Italy, Spain, Finland, Ireland and Luxembourg.

Considering only the degree of wage growth dispersion across countries may not be sufficient. A high degree of dispersion in compensation developments may be a concern if it is caused by persistent positive wage growth differentials in some countries that are not supported by positive productivity growth differentials. This would lead to sustained losses in cost competitiveness in certain countries, with adverse consequences for domestic output and employment developments. While some persistence in wage growth differentials may be a natural result of certain factors – such as productivity growth differentials, longer-lasting adjustment processes or may simply be associated with compensation convergence processes in some countries – persistence may also be related to structural rigidities and this should be a cause for concern.

**Chart 7 Annual average growth in compensation per employee relative to the euro area**



Source: Own computations based on European Commission and Eurostat data.  
Note: Countries are shown in ascending order for the period 1999-2006.

As can be seen in Table 3, all euro area countries except Germany and, to a lesser extent, Austria, have recorded wage growth for many years persistently above the euro area average during the past 14 years (see Chapter 5). The major factor behind this divergence between Germany and the rest of the euro area is an adjustment process in Germany following unification. Wage growth in Germany in the immediate aftermath of unification exceeded that in the rest of the euro area countries by an accumulated 30% between 1991 and 1994, and with productivity differentials being much smaller, relative unit labour costs rose by a similar extent as did wages in Germany. With adjustment via a devaluation of the D-Mark not being an option, and with productivity differentials remaining rather limited, wage growth had to fall substantially below that in the rest of the euro area in order to restore competitiveness. This process started in the second half of the 1990s and gained momentum in the past few years.<sup>21</sup> Given Germany's large weight within the euro area, it appears logical that most other countries

<sup>21</sup> On the adjustment process in Germany, see for example European Commission (2002b, 2006b).

**Table 3 Nominal compensation per employee growth rates relative to the euro area**

(percentage points)

	1993-1998	1999-2006	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	0.8	0.4	0.9	-0.4	1.0	1.2	-0.6	-0.1	0.8	0.6
Germany	0.2	-1.2	-1.4	-0.6	-1.0	-1.3	-0.7	-1.7	-1.8	-1.5
Ireland	2.1	3.6	2.0	5.6	4.9	2.9	2.8	4.5	3.3	2.8
Greece	8.3	4.1	4.0	3.5	3.1	7.4	2.4	3.7	4.9	3.8
Spain	1.8	0.5	-0.4	0.3	1.1	0.8	0.6	0.7	0.3	1.1
France	-0.1	0.5	-0.3	-0.1	-0.2	0.8	0.5	1.3	1.1	1.1
Italy	1.4	0.2	-0.5	-0.2	0.3	-0.4	0.2	1.2	1.1	0.3
Luxembourg	0.7	1.3	1.4	2.9	0.9	1.0	-0.4	2.1	2.0	0.2
Netherlands	0.3	0.9	0.8	2.1	2.3	1.7	1.1	1.1	-0.6	-1.3
Austria	0.5	-0.6	-1.0	-0.4	-1.6	-0.5	-0.1	-1.1	-0.1	0.3
Portugal	4.0	1.7	2.4	4.2	2.8	1.4	0.5	0.5	1.2	0.3
Finland	0.8	1.0	-0.4	1.3	2.1	-0.8	0.6	1.5	2.1	1.3
<i>Unweighted standard deviation</i>	<i>2.7</i>	<i>1.7</i>	<i>1.6</i>	<i>2.1</i>	<i>1.8</i>	<i>2.3</i>	<i>1.1</i>	<i>1.8</i>	<i>1.8</i>	<i>1.5</i>
<i>Weighted standard deviation</i>	<i>1.6</i>	<i>1.3</i>	<i>1.0</i>	<i>1.1</i>	<i>1.7</i>	<i>1.4</i>	<i>0.9</i>	<i>1.5</i>	<i>1.5</i>	<i>1.3</i>

Source: Own computations based on European Commission data.

recorded persistent above-average wage growth rates during the past decade. However, the differentials appear to have remained rather limited in Belgium, Spain (since 1999), France, Italy, and Austria.

When excluding Germany from the euro area aggregate in order to account for that country-specific adjustment process (Table 4) a significant degree of convergence occurred in most countries. Wage growth differentials compared with the rest of the euro area were minor in the case of Belgium, Italy, the Netherlands, Austria and Finland, and declined substantially in Greece, Spain, France, and Portugal. Country-specific

factors could explain the sustained wage growth differentials in Luxembourg (weight of financial sector) and Ireland (relative productivity growth, see Chapter 5).

Some persistence of wage growth differentials can also be seen in the benchmark regions. In the United States, ten of the 50 states<sup>22</sup> have shown a persistent upward bias in the period between 1980 and 2002, and in West Germany, Bavaria showed a persistent positive differential in wage growth against the West German

<sup>22</sup> These US States are: Connecticut, District of Columbia, Maryland, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Rhode Island and Washington.

**Table 4 Nominal compensation per employee growth rates relative to the euro area excluding Germany**

(percentage points)

	1993-1998	1999-2006	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	0.0	0.0	1.2	-0.7	0.5	0.6	-0.9	-0.9	-0.6	0.5
Germany	-0.5	-1.7	-1.2	-0.9	-1.6	-1.8	-1.0	-2.5	-2.7	-1.9
Ireland	1.3	3.2	2.2	5.3	4.3	2.3	3.8	3.5	2.5	1.8
Greece	7.5	3.6	4.2	3.2	2.5	6.8	2.0	2.9	4.0	3.2
Spain	1.1	-0.1	-0.2	0.0	0.6	0.2	0.2	-0.1	-0.4	-0.3
France	-0.9	0.1	0.0	-0.4	-0.7	0.2	0.2	0.6	0.5	0.4
Italy	0.7	-0.2	-0.3	-0.5	-0.2	-0.9	-0.1	0.4	0.2	-0.2
Luxembourg	-0.1	1.0	1.7	2.6	0.4	-0.1	-0.4	1.1	1.3	1.9
Netherlands	-0.5	0.6	1.1	1.8	1.8	1.2	0.8	0.5	-1.5	-0.4
Austria	-0.3	-1.0	-0.8	-0.8	-2.1	-1.1	-0.5	-2.0	-0.2	-0.3
Portugal	3.3	1.2	2.6	3.8	2.3	0.8	0.2	-0.2	0.4	-0.3
Finland	0.0	0.4	-0.1	1.0	1.6	-1.3	0.2	0.7	1.2	0.1

Source: Own computations based on European Commission data.

Note: Each entry refers to the relative compensation per employee growth of the indicated country vis-à-vis the euro area excluding Germany. In the case of Germany, the entry shows wage growth in Germany compared with that in the rest of the euro area.

average in the period 1992-2005. Moreover, while none of the Italian regions exhibited persistent above-average wage growth, four out of the 18 autonomous communities in Spain<sup>23</sup> showed persistently above-average wage increases during the period 1996-2003.

In sum, the decline in wage growth dispersion in the euro area does not stem from lower wage growth differences for some outliers with respect to the euro area average but can be related to declining differentials in most euro area countries. Taking into account the adjustment process in Germany following unification, the persistence of wage growth differentials across euro area countries appears to be comparable to that in the benchmark areas.

<sup>23</sup> The four Spanish autonomous communities are: Aragón, Castilla y León, Galicia and Rioja.

## 5 FACTORS BEHIND WAGE GROWTH DIFFERENTIALS AMONG THE EURO AREA COUNTRIES

Regarding the factors that may be behind wage growth differentials across the euro area countries, one may distinguish between shorter-term factors, such as the relative strength of domestic demand vs. supply, and longer-term factors.

The most relevant long-term factors on which we focus in this chapter are inflation differentials, productivity growth differentials and wage growth persistence within a country. Differences in wage levels are dealt with in Chapter 6.

Given the interdependence of the development of wages and consumer price inflation at the national level, one would a priori expect a positive correlation between relative wage growth and relative HICP inflation across euro area countries. Indeed, differences in wage growth rates between individual euro area

countries and the euro area appear to be positively related to the respective differences between their HICP inflation and average HICP inflation in the euro area. As can be seen from Chart 8, euro area countries with above-average HICP inflation also tended to record above-average wage growth rates, both during the period 1993-1998 and since 1999. It should be noted, however, that for a number of euro area countries (Belgium, Germany, France, Austria and Finland), the differentials of both wage growth and HICP inflation to the euro area average have been relatively small during both periods.<sup>24</sup> In particular, relatively substantial positive wage and inflation differentials have been recorded for Greece, Ireland and Portugal in the period since 1999, probably reflecting country-specific developments (catching-up process in Greece, strong domestic demand in Ireland and, partly, public sector wage increases

<sup>24</sup> The differences relative to the euro area average would be further reduced if the country-specific adjustment process in Germany, which included both comparatively low inflation and wage growth rates, were taken into account.

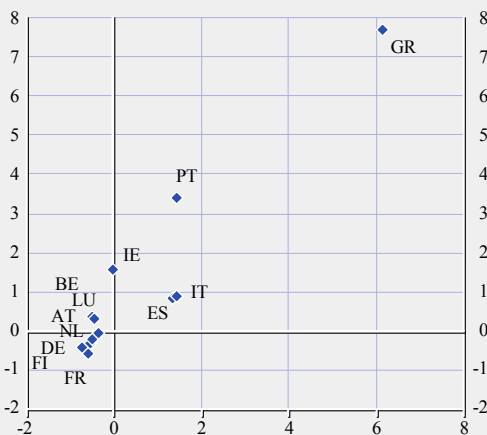
Chart 8 Differences in average wage growth and average HICP inflation relative to the euro area

(percentage points)

x-axis: HICP inflation (deviation from EA)  
y-axis: wage growth (deviation from EA)

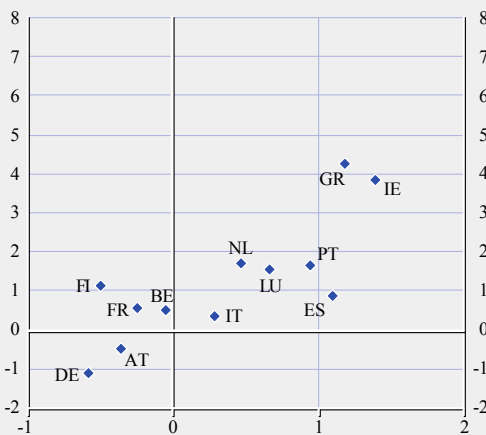
### a) 1993 to 1998

$R^2 = 0.90$  ( $R^{2*} = 0.42$ )



### b) 1999 to 2006

$R^2 = 0.64$  ( $R^{2*} = 0.45$ )



Sources: Own computations based on Eurostat and European Commission data.

Note:  $R^{2*}$  in the parenthesis denotes the R-squared computed excluding outliers, namely Greece and Portugal in panel (a) and Greece and Ireland in panel (b). Wage growth is defined as growth in compensation per employee.

in Portugal). Even when excluding these outliers, the correlation between relative wage growth and relative inflation appears significant, as indicated by the adjusted R-squared.<sup>25</sup>

The divergence of real wage growth across euro area countries hardly differs from the divergence of nominal wage growth in the period 1999-2006 (see Table 3 and Table 5). The standard deviation of real wage growth rates (nominal compensation per employee deflated by the private consumption deflator) averages 1.6 percentage points during the period 1999-2006, compared with an average standard deviation of 1.7 percentage points for nominal wage growth dispersion. Looking at individual countries, it is notable that almost all countries which recorded nominal wage growth above or below the euro area average showed the same differential in the case of real wages. The two exceptions to this pattern are Spain and Italy, where real wage growth since 1999 has been on average lower than that in the euro area as a whole, while nominal wage growth in these countries exceeded that of the euro area. In Spain, this appears to reflect the impact of strong domestic demand on mark-ups, pushing up inflation, and the dampening impact of immigration on nominal compensation per employee growth and on productivity in recent years. In Italy this appears to be related to the

abolishment of automatic wage indexation since 1993 and to the relatively disappointing performance of productivity growth.

As with the relationship between wage growth and inflation, a priori one would expect a positive link between relative wage and productivity developments across euro area countries, in the sense that those countries that experienced above (below) average wage growth also experienced above (below) average productivity growth. However, relative wage growth differentials across euro area countries have not been systematically related to and are generally higher than relative productivity growth differentials in both the periods examined (see Chart 9). As regards the period 1999-2006, this conclusion is particularly true when the outliers, namely Greece and Ireland, are excluded from the computation (Chart 9b), as indicated by the adjusted R-squared, which falls to zero in that case. It should be noted, however, that for a number of euro area countries, the differentials of both wage growth and productivity growth with respect to the euro area average have been rather small during both periods.

<sup>25</sup> From an econometric point of view, the analysis is limited to a rather small sample of countries – in comparison for instance with the number of US States – which has a negative impact on the robustness of the empirical analysis.

**Table 5 Real compensation per employee growth rates relative to the euro area**

(percentage points)

	1993-1998	1999-2006	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	1.5	0.4	1.6	-1.3	1.1	1.8	-0.2	-0.5	-0.1	0.4
Germany	1.0	-0.5	-0.9	1.0	-0.5	-0.6	-0.1	-1.2	-1.0	-0.8
Ireland	1.0	1.9	-1.7	2.0	3.0	-0.3	1.1	5.1	4.1	2.1
Greece	1.9	2.6	2.4	-1.4	3.2	6.5	1.6	3.2	3.1	2.3
Spain	0.4	-0.8	-1.8	-0.8	0.0	-0.2	-0.4	-0.3	-1.0	-0.5
France	1.2	1.1	1.1	0.2	0.4	1.7	0.8	1.4	1.1	1.8
Italy	-0.2	-0.4	-1.5	-1.0	0.0	-1.4	-0.4	0.6	0.7	-0.3
Luxembourg	0.9	0.7	-0.2	1.4	1.2	2.6	-0.6	1.6	0.4	-0.9
Netherlands	0.6	0.4	-0.2	0.8	0.2	0.6	0.8	2.4	-0.1	-1.1
Austria	1.0	-0.2	-0.9	-0.4	-1.1	0.1	0.5	-0.9	0.3	0.8
Portugal	2.3	0.7	0.9	3.2	1.7	0.2	-0.3	0.0	0.7	-1.0
Finland	1.5	1.3	-1.0	-0.5	1.8	-1.1	3.1	2.5	4.0	1.4
<i>Unweighted standard deviation</i>	<i>1.7</i>	<i>1.6</i>	<i>1.4</i>	<i>1.4</i>	<i>1.3</i>	<i>2.1</i>	<i>1.1</i>	<i>1.9</i>	<i>1.8</i>	<i>1.3</i>
<i>Weighted standard deviation</i>	<i>1.6</i>	<i>1.1</i>	<i>1.2</i>	<i>1.0</i>	<i>0.8</i>	<i>1.3</i>	<i>0.7</i>	<i>1.5</i>	<i>1.3</i>	<i>1.2</i>

Sources: Own computations based on European Commission data. Real compensation per employee is measured as compensation per employee deflated by the private consumption deflator.



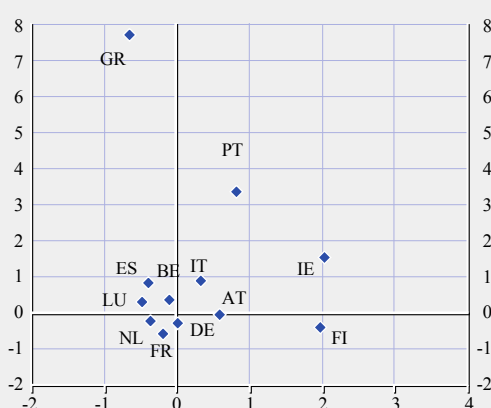
Chart 9 Differences in average wage growth and average productivity growth relative to the euro area

(percentage points)

x-axis: productivity growth (deviation from EA)  
y-axis: wage growth (deviation from EA)

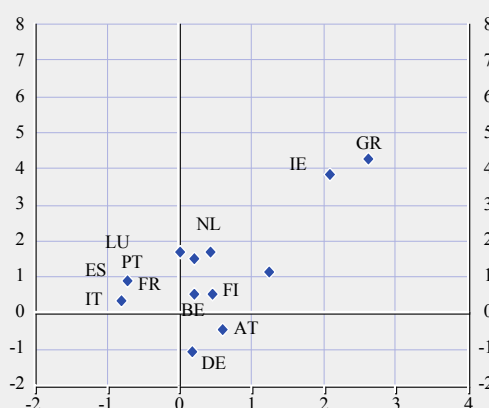
a) 1993 to 1998

$R^2 = 0.03$



b) 1999 to 2006

$R^2 = 0.53$  ( $R^{2*} = 0.00$ )



Sources: Own computations based on European Commission data.

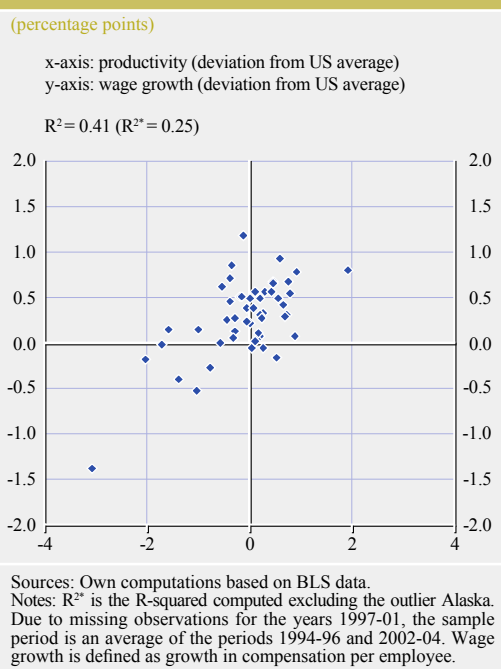
Note:  $R^{2*}$  in the parenthesis is the R-squared computed excluding the outliers Greece and Ireland in panel (b). Wage growth is defined as growth in compensation per employee.

Keeping in mind the caveat to such an analysis as mentioned above, an important message can be drawn from these findings. While for a number of countries the relative wage and productivity growth differentials appear to be small, countries that combine positive wage growth differentials and negative productivity growth differentials vis-à-vis the euro area average over an extended period – and hence positive unit labour cost differentials – run the risk of accumulating losses in competitiveness. Such a risk might be seen in particular in the group of countries in the upper left quadrant of charts 9a and b, respectively. This suggests that wage-setting parties in some countries might not have yet fully adjusted to the constraints of a currency union, which does not allow for the “emergency exit” of exchange rate devaluation. It is therefore a challenge for those countries in which relative wage developments exceed relative productivity developments to ensure that the necessary adjustment mechanisms operate fully, in the sense that wage developments are sufficiently flexible and reflect productivity developments.

A rather similar picture emerges when looking at the relationship between wage and productivity developments across the US regions (Chart 10). Also in this case there appears to be a rather loose relationship, although somewhat stronger than across the euro area countries when adjusted for outliers between relative wage and productivity growth differentials.

Wage growth persistence within individual euro area countries might also have contributed over time to wage growth differentials across countries. A time-series approach could be used to examine this point. However, wage growth persistence may not only depend on institutional features which would be captured by such an approach, but might also be driven by persistence in important explanatory factors of wage developments, such as inflation and productivity growth. In order to assess the impact of the latter factors, it is also important to examine the degree of persistence of these determinants and compare it to the persistence of wage growth. In order to assess the extent of wage growth persistence in individual euro area countries over time and relate it to that of productivity

**Chart 10 Differences in average wage growth and average productivity growth relative to the US, 1994 - 2004 \***



growth and inflation we have estimated simple autoregressive equations using quarterly data,<sup>26</sup> namely

$$\Delta x_t = c + \sum_{i=1}^5 \alpha_i \Delta x_{t-i} + \varepsilon_t,$$

where  $\Delta x_t$  represents – in turn – wage growth, productivity growth or inflation (measured by the growth rate of the private consumption deflator) at time  $t$ ,  $c$  represents a constant, and  $\varepsilon_t$  is the error term. The sum of the coefficients  $\alpha_i$  of the lagged dependent variable constitutes a measure of persistence (stickiness) in a period of time which covers for most countries five quarters (the maximum lag for which significant coefficients were found). The results of this exercise are summarised in Table 6. When interpreting the results of this time series approach, it should be borne in mind that the impact of other exogenous variables on the measured persistence has not been captured in this exercise. Table 6 shows for each variable the sum of all coefficients  $\alpha_i$  (i.e.  $\sum_{i=1}^5 \alpha_i$ ) of the autoregressive equation and also the sum of

the significant coefficients. For Finland in the case of compensation per employee growth, for France in the case of productivity growth and for Belgium in the case of inflation none of the coefficients was found to be significant. Thus, for these countries, the uncertainty related to our measure of persistence is particularly high.

A first result of this exercise is that the so-measured persistence in compensation per employee growth over the period 1993-2007 has been relatively high in a number of euro area countries. The strongest autoregressive coefficients were found in the Netherlands and Austria (0.6/0.8), followed by Spain, France and Germany. However, no apparent wage growth persistence was found for Belgium, Italy and Finland. In comparison, a similar exercise for the United States and the United Kingdom reveals autoregressive coefficients similar to the average of the eight largest euro area countries.

A similar exercise for productivity growth across euro area countries reveals a clearly lower degree of persistence across the euro area countries (see Table 6). The coefficient  $\alpha$  is positive and significant only for Italy, Austria and Finland, while for the other countries no significant persistence can be found. In this regard, the persistence of wage growth does not appear to be matched by a similar persistence of productivity growth. However, the same exercise for inflation, as measured by the private consumption deflator, reveals a high and significant degree of persistence across euro area countries.<sup>27</sup> Moreover, it appears that the higher the wage growth persistence, the higher the respective persistence of inflation. Thus, one may assert that wage growth persistence is related to

26 This approach follows the one chosen in the Inflation Persistence Network. See, for example, Gadzinski et al. (2004). To have a significant number of observations (59) quarterly data running from 1993:1 to 2007:3 were used. As quarterly data on compensation per employee (seasonally adjusted) are only available for the eight largest euro area countries: Belgium, Germany, Spain, France, Italy, the Netherlands, Austria, Finland, the persistence exercise has been carried out for this group of countries only.

27 See results from the Inflation Persistence Network (Altissimo et al. 2006).

**Table 6 Persistence in nominal compensation per employee growth, in productivity growth and in private consumption deflator growth across the euro area countries**

(1993 Q1-2007 Q3)

	Compensation per employee growth				Productivity growth				Private consumption deflator growth			
	sum of all coeff.	significant coefficients			sum of all coeff.	significant coefficients			sum of all coeff.	significant coefficients		
		lags	sum of coeff.	t-stat.		lags	sum of coeff.	t-stat.		lags	sum of coeff.	t-stat.
Belgium	0.0	4	-0.2	-1.8	-0.5	5	-0.2	-1.7	0.1	-	-	-
Germany	0.3	4, 5	0.4	2.0/2.9	-0.2	1	-0.2	-1.8	0.5	3, 5	0.4	1.7/2.0
Spain	0.4	6	0.2	2.0	-0.3	4	-0.2	-1.7	0.7	2, 3, 4	0.7	19.2/2.2
France	0.4	1, 5	0.5	2.1/1.9	0.4	-	-	-	0.4	1, 3, 4	0.3	2.6/2.2/-2.5
Italy	0.0	8, 9	0.0	-2.1/1.7	0.6	1, 5	0.6	1.6 / 3.3	0.7	1, 4	0.9	3.2/3.1
Netherlands	0.6	4, 5	0.5	2.1/2.1	-0.4	2, 3, 4	-0.1	-2.3/-3.0/4.1	0.4	3, 4	0.5	1.8/1.9
Austria	0.8	1, 4, 5	0.4	5.3/-4.4/3.0	0.4	1	0.4	3.2	0.9	1, 2, 3, 4	0.8	18.6/-8.1/4.2/-2.1
Finland	-0.3	-	-	-	0.4	1, 3, 4	0.2	1.9/2.2/-2.2	0.3	4	0.5	4.0
<i>Average</i>	<i>0.3</i>				<i>0.0</i>				<i>0.5</i>			
<b>Memo items:</b>												
UK	0.2	1, 4	0.4	-1.8/5.8	0.1	2, 4	0.3	1.6/4.5	0.0	4	0.4	3.7
US	0.3	4	0.3	2.1	0.0	-	-	-	0.4	3	0.3	2.5

Source: Own computations based on Eurostat data.

Notes: Measured by auto-regressive estimates up to the fifth lag, with the exception of Spain and Italy, where six and nine lags were used respectively in the autoregressive equation of compensation per employee growth.

inflation persistence. The close link between wage growth and inflation persistence might reflect the importance of inflation in the wage-setting mechanisms, as trade unions typically base their wage demands, among other factors, on past inflation developments. Moreover, the close link between the persistence of wages and inflation might be related to certain institutional factors, such as wage indexation. Incorporating the backward-looking inflation component into the wage rule can lead to wage rigidities under certain institutional practices. Since wages are important determinants of prices, backward-looking wage indexation enables temporary price shocks to initiate wage-price spirals leading to both persistent wage and price developments. Among the euro area countries covered in this paper, an automatic wage indexation mechanism is relevant in Belgium, Spain, France and Luxembourg (Table 7).

Other factors explaining persistence in wage developments within individual countries may be multi-year wage contracts and the fact that in some countries collective wage settlements are not totally independent, as wage agreements in major industrial sectors tend to provide a clear benchmark for wage bargaining in other sectors and even in some other euro area countries

(for instance in Belgium), irrespective of local labour productivity developments and labour market conditions or firm profitability.<sup>28</sup>

In sum, certain longer-term factors appear to be behind wage growth differentials among the euro area countries. Differences in wage growth rates between individual euro area countries and the euro area appear to be positively related to the respective differences between their HICP inflation and average HICP inflation in the euro area. Conversely, relative wage growth differentials across euro area countries have largely been unrelated to and are generally higher than relative productivity growth differentials. Although for a number of countries the relative wage and productivity growth differentials appear to be small, countries that combine positive wage growth differentials and negative productivity growth differentials vis-à-vis the euro area average over an extended period – and hence positive unit labour cost differentials – run the risk of accumulating losses in competitiveness. It is therefore a challenge for those countries in which relative wage developments exceed relative productivity developments to ensure that

28 See Hancké et al. (2003), pp. 149-160.

the necessary adjustment mechanisms operate fully, in the sense that wage developments are sufficiently flexible and reflect productivity developments. Wage growth persistence within individual euro area countries – largely reflecting

inflation persistence and certain institutional factors, such as indexation and multi-year contracts – might also have contributed, to some extent, to wage growth differentials across the euro area countries.

**Table 7 Current wage indexation in the euro area countries**

	Form	Inflation measure	Mechanism	Coverage
<b>Countries with predominantly automatic wage indexation</b>				
BE	Automatic, but limited by a wage norm and, in some sectors, by an “all in” clause	Health index <sup>1)</sup>	Increase in wages once the four-month moving average of past inflation exceeds a certain threshold, mostly 2%, or a fixed interval of one to 12 months.	Almost whole economy
ES	Automatic	National CPI	Clause included in most collective wage agreements in the private sector. This adjusts for inflation that is higher than the expected inflation rate embedded in wage agreements.	Around 68% of private sector employees
FR	Automatic	National CPI excluding tobacco	Minimum wage automatically raised in July by inflation + half real salary increase of blue collar workers + discretionary adjustment. More frequent adjustments possible.	Around 13%
CY	Automatic	National CPI	Wages adjusted twice a year (on 1 Jan. and 1 July) to average inflation in the preceding six months.	Around 65%
LU	Automatic	National CPI	Wages adjusted upwards when the six-month moving average of inflation is 2.5% higher than its level at the time the last wage indexation occurred.	100%
MT	Through cost of living adjustment	Retail price index	Minimum wages are adjusted by the average inflation rate over the last 12 months (to Sept.).	Not available
SI	Automatic	Expected national CPI	Adjustment in July for expected inflation. Additional adjustment made in January of each year if inflation exceeds forecast.	Around 20%
<b>Countries with no automatic wage indexation, but where some form of wage guidelines exists</b>				
GR	Not automatic	National CPI	Up to 2003, negotiated minimum wage and other private sector agreements sometimes included an inflation clause to compensate for inflation above a stated amount, applied at the beginning of the following year. Since then, there have been no such clauses in agreements.	Private non-banking sector
IT	Not automatic	National CPI	At contract renewal (every two years), compensation for the difference between expected inflation under the previous contract and actual inflation can be negotiated. Terms of trade shocks are excluded.	Private sector
FI	Contractual, not automatic	National CPI	Wage increases to compensate for past inflation exceeding that in agreements by threshold amount. These inflation clauses were typically included in comprehensive income policy agreements, but have only been triggered once.	Whole economy
<b>Countries with no automatic wage indexation and no or few wage guidelines</b>				
DE, IE, NL, AT, PT				

Sources: DuCaju et al. (2008) “Institutional features of wage-bargaining in 22 EU countries, the US and Japan”, mimeo and ECB Monthly Bulletin, May 2008.

Note:

1) National CPI excluding petrol, tobacco and alcohol.

## 6 DISPERSION IN NOMINAL WAGE LEVELS ACROSS EURO AREA COUNTRIES

The section above discussed a number of factors that appear to be behind wage growth differentials among the euro area countries. An additional factor is differences in wage levels. To the extent that wage levels differ across countries, a process of convergence would imply faster wage growth in the countries with lower wage levels and slower wage growth in the countries with higher wage levels, leading to overall wage growth dispersion.

What might cause such a process of convergence in wage levels? According to economic theory, firms maximising their profits set real wage levels equal to their productivity level divided by a mark-up term.<sup>29</sup> In other words, nominal wage levels, which are the focus of this chapter, should be equal to productivity levels multiplied by a factor, which is the ratio of price levels to mark-ups. Provided that this latter ratio is broadly stable, one should in principle expect to observe some close link between relative wage and productivity levels across countries, in the sense that countries with higher than the euro area average productivity levels would also be those countries with higher than the euro area average wage levels and vice versa. In the context of the Single Market and later EMU, the enhanced convergence of productivity levels<sup>30</sup> – thanks to a relatively high degree of factor mobility, as well as technological transfer being enhanced by stronger intra-area trade and foreign direct investments – should be expected to lead to a convergence in wage levels. Thus, in the absence of considerable labour market rigidities, eventually nominal wage levels would also largely converge, following the convergence of productivity levels.

### 6.1 SOME STYLISED FACTS

This section compares nominal levels of compensation per employee and per hour across the euro area countries in the total economy as well as in the major sectors over the last 14 years. This approach provides a first

insight into the existing degree of wage level convergence/divergence across the euro area countries and the extent to which wage level differences may disappear in the context of a catching-up process in some euro area countries.

Chart 11 displays average nominal levels of compensation per employee (in panel (a)) across the euro area countries relative to the euro area level in the years 1993, 1999 and 2006 in the whole economy. Data for compensation per hour (as shown in panel (b)) are available until 2004. For each year, the nominal wage level of the euro area has been set to 100. Hence any number above 100 indicates a wage level higher than that in the euro area and vice versa.

As can be seen from Chart 11, the euro area countries can be divided into various groups with respect to their relative wage levels. There is one group of countries comprising Portugal, Greece, Spain, and to a lesser extent Italy, where nominal levels of compensation, regardless of whether expressed in terms per employee or per hour worked, were below the euro area average between 1993 and 2006. While this group of countries recorded some catching-up of their relative wage levels, the gap has not been closed. There is a second group of countries, comprising Luxembourg, Belgium, the Netherlands and France which has, according to both wage measures, recorded above euro

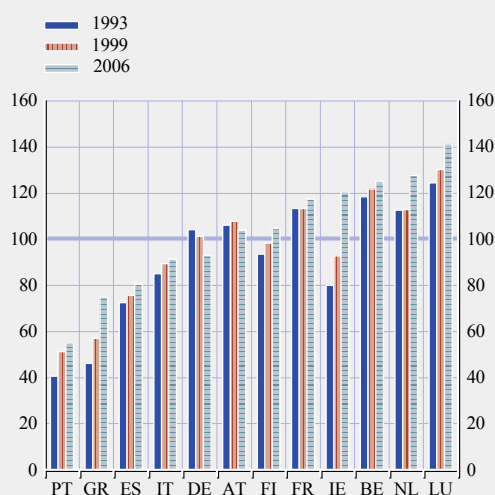
29 For details on real wage levels, see Annex 4.

30 The literature on productivity levels convergence broadly encompasses four views: 1. The neoclassical hypothesis, according to which initially capital-poor countries have higher marginal productivity of capital and hence faster economic growth, see Barro and Sala-i-Martin (1992). 2. The endogenous growth models explain the convergence process as a result of technological catch-up. “Follower” countries converge to the technological “leaders” mainly through a process of imitation. In particular, in these models imitation is less costly than innovation, so that countries initially behind the technology frontier experience faster improvements in technology than the “leaders”, see Howitt (2000). 3. The theory of economic integration interprets the convergence process as driven mainly by gains from trade and financial links which allow for an easier transfer of technology (Ventura, 1997). 4. The classical models of structural transformation view the convergence process as a by-product of the structural transformation, which is partially a process of reallocation of resources from low-productivity to high-productivity sectors, see Imbs and Wacziarg (2003).

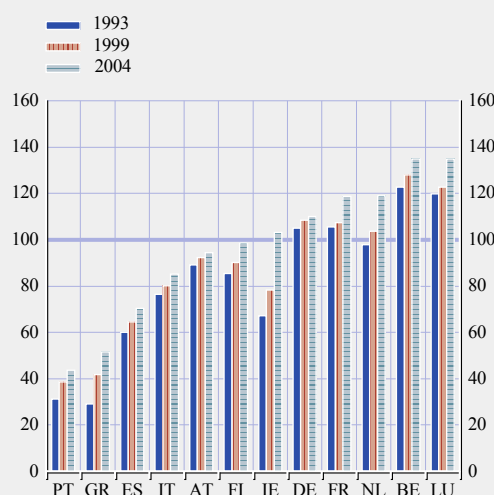
**Chart 11 Nominal levels of compensation across the euro area countries: total economy**

(euro area=100 for each year considered)

**a) Per employee<sup>1)</sup>**



**b) Per hour<sup>2)</sup>**



Source: Own computations based on (a) Eurostat data and on (b) EU KLEMS data.

Note:

- 1) Figures are sorted in ascending order according to nominal compensation per employee levels in 2006.
- 2) Figures are sorted in ascending order according to nominal levels of compensation per hour in 2004.

area average compensation levels over the entire period in review. There is a third group of countries, comprising Germany, Austria and Finland, where wage levels have been close to or hovered around the euro area average over the past 14 years. Finally, Ireland has successfully converged towards the euro area average wage level since 1993, and appears to be on course to exceed the euro area average, reflecting the strength of productivity. While hourly wage levels in Germany remain above the euro area average, the impact of a higher recourse to low paid jobs in the wake of labour market reforms explains the decline of wage levels per head below the euro area average in recent years.

Overall, as can be seen in the first two columns of Tables 8 and 9, the coefficient of variation – which is preferred on this occasion over the standard deviation, as underlying data are expressed in levels which have been trending over time – of total economy wage levels in the euro area has fallen somewhat between 1993 and 2006 in the case of wages per person (and between 1993 and 2004 in the case of hourly

data), nonetheless indicating that wage levels continue to differ considerably and seem to have converged only to some limited extent over this period.

Within certain countries, wage levels relative to the euro area average are quite different across sectors (Table 8 and Table 9). For example, while overall wages per employee in Germany in 2006 were slightly below the euro area average, wage levels in industry excluding construction were above the euro area level in that year. Similar differences across sectoral wage levels compared with the euro area average can be detected in some other countries, such as Ireland and Austria. In others, sectoral wage levels were below the euro area average across all sectors (Greece, Spain) or consistently above the euro area average (Belgium, France, Luxembourg, the Netherlands). It is interesting to note, however, that the level of hourly compensation in Germany, across most sectors, is substantially above the euro area average, while compensation per employee is more in

Table 8 Nominal levels of compensation per employee across the euro area countries

(euro area = 100 for each year considered)

	Total economy		Agriculture		Industry excluding construction		Construction		Trade and transport		Financial intermediation		Other services	
	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006
	Belgium	118	125	87	116	117	129	116	122	120	128	125	118	115
Germany	104	93	117	101	112	109	107	91	97	84	92	81	104	87
Ireland	80	120	-	134	-	98	-	159	-	98	-	117	-	135
Greece	46	75	46	81	39	55	34	58	45	73	45	73	53	81
Spain	73	81	55	65	71	71	72	83	70	78	85	90	76	87
France	113	118	137	123	110	107	112	116	121	120	115	120	108	113
Italy	85	91	89	90	78	82	80	83	95	104	93	87	85	91
Luxembourg	124	141	133	169	118	126	104	112	109	128	139	142	139	152
Netherlands	113	128	155	184	105	115	120	137	109	125	100	122	124	128
Austria	106	104	92	94	110	105	116	111	101	99	107	98	125	114
Portugal	41	55												
Finland	93	105	127	136	89	106	105	128	91	104	89	97	98	99
Spread <sup>(1)</sup>	84	86	109	119	80	74	86	79	75	55	94	68	85	71
Coefficient of variation <sup>1)</sup>	0.29	0.25	0.39	0.39	0.30	0.27	0.31	0.31	0.27	0.22	0.26	0.24	0.21	0.25

Source: Own computations based on Eurostat data.

Note: Highlighted in light mustard are countries where compensation per employee is more than 10% above the euro area average; highlighted in dark mustard are countries where compensation per employee is more than 10% below the euro area average. Due to the presence of co-variances and potential changes in the weights of the sectors in the total economy between 1993 and 2006, the coefficients of variation of the total economy and the sectors do not add up.

\*) Maximum minus minimum value in % of euro area average.

1) Excluding Ireland and Portugal for the calculation at the sectoral level.

Table 9 Nominal levels of compensation per hour across the euro area countries for the six sectors

(euro area = 100 for each year considered)

	Total economy		Agriculture		Industry excluding construction		Construction		Trade and transport		Financial intermediation		Other services	
	1993	2004	1993	2004	1993	2004	1993	2004	1993	2004	1993	2004	1993	2004
	Belgium	123	135	180	176	115	130	111	140	141	156	140	137	109
Germany	105	110	146	151	114	121	99	108	113	118	96	102	94	95
Ireland	67	103	74	116	45	93	82	137	58	102	71	102	80	115
Greece	29	52	39	84	26	39	21	46	28	55	28	42	34	61
Spain	60	70	62	74	61	64	60	73	62	80	67	81	58	70
France	106	119	162	174	102	110	97	115	123	133	105	126	95	109
Italy	76	85	100	94	71	76	76	90	83	96	84	86	74	85
Luxembourg	120	135	169	233	107	114	94	113	116	138	148	145	120	139
Netherlands	98	119	179	241	98	109	117	147	105	132	83	117	94	110
Austria	89	94	87	106	88	95	93	109	90	100	91	93	90	91
Portugal	31	44	46	50	23	31	23	35	35	45	45	53	29	39
Finland	85	99	117	143	87	102	87	118	91	106	83	102	81	86
Spread <sup>1)</sup>	94	91	140	191	93	99	96	113	113	112	120	103	91	100
Coefficient of variation	0.38	0.31	0.46	0.45	0.42	0.35	0.39	0.35	0.41	0.32	0.40	0.31	0.35	0.30

Source: Own computations based on EU KLEMS data.

Note: Highlighted in light mustard are countries where compensation per employee is more than 10% above the euro area average; highlighted in dark mustard are countries where compensation per employee is more than 10% below the euro area average. Due to the presence of co-variances and potential changes in the weights of the sectors in the total economy between 1993 and 2004, the coefficients of variation of the total economy and the sectors do not add up.

\*) Maximum minus minimum value in % of the euro area average.

line with the euro area average, which reflects the fact that German workers have the lowest working time across the euro area countries.

As can be seen from Table 8 and Table 9, wage levels also seem to have converged to a limited extent at the sectoral level between 1993 and 2006 (2004 in the case of hourly data). Looking at the coefficient of variation, this measure declined somewhat in most sectors between 1993 and 2006. Two exceptions seem to be the *agricultural* and the *construction sectors*. In the former the dispersion of nominal wage levels has not declined since 1993. This outcome can probably be explained by the persistent differences in productivity levels across the agricultural sectors of the euro area countries and the fact that this sector remains highly protected. The catching-up of *construction* sector wages in countries such as Greece, Spain and Portugal – where wage levels were initially very low and wage growth has been more rapid than in other euro area countries, thanks to strong construction activity – appears not to have been sufficient to lead to a reduction in wage level dispersion across countries. In Greece, Spain and Portugal the increase in wage levels in construction in terms of persons has been less pronounced than that in terms of hours, which might reflect a reduction of working time in this sector, in the aftermath of the employment boom observed in construction in recent years. Nominal wage levels in *industry excluding construction* are less dispersed than in the agricultural sector, and wage level dispersion has declined relatively strongly during the past 14 years, especially in terms of wages per hour. The convergence of wage levels in the industry sector might be related to increasing competitive pressures on wages, particularly in high-cost countries in the wake of globalisation. Finally, it is notable that wage level dispersion was relatively low in all three *services* sectors already in 1993, and that since then this dispersion has declined further in the trade and transport as well as in the financial intermediation sectors. At first sight, this may appear rather surprising in view of the non-tradable nature of these sectors, as well as the fact that these sectors remain relatively protected. However, this result is consistent with

**Table 10 Wage level dispersion in the euro area and selected benchmark regions**

(coefficient of variation)					
	EA	US	West Germany	Italy	Spain
1993	0.29	0.17	0.05	-	-
1995	0.30	0.17	0.05	0.08	0.11
1999	0.25	0.18	0.05	0.07	0.12
2004	0.25	0.18	0.06	0.07	0.11

Sources: Own computations based on European Commission/Eurostat data and the national statistical institutes of Germany (DESTATIS), Spain (INE), Italy (ISTAT), United States (Bureau of Economic Analysis).

the observation of a relatively low dispersion of productivity levels in these sectors across countries, reflecting a relatively more similar technological content of the production processes in the services sectors across countries than in the industrial sectors (see Section 5.2).

Similarly for wage growth dispersion, a benchmarking analysis has also been performed for the current degree of wage level dispersion. The question to be addressed is whether wage level dispersion among the euro area countries is high, low or in line with wage level dispersion within benchmark countries. Table 10 shows the degree of wage level dispersion, measured by the coefficient of variation, within the euro area and within each of the four benchmark regions, the United States, Germany, Italy and Spain, between 1993 and 2004. As can be seen, the dispersion of wage levels within the euro area has only slightly declined between 1993 and 2004 and its level has always been higher than that in the benchmark regions. This difference might reflect differences in price levels and in productivity levels which it is expected should be less marked within the benchmark areas than in the euro area. Another possible reason for the observed higher degree of dispersion among wage levels in the euro area than within the benchmark areas might be related to the much lower labour mobility in the euro area. As argued previously, higher labour mobility would trigger a convergence of wage levels as labour tends to move towards regions with higher wage levels, given similar skills requirements. Another reason might be certain institutional frameworks in the



benchmark areas, such as similar “entry wage” levels across sectors for similar professional skills (i.e. white collar workers, secretaries, civil servants, etc.), while such common institutional factors are absent among the euro area countries. This may suggest that the convergence process of wage levels within the euro area is far from complete.

In sum, wage levels across the euro area countries, either in the total economy or in the main sectors, differ considerably, with wage levels having converged only to some limited extent between 1993 and 2006. Moreover, comparing the degree of wage level dispersion, measured by the coefficient of variation, within the euro area and within each of the four benchmark regions between 1993 and 2004, although dispersion of wage levels within the euro area has slightly declined over this period, its level has always been higher than that in the benchmark regions. It therefore appears that wage level convergence is far from complete, and may continue to be a factor behind wage growth dispersion within the euro area for the foreseeable future.

## 6.2 HOW MUCH WAGE LEVEL DISPERSION CAN BE EXPLAINED BY DISPERSION IN LABOUR PRODUCTIVITY LEVELS?

As indicated above, the observed differences in nominal wage levels across the euro area countries should be related to differences in productivity levels.

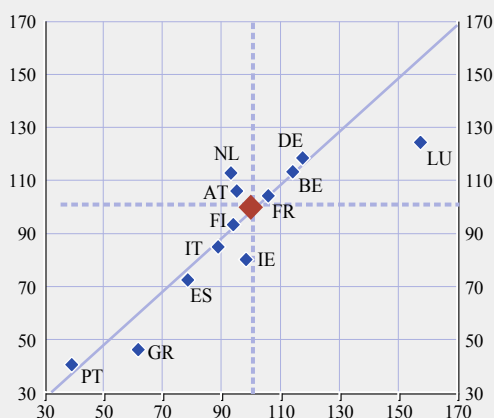
Focusing the analysis on productivity levels as measured in terms of persons, Chart 12 shows relative productivity levels plotted against relative wage levels. Countries lying in the neighbourhood of the 45° line have relative wage levels in line with relative productivity levels, while countries lying above (below) the 45° line have relative wage levels above (below) those of relative productivity. The chart contains two interesting sets of information. First, as expected, it is possible to observe some similarity between relative wage levels and relative productivity levels in 1993 and in 2006. In some countries the distance from the 45° line decreased significantly between 1993 and 2006, indicating that relative wage levels came closer to relative productivity levels. This is especially the case for Ireland,

Chart 12 Labour productivity and wage levels relative to the euro area in 1993 and 2006 – Total economy

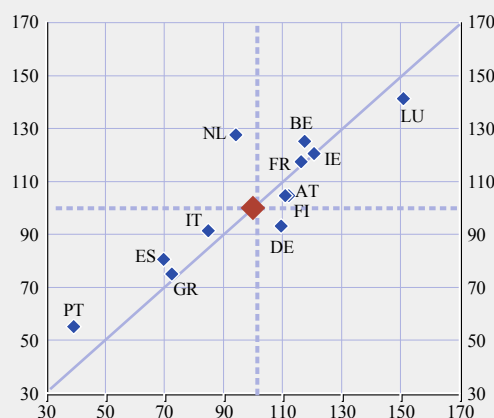
(per person)

x-axis: productivity levels (EA=100)  
y-axis: wage levels (EA=100)

a) Productivity and wage levels relative to the euro area average (EA=100) in 1993



b) Productivity and wage levels relative to the euro area average (EA=100) in 2006



Source: Own computations based on Eurostat data.

Note: The large red dot represent the euro area level set equal to 100 for both productivity and wage levels.

**Table 11 Productivity levels (per person) across the euro area countries for the total economy and for the six macro sectors**

(euro area = 100 for each year considered)

	Total economy		Agriculture		Industry excluding construction		Construction		Trade and transport		Financial intermediation		Other services	
	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006
	Belgium	118	117	147	137	131	137	121	155	112	112	102	111	109
Germany	106	109	99	103	102	110	108	120	92	97	114	111	108	107
Ireland	98	121	-	-	-	-	-	-	-	-	-	-	-	-
Greece	62	73	52	60	37	55	56	103	59	104	69	92	52	73
Spain	79	70	97	93	82	66	74	67	92	72	82	79	75	81
France	114	116	136	131	106	124	109	115	123	119	104	114	111	110
Italy	89	85	80	77	89	69	87	92	93	96	95	87	89	94
Luxembourg	158	151	-	93	-	138	-	129	-	160	-	131	-	140
Netherlands	93	94	168	143	122	120	102	114	102	113	67	70	88	86
Austria	95	112	37	25	111	122	127	152	116	113	99	70	124	120
Portugal	39	39	-	-	-	-	-	-	-	-	-	-	-	-
Finland	94	111	117	109	114	167	101	98	100	132	86	89	89	82
Spread *)	118	112	132	118	94	112	71	88	64	88	46	61	72	67
Coefficient of variation	0.43	0.37	0.43	0.37	0.27	0.32	0.24	0.22	0.19	0.22	0.19	0.20	0.24	0.19

Source: Own computations based on Eurostat data.

Note: Sectoral productivity data for Portugal and Ireland are not available.

Highlighted in light mustard are countries where labour productivity is more than 10% above the euro area average; highlighted in dark mustard are countries where labour productivity is more than 10% below the euro area average. Due to the presence of co-variances and potential changes in the weights of the sectors in the total economy between 1991 and 2005, the coefficients of variation of the total economy and the sectors do not add up.

\*) Maximum minus minimum value in % of the euro area average.

where the relative wage level was significantly below its relative productivity level in 1993 but evened out in 2006. Similarly, for Austria and Finland, the relative wage levels were above their respective relative productivity levels in 1993 but came into line in 2006.

By contrast, in some countries the distance from the 45° line increased considerably between 1993 and 2006, indicating an increased divergence between the relative wage and productivity levels. This is particularly the case in the Netherlands, where the relative wage level was above the relative productivity level in 1993 and the distance between wage and productivity levels increased further until 2006. In Germany, relative wage levels were somewhat higher than productivity levels in 1993; relative wage levels became lower than relative productivity levels in 2006.

For some countries the distance from the 45° line declined, however, they moved from below to above the 45° line. This is the case for Greece, Spain, Portugal and, to a much more limited extent, Italy and Belgium, indicating that relative

wage levels have moved from being below the relative level of productivity to above. Among this group of countries, Spain witnessed the largest switch from a position of a relative wage level lower than the productivity level in 1993 to a position of a relative wage level higher than the relative productivity level in 2006.

Second, Chart 12 and the first two columns of Table 11 indicate that, overall, the dispersion of productivity levels declined somewhat between 1993 and 2006. This is broadly in line with the small decline seen in the dispersion in wage levels (see Table 8 and Table 9). However, in Spain, Italy and Belgium wage levels grew faster relative to the euro area between 1993 and 2006 while productivity levels relative to the euro area declined. By contrast, wage levels relative to the euro area declined in Germany, and to a more limited extent in Austria while relative productivity levels increased in these two countries.

Turning to sectoral considerations, productivity levels across the six major sectors recorded

only minimal convergence to the euro area average level, with divergence as recorded by the coefficient of variation, increasing only slightly in industry excluding construction and in trade and transport services over the past 14 years (Table 11). Another feature of Table 11 is that dispersion in productivity levels in the services sectors was and remains slightly lower than dispersion in productivity levels in industry excluding construction. At first sight, this may appear rather surprising in view of the non-tradable nature of most services as well as the fact that services remain relatively protected. However, this result is consistent with the fact that production processes have a more similar technological content across countries in the services sectors than in the industrial sectors.

A comparison of the last row of Table 11 with that of Table 8 shows that, on the basis of the coefficient of variation, while dispersion in wage levels declined somewhat at the total economy level and across most sectors between 1993 and 2006, dispersion in productivity

levels also declined at the overall level and in the services sectors, but rose in the industrial and transport sectors, hence showing a more differentiated picture than dispersion in wage levels.

A useful way of summarising the extent of the link between wage and productivity levels is to divide nominal wage levels per person with the corresponding amount of output generated per person. In this way we obtain the concept of unit labour cost (ULC), i.e. the cost of labour (per employee) to produce one unit of output (Table 12).

In Table 12 a number greater (lower) than 100 indicates that the level of wages in a given country/sector is higher (lower) than the level of productivity in the same country/sector relative to the euro area average. In particular, numbers highlighted in light mustard and dark mustard correspond to sizeable differences between relative wage levels and relative productivity levels, with dark mustard highlighting cases where relative wage levels are more than 10%

Table 12 ULC levels in the total economy and in the six macro-sectors

(euro area = 100 for each year considered)

	Total economy		Agriculture		Industry excluding construction		Construction		Trade and transport		Financial intermediation		Other services	
	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006	1993	2006
Belgium	101	107	59	85	89	94	96	79	107	114	123	106	105	114
Germany	98	85	118	99	110	99	99	76	105	86	81	74	97	81
Ireland	81	99	-	-	-	-	-	-	-	-	-	-	-	-
Greece	75	103	87	136	105	101	61	56	77	71	66	80	102	110
Spain	92	115	56	70	86	108	98	124	76	108	103	114	102	108
France	99	101	101	94	103	86	103	101	98	101	110	106	97	103
Italy	96	108	110	117	88	120	91	90	102	107	98	100	96	97
Luxembourg	79	94	-	181	-	91	-	87	-	80	-	108	-	109
Netherlands	121	135	92	129	86	96	117	120	107	110	148	174	142	149
Austria	111	93	251	378	99	86	92	73	87	88	108	140	101	95
Portugal	103	140	-	-	-	-	-	-	-	-	-	-	-	-
Finland	99	94	108	124	78	64	104	130	91	79	104	108	110	120
Spread	46	55	195	308	32	57	56	73	31	44	82	101	46	69
Coefficient of variation	0.14	0.16	0.52	0.63	0.11	0.16	0.16	0.26	0.13	0.16	0.22	0.26	0.14	0.17

Source: Own computations on Eurostat data.

Note: Sectoral productivity data for Portugal and Ireland are not available.

Highlighted in light mustard are countries where ULC levels are more than 10% below the euro area average; highlighted in dark mustard are countries where ULC levels are more than 10% above the euro area average. Due to the presence of co-variances and potential changes in the weights of the sectors in the total economy between 1993 and 2006, the coefficients of variation of the total economy and the sectors do not add up.

higher than relative productivity levels and light mustard highlighting cases where relative wage levels are more than 10% lower than relative productivity levels. Using these rough criteria, a rather heterogeneous picture emerges. Looking at the total economy, in 1993, the Netherlands and Austria were the two euro area countries which had a significantly higher relative wage than productivity level (dark mustard), while Ireland, Greece and Luxembourg had a significantly lower relative wage than productivity level (light mustard). In 2006, Spain and Portugal, together with the Netherlands, had a significantly higher relative wage than productivity level (dark mustard), while Germany turned out to be the only country with a significantly lower relative wage than productivity level (light mustard).

Turning to sectoral considerations, the industry excluding construction sector showed lower divergences in unit labour costs across euro area countries in both 1993 and 2006 than all other sectors, hinting at the relatively high degree of cross-country competition in this sector within the euro area. The agricultural sector revealed the highest divergence in unit labour costs across countries, possibly reflecting the high degree of subsidies in this sector. The above ULC considerations clearly confirm that for certain individual euro area countries, both for the total economy as well as for their individual sectors, the developments in relative wage levels have not always followed the developments in relative productivity levels.

In sum, the previous analysis has shown that the modest decline in the dispersion of wage levels was in line with the modest decline in the dispersion of productivity levels between 1993 and 2006. However, for certain individual euro area countries, both for the total economy as well as for their individual sectors, the developments in relative wage levels have not always followed the developments in relative productivity levels.

### 6.3 CAN WAGE GROWTH DISPERSION BE SEEN EMPIRICALLY AS A LONGER-TERM WAGE LEVEL CONVERGENCE PROCESS ACROSS EURO AREA COUNTRIES?

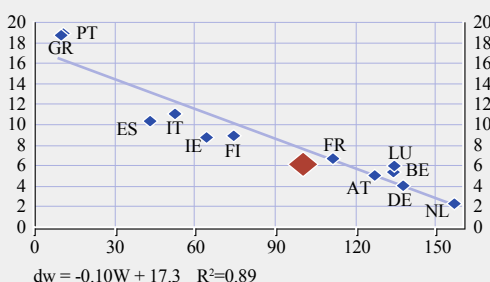
In the previous chapter, we investigated relative wage levels across the euro area countries and the link to relative productivity levels in 1993 and 2006. This section complements the previous analysis by focusing on the empirical relationship between wage levels and wage growth rates over three periods – the 1980s, the 1990s and 1999-2006. Chart 13 exhibits the correlation between initial levels of compensation per employee across the euro area countries and average compensation growth rates during the subsequent period. Panel (a) shows the relationship between compensation per employee levels in 1980 and the average compensation per employee growth rates across the euro area countries in the period 1980-1992. Over that period, initial compensation levels and average compensation growth rates were significantly and negatively correlated, which supports the hypothesis that a catching-up process across the euro area countries, i.e. wage level convergence, played a significant role for wage growth differentials over this period. In particular, average compensation growth has been the highest in countries such as Greece and Portugal which registered the lowest initial compensation levels, while countries such as Germany and the Netherlands with the highest initial levels of compensation per employee, recorded the lowest average compensation growth rates.

Panels (b) and (c) also show a negative relationship between the initial compensation levels in 1993 and 1999 and the average compensation growth rate across the euro area countries during the periods 1993-1998 and 1999-2006 respectively. However, the relationship appears slightly less robust in the 1990s. Notably, in the period after the inception of EMU, from 1999 to 2006, the negative relationship between the initial compensation level in 1999 and the subsequent

**Chart 13 The role of initial conditions across the euro area countries – Total economy**

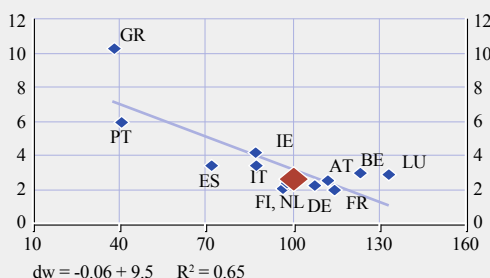
**a) Nominal levels of compensation per employee in 1980 (EA =100) and its average growth rate in 1980-1992**

x-axis: level in 1980 (EA=100) (W)  
y-axis: average growth rate 1980-1992 (dw)



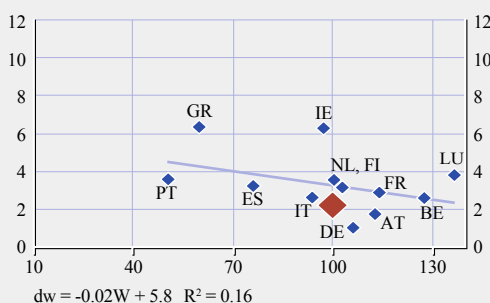
**b) Nominal levels of compensation per employee in 1993 (EA =100) and its average growth rate in 1993-1998**

x-axis: level in 1993 (EA=100) (W)  
y-axis: average growth rate 1993-1998 (dw)



**c) Nominal levels of compensation per employee in 1999 (EA=100) and its average growth rate in 1999-2006**

x-axis: level in 1999 (EA=100) (W)  
y-axis: average growth rate 1999-2006 (dw)



Sources: Own computations based on Eurostat data.  
Note: The red large dot indicates the euro area. Such simple cross-country correlations should be interpreted with caution and can only be indicative, as the number of observations is rather small and single data points can have a notable effect on the estimates.

average growth rate of compensation per employee seems to be barely significant and the average growth rate of compensation per employee is, in fact, very close to 3% in many countries (Portugal, Spain, Italy, Finland, France, Belgium and Luxembourg) despite still considerably different levels of compensation per employee in 1999 among these economies.<sup>31</sup> This seems to imply that most of the convergence of wage levels took place before 1999 and especially in 1980s, while it came broadly to a halt after the inception of Stage 3 of EMU.<sup>32</sup> In that regard, it appears that differences in growth of compensation per employee across the euro area countries have been driven to a lesser extent by catching-up processes since 1999.

In sum, in this section, it has been empirically verified that wage level convergence, albeit still far from being complete, has played a certain role in explaining wage growth patterns during the 1980s and the 1990s. In this period growth in compensation per employee was indeed visibly slower in countries with high initial levels of compensation, while a higher rate of wage growth was observed in countries with initially low compensation per employee levels. However, in the period after the inception of EMU, the link between the initial compensation level in 1999 and the subsequent average growth rate of compensation per employee appears barely significant. This seems to imply that some convergence of wage levels took place before 1999, bolstered by the completion of the Single Market, while it came broadly to a halt after the inception of Stage 3 of EMU.

31 Interestingly, a similar analysis of the role of initial conditions and productivity during the past decades suggests that initial productivity levels played no significant role in productivity growth during any of the various sub-periods and that productivity levels have not converged particularly since the 1980s.

32 These results are broadly in line with those reported in the European Commission (2003) study.

## 7 CO-MOVEMENT OF COMPENSATION GROWTH RATES ACROSS EURO AREA COUNTRIES AND SECTORS

An important complementary approach to the analysis of dispersion is the analysis of synchronisation of wage growth across euro area countries. While dispersion captures the degree of difference in wage growth rates at a certain point in time across the euro area countries, synchronisation indicates the degree of co-movement of wage growth across euro area countries over a certain period of time.

What may be driving synchronisation of wage developments across the euro area countries? On the one hand, as competition is fostered by economic integration, in particular by the Single Market, and in the absence of adjustment via nominal exchange rate changes in the context of EMU, social partners need to take wage developments in other euro area countries into account. As an example within the euro area, Belgium has adopted a wage rule which effectively indices overall wage growth during a certain period to the expected or actual wage developments in its most important trade partner countries, i.e. Germany, France and the Netherlands. Moreover, to the extent that compensation developments are driven by common cyclical factors and other developments that are rather similar across the euro area countries, such as oil price shocks or shocks to extra-euro area demand, one would expect a high degree of co-movement of wage developments across countries. On the other hand, a low degree of co-movement of compensation per employee growth across countries could reflect the normal and desirable working of adjustment mechanisms, which in the context of a currency union take place via price and cost developments. Moreover, a low degree of wage growth co-movement could result from the impact of country-specific factors on wage developments, such as for instance fiscal policies determining the size of social security contributions, and structural reforms, which may affect productivity growth or the wage drift.<sup>33</sup> However, a low degree of wage growth synchronisation could also reflect

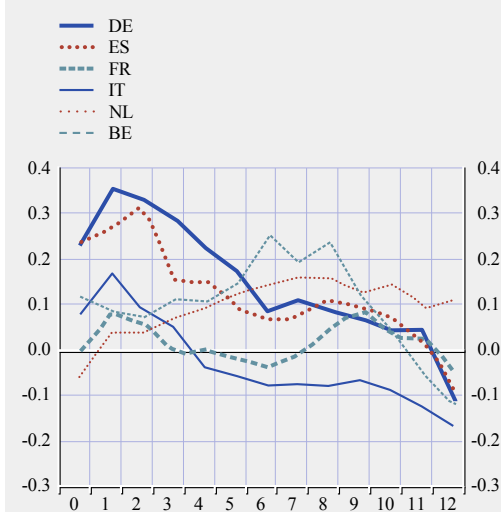
structural rigidities in some countries, related for example to a low degree of competition and a relatively low degree of openness in domestically-oriented sectors.

### 7.1 SOME STYLISED FACTS

A variety of methods can be used to assess the degree of synchronisation of wage growth across the euro area countries. One way of determining the degree of co-movement between compensation per employee developments across the euro area countries is to consider the correlation between the annual compensation per employee growth rate in each individual euro area country and compensation per employee growth for the euro area over different lag structures. Chart 14 below shows the correlation coefficients for compensation per employee developments between each of the six major euro area countries (Belgium, Germany, Spain, France, Italy and the Netherlands), in the period from 1993 to 2006,

33 For instance, labour market reforms in Germany aimed at making the unemployed active and increasing their employability seem to have had a substantial downward impact on the wage drift, which has been significantly negative in recent years.

Chart 14 Correlation between wage growth in each of the six largest euro area countries at time  $t$  and wage growth in the EA8 average at time  $t+i$ ,  $i=1, 2, \dots$  quarters



Source: Own computations based on Eurostat data.  
Note: the period considered is 1993-2006.

at time  $t$ , and the EA8 aggregate<sup>34</sup> in the same quarter as well as at time  $t+i$ , for  $i=1, \dots, 12$ .<sup>35</sup> In other words, for each of the six major euro area countries, we consider the contemporaneous correlations between the national wage growth and the EA8 average wage growth and also whether wage growth in any of these six countries has leading properties with respect to the EA8 group.

The first general impression from Chart 14 is that the degree of co-movement appears to be quite low. The contemporaneous correlation of wage developments reached about 0.25 in the cases of Germany and Spain, about 0.1 in the cases of Belgium and Italy, but it was nil for France and negative for the Netherlands. This finding is also true at the sectoral level, as the correlation between wage growth in a specific sector in a given country and wage growth in that sector in the euro area appears to have been rather low across all sectors.<sup>36</sup>

Considering individual countries, in the case of Germany, the correlation to the euro area average is the highest with a lead of one quarter, suggesting that wage developments in Germany have a subsequent impact on wages in other euro area countries. The positive correlation between wage growth in Spain and the EA8 during the period from 1993 to 2006 could reflect the gradual decline in compensation per employee growth rate in Spain during the run up to EMU. The low correlation between wage growth in France and the EA8 may be explained by the fact that wage contracts in the private

sector in France are, to a very large extent, concluded at the level of the undertaking, and as a result might be less affected by developments in other countries where wage settlements are more influenced by sectoral or nationwide developments. The correlation between wage growth in Belgium and the EA8 group is highest with a lead of up to eight quarters. That might be related to the wage norm in Belgium whereby wage developments over a period of two years – for competitiveness reasons – should not exceed expected wage developments in its most important trading partner economies, i.e. Germany, France and the Netherlands.

Trade relations appear to have some impact on bilateral correlations of wage growth. For example, wage growth in Germany is significantly and positively correlated with wage growth in Austria, while wage growth in France is positively correlated with wage growth in Spain. Italy shows the highest correlation with Belgium, Germany and Spain (Table 13). It is notable that wage growth in the Netherlands appears to be uncorrelated with that in other countries, pointing at the relevance of country-specific factors driving wage growth.

Has the correlation of wage growth rates across the euro area countries changed over time? For that purpose, pair-wise correlation

34 The group EA8 comprises Germany, France, Italy, Spain, the Netherlands, Belgium, Austria and Finland.

35 See Annex 5 for synchronisation of wage growth in the six major sectors in the EA8 countries.

36 See Chart 22 in Annex 5.

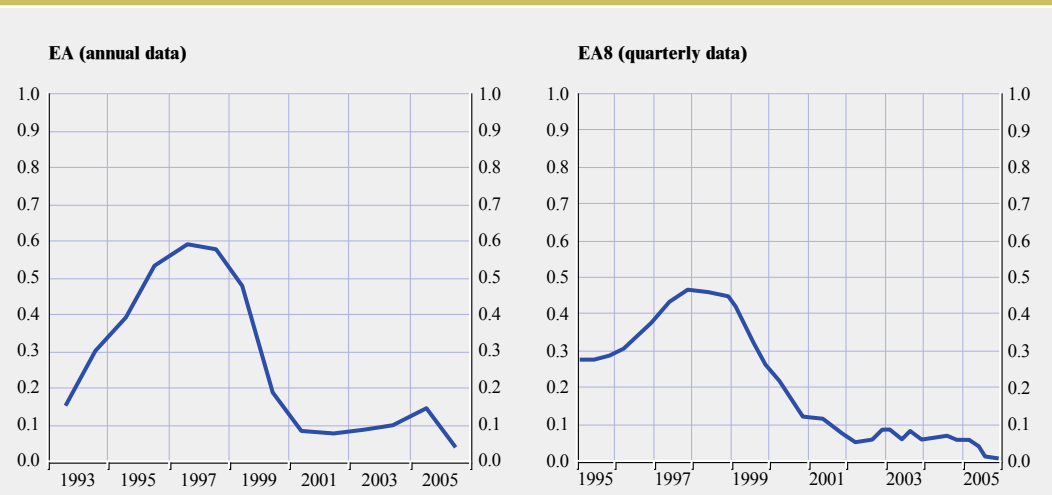
**Table 13 Matrix of contemporaneous pairwise correlations of wage growth for the total economy**

(in the period 1993 - 2006)

	BE	DE	ES	FR	IT	NL	AT	FI
BE	1.0	0.2	0.4	-0.1	0.3	0.1	0.1	-0.2
DE	0.2	1.0	0.6	0.0	0.3	0.0	0.8	-0.1
ES	0.4	0.6	1.0	0.3	0.3	0.0	0.4	-0.3
FR	-0.1	0.0	0.3	1.0	0.1	-0.1	0.1	-0.2
IT	0.3	0.3	0.3	0.1	1.0	-0.2	0.1	0.4
NL	0.1	0.0	0.0	-0.1	-0.2	1.0	-0.4	0.2
AT	0.1	0.8	0.4	0.1	0.1	-0.4	1.0	0.4
FI	-0.2	-0.1	-0.3	-0.2	0.4	0.2	0.4	1.0

Source: Own computations based on Eurostat data.  
Note: Highlighted in dark mustard are pairwise correlations above 0.5.

**Chart 15 Average correlations of compensation per employee growth, over 8-year periods**



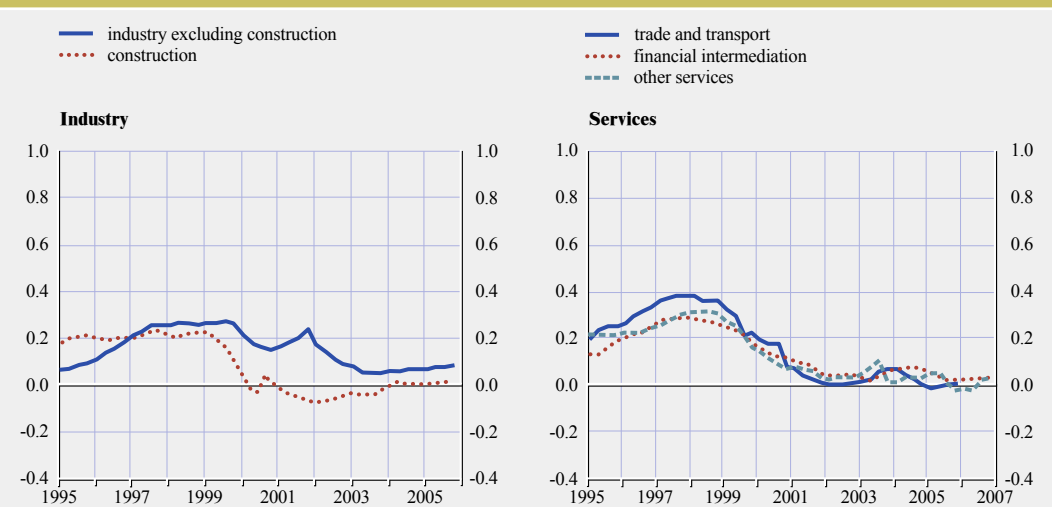
Source: Own computations based on Eurostat data.  
 Note: The charts show the average of bilateral coefficients of correlation for all the countries in the indicated group (12 or eight euro area countries), for the last eight-year period in each point in time. The group EA8 contains Germany, France, Italy, Spain, the Netherlands, Belgium, Austria and Finland.

coefficients of wage growth rates across the euro area countries have been computed over rolling periods of eight years, the average length of a typical business cycle, over the period 1981-2005. In order to provide a synthetic measure of the degree of synchronisation across countries, the unweighted average of all these

pair-wise correlation coefficients has been computed.

Chart 15 shows the average eight-year rolling correlation among the twelve euro area countries (using annual data since 1985) and among the EA8 group (using quarterly data since 1988).

**Chart 16 Average correlations of compensation per employee growth in the EA8 countries, over 8-year periods**



Source: Own computations based on Eurostat data.



This synthetic correlation measure suggests that the degree of synchronisation of wage growth among the euro area countries, following an increase in correlation in the years preceding EMU, has been very low since 2002.

As regards sectoral developments, the pattern of the synchronisation of sectoral wage developments across countries is rather similar, with an increase in correlation in the years preceding EMU particularly visible in the services sectors. However, since 1999, wage developments in individual euro area countries appear to be unrelated to those in other euro area countries in all sectors (Chart 16).

In sum, the cross-correlation analysis suggests that there are no significant co-movements in wage developments within the euro area. Across the euro area countries, countries which show some significant degree of correlation with the rest of the euro area countries are Belgium, Germany, Spain and Italy. Moreover, the correlation analysis suggests that the degree of synchronisation of wage growth among the euro area countries, following an increase in correlation in the years preceding EMU, has been very low since 2002. This suggests that the impact on wage growth of country-specific

developments across euro area countries has as yet been larger than the impact of common cyclical developments and external shocks.

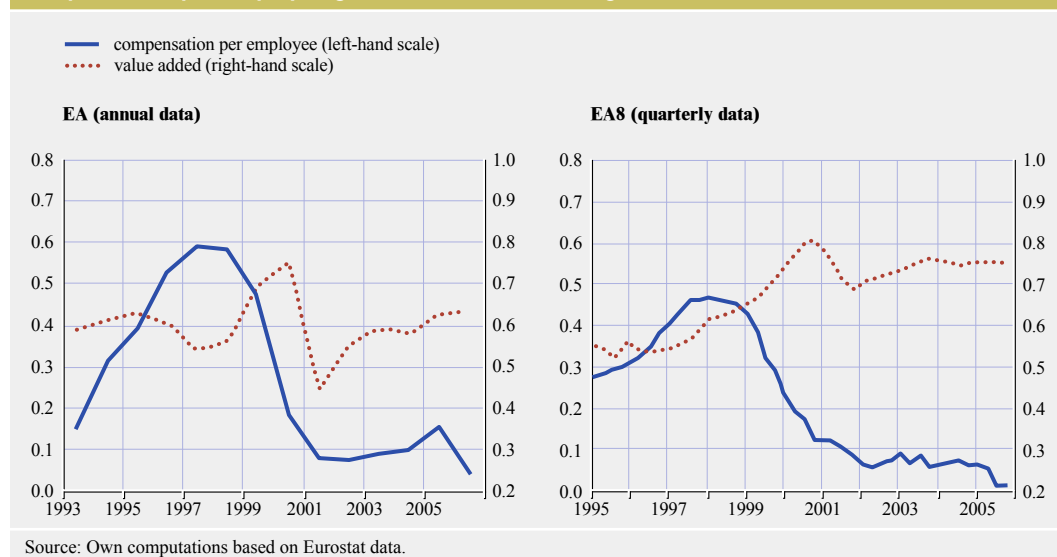
## 7.2 BUSINESS CYCLES AND WAGE GROWTH SYNCHRONISATION

This section investigates whether the degree of synchronisation of wage growth across countries is linked to the degree of synchronisation of activity developments across countries.

In this regard, we compare the degree of synchronisation of wage growth – as measured by the unweighted average of rolling correlations of compensation per employee growth among the twelve (annual data) or eight largest euro area countries (quarterly data) – with the degree of synchronisation of real activity growth – as measured by the unweighted average of rolling correlations of value added developments across the same groups of euro area countries, used as a proxy of synchronisation of business cycles.<sup>37</sup> A priori, one would expect to observe a positive relationship between these two series, as a higher degree of co-movements of business cycle developments could be linked with a

<sup>37</sup> See Chart 23 in Annex 5 for the main sectors.

Chart 17 Average of 8-year rolling correlations in the EA and in the EA8 countries of compensation per employee growth and value added growth



higher degree of co-movements of wage developments across countries.

As can be seen from Chart 17, the link between the degree of synchronisation of wage growth and of business cycles has been rather weak during the period since 1993. In particular, while the synchronisation of business cycles seems to have been high and quite stable since the early 1990s, the synchronisation of wage growth shows a protracted upward trend during most of the 1990s, followed by a downward trend between 1998 and 2002 and a rather low degree of synchronisation during the past few years. A disaggregated analysis also shows such a weak link between the synchronisation of wage growth and business cycles at the sectoral level (see Chart 23 in Annex 5).

Overall, and somewhat in contrast to a priori expectations, one can conclude that the high and rather stable degree of business cycle synchronisation seen in recent years does not seem to have had coincided with a similar degree of wage growth synchronisation. In other words, while the presence of common shocks might have played a role in the synchronisation of business cycles across euro area countries, wage growth remains dominated by country-specific factors. In a way, the low degree of wage growth synchronisation and the loose link to more synchronised business cycles might, in fact, be desirable, as in an optimal currency union with synchronised business cycles, adjustments to shocks take place via relative price and cost developments. In a situation where countries are exposed to asymmetric shocks or cumulated losses in competitiveness, one should expect differences in wage growth, and hence low synchronisation of wage growth. On the other hand, structural factors, related for example to a low degree of competition and a relatively low degree of openness in domestically-oriented sectors, might also prevent a stronger link between the degree of synchronisation of wage growth rates and business cycle synchronisation in these sectors. This might be considered a potential source for concern, in particular to the

extent that such factors prevent relative wage growth developments from following relative productivity developments.

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## ANNEX I – DATA SOURCES AND COVERAGE

Three sources of data have been used in this study: the EU KLEMS database (European Commission and Groningen Growth and Development Center), Ameco (European Commission) and Eurostat. While the former contains data on compensation per employee in terms of hours worked, the latter two contain

national account data on compensation per employee in terms of persons employed. From the sectoral database available in EU KLEMS (Table 14) six main sectors have been analysed. The main sectors are: Agriculture (corresponding to ISIC codes: 01-05), Industry excluding construction (10-41), Construction (45), Trade and transport (50-64), Financial intermediation (65-74), and Other services (75-99).

**Table 14 Sectoral data**

(EU KLEMS database)

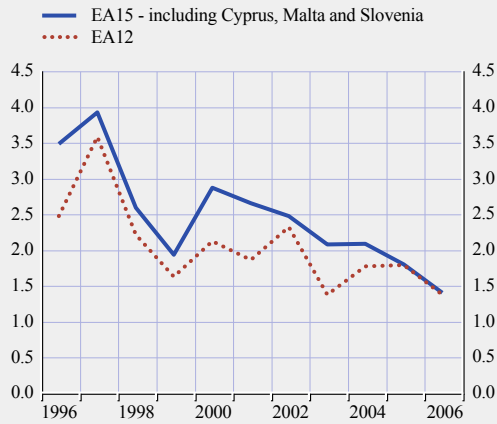
	ISIC classification
TOTAL INDUSTRIES	01-99
<b>Agriculture, hunting, forestry and fishery</b>	<b>01-05</b>
<b>Mining and quarrying</b>	<b>10-14</b>
<b>Total manufacturing</b>	<b>15-37</b>
Food, drink and tobacco	15-16
Textiles, textiles products, leather and footwear	17-19
Wood and products of wood and cork	20
Pulp, paper, paper products, printing and publishing	21-22
Chemicals, rubber, plastic and fuel products	23-25
Non-metallic mineral products	26
Basic metals and fabricated metal products	27-28
Machinery and equipments	29-33
Transport equipments	34-35
Furniture, miscellaneous manufacturing; recycling	36-37
<b>Electricity, gas and water supply</b>	<b>40-41</b>
<b>Construction</b>	<b>45</b>
<b>Wholesale and retail trade; restaurant and hotels</b>	<b>50-55</b>
Wholesale and retail trade; repairs	50-52
Hotel and restaurants	55
Transport and storage and communications	60-64
Transport and storage	60-63
Communications	64
<b>Finance, insurance, real estate and business services</b>	<b>65-74</b>
Financial intermediation	65-67
Real estate, renting and business activities	70-74
<b>Community, social and personal services</b>	<b>75-99</b>

## ANNEX 2 – THE INCLUSION OF CYPRUS, MALTA AND SLOVENIA

Chart 18 shows the difference between dispersion in compensation per employee growth, measured by the unweighted standard deviation, across the 12 initial and the 15 current euro area countries (including Cyprus, Malta and Slovenia), respectively. The chart shows that the overall conclusions remain the same when including Cyprus, Malta and Slovenia, i.e. there has been a marked decline in dispersion in the euro area 15 countries since 1996 (start of data for Cyprus). Dispersion of wage growth was somewhat higher for the aggregate of the 15 euro area countries until 2004, owing to higher wage growth in the three new euro area countries. Since then the gap has closed.

**Chart 18 Dispersion of compensation per employee growth**

(unweighted standard deviation, percentage points)



Source: Own computations based on European Commission data.

### ANNEX 3 – MEASURES OF DISPERSION

**Spread.** The simplest measure of dispersion is the spread. It is equal to the difference between the largest and the smallest value. This measure is very sensitive to extreme scores as it is based on only two values. It should not be used as the only measure of dispersion, but can be informative if used in conjunction with other measures.

**Standard Deviation.** The standard deviation  $S$  is the square root of the variance:

$$S = \frac{\sqrt{\sum_{j=1}^N (y_j - \bar{y})^2}}{N-1}$$

where  $N$  is the number of observations in the current sample and  $\bar{y}$  is the mean of the series. It is the most commonly used measure of dispersion. An important attribute of the standard deviation as a measure of dispersion is that if the mean and standard deviation of a normal distribution are known, it is possible to compute the percentile rank associated with any given score. It is less sensitive to extreme scores than the spread.

#### Mean absolute percentage deviation (MAPD).

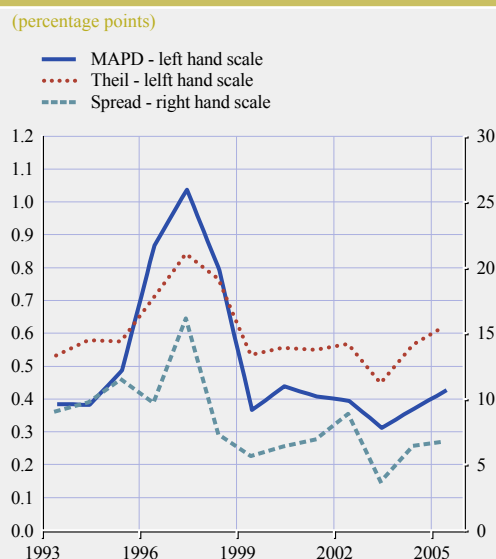
The mean absolute percentage deviation is a measure of dispersion computed as the absolute value of the percent difference of each observation to the mean.

**Theil inequality index.** Theil's  $U$  inequality index (Theil 1961) is a measure of the degree to which one time series  $X_i$  differs from another  $Y_i$ . The index is computed as

$$U = \frac{\sqrt{\frac{1}{n} \sum (X_i - Y_i)^2}}{\sqrt{\frac{1}{n} \sum X_i^2} + \sqrt{\frac{1}{n} \sum Y_i^2}}$$

$U$  varies from 0 to 1, with 1 meaning maximum disagreement.

Chart 19 Dispersion in compensation per employee growth in the total economy



Source: Own computations based on Eurostat data.

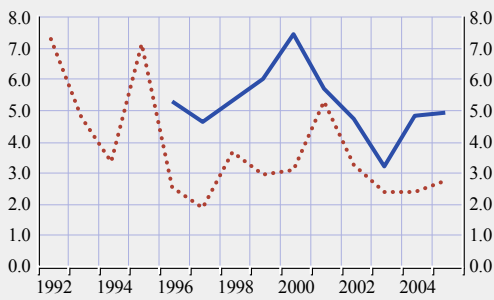


**Chart 20 Dispersion in compensation per employee growth in the six macro sectors**

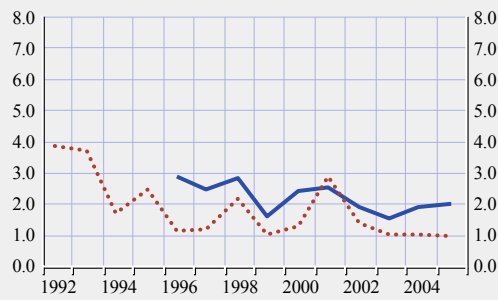
(unweighted standard deviation, percentage points)

— EA  
 ..... EA8

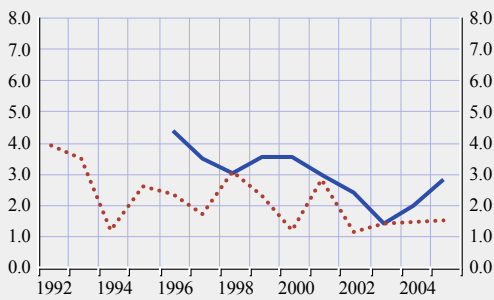
**Agriculture**



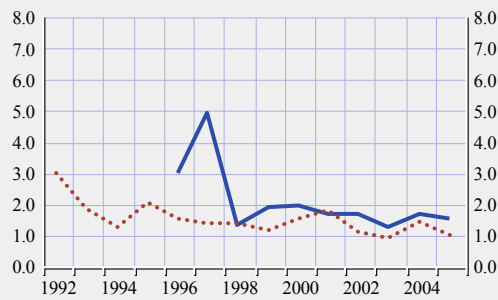
**Industry excluding construction**



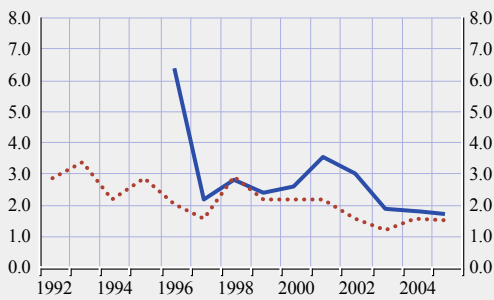
**Construction**



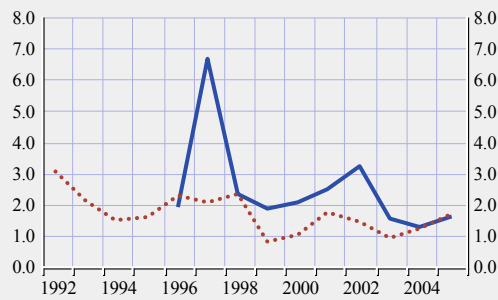
**Trade and transport**



**Financial intermediation**



**Other services**



Source: Own computations based on Eurostat data.

## ANNEX 4 – REAL WAGE LEVELS

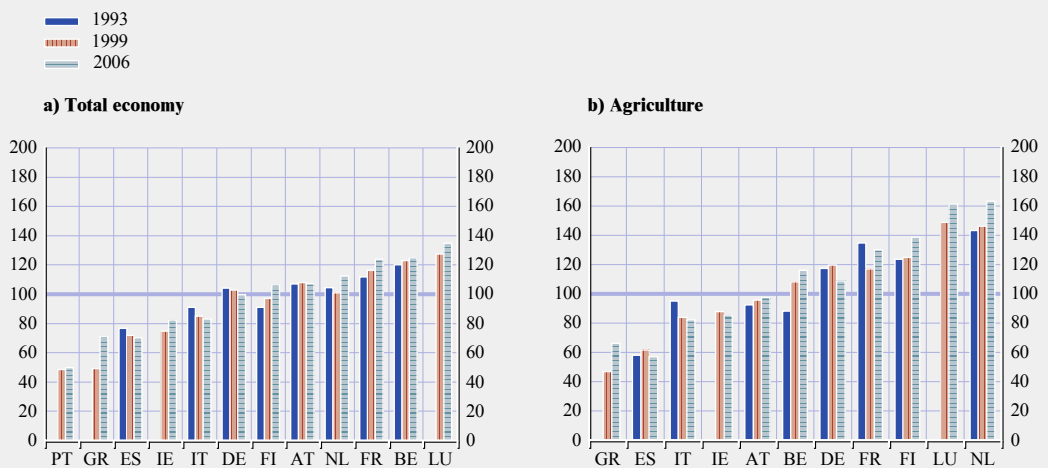
The charts below show average real wage levels per employee (nominal wages deflated by the value added deflator in the respective sector) across the euro area countries relative to the euro area level in 1993, 1999 and 2006 in the whole economy and in the six major sectors. In each sector and for each year, the real wage level of the euro area has been set to 100. For the total economy, real wage levels in most countries exhibit the same order, as in the nominal wage pattern across the euro area countries, with Portugal and Greece at the lower end of the range and France, Belgium, Luxembourg and the Netherlands at the higher end (Chart 21, panel (a)). Since 1999, the Irish real wage level has increased somewhat,

but much less than the nominal wage level. In contrast, the real wage levels in Spain and Italy have declined compared with the euro area level over the past 15 years.

Also in each of the major six sectors, the pattern of real wage levels is broadly similar to that of nominal wage levels (Chart 21 panels (b)-(g)). The Portuguese and Greek real wage levels are, in general, the lowest. In Germany, wage levels in 2006 in comparison with the euro area level are somewhat higher in real terms than in nominal terms, but still close to the euro area average. Real wage levels in France remained above the euro area level in all sectors. In contrast, real wages in Spain and Italy have declined with respect to the euro area level in basically all sectors over the past 15 years.

Chart 21 Real levels of compensation per employee across the euro area countries

(euro area = 100 for each year considered)



Source: Own computations based on Eurostat data.

Note: Greek data refer to 2005 for the total economy and 2004 for the sectors.

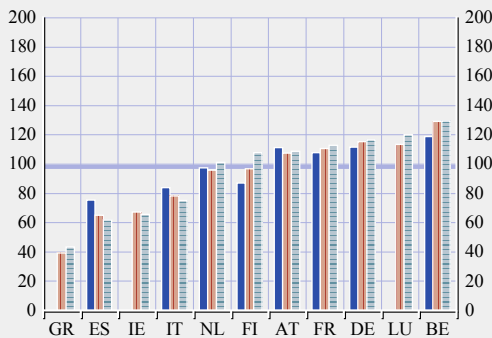
Figures are sorted in ascending order according to real level of compensation per employee in 2006.

Chart 2I Real levels of compensation per employee across the euro area countries (continued)

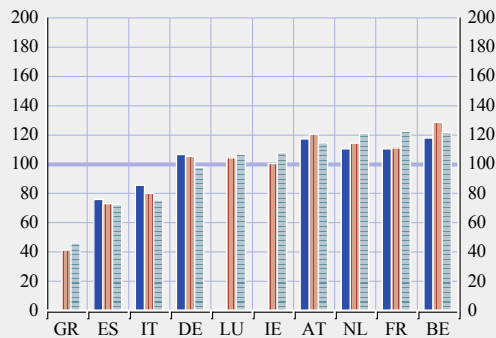
(euro area = 100 for each year considered)

■ 1993  
 ■ 1999  
 ■ 2006

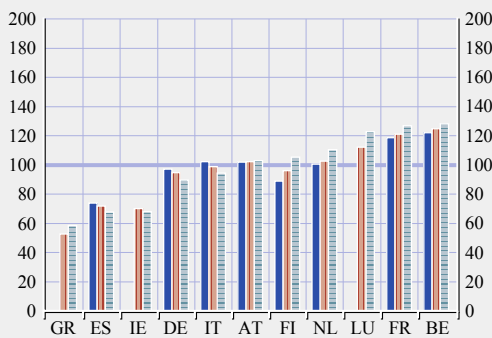
## c) Industry excluding construction



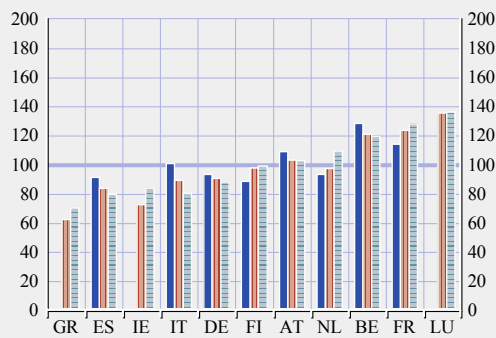
## d) Construction



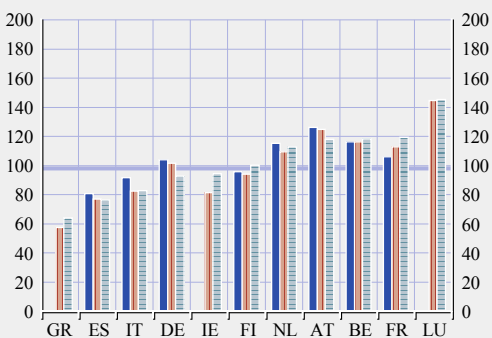
## e) Trade and transport



## f) Financial intermediation



## g) Other services



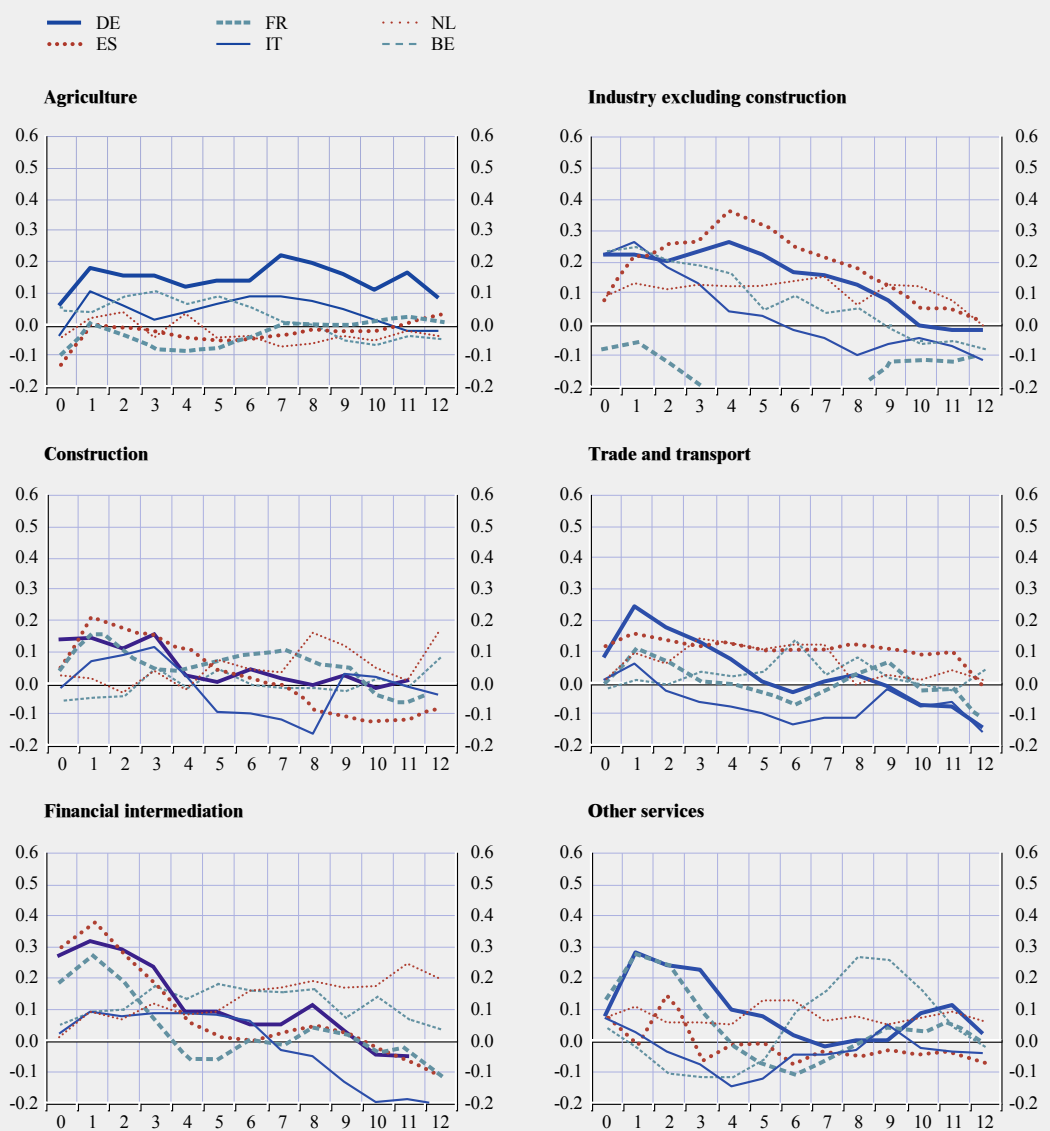
Source: Own computations based on Eurostat data.

Note: Greek data refer to 2005 for the total economy and 2004 for the sectors.

Figures are sorted in ascending order according to real level of compensation per employee in 2006.

## ANNEX 5 – SYNCHRONISATION OF WAGE GROWTH IN THE SIX MACRO SECTORS

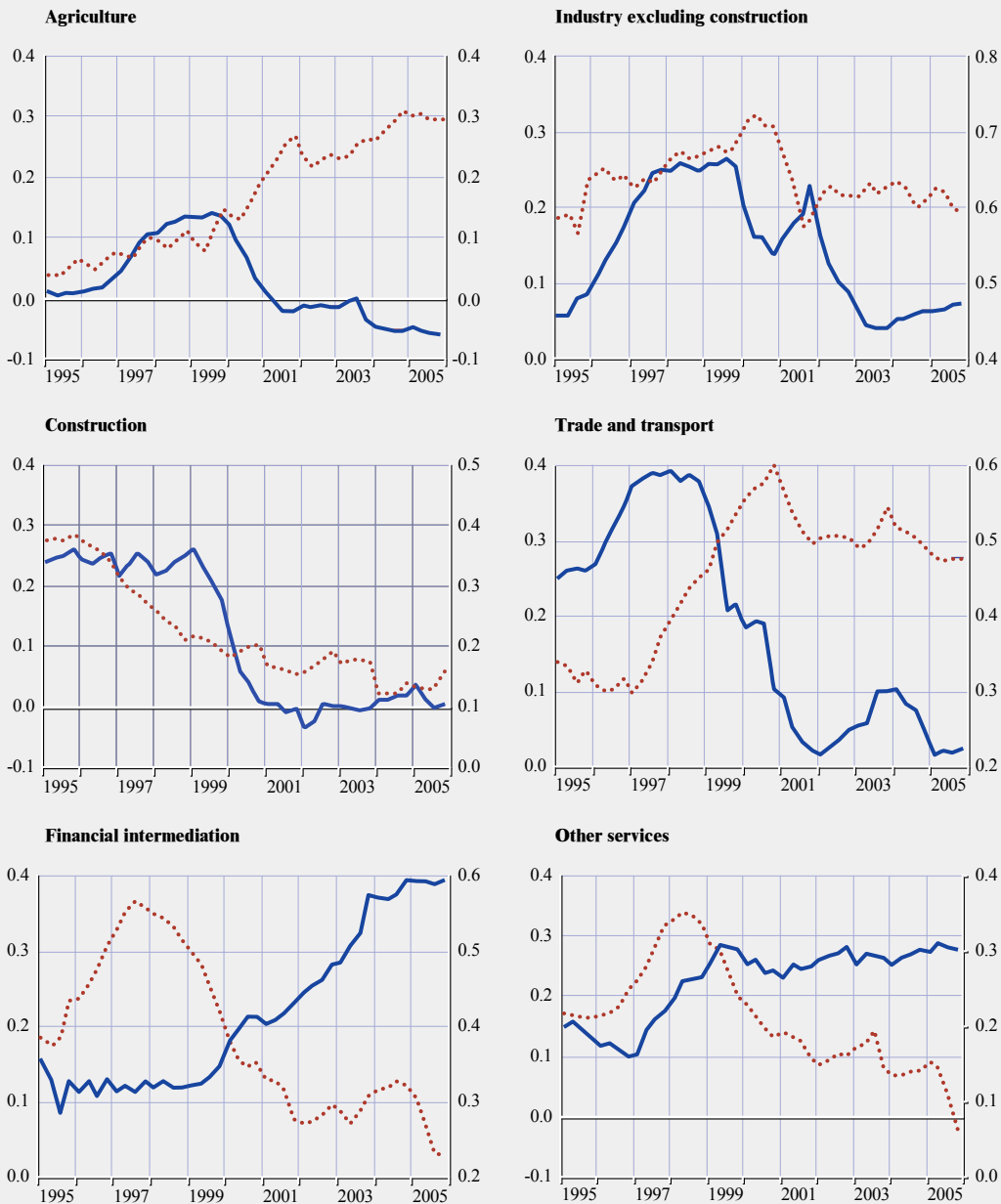
Chart 22 Cross-correlations between each of the six largest euro area countries at time  $t$  with EAB average at time  $t+i$ ,  $i=1,2,\dots,12$  quarters



Source: Own computations based on Eurostat data.  
Note: The period considered is 1993-2006.

**Chart 23 Average of 8-year rolling correlations in the EA8 of compensation per employee growth and value added growth**

— compensation per employee (left-hand scale)  
 ..... value added (right-hand scale)



Sources: Own computations based on Eurostat data.

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