EUROPEAN CENTRAL BANK

ECB EZB EKT BCE EKP

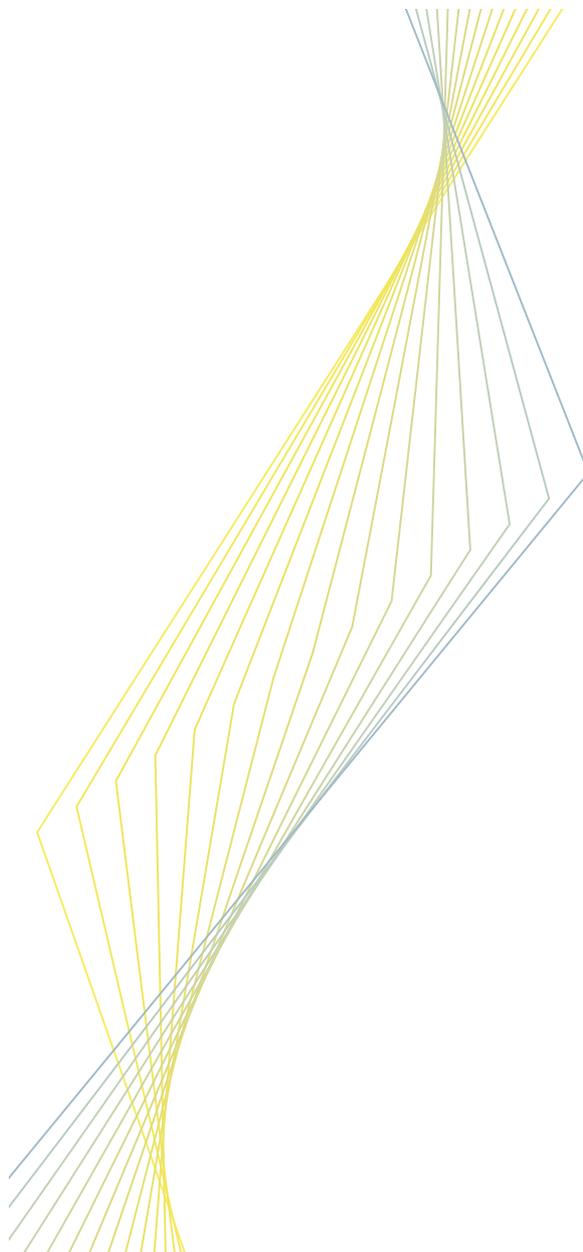# INFLATION DIFFERENTIALS IN THE EURO AREA: POTENTIAL CAUSES AND POLICY IMPLICATIONS

September 2003

INFLATION
DIFFERENTIALS
IN THE EURO AREA:
POTENTIAL CAUSES
AND POLICY
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Inflation differentials in the euro area: potential causes and policy implications

Executive summary

This report, prepared by the Monetary Policy Committee of the European System of Central Banks[1], examines the size, persistence and origins of inflation differentials in the euro area. Inflation differentials across euro area countries and their potential policy implications have been widely discussed in the economic literature in recent years and have featured prominently in economic policy debates.[2] In this context, it has sometimes been argued that inflation differentials within the euro area have increased since Stage Three of Economic and Monetary Union (EMU) started in 1999 and that these differences could not only make the implementation of the single monetary policy more difficult but could also complicate the task of finding the appropriate balance of macroeconomic policies for individual countries.

Since the start of Stage Three of EMU regional economic imbalances and (asymmetric) shocks in euro area countries can no longer be corrected by changes in monetary policy or the exchange rate. It has therefore been stated that relative price and wage flexibility and/or factor mobility have become increasingly important in correcting for such imbalances and shocks among euro area countries. In this context, inflation differentials within the euro area are a natural part of an adjustment process, rather than a problem per se for economic policy. Moreover, several studies have stressed that inflation differentials may reflect cross-country differences in real variables, such as productivity growth differentials and catching-up processes, to which economic policy would not necessarily be expected to react.

However, it has also been argued that national inflation rates will remain key for euro area countries in assessing competitiveness and that lasting inflation differentials in the euro area may therefore be a cause of concern for domestic economic policies. In this respect, inflation differentials associated with differences in the adjustment process to economic shocks across the constituent economies of the euro area could be relevant. Moreover, both common and idiosyncratic shocks could interact with imperfections in product, labour and capital markets and lead to such lasting inflation differentials. Finally, it has been stressed that inflation differentials may also reflect inappropriate domestic policies or other unwarranted domestic developments such as wage increases out of line with productivity and employment considerations, inappropriate fiscal policies, unsustainable expansions of profit margins or untenable demand developments caused by, for instance, excessive increases in house prices or financial asset price bubbles. Such differentials, if not counteracted by domestic economic policies, would lead to sustained losses in competitiveness and, ultimately, in national output and employment growth, including potentially negative consequences for growth in the euro area.

Against the background of this debate, and even though this report does not explicitly deal with the issue of economic policy responses to inflation differentials, a number of general comments can be made. As regards monetary policy, the single monetary policy of the ECB can only be geared towards the objective of price stability in the euro area as a whole. Just as in any monetary union, inflation differentials within the euro area reflect different regional price dynamics and adjustments in relative prices and, as such, cannot be addressed by the single monetary policy.

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[1] For the purpose of this report, the Monetary Policy Committee comprised experts from the European Central Bank and the national central banks of the euro area countries.

[2] Inflation differentials have also been mentioned in the discussions about the ECB's monetary policy strategy (see "Background material related to the Governing Council's reflections on the ECB's monetary policy strategy", published on the ECB's website, www.ecb.int, on 8 May 2003).

Nevertheless, to the extent that price formation processes diverge across countries, it is necessary for monetary policy to consider the size, persistence and determinants of inflation differentials in assessing the area-wide inflation dynamics. Moreover, the fact that euro area-wide monetary policy is often discussed from the viewpoint of the inflation rates observed in individual euro area countries and its implications for national economic policies implies an important communication challenge. This challenge may increase with the number and size of countries diverging in terms of their inflation rates from the euro area average and, more generally, with the magnitude of their respective differentials. A particular concern for the ECB's monetary policy strategy is to avoid that the presence of unavoidable inflation differentials – stemming, for instance, from the catching-up process in standards of living – could push lower-inflation regions within the euro area towards inflation levels that could complicate the process of economic adjustment in the presence of downward nominal rigidities. Therefore, the ECB's monetary policy strategy attributes a secondary role to inflation differentials when calibrating the safety margin for admissible inflation in the euro area. In this respect, the ECB's explicit aim of maintaining euro area inflation below but close to 2% is regarded as sufficient to address those concerns.

As to the relevance of inflation differentials to the national economic policies of euro area countries, it is worthwhile stressing that, from a national perspective, the single monetary policy stance is a given. Consequently, national economic policies, such as fiscal and structural policies, need to be adjusted to counteract persistent and potentially damaging inflation differentials. Some inflation differentials, for instance those caused by convergence or differences in the transmission of monetary policy, do not necessarily call for domestic policy actions. However, the findings of this report suggest that inflation differentials in the past few years have indeed been large and persistent enough

to justify national remedies in some countries in order to prevent undue losses in competitiveness. Over the medium term, equilibrating forces in a monetary union may work towards automatically reducing divergences. Indeed, within the euro area, cross-country inflation differentials in the tradable sectors are much lower than differentials in the services sector. Differentials in the non-tradable sectors are more difficult to curb, and policy measures can help to speed up the adjustment.

Given that there may be cases for policy intervention at the national level, well-designed structural reforms, particularly measures aimed at removing nominal wage and price rigidities and leading to a more diversified wage-setting process within individual euro area countries, can speed up the wage and price adjustments necessary to deal with shocks. These, in turn, would lower the likelihood of persistent inflation differentials in the euro area. However, differences in the speed of implementing structural reforms across countries may temporarily translate into higher inflation differentials. Asymmetric structural reforms across countries, such as lowering income taxes in one country, may have a positive short-term effect on domestic demand, so that inflation differentials may temporarily increase – although such reforms would lower the scope for lasting inflation differentials over the medium and longer run. Finally, fiscal measures, given their considerable time lags, are not well suited to the fine-tuning of inflation developments in the short run. They may be used to address inflation differentials over the longer term, particularly if a country experiences persistently positive inflation differentials. When doing so, the measures need to be carefully designed in order not to fuel inflation in the short term. In any event, fiscal measures should not endanger the medium-term aim of fiscal policy of maintaining or achieving budgetary positions close to balance or in surplus in line with the Stability and Growth Pact.

In light of these policy considerations, it has been the objective of this report to analyse the current extent, persistence and origins of inflation differentials in the euro area. The report focuses on the following key questions: *What is the size and pattern of inflation differentials in the euro area? Have inflation differentials been persistent and systematic? What can be said about the underlying reasons for the observed inflation differentials and their potential scope in the future?*

Regarding the first two questions, the following facts emerge from the analysis in this report:

• Focusing on the period since Stage Three of EMU started in 1999, various indicators of inflation dispersion in the euro area reached their lowest levels around the second half of that year, picked up modestly in the course of 2000 and have remained broadly stable since early 2001. The size of the inflation differentials observed at present is not notably different from that seen in the United States, but it is higher than observed within some individual euro area countries.

• In contrast to inflation differentials seen among regions of the United States and among regions of individual euro area countries, most countries within the euro area have witnessed relatively persistent inflation differentials in the past four years. With the exception of Luxembourg, Belgium and Finland, all countries have experienced inflation persistently above or below the euro area average since 1999. In particular, a group of five countries (Greece, Spain, Ireland, the Netherlands and Portugal) has experienced relatively large and persistently positive inflation differentials. In Italy, the differential has also been positive, but not as large. By contrast, another group of three countries (Germany, France and Austria) has observed a persistently negative inflation gap relative to the euro area average. Moreover, compared with earlier periods, Ireland and the Netherlands witnessed an

increase in their respective inflation differentials versus the euro area average from around zero to large positive values. A related issue is that differences in the evolution of inflation among the three largest euro area countries appear to have increasingly diverged since 2002. Despite the common slowdown in economic activity experienced by France, Italy and Germany, and notwithstanding the relatively similar cyclical positions of the latter two countries, inflation in core HICP components in Germany declined throughout 2002, whereas it was more or less flat in France and increased in Italy.

• Among regions within individual euro area countries, inflation differentials larger than 1 percentage point and persisting for more than two years have not been seen in the available sample period. Among regions of the United States they have occurred only in a very few specific cases. The persistence of inflation differentials seems, thus, to be a specific feature of the euro area.

However, merely comparing the size of inflation differentials observed within the euro area or regions within other countries such as the United States is not sufficient to assess the relevance of inflation differentials to the conduct of economic policy. The underlying reasons for the observed inflation differentials also need to be properly analysed, given that the adjustment between regions of a monetary union is likely to be more harmful the less flexible the goods and factor markets of these regions are.

With respect to the inflation differentials observed in the euro area it needs to be stressed from the outset that the inception of the single monetary policy implied a regime shift whose effects on price formation processes may take several years to unfold. In particular, the move to Stage Three of EMU led to very low interest rates in Ireland, Portugal, Spain and later Greece, i.e. in countries where inflation rates have been systematically above the euro area average since the mid-1990s. In most of the other

euro area countries these nominal convergence effects were considerably less sizeable. However, the equilibrating effect of changes in national competitiveness triggered by an increase in inflation differentials is likely to limit the size and persistence of inflation differences emanating from the adjustment to the new monetary regime. It should also effectively limit any potential temporary demand effects resulting from inflation differentials across euro area countries in conjunction with a single nominal interest rate. In this respect, countries with below-average inflation rates should benefit from a gain in competitiveness and also, in the short term, from the relatively smaller adverse effect of inflation on real disposable income and real wealth.

It therefore appears to be still too early to make a "final" assessment of "natural" inflation differentials in the euro area and some caution is called for in interpreting the following results of the various analyses included in the report.

- The results of an inflation accounting exercise suggest that the observed diversity in inflation rates since 1999 is mirrored by a considerable diversity in profit margin changes and unit labour cost (ULC) developments. While profit margins were dominant in explaining GDP deflator differentials relative to the euro area in Belgium, Spain, Greece, France, Ireland and Italy, differences in ULCs featured prominently in Portugal, Luxembourg, the Netherlands, Austria and Germany. For the five largest euro area countries, the sign of the observed inflation differentials seems to be systematic, i.e. a positive (negative) GDP deflator differential was reflected in relatively higher (lower) ULCs, profits and indirect taxes and, therefore, grounded in their "cost chain". The picture is different for the other countries where GDP deflator differentials were often the result of offsetting positive and negative differentials in the components. Finally, most countries with a relatively high degree of openness tend to have their

inflation differentials accounted for to a relatively larger extent by the evolution of import costs. All in all, the findings of the inflation accounting exercise suggest that the sources of the observed inflation differentials appear to vary markedly across euro area countries, pointing to the complexity of explaining the reasons for the observed inflation performances.

- A combination of factors with both temporary and more persistent effects on inflation has played an important role. As to temporary factors leading to inflation differentials, one-off domestic policy measures, such as changes in administered prices and indirect tax measures have varied across countries and, thus, contributed to the observed inflation differentials. However, these measures do not seem to have accounted for much of the observed inflation differentials since Stage Three of EMU started, and are not likely to play a larger role unless domestic policy measures increasingly diverge across euro area countries in the future.

- As to cyclical reasons, there is a positive relationship between relative cyclical positions and relative inflation rates: euro area countries with above-average inflation rates have seen the strongest average growth rates in domestic demand alongside relatively large, positive output gaps. The opposite applies to the euro area countries with below-average inflation rates. Also, cross-country differences in the fiscal policy stance may have played a role in explaining inflation differentials, notably for countries like Ireland and Greece, where fiscal policies have been relatively expansionary in the last few years.

- Different levels of exposures to external shocks, such as the marked fluctuations of energy prices and exchange rates over the last four years, also appear to have contributed to the existence of inflation differentials across euro area countries. Due to national differences in the degree of openness concerning extra euro area

trade and oil dependency, import prices and inflation have been affected differently across countries. The resulting impact on inflation dispersion should, however, be temporary.

- As regards longer-term structural factors, inflation differentials in Greece, Ireland, Portugal and, to a lesser extent, Spain may have been partially caused by price level and income convergence and/or Balassa-Samuelson (BS) effects. Conversely, low productivity growth differentials between tradable and non-tradable goods sectors in Germany may have contributed to lower-than-average inflation in this country. However, the size of the observed inflation differentials among euro area countries has been significantly higher than what the BS model would imply. In any event, the continued process towards convergence among the euro area countries should lead to a decline in inflation dispersion due to price level and income convergence in the long run. Other structural factors such as differences in the degrees of wage and price rigidities or a divergent degree of competition in key domestic markets may also have contributed to the observed inflation differentials and their persistence. In this respect, empirical studies show that the relative degree of market competition

seems to be an important parameter in explaining the size and volatility of relative price responses to symmetric shocks across euro area countries.

In the light of the above findings, it appears that differences in economic activity and in cyclical positions, while undoubtedly relevant, do not seem sufficient to explain the observed level and persistence of inflation differentials in the euro area. Instead, it seems likely that current inflation differentials are better explained by a combination of temporary and structural factors, such as the impact of the move to Stage Three of EMU, income convergence and BS effects, and possibly structural rigidities. As regards the last of these, while structural factors behind inflation differentials, such as wage and price rigidities or lack of competition, are quite difficult to identify and gauge, they are likely to be relatively more persistent than cyclical factors. Inasmuch as structural reforms in the EU continue to reduce these rigidities, making re-equilibrating movements of wages and prices faster and more widespread, the persistence of inflation differentials should tend to decrease in the long run. However, given the current heterogeneity of national economic structures and countries' exposure to idiosyncratic shocks, it is likely that some differences in inflation rates will continue to exist in the future.

1 Introduction

Inflation differentials across euro area countries and their potential policy implications have been widely discussed in economic literature[3] in recent years and have featured prominently in economic policy debates. Over the past year, international institutions have reported on increasing inflation divergence within the euro area which would pose challenges to the conduct of macroeconomic policies, particularly if prices and labour compensation exhibit rigidities.[4]

From an economic policy point of view, the issue of inflation differentials within a monetary union has been approached in different ways in these discussions. On the one hand, it has been argued that, as it is not possible to correct for regional economic imbalances and (asymmetric) shocks through a change in the ECB's monetary policy or the exchange rate of the euro, a greater reliance on factor mobility and/or relative price and wage flexibility is necessary. Inflation differentials within the euro area may thus be viewed as a natural part of this adjustment process, rather than a problem *per se* for economic policy. Moreover, in the long run inflation differentials may in principle be a reflection of cross-country differences in real variables, such as productivity growth differentials and catching-up processes, indicating a structural adjustment process within a highly integrated economic area, which in turn may not be of concern for economic policy. On the other hand, it has been argued that inflation differentials may reflect inappropriate domestic policies or other unwarranted domestic developments such as wage increases out of line with productivity and employment growth, excessive increases in house prices, unsustainable expansion of profit margins, financial asset price bubbles or an inappropriate fiscal policy stance, etc. Moreover, both common and idiosyncratic shocks could interact with imperfections in product, labour and capital markets, generating lasting inflation differentials. Such differentials could, if not counteracted by domestic economic policy, eventually lead to losses in competitiveness and, thus, in output and employment growth for those countries with relatively higher inflation rates.

Against this background, this report aims to provide some indications regarding the relative size and persistence of inflation differentials across euro area countries (Section 2). Moreover, on the basis of an inflation accounting framework, inflation developments are decomposed into the relative importance of domestic determinants, such as ULCs and profit margins, as well as external determinants, such as import prices.[5] In looking at the explanatory factors of inflation differentials in a monetary union, Section 3 of the report analyses in a stylised manner a broad variety of potential factors which could generate inflation differences. In particular, it first looks at various special or mechanical factors such as the measurement of inflation or changes in administered prices that could contribute to inflation differentials. In a second step, various structural factors are considered, such as differences in the exposure to trade and price level convergence across euro area countries. Finally, the importance of cyclical effects in explaining inflation differentials between euro area countries is assessed.[6]

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3   Recent studies by the OECD (2002a), IMF (2002), Hendrikx and Chapple (2002), Cechetti et al. (2000), Rogers (2001, 2002), Sinn and Reutter (2001) and Alberola (2001) feature prominently.

4   Inflation differentials have also been mentioned in the discussions about the ECB's monetary policy strategy (see "Background material related to the Governing Council's reflections on the ECB's monetary policy strategy", published on the ECB's website [www.ecb.int] on 8 May 2003).

5   The cut-off date for the inclusion of national accounts data was end-March 2003.

6   Various annexes are attached to each section of the report to provide additional background information on the respective topics.

2 Trends in inflation diversity and inflation persistence in the euro area

2.1 Trends in the measures of dispersion

This section briefly assesses the degree of inflation dispersion across the euro area countries. For this purpose, it is useful to provide some references or benchmarks in order to judge whether the observed degree of dispersion can be considered high or low. A first reference, an "internal benchmark", is a historical perspective of the evolution of dispersion of overall inflation across the euro

area countries since 1990 when the EMU process started. However, given that the euro area represents not only a rather recent but also a unique and unprecedented monetary union, past experience may not provide the best reference. The analysis is therefore extended to provide some "external benchmarks", comparing the degree of diversity in the euro area to the diversity observed in other countries for which adequate data are available. In particular, external benchmarks (i.e. measures of

Chart 1

Inflation dispersion in the euro area and the United States (14 MSAs)
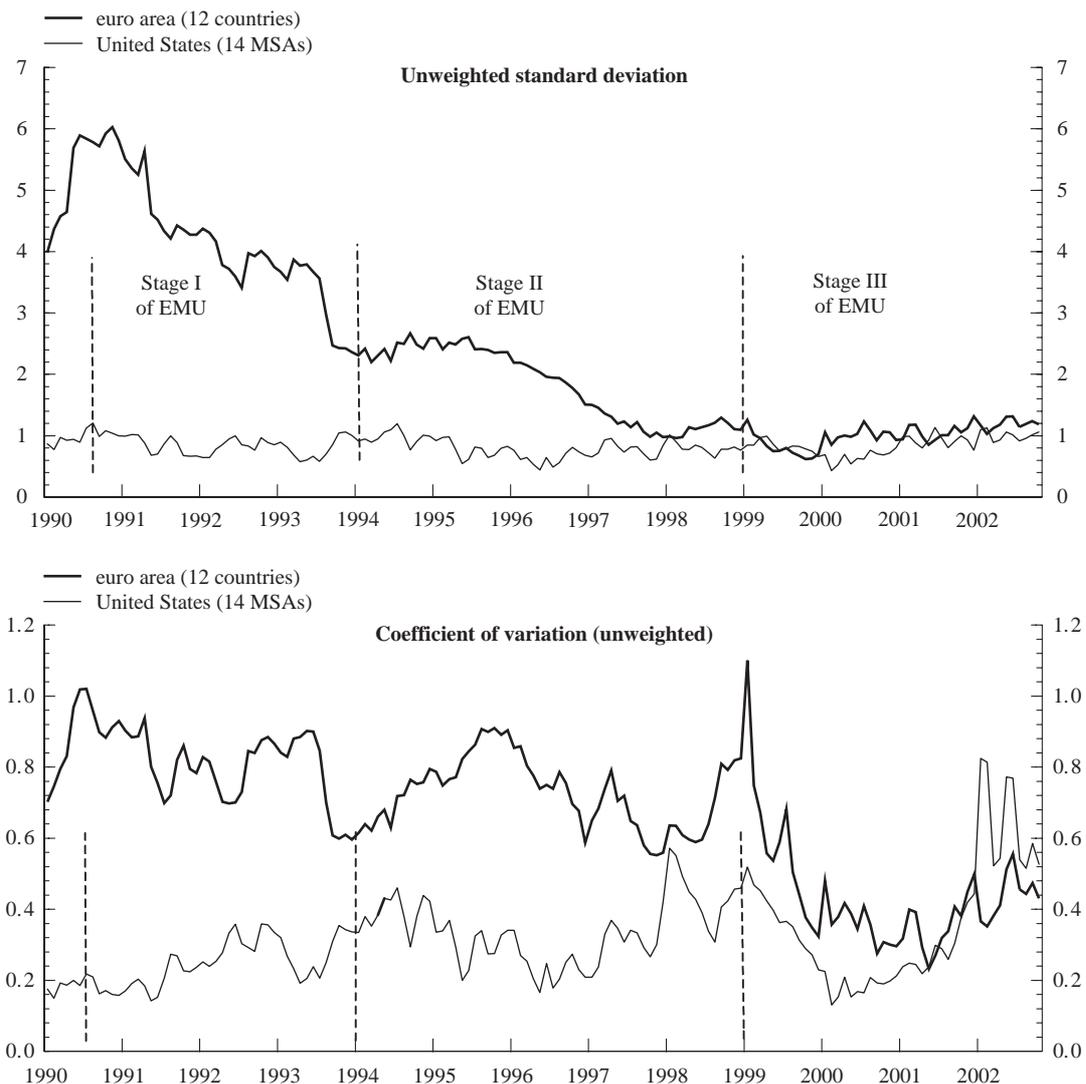
Sources: Eurostat, BLS and ECB calculations.

dispersion) have been computed across different regions/states of the United States, Germany, Spain and Italy. Chart 1 shows developments in inflation dispersion (using the unweighted standard deviation and the coefficient of variation) for the euro area and the 14 Metropolitan Statistical Areas (MSAs) of the United States since 1990. Several other standard indicators can also be used for this purpose. Annex A.1 elaborates on the various measures, their properties and shows their behaviour.

As to the euro area, the degree of consumer price inflation dispersion (in terms of the standard deviation) decreased over time, especially during the second half of the 1990s. The unweighted standard deviation has fallen from around 4 percentage points at the beginning of the 1990s to about 1 percentage point since the beginning of Stage Three of EMU in January 1999. However, the lowest values of inflation dispersion were reached in mid-1999. Afterwards, inflation dispersion picked up in 2000, but has changed little since early 2001. The coefficient of variation (i.e. the standard deviation divided by the mean) shows a different profile as the decline in the standard deviation is adjusted by the fall in average inflation. Judged by this measure, the

Chart 2

Inflation dispersion in the euro area, Spain, Germany and Italy

— euro area (12 countries)
— Germany (11 states)
----- Spain (18 Aut. Communities)
— Italy (12 cities)

Unweighted standard deviation

— euro area (12 countries)
— Germany (11 states)
----- Spain (18 Aut. Communities)
— Italy (12 cities)

Coefficient of variation (unweighted)
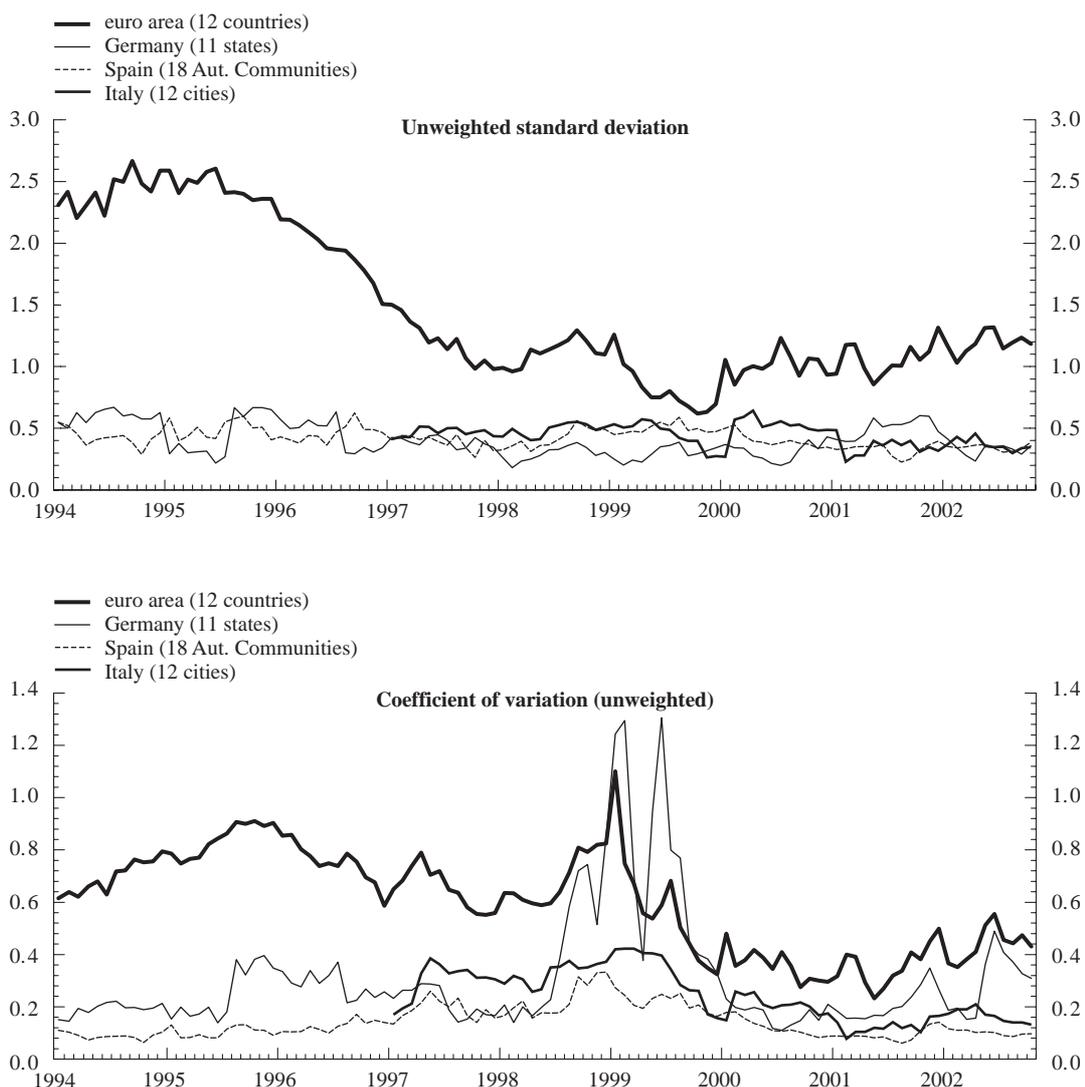
Sources: Eurostat, national statistical offices and ECB calculations.

dispersion fluctuated around a roughly constant value over most of the 1990s, and has fluctuated around a somewhat smaller value since the inception of Stage Three of EMU. The United States had a much lower degree of dispersion until around 1997. However, since then and in particular since the start of Stage Three of EMU, the degree of dispersion in the euro area seems to be almost the same as that observed within the United States. As shown in Annex A.1, other measures provide broadly the same result.

When compared with the degree of dispersion within some individual euro area countries, inflation dispersion within the euro area is still relatively high (see Chart 2). In particular, the degree of dispersion within the euro area is around twice the comparable measures computed across the German Länder, the Spanish Autonomous Communities and the Italian cities.[7]

It is also worth noting that the degree of dispersion measured within these three countries was rather similar. In particular, the unweighted standard deviation has been systematically moving around 0.4 percentage points for the entire available period despite the introduction of the euro.

Summing up, the degree of dispersion in inflation within the euro area is not notably different from that seen in the United States. However, the current degree of inflation dispersion in the euro area is higher than within some individual euro area countries. The different results obtained for the degree of dispersion within the United States, within the euro area and within the aforementioned individual euro area countries have to be seen in the light of differences in the degree of economic policy centralisation and geographical distance. The relatively greater degree of fiscal policy decentralisation in the United States in terms of government measures affecting administered prices and indirect taxation could tentatively explain the higher degree of inflation dispersion within the United States compared with some individual euro area countries. Also, the

larger geographical distances in the United States could play a role. In a similar vein, more centralised fiscal, labour and product market policies together with statistical reasons may well account for the lower degree of dispersion seen within some individual euro area countries compared with the euro area.[8]

2.2 Country developments behind euro area inflation dispersion

A natural deepening of the previous analysis is to focus in more detail on the inflation differentials of euro area countries relative to the euro area average. As can be seen in Table 1 and Chart 3, Greece, Spain and Portugal have had relatively large and persistent, although declining, positive inflation differentials since 1990. On average, between 1999 and 2002 the inflation differential increased somewhat from around 1 to 1.5 percentage points in these countries. In Italy, the differential was also relatively large and persistent up until the start of Stage Three of EMU, but has shrunk to around 0.3 percentage point on average since then. In the cases of Ireland and the Netherlands, a relatively sizeable positive inflation differential relative to the euro area average has been observed only during the last few years. These two countries had negative differentials during most of the 1990s. In contrast, Germany, France and Austria have experienced persistently negative inflation differentials of around 0.5 percentage point over the last four years, in line with trends before the inception of EMU. After being mostly below the euro area average in the 1990s, Belgium, Luxembourg and Finland have remained close to the euro area average in recent years. In 2002, however, the differentials in Belgium and Germany widened

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7   See Alberola and Marqués (2002) for evidence of regional inflation differentials in Spain.
8   In this respect, it needs to be borne in mind that certain prices are quoted centrally for the country as a whole and, thus, the dispersion of inflation calculated across regions of an individual country may appear somewhat lower than across euro area countries.

Table I

Inflation differentials across countries relative to the euro area average

(annual averages in percentage points)

	1990-1993	1994-1998	1999-2002	1999	2000	2001	2002
Belgium	-1.1	-0.4	-0.1	0.0	0.4	0.0	-0.7
Germany	-0.6	-0.6	-0.6	-0.5	-0.7	-0.5	-0.9
Greece	12.9	5.4	1.1	1.0	0.6	1.2	1.7
Spain	1.9	1.3	1.2	1.1	1.2	1.2	1.4
France	-1.1	-0.5	-0.5	-0.6	-0.5	-0.7	-0.3
Ireland	-1.6	0.3	2.1	1.3	2.9	1.5	2.5
Italy	1.6	1.5	0.3	0.5	0.3	0.2	0.4
Luxembourg	-0.6	-0.6	0.3	-0.1	1.5	-0.1	-0.2
Netherlands	-1.4	-0.3	1.3	0.9	0.0	2.6	1.7
Austria	-0.8	-0.4	-0.4	-0.6	-0.4	-0.2	-0.5
Portugal	6.0	1.2	1.2	1.0	0.5	1.9	1.4
Finland	0.3	-0.9	0.2	0.2	0.6	0.2	-0.2

Sources: Eurostat and ECB calculations.

to close to -0.8 percentage point on average.[9]

Grouping countries together, it can be argued that there has been a relatively large and persistent inflation gap between countries which mostly have been above the euro area average over the last four years (Greece, Ireland, the Netherlands, Spain and Portugal) and countries which mostly have been below the average (Germany, France and Austria). For most of these countries, the same differentials were also apparent in the years before the start of Stage Three of EMU. Ireland and the Netherlands, however, have witnessed an increase in inflation rates in recent years, seeing their respective inflation differentials shift from around zero to well in the positive zone. Recently, however, the positive Dutch inflation differential, while still high, has started to decline again. In Belgium, Luxembourg and Finland, the negative differential before the Start of Stage Three of EMU has declined to around zero since 1999, and the inflation rate in Italy has fallen to a level closer to the euro area average.

In contrast to the euro area, inflation differentials larger than 1 percentage point and persisting more than two years have not been seen among regions of individual euro area countries in the available sample (Germany, Spain and Italy) and only in a very few specific cases within the United States (14 MSAs). The maintenance of relatively sizeable and lasting inflation differentials seems, therefore, to be a specific feature of the inflation diversity within the euro area.

As regards the countries with above-average inflation rates, Ireland and – though to a lesser extent – the Netherlands, Portugal, Greece and Spain have experienced relatively persistent positive inflation differentials of at least 1 percentage point on average since 1999. Some notable differences in inflation developments emerge between the aforementioned countries. The positive inflation differential in Ireland has been stubbornly high since 1999. While Greece experienced its largest positive inflation differentials in the years before adopting the euro, the size of the inflation differential declined from 1999 to 2001, and started to rise again thereafter. By contrast, the Netherlands experienced the largest positive differentials towards end-2001, with a gradual decline in the differential since then. The

9 *In Belgium, the overall HICP inflation rate in 2002 was strongly affected by measures in the field of administered prices. Adjusting for this effect, the differential in 2002 would have been close to zero.*

Portuguese differential rose sharply in early 2001, mostly on account of one-off tax measures, and remained on average some 1.6 percentage points above the euro area figure thereafter. Finally, Spain's positive inflation differential has risen gradually since autumn 2001. The decomposition into HICP components reveals that the Netherlands and – to a lesser extent – Greece experienced a decline, on average, in their differentials of

Group of countries mostly above the euro area average

Group of countries mostly below the euro area average
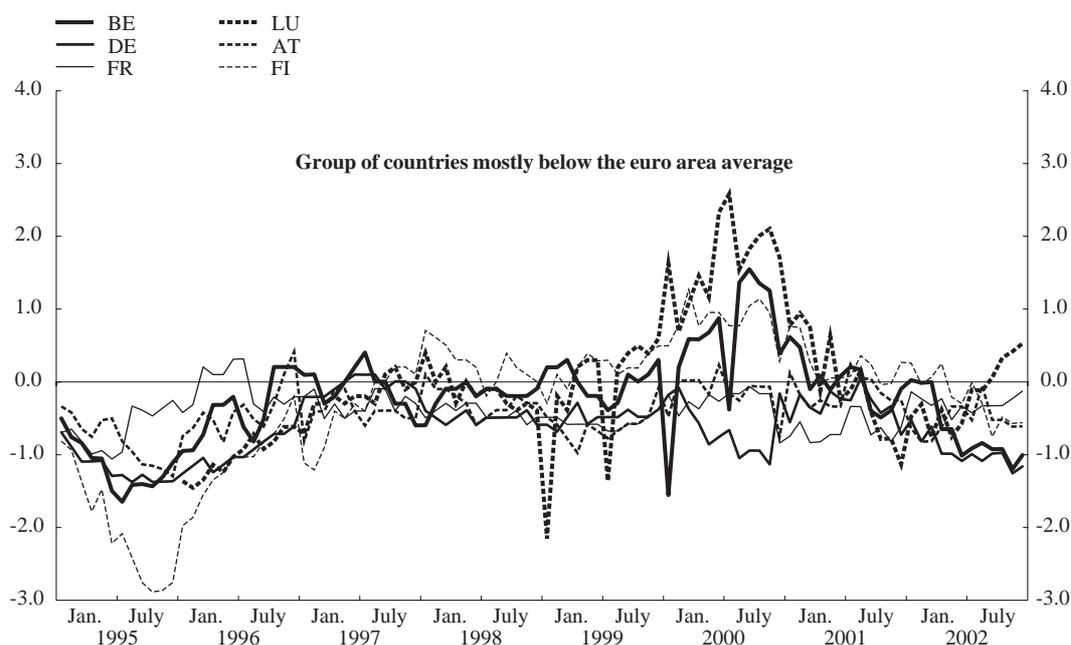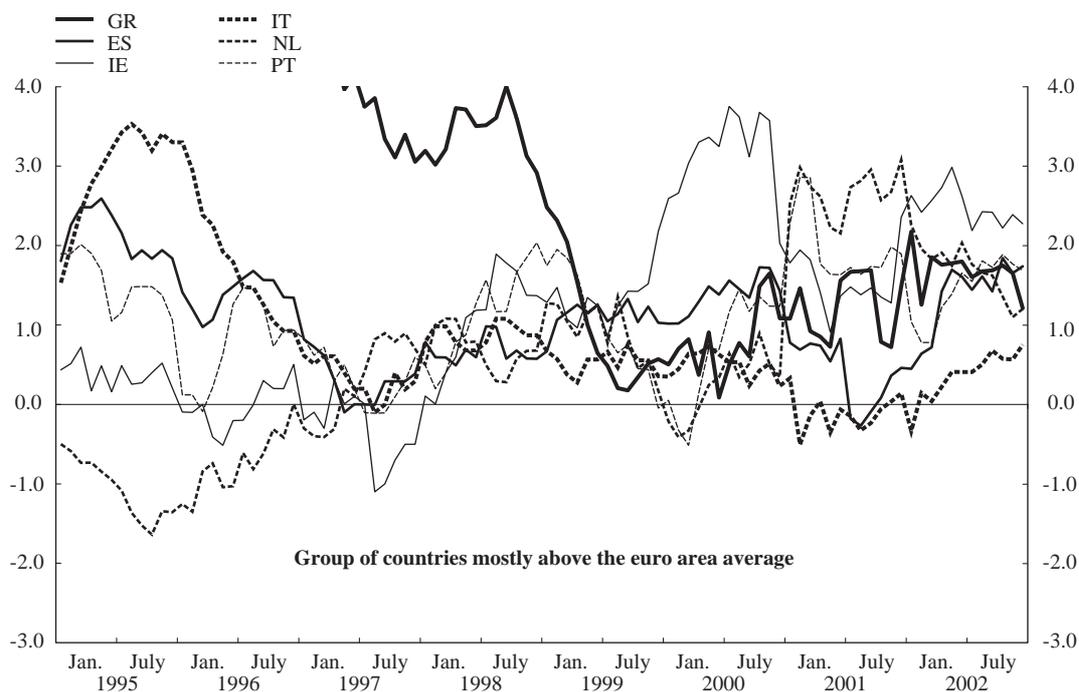
Sources: Eurostat (HICP) and BIS (CPI).

some of the core components of the HICP in 2002 (e.g. services and the HICP excluding unprocessed food and energy (HICPX)), whereas the opposite was observed in Portugal and Spain. In Ireland, the HICPX inflation differential remained on average more or less constant in 2002, whereas the positive inflation differential in services declined gradually during 2002. All in all, these findings suggest a relatively high persistence of inflation differentials in key components of the HICP in some of the countries with above-average inflation rates.

As for the group of countries with relatively persistent negative inflation differentials, Germany has experienced a gradual increase in its negative differential since 2002, whereas Austria's differential has remained fairly constant and the differential observed in France has declined gradually. As regards the developments in key HICP components in 2002, Germany experienced a gradual widening of the HICPX differential and, to a lesser extent, the services differential. The widening of the services differential was also observed in Austria, but the negative HICPX differential remained fairly constant in 2002. By contrast, France witnessed a declining negative differential both to the HICPX and to the services average. Finally, it should be

noted that the overall Belgian inflation differential turned markedly negative in 2002, particularly on account of a widening negative differential in the services and energy components of the HICP. However, as mentioned before, most of this development can be attributed to changes in administered prices.[10]

In line with these findings, Chart 4 shows that – on the basis of the unweighted variance – some 60% of the slight increase in euro area inflation dispersion since mid-1999 has been caused by inflation dynamics in countries with above-average inflation rates such as Ireland and, to a lesser extent, the Netherlands, Greece and Portugal. Below-average inflation in Germany and Belgium has contributed some 30% to the moderate increase in the variation of inflation rates in the euro area since mid-1999. As regards the dispersion within core HICP components, Chart 4 reveals that more than 70% of the overall increase in inflation dispersion in services and around 45% of the overall

10 Due to the abolition of the radio and television license fee, it is not surprising that the decline in HICP services was particularly large in Belgium. If corrected for this effect and other exceptional factors (e.g., one-off reductions in gas and electricity tariffs related to the liberalisation of energy markets), Belgium's HICP inflation performance in 2002 would have been very close to the euro area inflation rate.

Chart 4

Country contributions to changes in inflation dispersion between 1999 and 2002

HICP
HICP services
HICPX

Contribution to the increase in the variance of HICP inflation and its main components (annual average rates); percentage change between 1999 and 2002
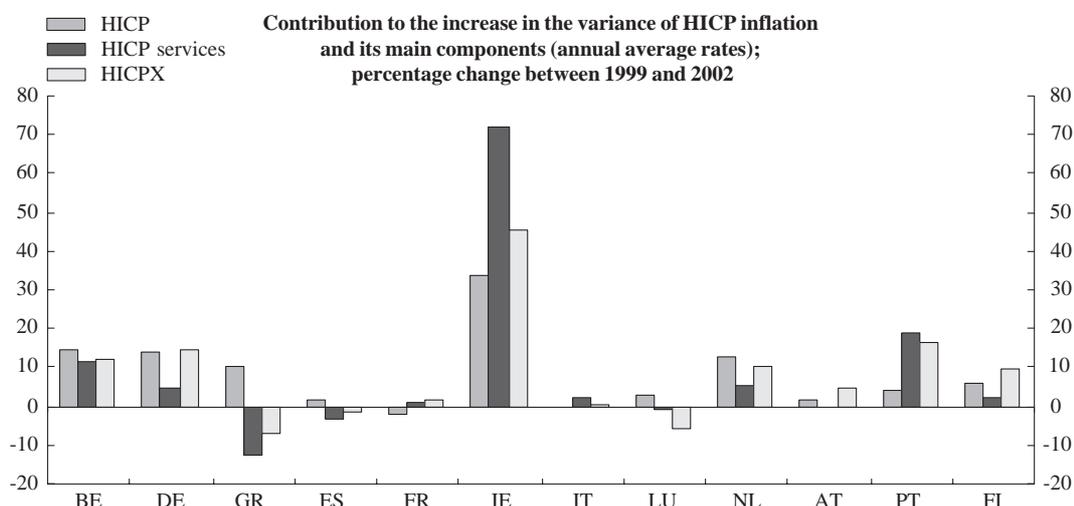
Sources: Eurostat and ECB calculations.

increase in dispersion of the HICPX can be explained by the inflation performance in Ireland during the period from 1999 to 2002.

In this context, it is also worth noting that the HICP inflation rates of the three largest euro area economies have increasingly diverged since early 2002 (Chart 5; left-hand panel), even if adjusted for differences in the impact of volatile energy prices and changes in prices of unprocessed food (HICPX; see Chart 5; right-hand panel). Indeed, since early 2002 HICPX inflation has steadily declined in Germany, remained more or less constant in France and increased steadily in Italy. These trends were particularly marked in one of the key HICP components, namely HICP non-energy industrial goods. For this component, inflation in Germany declined from 0.7% in December 2001 to -0.2% in December 2002, whereas it declined only from 1% to 0.7% in France over the same period. In Italy, however, price increases for non-energy industrial goods accelerated from 1.6% to 2.7% over the same period, despite the fact that it appears to be in nearly the same cyclical position as Germany (see also sub-section 3.3.1 of the report). Relative changes in services prices appear to explain the bulk of the recent increase in the inflation differential between Germany and France. While German service price inflation declined from 1.9% at end-2001 to 1.7% in December 2002, French service price inflation accelerated from almost 2% at end-2001 to

nearly 3% in December 2002. This lack of synchronisation in inflation dynamics in core euro area countries, particularly between France and Germany, appears to be rising at present. As to the possible underlying reasons for the recent increase in inflation diversity among the three largest euro area countries, divergent movements in ULCs may offer an explanation (for further details see sub-section 2.3 on inflation accounting).

In sum, the analysis of inflation developments across euro area countries over the past four years reveals that Ireland, the Netherlands, Greece, Portugal and Spain witnessed relatively persistent and large positive inflation differentials, whereas Germany, France and Austria experienced a persistently negative inflation gap relative to the euro average. While the size of the currently observed inflation differentials across euro area countries is not notably different from that seen in the United States, the differentials are relatively more persistent. In this respect, it is noteworthy that inflation in Ireland has continuously been well above the euro area average since 1999 and increasingly so especially in core HICP components such as services prices. Also, Greece and Spain's positive inflation differentials rose in 2002. By contrast, a few other countries with above-average inflation rates, namely Portugal and the Netherlands, have recently experienced declines in their respective positive inflation differentials (see Table 1).

Inflation trends in the big three euro area countries

(in percentage points)
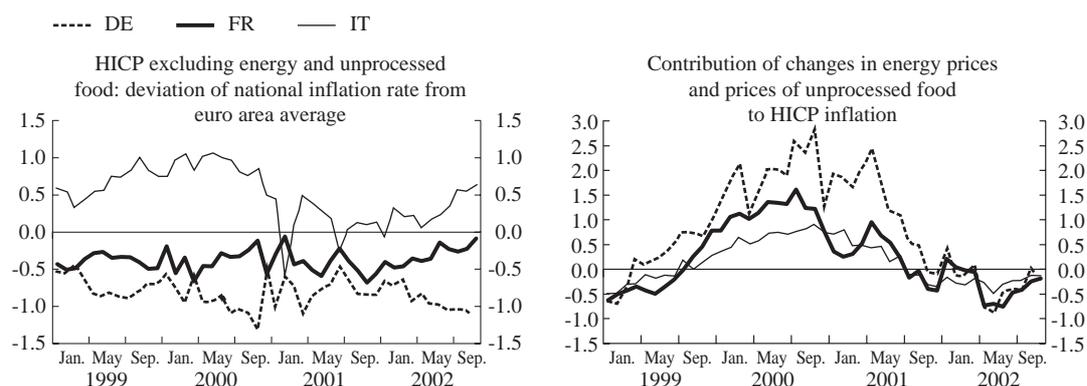
Sources: Eurostat and ECB calculations.

However, their positive differentials are still large and it is too early to assess whether this is a reflection of a convergence process back to the euro area average or, if so, how fast this adjustment would take place. Moreover, inflation developments among the largest three euro area countries appear to have increasingly diverged since early 2002. Despite the common slowdown in economic activity experienced by France, Italy and Germany, and notwithstanding the relatively similar cyclical positions of the latter two countries, inflation in core HICP components in Germany declined throughout 2002, whereas it remained more or less flat in France and increased in Italy. The bulk of this divergence seems to be related to marked differences in price changes of core HICP components, such as services and non-energy industrial goods, and may warrant further monitoring/analysis in the future.

2.3 Inflation accounting

An inflation accounting framework makes it possible to determine the relative contributions of internal factors, such as ULCs, profit margins and indirect taxes, as well as external factors, such as import prices, to the observed inflation differentials. The accounting framework decomposes changes in the GDP deflator and final demand deflator of the euro area countries into domestic and external factors using annual national accounts data for the period from 1992 to 2002, focusing particularly on the period from 1999 to 2002.[11] ULC developments are further broken down into compensation growth per employee and productivity developments. Given the focus on inflation differentials, the inflation accounting exercise emphasises the determinants of inflation differentials across euro area countries rather than the drivers of inflation developments within individual euro area countries. For this purpose, developments in each of the relevant cost and price components of the euro area countries are normalised and reflect the deviation of each respective variable from the euro area average (Table 2).

Concerning the decomposition of differences relative to the euro area in final demand deflator changes into contributions from differences in domestic and imported costs, the analysis reveals a mixed picture for the euro area countries. While divergent domestic cost developments have been the driving force behind observed differences in the final demand deflator in seven countries (Germany, Greece, Spain, Italy, the Netherlands, Austria and Portugal) on average since 1999, diverse changes in imported costs were on average more dominant in explaining the observed final demand deflator inflation differentials in Belgium, France, Ireland, Luxembourg and Finland over the same period. This suggests that changes in import costs tend to account for the inflation differentials of most countries with a relatively high degree of openness and/or oil dependency, with the Netherlands being a notable exception. Apart from this finding, it is noteworthy that in the other countries domestic and external cost components have often moved in opposite directions (both across countries and relative to the euro area average), thus highlighting the complexity of inflation dynamics and the diversity of the underlying sources of inflation in the euro area. Finally, the relative diversity of changes in import prices in 2001 and 2002 was markedly lower than in the past, particularly if compared with 2000 when energy prices rose substantially, leading to a relatively high degree of diversity in import price changes and, thus, in final demand deflator developments.[12]

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11 *The inflation accounting framework is based on an end-March 2003 cut-off date for annual national accounts data derived from the AMECO database for the period from 1992 to 2002. For Portugal and Luxembourg, however, the compilations are based on data provided by the respective national central bank. For Greece, the data used need to be interpreted with caution, given that sector-specific employment developments tend to lead to an upward bias in labour productivity growth and, thus, a downward bias in ULC growth. For more details on the accounting framework, including country-specific results, see Annex A.2.*

12 *A more detailed analysis of the contribution of import price developments to inflation diversity in the euro area is conducted in sub-section 3.2.1 of this report.*

As to the decomposition of differences in GDP deflator changes across euro area countries from 1999 to 2002, the results again provide a fairly mixed picture. While differentials in ULC changes were the most important contributor to the observed differences in GDP deflator changes in five euro area countries, namely Germany, Luxembourg, the Netherlands, Austria and Portugal, differentials in profit margin changes were dominant in explaining GDP deflator differentials in Belgium, Spain, Greece, France Ireland and Italy. In this context, it is noteworthy that most of the countries with above-average GDP deflator changes also experienced above-average ULC growth, and vice versa.

Diverse trends in profit margin and ULC developments within euro area countries appear to have also played an important role in explaining the size of the observed GDP deflator differentials. For instance, among those countries with relatively high ULC growth, Luxembourg (in 2001 and 2002) and, to a lesser extent, Portugal (in 2000) experienced a partially offsetting decline in profit margins, limiting the increase in the GDP deflator and, thus, the positive inflation differential. By contrast, in Ireland, Spain[13], the Netherlands and Italy, above-average profit margin growth added to inflationary pressures resulting from above-average ULC growth.[14] More generally, it can be noted that

13 See Estrada, A. and J. López-Salido (2002) for evidence on Spain.
14 This finding is in part a consequence of the fact that profit margins are calculated in nominal terms, which implies that they will grow relatively stronger in countries with relatively higher inflation rates. For an alternative approach see, for instance, Ortega (2003). The author stresses the importance of sectoral differences in profit margins and ULC growth between, inter alia, several euro area countries, such as Spain, Italy, France and Germany, in explaining persistent differences in relative sectoral price developments across countries on the basis of sectoral input-output data.

Table 2
Results of the inflation accounting exercise for the period from 1999 to 2002

| | Final demand deflator | | | GDP deflator | | | | Unit labour costs | | |
| | Contribution to change | | | | Contribution to change | | | | Contribution to change | |
	Total change in %	Domestic costs	Import costs	Total change in %	Unit labour costs	Gross operating surplus	Indirect taxes	Total change in %	Compen- sation	Inverse produc- tivity
			In percentage points if not otherwise noted							
EU12	1.90	0.94	0.98	1.92	1.22	0.49	0.21	2.05	2.78	-0.72
			Deviation of average growth rate of each variable from the euro area average (in percentage points)[1]							
BE	0.42	-0.22	0.65	-0.25	0.16	-0.30	-0.11	0.15	0.48	-0.33
DE	-1.00	-0.85	-0.14	-1.15	-0.63	-0.49	-0.03	-1.07	-1.06	-0.01
GR	1.26	1.47	-0.22	1.35	-0.23	1.32	0.26	-0.35	2.88	-3.18
ES	1.36	1.23	0.12	1.65	0.67	0.71	0.27	1.07	1.03	0.05
FR	-0.87	-0.43	-0.45	-0.75	-0.23	-0.29	-0.22	-0.31	-0.35	0.04
IE	2.25	0.99	1.24	3.17	0.91	1.95	0.31	2.10	5.00	-2.81
IT	0.44	0.49	-0.05	0.31	0.10	0.26	-0.05	0.32	-0.23	0.54
LU	0.64	-0.65	1.28	0.34	1.35	-1.18	0.17	2.79	1.21	1.44
NL	1.22	0.92	0.30	1.79	1.12	0.20	0.46	1.87	1.56	0.30
AT	-0.82	-0.97	0.13	-0.65	-0.76	0.28	-0.17	-1.31	-0.86	-0.46
PT	1.36	1.66	-0.32	2.11	1.80	-0.12	0.43	2.57	2.87	-0.31
FI	-0.56	-0.06	-0.51	-0.15	-0.04	0.14	-0.26	0.11	0.61	-0.53

Sources: AMECO, Banco de Portugal, Banque Centrale du Luxembourg and ECB staff.
1) The numbers in the table can be interpreted as follows: In the case of Belgium, for instance, the total change in the final demand deflator was 0.42 percentage point higher than in the euro area as a whole. The contribution from average import cost change to the observed differential in final demand deflator inflation was some 0.65 percentage point, whereas differences in domestic costs contributed some negative 0.22 percentage point to the final demand deflator differential.

the deflator differentials of the five largest euro area countries can be traced back to differentials of the same sign in the components. Countries with above-average inflation also tend to have above-average changes in all respective components, and vice versa (the only partial exception is Italy). For the five largest euro area countries, the sign of the observed inflation differentials therefore seems to be not only systematic but also grounded in their "cost chain".

Table 2 also shows that the impact of differences in net indirect tax changes on developments in the GDP deflator appears to have been relatively limited, albeit non-negligible, across euro area countries. In fact, while below-average indirect tax increases were the dominant source of the observed negative GDP deflator differential in Finland between 1999 and 2002, changes in indirect taxes contributed on average only moderately to the observed positive GDP deflator in Ireland, the Netherlands, Luxembourg, Portugal, Greece and Spain. It is also interesting to note that the diversity in the contribution of ULC changes to changes in the GDP deflator fell substantially in the run-up to Stage Three of EMU, and has remained roughly unchanged thereafter, whereas the diversity in the contribution of profit margins and net indirect taxes remained fairly constant over the whole sample period of the accounting exercise (1992 to 2002). In other words, the relative contribution of diversity in profit margins and net indirect taxes in explaining GDP deflator changes across euro area countries appears to have increased over the whole sample period.

As regards the further decomposition of ULC developments at the euro area level between 1999 and 2002, the analysis reveals that most countries with above-average ULC growth witnessed compensation growth rates which clearly exceeded the euro area average, and vice versa (Table 2). Below-average productivity growth contributed to the observed positive ULC differential in Italy, Luxembourg, the Netherlands and Spain. All in all, cross-country diversity in ULC

Table 3

Divergence in the GDP deflator and its components in the three largest euro area countries

(average annual change in percentage points if not otherwise noted)

	DE	FR	IT
		1999-2002	
GDP deflator (in %)	0.77	1.17	2.23
ULCs	0.59	1.00	1.32
Profits	0.00	0.16	0.75
Indirect taxes	0.18	-0.03	0.16
ULCs (in %)	0.98	1.74	2.37
Compensation per employee	1.72	2.43	2.55
Inverse productivity	-0.73	-0.68	-0.18
		2002	
GDP deflator (in %)	1.38	1.94	2.44
ULCs	0.65	1.42	1.98
Profits	0.62	0.20	0.06
Indirect taxes	0.12	0.18	0.40
ULCs (in %)	1.08	2.44	3.58
Compensation per employee	2.00	2.74	2.91
Inverse productivity	-0.91	-0.30	0.64

Source: AMECO and ECB.

growth peaked in 2001 (for the period from 1999 to 2002) in the euro area. It appears to have been declining since then and has lately been generally lower than during the 1990s.

As regards the divergence of inflation rates among the three largest euro area economies (see also sub-section 2.2) since 1999, and the recent increase thereof, Tables 2 and 3 reveal that the bulk of the divergence appears to have been related to relative differences in ULC changes and profit margin changes.

Regarding Germany, the country has benefited from a below-average increase in ULCs since 1999, due mostly to a favourably modest increase in compensation relative to the experience of other large euro area countries (Table 3). Coupled with relatively moderate growth in profit margins, relatively lower compensation growth contributed the most to the below-average increase in the GDP deflator. By contrast, in Italy above-average profit margin growth and below-average productivity performance feature prominently in explaining the above-average

increase in the GDP deflator and in ULCs, respectively, since 1999. Moreover, above-average ULC growth in Italy was compounded by higher average compensation growth relative to Germany. Looking at the spread of the relative contribution of each GDP deflator component in explaining the observed GDP deflator differentials between Italy and Germany, it emerges that the relative role of profit margin differences has slightly dominated the contribution from ULC differentials on average since 1999. However, ULC differences became more prominent in explaining the observed inflation differential in 2002. By the same token, relatively higher compensation growth in Italy turns out to be the most important determinant of the observed differences in ULC growth between these two countries in the period from 1999 to 2002. Turning to France and Germany, the average productivity performance in France was almost the same as in Germany between 1999 and 2002, as higher output growth was offset by more favourable developments on the French labour market. However, relatively higher compensation growth in France led to a positive ULC differential with Germany, which in turn appears to have driven the divergence in GDP deflator changes between the two countries since 1999 and, increasingly so, in 2002. Concerning the differences between Italy and France, it emerges that differences in profit margin growth were on average more important than ULC changes in explaining the observed GDP deflator differentials between the two countries since the inception of EMU. However, the role of differences in ULCs in explaining these differentials became increasingly important in 2002.[15]

Notwithstanding the lack of consistent methodologies and analytical relationships among these measures, Chart 6 confirms a relatively close relationship between the HICP, the GDP deflator and the final demand deflator both for the euro area as a whole and at the national level over the last few years. It therefore comes as no surprise that most of the countries which were found to have relatively high (low) increases in domestic labour costs and profit margins have been identified as having the largest positive (negative) HICP inflation differentials.

In sum, evidence derived from the inflation accounting framework suggests that the observed dispersion of inflation rates, proxied by changes in the GDP deflator during 1999-2002, relates mainly to the considerable diversity in profit margin changes and ULC developments. While profit margins were dominant in explaining GDP deflator differentials relative to the euro area in Belgium, Spain, Greece, France, Ireland and Italy, ULCs featured prominently in Portugal, Luxembourg, the Netherlands, Austria and Germany. The deflator differentials of the five largest euro area countries reflect differentials of the same sign in the components. Countries with above-average inflation also tend to have above-average changes in the respective components, and vice versa (the only partial exception is Italy). For the five largest euro area countries, the sign of the observed inflation differentials seems therefore to be not only systematic but also grounded in their "cost chain". However, the picture is different for the other countries where deflator differentials are often the result of offsetting positive and negative differentials in the components. Notwithstanding this diversity, however, it is noteworthy that most of the countries with above-average GDP deflator changes also experienced above-average ULC growth, and vice versa. Moreover, as to the decomposition of ULCs, most countries with above-average ULC growth witnessed compensation growth rates, which clearly exceeded the euro area average, and vice versa. Finally, the decomposition of cross-country differences in final demand deflator inflation reveals that changes in import costs tend to account for inflation differentials of most countries with relatively high degrees of openness, with the Netherlands being a

15 Furthermore, in the November 2002 Economic Bulletin, the Banca d'Italia points out that different ULC developments in the services and industrial sectors may play a key role in explaining the widening of inflation differentials between the largest euro area countries.

Chart 6

Comparison of changes in the HICP, GDP deflator and final demand deflator
(annual change in %)

Euro area – Comparison of changes in inflation measures

Legend:
- final demand deflator
- GDP deflator
- HICP
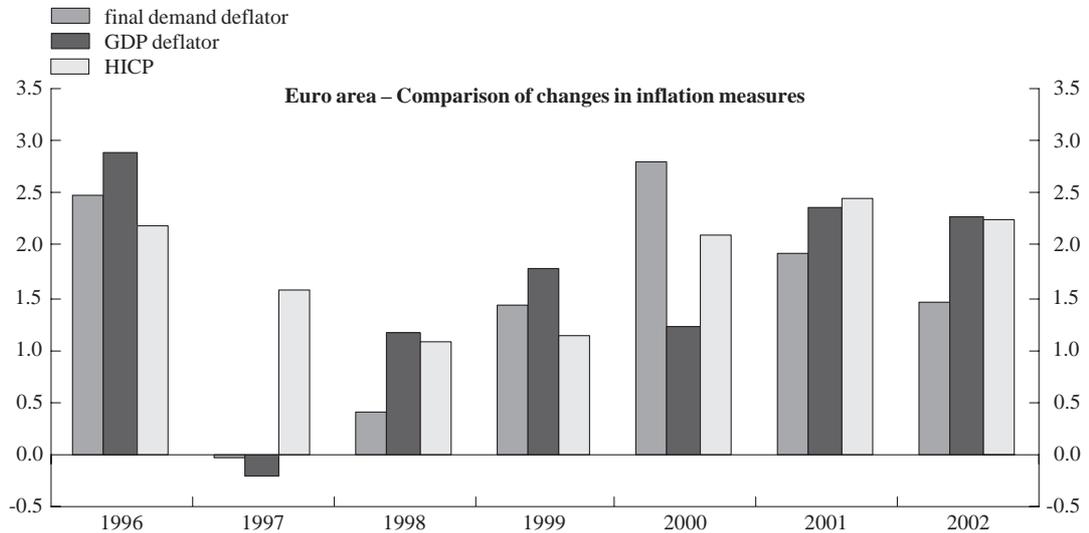
Sources: Eurostat and ECB calculations.

notable exception. In the other countries, the relative importance of domestic and import costs in explaining inflation differences varied substantially, with relative changes in domestic costs often counteracting imported cost developments (relative to euro area averages). All in all, these findings suggest that the sources of the observed inflation differentials appear to vary markedly across euro area countries, pointing at the complexity of the observed inflation developments.

A related issue is that inflation developments among the three largest euro area countries appear to have increasingly diverged in 2002, compared with the differences observed since 1999. Despite the common slowdown in economic activity experienced by France,

Italy and Germany, and notwithstanding the relatively similar cyclical positions of the latter two countries, inflation in core HICP components in Germany declined throughout 2002, remained more or less flat in France and increased in Italy. While divergent developments in profit margins appear to have been the dominant source of the observed differences in GDP deflator changes between Germany and Italy as well as between France and Italy on average since 1999, differences in ULC performances have become more important lately. For France and Germany, divergent ULC developments, driven by marked growth differences in compensation per employee, seem to have been the main determinant of the observed differences in GDP deflator changes on average since 1999 and, increasingly so, in 2002.

3 Underlying reasons for inflation differentials

Merely comparing the size of inflation differentials observed within the euro area and regions within other countries such as the United States is not sufficient to assess the relevance of inflation differentials to the conduct of economic policy. The underlying reasons for the observed inflation differentials also need to be properly analysed, given that the real adjustment to a positive inflation differential between regions of a monetary union is likely to be more harmful the less flexible the goods and factor markets of these regions are. Therefore, the following section of the report focuses on the potential underlying reasons for the observed inflation differentials in the euro area.

3.1 Differences in consumption patterns and institutional reasons

Observed inflation differentials within the euro area reflect not only differences in price developments of individual consumer goods and services across countries, but also differences in the shares of these items in national consumption, i.e. their different weights in the various sub-indices. This section examines the effect of using different national weights on euro area HICP dispersion.

Ex-ante, two opposite results could be expected from using common weights for the euro area: on the one hand, inflation dispersion might decrease because similar price developments (e.g. for oil) would have very similar effects on all national HICPs. On the other hand, dispersion might increase because common weights do not take into account consumer substitution at the national level, i.e. the reaction of consumers to sharp price increases or decreases at the national level, and the effect of different price levels on consumption shares. The analysis in this section compares inflation dispersion of the officially published HICPs with simulated dispersion of national HICPs using the same euro area average item weights at the lowest available national sub-index level.[16] The results of the weighted mean square deviation (MSD) from the euro area are shown below, in Chart 7 and Table 4.

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16 The HICP limits the analyses only to the four-digit COICOP. There are other reasons why national baskets differ (e.g. the detailed product selection) which cannot be considered here. At this index level data is available only from 1995.

Inflation dispersion in the euro area, official and simulated
(weighted mean square deviation)
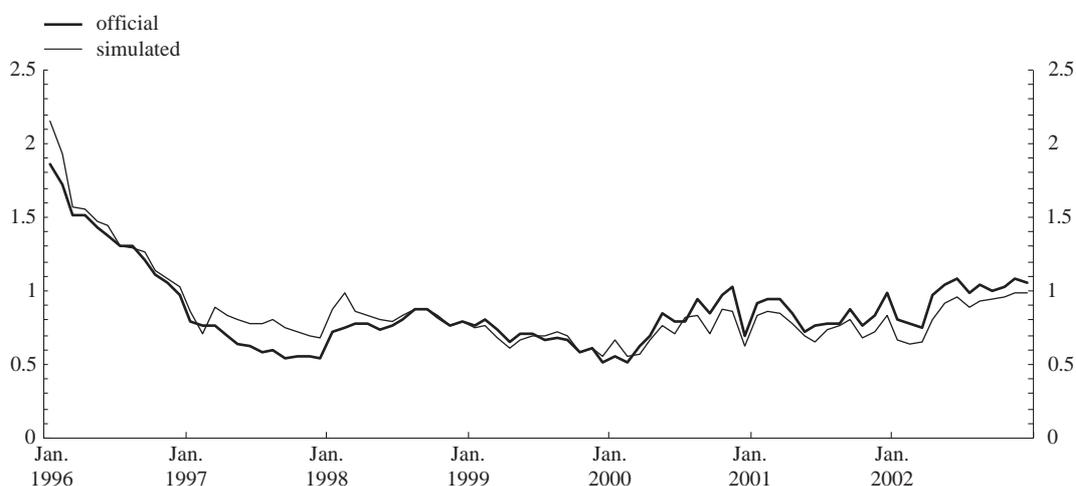
Sources: Eurostat and ECB calculations.

Table 4

Total mean square deviation of national inflation rates from simulated national rates (1996 to 2002)

BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
0.53	0.10	0.49	0.24	0.14	0.60	0.16	0.32	0.18	0.25	0.57	0.16

Sources: Eurostat and ECB calculations.

In Chart 7, MSDs show a very similar degree of dispersion over the period examined. The total dispersion indicator, which is the sum of the deviations over the whole period, is only marginally higher for the simulated common basket series (total MSD for the official series is 72.7 versus 72.8 for the simulated series). Since early 2002, however, the dispersion indicator for the official series has clearly exceeded the MSD for the simulated series. Table 4 shows the total MSDs of the official national HICP inflation rates to the simulated ones over the whole period under consideration. Although influenced by the euro area country weights, this measure indicates the impact of differences in the national baskets from the euro area average consumption pattern on national inflation rates.

Government policies can affect HICP inflation through changes in administered prices and indirect taxes and thus such national measures may add to inflation dispersion within the euro area. Regarding these institutional reasons, the available information on the impact of changes in administered prices and tax measures was recently collected.[17] The main conclusion from this work was that a fully reliable and comparable set of indicators regarding administered prices and indirect taxes is lacking for the euro area.

However, for the purpose of this report, a rough estimate of a minimum basket of items generally affected by government policies in all euro area countries was compiled.[18] This administered price index accounts for around 6% of the overall HICP for the euro area, while the weight varies between 3% and 8% in the countries. Three important caveats

should be considered in analysing these results. First, while possibly not all items are directly administered by governments in all euro area countries, these components should be subject to some kind of regulation in most countries in the euro area. Second, although this measure of administered prices is constructed from the highest level of disaggregation available for the HICP, this is not sufficient to separate out all administered prices. A further breakdown would be required in order to obtain a more accurate and reliable measure. And third, some of the items included in the estimate were added to the HICP only in January 2000, and this also affects its development.

A dispersion measure was calculated for these series and compared with the dispersion of the overall index (Chart 8). The available data shows that the total dispersion within the euro area over the years from 1997 to 2002 for administered prices is much higher than the degree of dispersion for the overall HICP (total MSD is 120.3 and 58.0 respectively). For comparison, the dispersions of these series along with the overall index excluding administered prices (total MSD 49.7) are shown in Chart 8. Although these conclusions should be treated with caution due to their tentative nature and the various caveats regarding the minimum coverage of these indices, the analysis shows that the estimated magnitude of the impact of administered prices on inflation dispersion in the euro area

17 See ECB (2002a), Box 5.
18 The individual sub-components, at the lowest level of aggregation, that are used in the estimate are: refuse collection (HICP weight in 2002 0.6%), sewerage collection (0.5%), medical and paramedical services (1.0%), dental services (0.7%), hospital services (0.7%), passenger transport by railway (0.4%), postal services (0.2%), education (0.9%) and social protection (0.9%).

Chart 8

Inflation dispersion in the overall HICP and overall HICP excluding administered prices in the euro area

(weighted mean square deviation)

- ━━ overall HICP inflation dispersion
- ── administered prices inflation dispersion
- ── overall HICP excluding administered price inflation dispersion
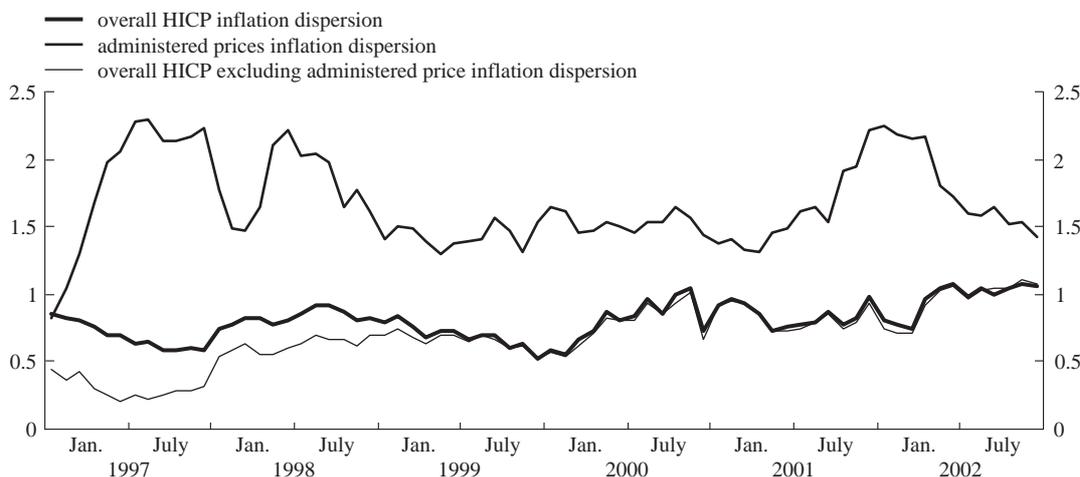
Sources: Eurostat and ECB calculations.

has been relatively small, at least in the more recent period from 1999 to 2002.

Finally, as to the impact of the euro cash changeover on consumer price inflation in 2002, currently available estimates differ considerably across countries. While most of the impact presumably occurred in the first half of 2002, the effects may have lasted into the second half in some countries, as more prices were rounded up or changed to "attractive" levels. All in all, the euro cash changeover may have contributed slightly to an increase in inflation dispersion in the euro area, if countries with higher inflation rates also experienced higher cash changeover effects. For some countries, such as the Netherlands, this appears to have been the case. In any event, divergent inflationary effects from the cash changeover are expected to fade away in the course of 2003.

In conclusion, the results indicate that differences in consumption patterns across the euro area countries do not have a major impact on inflation dispersion.[19] As expected, the dispersion of administered prices across the euro area is much larger than overall HICP dispersion. Although the relative weight of the administered price indices is small,

their contribution to overall dispersion in HICP inflation was significant during the years from 1997 to 1999. As regards changeover effects, while national differences in the impact of the euro cash changeover on consumer prices were witnessed, they should be temporary in nature. In most euro area countries, methodological differences are not an important explanatory factor for aggregate inflation dispersion since 1995, due to the achieved level of harmonisation of HICP data across countries.

3.2 Structural reasons

This sub-section discusses the relevance of structural effects, notably external effects, convergence in the tradable and non-tradable goods sectors and market rigidities, in explaining inflation differentials.

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19 *These results do not change considering further simulations on HICPs excluding items that might have different inflation developments at the national level (e.g. energy and unprocessed food).*

3.2.1 External effects

The previous section touched upon the role of internal and external factors in explaining inflation developments in the past few years from an accounting point of view. The divergence in inflation rates within the euro area may also have an external dimension of a structural character, associated with oil price shocks and exchange rate changes. If euro area countries have different degrees of oil dependency and/or different pass-through patterns, then the impact of oil price and exchange rate changes on domestic prices might also differ, contributing to inflation divergence.[20] Although the transitory nature of such shocks may dampen their impact on inflation divergence over time, the euro area has indeed experienced remarkable swings in both variables in recent years. The nominal effective exchange rate (EER) of the euro had declined by about 20% at its trough in October 2000, before recovering in the period from 2001 to 2003. Moreover, oil prices tripled in 1999/2000 before (temporarily) moderating somewhat (see Chart 9).

Regarding oil dependency, measured as the share of net oil imports as a percentage of GDP, it appears that the dependency varies across the euro area countries (Chart 10). Overall, the relationship between oil dependency and inflation performance appears rather weak if assessed in isolation. This may partly reflect the fact that the surge in oil prices in 1999/2000 was accompanied by different administrative measures in the euro area implying, in turn, that prices at the consumer level were affected to different degrees across countries. Moreover, inflationary pressures stemming from the rise in oil prices have been more than offset by other factors.[21]

As regards the potential heterogeneity of pass-through effects from changes in exchange rates on domestic prices, different degrees of openness among individual euro area countries towards trading partners outside the euro area ("extra-openness"), the geographical trade structure and the

20 Inflation divergence is measured as the change in the differentials in inflation rates from 1999 to 2002 across the euro area countries relative to the euro area average.
21 This analysis is admittedly only partial since it does not take into account second-round effects – such as the impact of a change in the exchange rate/oil price on real economic activity and the competitive position which may either reinforce or offset the initial effect. In the case of Luxembourg, the magnitude of oil dependency may be upward-biased owing to a significant amount of fuel sales to non-residents which is not properly accounted for in the trade statistics.

Chart 9

Developments in nominal effective exchange rates and in oil prices
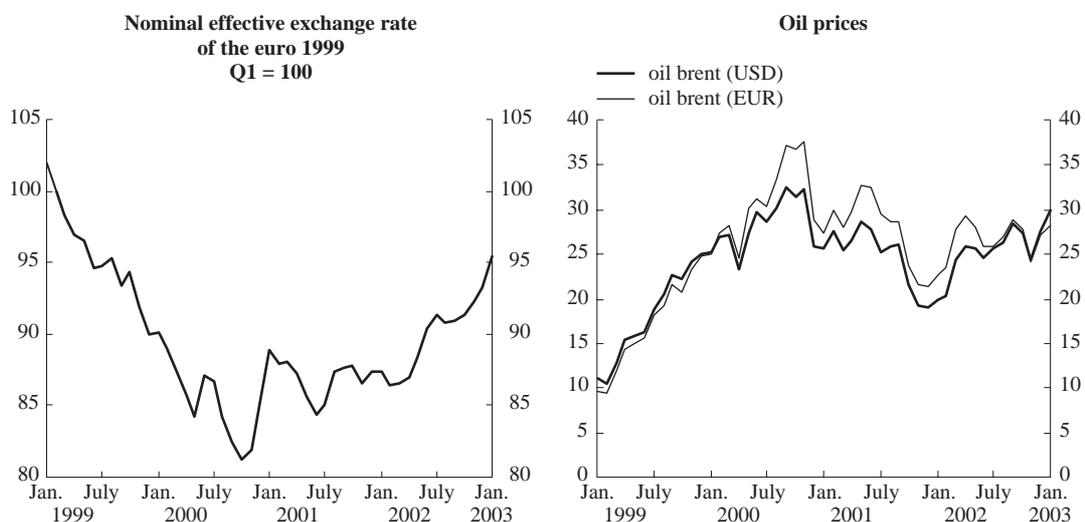
Source: ECB.

Chart 10

Oil dependency of euro area countries in 2001

■ net oil imports
—■— inflation performance (right-hand scale)

Net oil imports in % of GDP; change in inflation 1999-2002
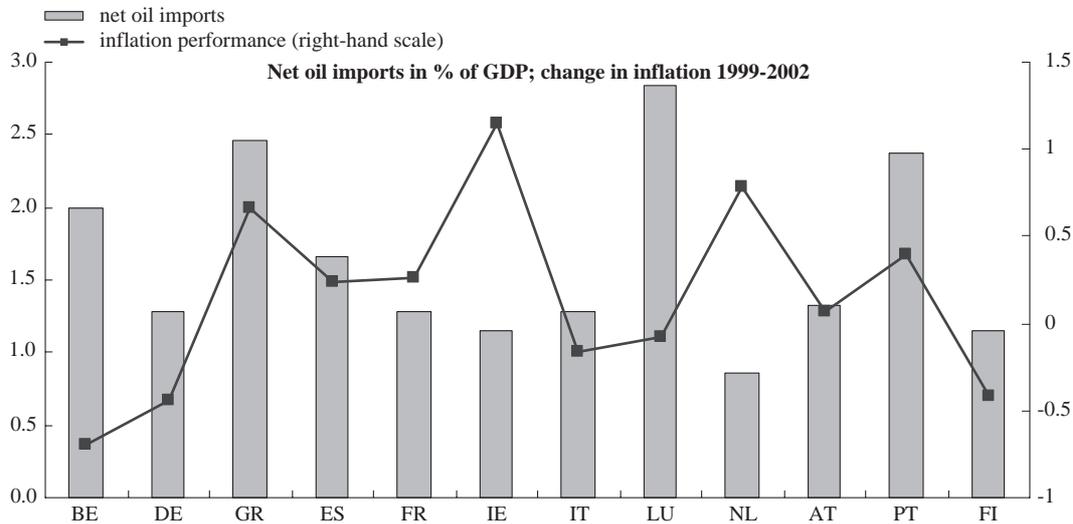
Sources: Eurostat and IFS.

commodity composition of extra-euro area imports are three key factors. In general, greater "extra-openness" should be reflected by a higher weight of extra-euro area goods in a country's overall goods basket and, therefore, a stronger pass-through effect from exchange rate changes on domestic prices. Thus, the depreciation of the euro (in effective terms) in 1999/2000 may have contributed to higher inflationary pressures in Ireland and the Netherlands, which are

relatively more exposed to extra-euro area trade – measured in terms of GDP (see Chart 11). By contrast, in Belgium – another economy which is very open to extra euro area trade – inflation was quite subdued in the last four years, implying that greater exposure to external trade does not automatically translate into higher rates of inflation. However, inflation in Belgium in 2002 was influenced (downward-biased) by changes in the field of administered prices,

Chart 11

Extra-euro area import openness and inflation performance

■ extra-euro area imports
—■— inflation performance (right-hand scale)

2001, in % of GDP; change in inflation 1999-2002
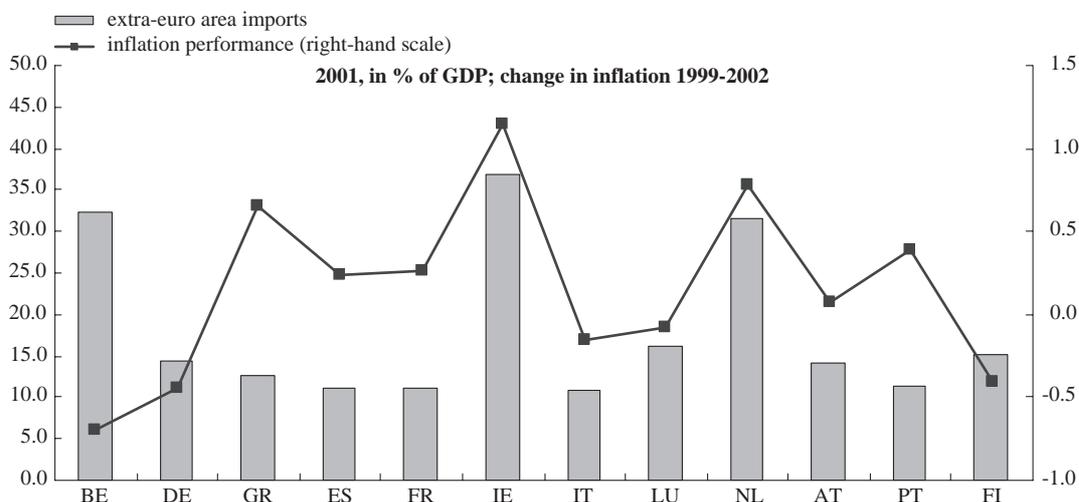
Sources: Eurostat and IFS.

which explains why the link between "extra-openness" and inflation is rather disguised for this country. Furthermore, the figures for Belgium and the Netherlands may be distorted by their role as entrepôt and transit centres for extra-euro area imports to the euro area as a whole. Overall, among other euro area countries which seem to have similar degrees of "extra-openness", inflation rates still differed, indicating that other factors are also important for the divergence of inflation rates in the euro area.

Differences in the geographical trade structure of the euro area economies may represent another facet, reflecting a country's exposure to exchange rate fluctuations given their degree of openness. If the trade structure of a country is weighted towards countries whose exchange rates tend to fluctuate less vigorously against the euro, the impact of an appreciation/depreciation episode on domestic prices can be expected to be weaker. In order to assess this trade structure effect, one needs to look at changes in the euro EERs computed for each individual country, i.e. using country-specific trade weights vis-à-vis trading partners outside the euro area (Chart 12).[22] Assuming similar pass-through effects between these "country-specific" EERs and each country's import

prices, the impact of an effective depreciation of the euro appears to be lowest on import prices in Finland, Portugal and, to a lesser extent, Austria and Greece, given their trade structures. By contrast, the expected impact on import prices in Luxembourg, Italy, Ireland and France is somewhat higher. However, these differences are not large and, under reasonable assumptions concerning the magnitude of the exchange rate pass-through effects on domestic prices, one should expect only a rather limited overall impact from different foreign trade patterns on inflation divergence.

Finally, the magnitude of the pass-through coefficient may be linked to the commodity composition of extra-euro area imports. However, the evidence available in the academic literature suggests that the difference in pass-through rates across euro area countries due to the industry

22 Effectively, these EERs are computed using country-specific trade weights for aggregating the effect of the euro depreciation vis-à-vis the trading partners in the narrow group. The use of such an artificial indicator should be considered as exception in the above analysis, given that its country-specific focus and since it compares developments across countries. In general, however, one should use the official EER series to facilitate a consistent communication of exchange rate developments of the euro.

Change in the effective exchange rate for each euro area country and the euro area as a whole

(percentage change between 199Q1 and 2002)
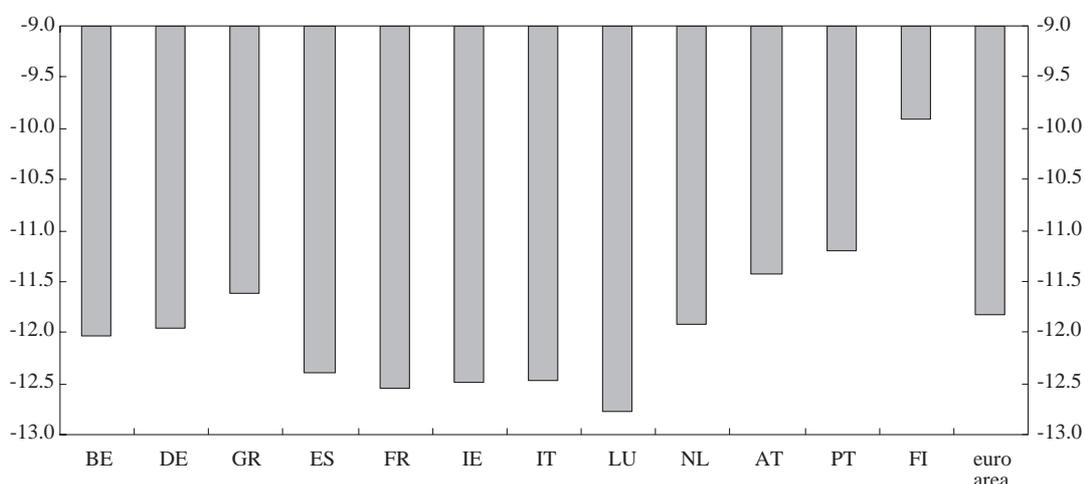
Source: ECB.

composition is likely to be limited in the medium run.[23]

To assess the joint impact of the above-mentioned individual factors – oil dependency, "extra-openness", geographical trade structure and the commodity composition of imports – on inflation performance divergence, we have constructed a synthetic indicator of "external exposure". This was calculated as:

$$pex = -\alpha_i \beta \Delta e_i - \gamma_i \Delta e_{USD/EUR} + \gamma_i \Delta oil,$$

where α_i is the non-oil import share of country i relative to GDP, β is the pass-through-coefficient (assumed to be 0.8 and the same for all countries), Δe_i is the country-specific change in the nominal EER (as described above), $\Delta e_{USD/EUR}$ is the euro/US dollar exchange rate, γ_i is the oil dependency of country i, and Δoil reflects the change in the oil price (in US dollar) in the reference period.[24] This exercise used exchange rate and oil price developments in the period from the first quarter of 1999 to 2002.

The results, shown in Chart 13, suggest a clear positive relationship between "external exposure" and inflation in the period under consideration. Indeed, for most countries the inflationary pressure seems to be broadly in line with their "structural exposure" to external shocks. However, Belgium and, to a lesser extent, Luxembourg seem to be clear outliers in this exercise. Given their high degree of "extra-openness" and relatively high oil dependence, one would have expected a much stronger impact from the changes in oil prices and the exchange rate on domestic prices. In the case of Belgium, this may be attributed to the fact that the inflation performance indicator was pulled downward by changes in administered prices in 2002, while the indicator for external exposure may be biased upward owing to the country's role as a transit centre for the euro area.[25] Overall, however, this exercise suggests that external factors have played a part in explaining the divergence in inflation rates across the euro area in recent years.

External exposure and inflation performance
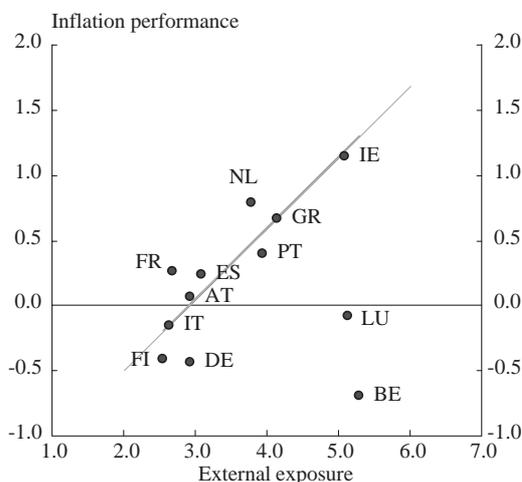
Source: ECB.

In conclusion, the euro area countries have been exposed to marked fluctuations in energy prices and – to a lesser extent – exchange rates over the last four years. Due to country differences in the degree of openness and oil dependency, import price developments and, thus, inflation developments have been affected differently. Consequently, particularly the relatively more open countries (concerning extra-euro area trade) and/or more oil dependent economies, such as Ireland, the Netherlands and Greece have experienced an acceleration of their inflation rates in response to the depreciation of the euro witnessed in 1999/2000 and the strong rise in oil prices. To the extent that the magnitude of the observed fluctuations in energy prices and the exchange rates has been exceptional, the related impact on inflation diversity should be transitory as well.

23 See, for instance, Campa and González-Mínguez (2002). This study also suggests an average pass-through coefficient of roughly 0.8.

24 An appreciation of the euro corresponds to an increase in the EER ($\Delta e_i > 0$) or in the euro dollar exchange rate ($\Delta e_{USD/EUR} > 0$). In practice, the underlying dynamics are rather complicated, however, so that the following exercise should be considered only as a rough illustration of the combined effect in an episode of euro depreciation and rising oil prices (as experienced in 1999/2000).

25 In the case of Luxembourg, the degree of oil dependency may be distorted by fuel purchases by non-residents (e.g. transport firms, tourists, cross-border workers).

3.2.2 Tradable goods price convergence

In literature, it is often assumed that purchasing power parity holds for tradable goods, i.e. that prices of homogenous products expressed in the same currency do not differ between locations. However, differences between tradable goods price levels continue to exist across, as well as within, euro area countries. Furthermore, though they are smaller than price differences for non-tradable goods, they seem to be clearly correlated with the latter (see Chart 14).[26]

These price differences for tradable goods are likely to be affected by the level of national and international competition, which in turn depends inter alia on factors such as the efficiency of national competition policy or a country's exposure to international trade.[27] Much of the marked decline in the dispersion of tradable goods price levels appears to have taken place during the first half of the 1990s, thanks to the implementation of the European Single Market. More recently, however, tradable goods price convergence seems to have slowed down, according to some studies.[28] The introduction of the single currency is, however, likely to have contributed further to the convergence of tradable goods prices. At the aggregate level, price level dispersion has continued to moderate in the euro area in recent years (see Chart 15).
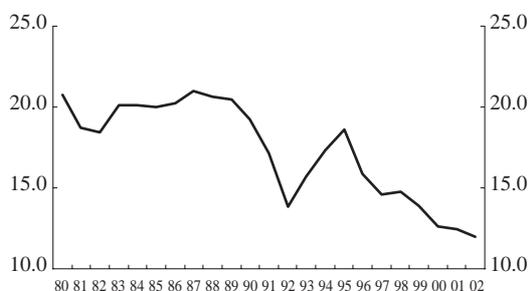
The European Commission (2002a) has identified indirect taxation, the structure of distribution networks, market power/ competition and inefficient services sectors as the main factors accounting for a significant proportion of the remaining differences in the prices of tradable goods. In the market for new cars, for example, differences in

26 On perfectly competitive markets consumer prices of tradable goods may be broken down into the uniform world market price plus some services costs, such as marketing costs. These country-specific services costs are typically non-tradable, which in turn may explain the close correspondence between the price differences for tradable and non-tradable products.

27 Andrés et al. (2003) shows that the relative degree of market competition is a key parameter in explaining the size and volatility of relative price responses to symmetric shocks within the euro area. See also ECB (2002b) and Cavelaars (2002) on the relationship between inflation and competition.

28 See, for example, Rogers (2002).

Chart 14

Price levels of tradable and non-tradable goods in 2000

(euro area = 100)
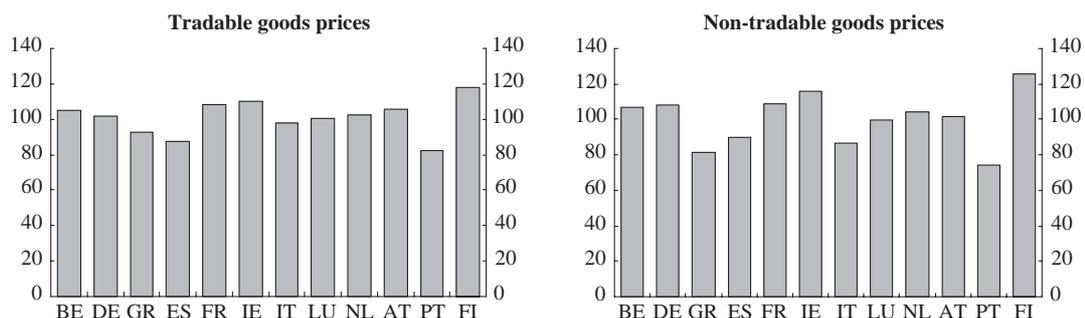
Source: Eurostat.

taxation seem to play a major role in explaining price differences, as well as, though to a lesser extent, lack of competition. More specifically, pre-tax price differences on new cars could be reduced by 16% if tax distortions were removed. In addition, continuing fragmentation in the Single Market also seems to play an important role in the remaining dispersion of traded goods price levels across euro area countries, as surveys have demonstrated (see, for example, European Commission (2002b)).

Overall, stricter enforcement of Single Market legislation, a reduction of trade-impeding national regulations and further improvements in both European and national competition policies would appear to be suitable ways of reducing the remaining fragmentation in the Single Market and further enhancing intra-EU competition in tradable goods and services. However, it is difficult to estimate the potential impact of these measures on tradable good prices or on inflation dispersion across euro area countries. Furthermore, it is important to bear in mind that there is no automatic link between the dispersion of price *levels* and the dispersion of price *changes* across countries in the tradable goods sector. Convergence in tradable goods price levels could accompany both convergence and divergence of tradable goods price changes, depending on the nature of the changes in the national competitive situation. In any case, it should be taken into account that, even after completion of the Single Market, differences in the degree of nominal rigidities across national markets will always remain. As commented above, price discrimination practices of firms across countries in conjunction with those nominal rigidities would imply inflation differentials when the economy faces either common or, in particular, idiosyncratic shocks (Andrés et al (2003)).

3.2.3 Non-tradable goods price convergence

The Balassa-Samuelson (BS) model, which explains differences in non-tradable goods prices across countries, has been much discussed in relation to inflation differentials among countries in a monetary union. At the centre of the explanation of divergent inflation rates across countries are differences in productivity growth between the tradable and non-tradable goods sector. The tradable goods sector consists mainly of manufacturing, is more capital-intensive and has a higher degree of competition, while the non-tradable goods sector consists of mainly services, is more labour-intensive and less exposed to competition. When productivity growth rises in the tradable goods sector, wages will tend to increase without leading to higher prices. Due to labour mobility, wages in the non-tradable goods sector will rise as well. As productivity growth in the non-tradable goods sector is normally lower (and more similar across countries) than in the tradable goods sector, wage increases in excess of productivity growth will tend to lead to higher price increases in the non-tradable goods sector. Higher labour productivity growth in the tradable goods sector and higher inflation in the non-tradable sector over the long run are confirmed by historical data from 1960 onwards in all euro area countries, although the differences vary across countries. The larger the difference in productivity growth between the tradable and non-tradable goods sectors, the higher overall inflation will tend to be. Inflation differentials among countries would thus develop which could be considered as "steady-state" or "equilibrium" inflation differentials. As wage increases in the tradable goods sector reflect productivity gains, there is no pressure on tradable goods prices and, therefore, no effect on competitiveness among countries.

The BS model assumes that purchasing power parity for tradable goods holds. Although this has been rejected by most studies, at least in the short run, the model provides intuitively appealing results that are consistent with

historical data over longer periods. However, there are drawbacks associated with this model, which make it difficult to quantify possible BS effects. These mainly relate to caveats concerning the underlying assumptions and difficulties in isolating BS effects from other historical influences on inflation, in particular differences in monetary and exchange rate policies across countries. These drawbacks have led to quite a large spectrum of estimates of BS effects and contradicting results for individual countries. Table 5 provides a list of some of the studies estimating the extent of inflation differentials resulting from the BS effect (recalculated for euro area inflation of 2%). It is important to note, however, that these studies are not directly comparable due to differences in methodology and sample periods.

Although the estimates of BS effects differ greatly among these studies and appear to be unduly large for some countries, some broad patterns are discernible, with Germany and France being below the average, for example, and Greece and Ireland above. This would be broadly consistent with the idea that catching-up countries should experience a real appreciation. Historically, however, catching-up has not always led to higher inflation or an appreciating nominal exchange rate, as the case of Ireland between 1987 and 1999 shows. Moreover, in many studies Germany appears to differ from most other countries with a significantly lower "equilibrium" inflation rate. This largely results from the fact that productivity data for Germany shows very low productivity growth differentials between the tradable and non-tradable goods

Table 5

"Equilibrium" inflation rates implied by Balassa-Samuelson effects according to selected studies

(euro area inflation normalised to 2%)

Sample	Alberola and Tyrväinen 1975-1995	HICP proxy IMF [1]	IMF (1999a) 1960-1996	Canzoneri et al. 1973-1997	De Grauwe and Skudelny 1971-1995	Sinn and Reutter [2] 1987-1995	Average of all columns	Actual average HICP 1995-2002
Belgium	3.1	2.0	3.8	2.6	2.1	1.8	2.6	1.7
Germany	1.3	1.9	1.5	1.0	1.7	1.0	1.4	1.2
Greece	-	2.7	2.8	-	-	5.3	3.6	3.8[4]
Spain	3.1	2.3	-	2.4	2.0	2.5	2.5	3.0
France	1.7	1.9	2.8	2.4	1.6	2.3	2.1	1.5
Ireland	-	3.4	3.0 [3]	-	-	3.4	3.3	3.1
Italy	2.4	1.9	2.7	2.8	2.4	2.5	2.5	2.8
Netherlands	2.3	2.3	1.6	-	2.0	2.4	2.1	2.5
Austria	1.8	2.5	-	1.8	2.5	2.4	2.2	1.5
Portugal	-	2.7	4.3	-	2.1	1.8	2.7	3.0
Finland	2.4	2.3	2.9	2.4	1.4	3.7	2.5	1.6
Euro area	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**1.9**
Max-min	1.8	1.5	2.8	1.8	1.1	4.3	2.2	2.5
Standard dev.	0.6	0.4	0.9	0.6	0.4	1.1	0.6	0.9

1) *The IMF (2002) calculates an HICP proxy, which assumes that the historical trend differential between price developments of industrial goods and services between 1995 and 2001 remains the same. This measure is immune to some of the criticism of the other BS studies as it relies directly on observed inflation rather than on productivity differentials. However this analysis also entails an important caveat in that it is based on a short period, which does not comprise a complete business cycle, and therefore may be biased.*

2) *Sinn and Reutter (2001) assume that historical productivity differentials will be reflected in equally large inflation differentials between sectors. Most other studies do not find a unitary relationship, implying that the dispersion found by Sinn and Reutter is likely to be upward biased.*

3) *IMF (1999b) based on Total Factor Productivity between 1991-96.*

4) *Greece since 1997.*

sectors over the long run compared with many other countries.[29]

In order to get a rough indication of how these estimates of BS effect relate to actual inflation, Table 6 compares the implied inflation differentials due to the BS effect with actual HICP inflation differentials between 1995 and 2002.[30] Several conclusions can be drawn from these data. First, actual inflation developments and estimates of the BS effect appear to be broadly consistent in those countries with the highest and lowest BS effects, i.e. Germany and France on the one hand, and Greece and Ireland on the other. Second, however, the differences in the estimates of the BS effect between Germany and France found in most studies have not been seen in the actual inflation data (even when a longer time period is considered). Third, there is a wider gap in actual inflation developments between two groups of countries – (Belgium, Germany, France, Austria and Finland, on the one hand, and Greece, Spain, Ireland, Italy, the Netherlands and Portugal, on the other) than what the BS estimates would imply. In fact, inflation in the first group of countries (representing 61% of the euro area HICP) has been around 1.5% on average since 1995, while it has been around 3% in the second group (around 39% of the area). Fourth, Belgium and Finland are sometimes found to have high BS effects, but this is not confirmed by the data on actual inflation differences. Conversely, the Netherlands has had a higher inflation differential than that predicted by the BS model.

An important point to keep in mind is that the BS theory does not explain the possible sources of productivity differentials between sectors and countries. Whereas BS effects are often associated with catching-up and convergence phenomena, it would be possible for a catching-up process to take place without a BS effect, if, for example, productivity growth in the tradable and non-tradable goods sectors is equally high. Similarly, countries with already high productivity levels may, for various reasons, such as economic policies that are conducive to technological innovation, also experience relatively high productivity growth in the tradable goods sector. Importantly, structural rigidities and different degrees of competition can affect productivity growth differentials between sectors and overall productivity growth in a way that favours either positive or negative inflation differentials in those countries.

29 Seen over a longer period, labour productivity growth has been relatively low in the tradable goods sector in Germany while it has been relatively high in the non-tradable goods sector compared with other euro area countries, resulting in a low productivity growth differential. However, other measures of productivity may be more appropriate. A study by the Deutsche Bundesbank (2002) concluded that the degree by which total factor productivity has contributed to growth is not much different from that in other industrialised countries. Studying output per hours worked could also reveal differences between countries, although here sectoral data is not available for all countries. Another explanation for the relatively low labour productivity in the tradable goods sector could be a lower degree of labour shedding in the manufacturing sector, especially in the 1980s, compared with, for instance, France (see Von Wachter (2001).

30 Inflation measures are not directly comparable as most studies use value-added deflators rather than the HICP. Moreover, given the diversity of BS estimates for some countries in the selected studies, using an average could be disputed.

Table 6

Implied inflation differentials to the euro area average due to the BS effect compared with actual HICP inflation differentials between 1995 and 2002

	DE	FR	NL	AT	FI	ES	IT	BE	PT	IE	GR
Estimated BS inflation differential (average in Table 5)	-0.6	0.1	0.1	0.2	0.5	0.5	0.5	0.6	0.7	1.3	1.6
Actual HICP inflation differential 1995-2002	-0.7	-0.4	0.6	-0.4	-0.3	1.1	0.9	-0.2	1.1	1.2	1.9

Sources: Eurostat and ECB calculations.

As far as the magnitude and time horizon of convergence is concerned, it should be stressed that most countries are currently relatively similar in terms of GDP per capita and price levels. This implies that the impact of catching-up effects on euro area inflation and inflation differentials should be relatively limited. For instance, assuming that price levels in Greece, Spain and Portugal (the three countries that are lagging behind in terms of price levels and per capita income) continued to converge at the same rate as they have on average since 1987, this would (mechanically) result in around 0.2 percentage point higher inflation in the euro area as a whole per year. Such a convergence process would be completed in 10 to 15 years. As regards the accession countries, euro area inflation would not be much affected by convergence of price levels in these countries due to their low country weights (GDP in the ten acceding countries accounts for around 6% of the euro area). Estimates of the BS effect for some of these countries mostly range between 0 and 3 percentage points, which implies an increase in euro area inflation of up to 0.2 percentage point, if inflation in all the acceding countries were 3 percentage points higher than the average for the rest of the euro area countries.

In sum, although the BS model appears to have some relevance, the available estimates cannot be regarded as reliable enough to judge whether and to what extent individual countries have been experiencing "equilibrium" inflation. Inflation differentials in Greece, Ireland, Portugal and, to a lesser extent, Spain may have been partially caused by price level and income convergence and/or BS effects. Conversely, the low productivity growth differentials between the tradable and non-tradable goods sectors in Germany may have contributed to lower-than-average inflation. Concerning the size of inflation differentials between countries, it appears that actual differences between groups of countries have been significantly larger than what the BS model would imply. The continued process towards real convergence among the euro area countries should lead to a decline in inflation diversity on this account in the long run.

3.2.4 Market rigidities, structural reform and inflation differentials

As seen in the previous section, the level of inflation differentials and their persistence could be affected by nominal and real rigidities in individual countries that affect productivity developments. Reducing market rigidities through structural reforms improves conditions for output growth and employment and facilitates the absorption of shocks, thereby reducing the persistence of their impact on inflation. However, structural reform in individual countries could also have temporary negative effects on wage and price formation and inflation differentials. For instance, the short-run effects on demand from a reduction in income taxes could lead to higher inflation. This impact depends on a number of factors, such as the nature of the structural reforms, the time horizon involved and the level of symmetry in their implementation across countries.

Starting with the nature of the structural reforms, two main types can be distinguished. First, structural reforms in particular sectors such as network industries are likely to have a temporary effect on inflation until the price level in both the sector involved and the economy has reached a new steady state. Second, "horizontal" structural reform measures, such as reforms that are designed to increase supply and demand on the labour market, are likely to boost the overall level of activity in the economy. This, in turn, could result in a higher level of inflation, assuming some capacity constraints. It may thus be necessary to accept inflation differentials caused by well-designed structural reform in the short-term.

Turning to the time horizon, the above examples show that it is very difficult to predict the impact of structural reforms on inflation in a particular country during the adjustment period following policy changes.

Depending on the nature of the reform undertaken, this adjustment period can easily take a number of years. In the long run, however, well-designed structural reforms should reduce nominal and real rigidities. A higher degree of wage and price flexibility in turn enables the economy to adjust to shocks more quickly, thus lowering the likelihood of persistent inflation differentials in an integrated economic area.

The impact of structural reforms on inflation differentials depends on the symmetry with which structural reforms are implemented across the euro area countries. On the one hand, asymmetric implementation of price level-reducing reforms in countries with above-average rates of inflation is likely to contribute to a temporary decline in inflation differentials. On the other hand, asymmetric implementation of demand-stimulating reforms in fast-growing economies may temporarily increase inflation differentials across the euro area.

3.3 Cyclical reasons

This sub-section of the report will focus first on the relationship between the business cycle and inflation. In a second step, the relative strength and duration of the real interest rate and real exchange rate channels are assessed with respect to the potentially self-reinforcing effects of changes in inflation differentials through induced output effects.

In this context, it is important to note that the implementation of Stage Three of EMU implied a shift in the monetary policy regime for all euro area countries, triggering a nominal convergence process that was particularly marked in those countries with relatively high inflation rates and nominal interest rates in the past. However, in other euro area countries, such as the former hard currency countries, these nominal convergence effects were considerably smaller. As a consequence, it appears likely that the monetary policy regime shift led to a different degree of temporary expansionary

effects on economic activity across euro area countries. Sub-section 3.3.2 refers to these effects.

3.3.1 The relationship between the business cycle and inflation

Inflation differentials in the euro area countries may be caused at least in part by differences in their cyclical positions. To the extent that inflation in each country is driven by its output gap – defined as the difference between actual and potential output[31] – inflation differentials across the euro area countries should reflect differences in the size of the output gaps across these countries.

Therefore, this sub-section focuses first on factual evidence about the relationship between relative output gap and inflation developments across the euro area countries. In a next step, the report looks at cross-country differences in proxies for demand pressures (such as wage growth and wage drift, unemployment and real credit growth) with a view to their potential role in explaining output gap differentials and, thereby, inflation differentials between euro area countries.

Alongside several recent studies (e.g., Sinn and Reutter (2001), Alberola (2000), OECD (2002a) and the European Commission (2002a)) Chart 16 illustrates in a stylised manner a positive relationship between measures of the relative cyclical positions of euro area countries and their relative inflation rates. Since the start of Stage Three of EMU in 1999, countries with above-average

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31 There is a considerable body of evidence supporting the view that inflationary pressures in euro area countries tend to rise in a country when output is above potential, and vice versa. Empirical studies by the European Commission (1999), Gerlach and Smets (1997) and Turner (1995) confirm a positive relationship between the output gap and the inflation rate for most euro area countries, whereas Fagan (2001) and Rogers (2002) report a significant positive relationship for the euro area as a whole. All in all, the empirical estimates, often derived from unobserved component models, appear to suggest that a 1 percentage point increase in the positive output gap typically leads to an increase in the annualised inflation rate of about 15 to 30 basis points in the larger euro area economies.

Chart 16

Inflation differentials and differences in output growth and cyclical conditions

Average differential in GDP growth from
1999 to 2002 across the euro area countries with
respect to the euro area average

$R^2 = 0.37$

Change in the differentials of inflation rates from
1999 to 2002 across the euro area countries with
respect to the euro area average

Change in the HICP in 1999-2002

$R^2 = 0.41$

Cumulative output gap from 1999 to 2002
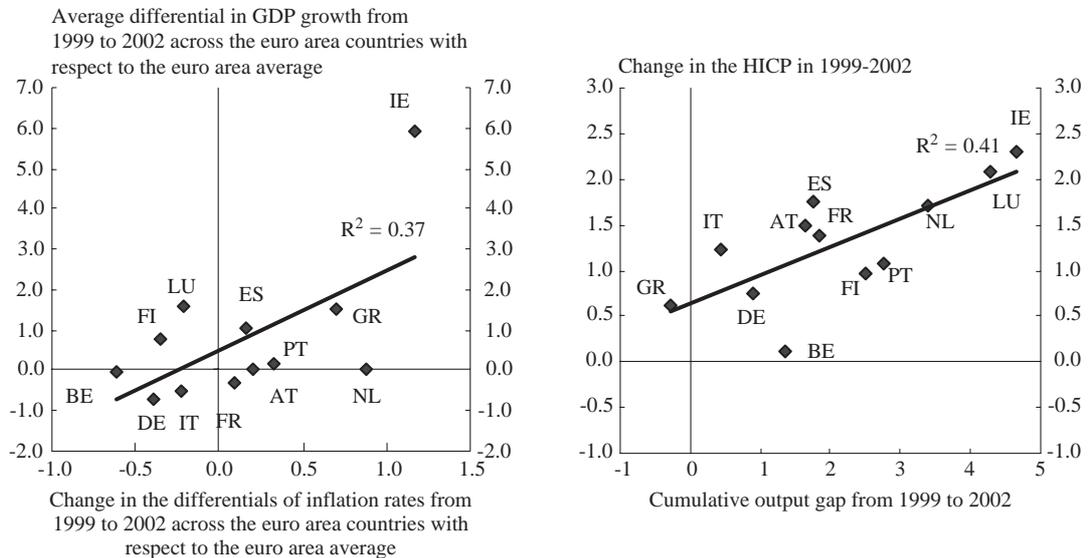
Sources: Eurostat and ECB calculations. The output gap is measured as the difference between potential GDP and GDP, in percent of potential. The former is calculated using the bandpass filter approach by Baxter and King (1999). Inflation differentials are based on HICP data.

inflation rates have experienced higher cumulative output growth than the euro area average, and vice versa (see left-hand panel of Chart 16). Moreover, it appears to be a relatively common pattern – though with some notable exceptions – that the accumulation of inflationary pressures has

been the highest in countries with relatively large positive cumulative output gaps (see right-hand panel of Chart 16). These findings are consistent with the results reported by Rogers et al. (2001) and Blanchard (2001), according to whom the recent inflation trend in Ireland, for instance, has been

Chart 17

Inflation and wage differentials and cumulative changes in unemployment levels

Average differential in compensation per
employee growth from 1999 to 2002 in euro area
countries with respect to the euro area average

$R^2 = 0.59$

Change in the differentials of inflation rates from
1999 to 2002 across the euro area countries with
respect to the euro area average

**Cumulative changes in
harmonised unemployment rate (in %)**

1993-1999   1999-2002

euro area BE DE GR ES FR IE IT LU NL AT PT FI

Sources: Eurostat (harmonised definition of unemployment rate) and ECB (HICP inflation).

Chart 18
Contributions by country to euro area wage dispersion

Legend: BE · DE · FR · IE · NL · AT · GR · ES · IT · LU · PT · FI

Country contributions to dispersion growth in nominal compensation per employee — years 1999, 2000, 2001, 2002.
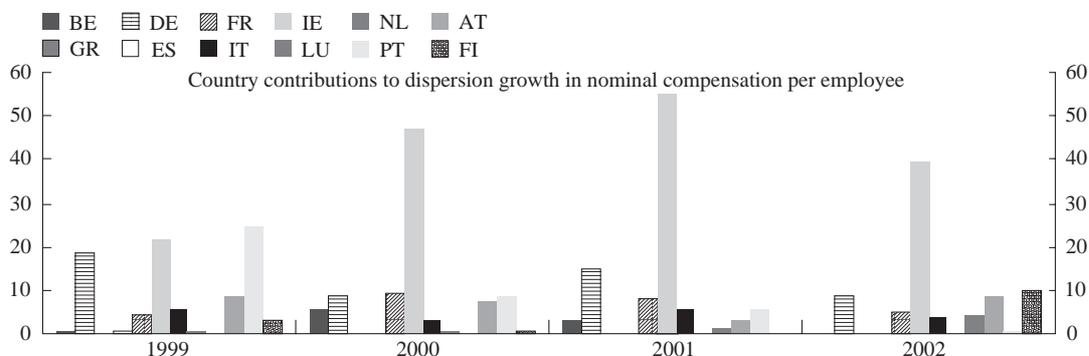
Sources: Eurostat and ECB calculations.

predominantly driven by GDP growth and the output gap. Moreover, Rogers (2001) suggests that mainly convergence effects rather than business cycle effects fuelled inflation dynamics in Greece in the past. Given its relatively large negative output gap in the first half of the 1990s and its relatively high potential growth rate, Greece has yet to close its negative output gap.

Focusing on the demand side of the economy, it is clear that a number of cyclical factors could have led to differences in the output gap positions and, thus, to differences in inflation across the euro area countries. As indicated in Chart 17, wage and unemployment developments may have played a role, as above-average price inflation in euro area countries goes hand in hand with high compensation growth, accompanied by substantial reductions in unemployment levels in selected euro area countries. In some

countries, such as Ireland and the Netherlands, however, the fall in unemployment might not only reflect cyclical developments but also progress achieved by structural labour market reforms.

The overall dispersion of growth in nominal compensation per employee in the euro area since 1999 has been driven mainly by wage developments in Ireland, Portugal and Greece, on the one hand, and in Germany, on the other (Chart 18), thus replicating the main findings reported in the discussion of inflation accounting in sub-section 2.3 concerning the individual country contributions to dispersion in HICP inflation. Moreover, causality tests between the dispersion in wage growth and in inflation suggest that short-term variations in the dispersion of nominal wage growth appear to have caused changes in HICP dispersion (see Table 1 in Annex A.3).

Table 7
Correlation coefficients between wage drift and measures of the economic cycle [1]

Average annual value		EU12[2]	BE	DE	EL	ES	FR	IE	IT	LU	NL	AT	PT	FI
GDP growth	1992-2002	0.7	0.8				0.7				0.6		0.8	
(deviation from trend)	1998-2002	0.8	0.9	1.0			0.6				0.7		0.8	0.8
Unemployment rate	1992-2002	-0.7								-0.5	-0.7		-0.6	
	1998-2002			-0.6	-1.0						-0.8		-0.7	
Employment growth	1992-2002					-0.8	0.6	0.6						
	1998-2002					-0.9	0.6	0.6			0.5			

Sources: National central banks and ECB calculations.
1)   Only correlation coefficients equal to or higher than 0.5 are reported.

Chart 19
Dispersion in real credit growth to the private sector

Deviation of real private sector credit growth from euro area average
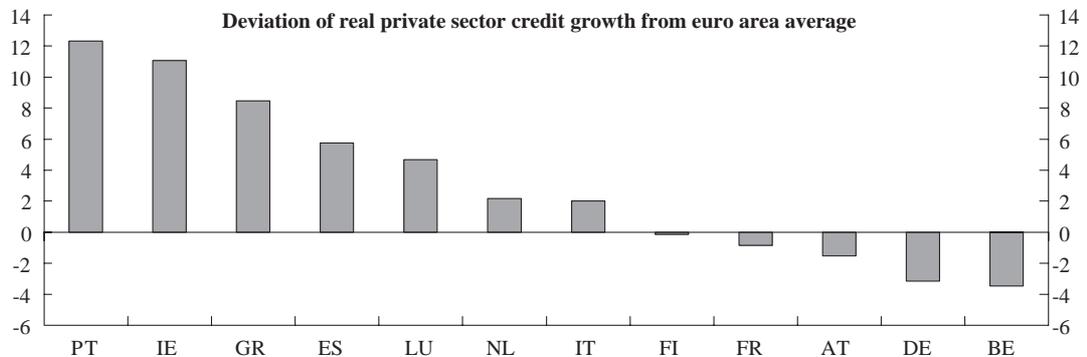
Source: ECB.
Note: Chart 19 is based on loans to the private sector, including non-residentials, deflated by the HICP. Since in some countries the portion of loans provided to non-residentials might be substantial, the results displayed in the chart should be interpreted with caution.

Looking at the decomposition of wage developments, the focus is on the most cyclical component of compensation growth, namely estimates of wage drift for euro area countries.[32] As indicated in Table 7, stylised facts suggest that in the euro area and in most member countries wage drift highly correlates either with the business cycle or with labour market developments (see also Charts 1 and 2 of Annex A.4). Divergent developments in wage drift across countries may therefore partially reflect divergent cyclical positions of the economies and, therefore, inflation differentials.[33]

Wage developments across euro area countries can also be affected by automatic indexation of nominal wages to prices, which exists in some countries. Indexation of wages to prices in all or almost all sectors of the economy can be found in four euro area countries, namely in Belgium and Luxembourg (with an automatic adjustment for past price inflation) as well as in Spain (contractual adjustment for higher-than-expected inflation outcome) and Finland (adjustment if actual inflation exceeds the official target). However, no such explicit mechanisms exist in other countries. In general, indexation of wages to prices should tend to give rise to real wage rigidities.[34]

Furthermore, labour market institutions can also give rise to nominal wage rigidities, which may impede a fall in nominal wages and, thus, in inflation, thereby possibly having an effect on the size and persistence of inflation differentials. Nominal wage rigidities might be due to structural factors, such as minimum wages, reservation wages determined by unemployment benefits, long contract duration, etc. The empirical evidence on the existence of nominal wage rigidities is mixed, with several studies using micro-data on wage settlements, suggesting that negative wage adjustments occur much less frequently than positive wage adjustments. Moreover, given the lack of clear empirical evidence regarding the relation between wage indexation and inflation

32 Wage drift is defined as the percentage point difference between the yearly increase in wages and salaries per employee (in other words compensation per employee less payroll taxes) and the yearly increase in negotiated wages or in monthly basic pay increases, depending on the country and on data availability. Data are available on an annual basis since at least 1992 for most euro area countries. Wages are for the economy as a whole except for the Netherlands where they are for the market sector, and for Belgium and Finland where they are for the private sector.
33 For more details on country-specific results, please see Annex A.4.
34 Wages are said to be rigid downwards if the responsiveness of wages to a shock to labour demand is greater when the shock is positive than when it is negative. A further crucial argument for the rise in nominal wage rigidities raised in the literature is the existence of money illusion and loss aversion. See Yates (1998) and OECD (2002b) for a survey of wage rigidities.

performance, the mere existence of indexation schemes cannot be used to divide countries into high and low inflation performers.[35]

Differences in real credit growth across euro area countries may also serve as proxy for heterogeneous demand pressures and, thus, output gap and inflation developments across countries. In fact, divergent real credit growth may be mainly explained by differences in the pace of economic growth, changes in retail lending rates, mergers and acquisitions as well as trends in housing markets. Evidence presented in Chart 19 appears to confirm that countries with above-average output growth and/or buoyant housing markets, such as Portugal, Ireland, Greece, Spain and the Netherlands, have witnessed the highest relative credit growth in the euro area.

In Portugal and Greece the credit boom might also reflect an increasing degree of financial intermediation, thus pointing to structural convergence in the financial sector. In other countries, such as the Netherlands and Ireland, strong credit growth in the period from 1999 to 2002 probably reflected primarily buoyant domestic demand and an overheated housing market.

Finally, cross-country differences in the stance of fiscal policy may also have played a role in explaining inflation differentials. For countries like Ireland and Greece, for instance, expansionary fiscal policies may have played a role in creating inflation differentials. According to the autumn forecasts of the European Commission, for instance, the cyclically-adjusted primary budget surpluses decreased by 4.4% of GDP in Ireland and by 1.2% of GDP in Greece between 2000 and 2002.

In sum, considerable cross-country differences in employment and wage growth, wage drift and real credit growth appear to confirm that differences in inflation developments have, at least in part, been caused by differences in cyclical positions. Overall, euro area countries with above-average inflation rates, namely Ireland, Greece, Portugal, the Netherlands and, to some extent, Spain have seen the relatively strongest average growth rates in domestic demand and highest cumulative increase in their respective (positive) output gaps. The opposite applies to euro area countries with below-average inflation rates, notably Germany, Belgium and Austria. Also, cross-country differences in the fiscal policy stance may have played a role in explaining inflation differentials, notably for countries like Ireland and Greece, where fiscal policies were relatively expansionary.

3.3.2 The role of real interest rate and real exchange rate changes

Some observers argue that – depending on their underlying source – inflation differentials among countries within a monetary union may trigger transitory expansionary effects on aggregate demand through real interest rate differentials, adding further to the divergence of inflation rates.

Based on a partial equilibrium analysis for the United States, Arnold and Kool (2002) provide empirical evidence that real interest rate changes caused by a rise in regional inflation differences resulted in transitory expansionary effects on domestic demand which temporarily dominated the counterbalancing loss in competitiveness induced by the increase in inflation. It is only some three to four years after the initial rise in the inflation differential that the cumulative deterioration in competitiveness triggered by a real appreciation more than offsets the pro-cyclical real interest rate effects.

With regard to the euro area, while ex-post real long-term interest rates[36] have declined

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35 A recent study by Dessey (2002) finds indications that wages are significantly less likely to be cut in Germany and Italy than in France, Spain or Ireland. Other studies, however, such as Knoppik/Beissinger (2001) find for Germany that less than 10 percent of employees experienced unchanged wages in, for instance, 1994/95, providing counterbalancing evidence of the degree of wage flexibility in Germany.

36 The real interest rate is usually defined in ex-ante terms, i.e. as the difference between nominal interest rates of a given maturity and the expected rate of inflation at the respective horizon. However, due to data limitations, the ex-post real interest rate is often reported. The latter reflects the ex-ante rate adjusted by unpredictable short-term fluctuations in inflation.

across all euro area countries over the last decade – including the period since the start of Stage Three of EMU – there has been a pronounced divergence in the relative extent of this decline. In fact, ex-post real long-term interest rates have fallen substantially below the euro area average in the group of fast-growing countries with above-average inflation rates, namely Ireland, the Netherlands, Portugal, Spain and Greece.[37] It is likely that this reflects in part the one-off convergence of nominal interest rates within the euro area – particularly in countries which experienced relatively higher inflation rates in the past, such as Portugal and Spain, and also Greece, which joined the euro area relatively recently.

Inasmuch as nominal interest rate convergence effects related to the monetary regime shift at the inception of Stage Three of EMU have been at work, the potential of expansionary effects channelled through a decline in real interest rates should remain relatively limited, given the transitory nature of the effects related to the one-off convergence of nominal interest rates during the run-up to Stage Three of EMU. However, inflation differentials appear to have also played a role in explaining the dispersion of real interest rates in recent years. To the extent that the existing patterns of growth and inflation differentials prior to the start of Stage Three were expected to persist for some period of time – as they reflected deep structural causes – the move to Stage Three of EMU may have also had a lasting impact on differences in real interest rates.

As to the group of countries that recently experienced a deceleration of growth and inflationary pressures, ex-ante and ex-post real long-term interest rates have also declined relative to the years before the start of Stage Three of EMU, albeit less than for the group of countries with above-average inflation rates. In this context, it is important to note that Germany, Italy and France do not appear to have suffered from exceptionally high long-term real interest rates since the start of Stage Three of EMU,

at least if compared with the level of real interest rates which prevailed in the period from 1992 to 1998. However, among the group of countries with above-average output growth and inflation rates, transitory expansionary effects may have been experienced.

Even if one presumes that the aforementioned differences in observed ex-post real interest rates are also reflected in divergent ex-ante real interest rates and were triggered by an increase in inflation differentials, it is important to look at the underlying source of the change in inflation differentials. If inflation differentials are, for instance, due to changes in administered prices, there is no reason to assume that this leads to higher incentives for investment. The same argument holds, if inflation differentials are caused by, for example, divergent wage growth or changes in import prices, as profit margins may then remain unchanged, thus offering no additional incentives to increase future investments.

Regarding the equilibrating effects of real exchange rate changes sparked by a change in inflation differentials, evidence suggests that the euro area countries have experienced marked differences in the evolution of indicators of national competitiveness. Countries with above-average inflation rates such as Ireland, the Netherlands, Portugal and Spain have experienced a deterioration in their competitiveness since 1999, both as regards intra-euro area competitiveness and real effective exchange rates (Chart 20). Consequently, the export performance of some of these countries (e.g. the Netherlands and Portugal) appears to have been already

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37 Long-term inflation expectations for the big five euro area economies derived from the Consensus Forecast also point to the existence of sizeable but less pronounced real interest rate differentials. In any event, some degree of persistence in inflation dynamics should be sufficient to yield differentials in inflationary expectations and thus ex-ante real interest rate differentials. In the case of Portugal, short-term real interest rates are more relevant than long-term rates, given that fixed long-term rates are not of importance for the private sector in Portugal. That said, short-term ex-post real interest rates also fell considerably to below the euro area average over the aforementioned period, thus resembling the results of long-term interest rates. However, short-term rates declined later than long-term rates.

Chart 20

National competitiveness indicators
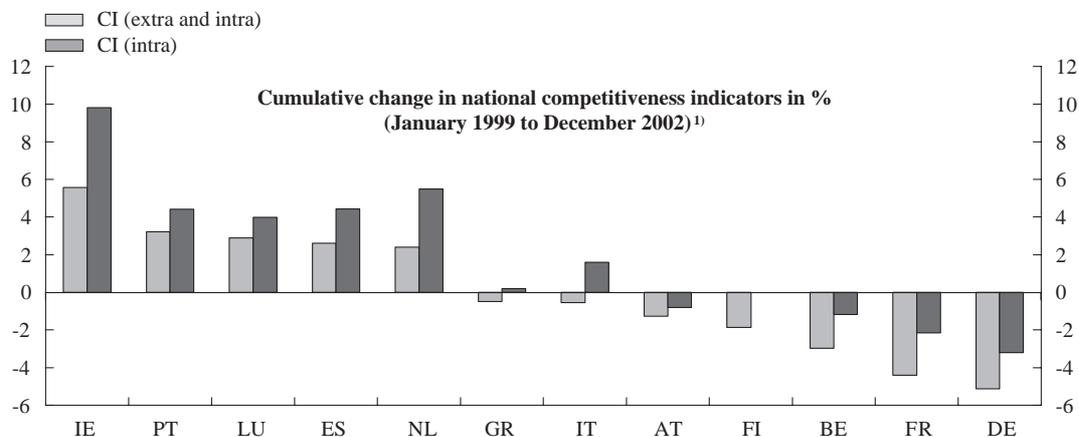
Source: ECB.
1) An increase indicates a real appreciation or a decline in national competitiveness. The competitiveness indicator "CI intra" is
    based on intra-euro area trade and deflated by the national CPI, whereas the "CI extra and intra" also incorporated trading
    partners outside the euro area based on a narrow group of trading partner countries.

adversely affected by this loss in competitiveness, which took place notwithstanding the nominal effective depreciation of the euro between 1999 and 2002. Moreover, countries like Ireland, which have witnessed not only above-average inflation rates and output growth but also substantial productivity gains in the recent past, are probably better suited to cope with a partial loss in competitiveness triggered by a rise in their inflation differential.

As to the group of relatively slow-growing countries with below-average inflation rates, they have clearly benefited from the gain in competitiveness trigged by inflation differentials. As indicated by the results of the inflation accounting exercise (see Chapter 2.3), the below-average increase in inflation observed in these countries may well be the consequence of relatively lower compensation growth, which thus may have contributed to the improvement in relative competitiveness. This effect has been reinforced by the cumulative nominal effective depreciation of the euro since 1999. All in all, stylised facts show that the changes in indicators of national competitiveness triggered by inflation differentials have been substantial across euro area countries over the last three years, suggesting considerable scope for the equilibrating effects of the real exchange rate channel over the medium term.

Divergent house price trends across the euro area countries may have reinforced the effects of differences in nominal interest rate changes on business cycles[38],[39]. Sharp housing price increases in Greece, Spain, the Netherlands and Ireland, for instance, are found to have further fuelled domestic demand since 1999, enhancing real output growth and thereby inflation, whereas house prices in Germany and Austria remained relatively stable over the last three years. In Portugal, house prices have remained relatively stable since mid-2001, following an upward trend until mid-1999 and a subsequent decline until mid-2001.[40]

38 In this context, Arnold and Kool (2002) provide empirical evidence for the United States, suggesting a mutual reinforcement between output growth and house price increases across the US states, with higher real output growth leading to higher housing prices, which further stimulate economic activity via positive wealth effects.

39 Case, Quigley and Shiller (2001) and Ludwig and Sloek (2002) provide further empirical evidence of the positive relationship between the business cycle and house prices.

40 See De Nederlandsche Bank (2000) for a more detailed analysis of changes in house prices on household wealth in the Netherlands. Given the considerable weight of owner-occupied homes in household wealth, an increase in housing prices by 40% is estimated to result in a cumulative increase in real GDP of about 2% over a time span of four years. As regards empirical evidence for Ireland, the results reported by Kenny (1998) also indicate a strong positive relationship between house prices and output growth. Moreover, see ECB (2003) for a good survey of recent house price developments and the underlying reasons therefore in the euro area countries.

In sum, it is plausible to conclude that the move to Stage Three of EMU may have led to transitory expansionary effects on domestic demand in countries that experienced the largest decline in nominal and real interest rates, most notably Ireland, Portugal, Greece and Spain. Given the one-off nature of this regime shift, however, this source of inflation differentials is temporary. Moreover, as illustrated by the model simulations, the equilibrating effect of changes in national competitiveness triggered by an increase in inflation differentials is likely to offset any expansionary effects of real interest rate changes over time. The loss in competitiveness in countries with above-average inflation rates should eventually help to counterbalance the expansionary effect of the real interest rate decline on economic activity. By the same token, countries with below-average inflation rates, such as Germany and Austria, are found to benefit particularly from the gain in competitiveness resulting from the induced real depreciation.

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Annex I

Measures of dispersion –a brief review

The concept of *dispersion* indicates to what extent a certain variable – inflation in this case – differs across countries at a certain point in time. To measure the degree of inflation dispersion, several statistical indicators can be used, the following being the most common:

- The spread that measures the difference between the highest and the lowest inflation within a group of countries. It is therefore sensitive to outliers and does not allow for any weighting of the series.

- To adjust for the sensitiveness of the spread to outliers, the spread between the three countries with the highest and the lowest inflation rates could be computed.

The weighted and unweighted standard and mean-square deviations are some of the most regularly used indicators, as they provide a summary indicator of the value of the standard inflation differential across countries. The mean square and the standard deviations differ in technical terms only because the first calculates the deviation from a value that is not strictly the average of the euro area countries' inflation.[1] The weighted standard deviation takes into account the size of the countries in the calculation of dispersion, while the unweighted measure gives equal importance to all countries. As the euro area average is a weighted concept, the weighted standard deviation may be more appropriate. However, the latter measure may in some circumstances mask important developments in the smaller countries. Standard deviation measures are also relatively sensitive to the presence of outliers, especially when working with small samples.

In the particular case of inflation dispersion, all of the above-mentioned measures tend to move in parallel and provide broadly similar patterns and results, bearing in mind the different scales. In particular, the profile of the spread between the three countries with the highest and lowest inflation rates and the weighted standard deviation are quite similar, as well as the profiles of the unweighted standard deviation and the simple spread (see Chart A1-1, which plots these dispersion measures for the euro area, and Chart A1-2, which compares the behaviour of the weighted standard deviation and the spread between the euro area and the MSAs in the United States).

Finally, another relevant measure is the coefficient of variation, which divides the standard deviation by the average value. In general, it is useful when comparing dispersion across series with completely different scales or units of measure (for instance, price levels), as the degree of dispersion measured is affected by the value of the units. However, in some circumstances, the coefficient of variation must be interpreted carefully when the mean changes suddenly or when it reaches values relatively close to zero. In the particular case of inflation there is no obvious and clear-cut relationship between the degree of dispersion and the average level of inflation.

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1   *The euro area HICP is a chain index and therefore the weighted average of the inflation rates may differ from the euro area inflation rate calculated from the euro area index level.*

Inflation dispersion measures across the euro area countries

—— unweighted standard deviation (left-hand scale)
—— spread between the highest and lowest rate (right-hand scale)

—— weighted standard deviation (left-hand scale)
—— spread between the average of the three highest and lowest rates (right-hand scale)
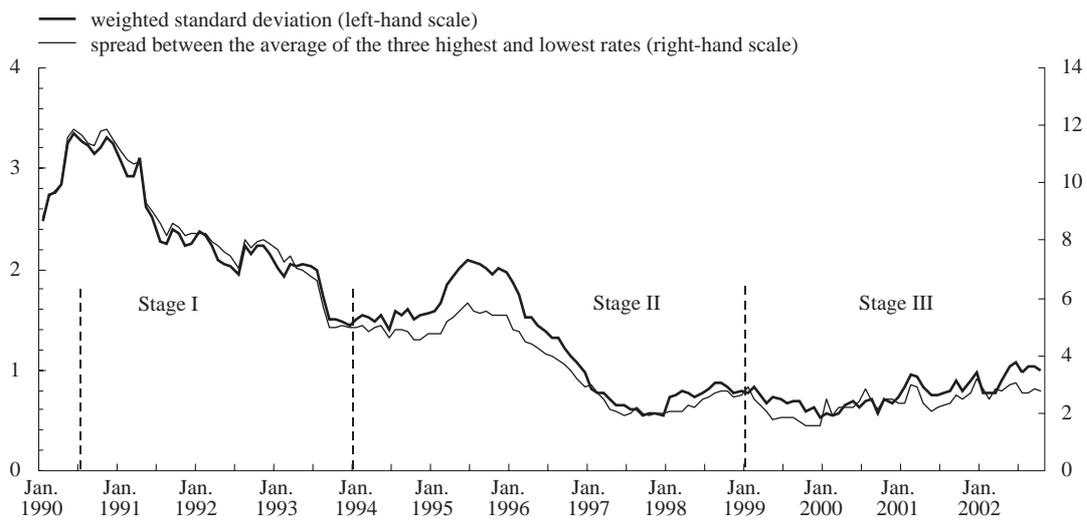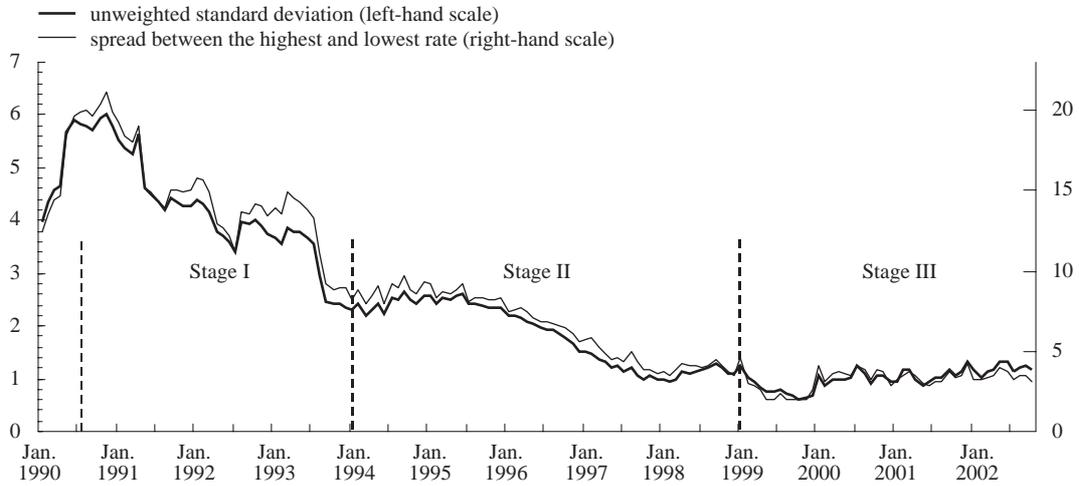
Sources: Eurostat, BLS and ECB calculations.

Comparison of inflation dispersion measures in the euro area and in MSAs of the United States

— euro area (12 countries)
— United States (14 MSAs)

Weighted standard deviation

— euro area (12 countries)
— United States (14 MSAs)

Spread between the highest and the lowest rate
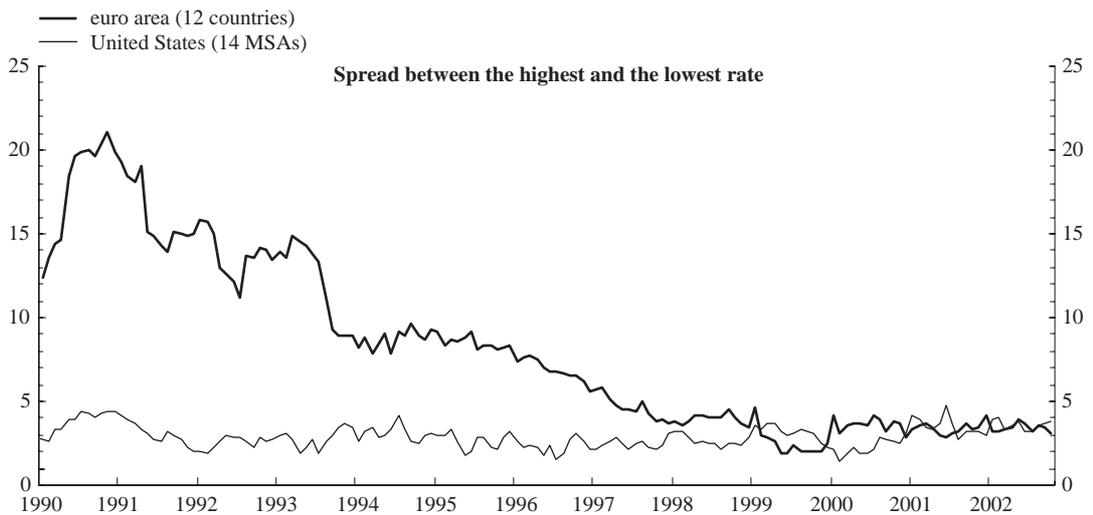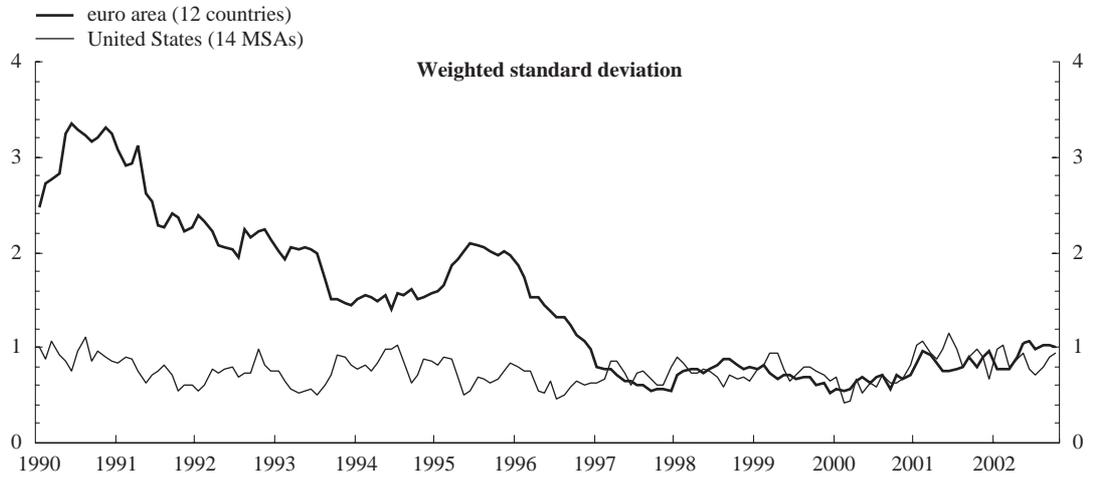
Sources: Eurostat, BLS and ECB calculations.

Annex 2

Inflation accounting

The inflation accounting framework bases annual national accounts data from Eurostat's AMECO database for the period from 1992 to 2002, except for Portugal and Luxembourg where the data was provided by the respective national central bank. For Greece, the data used need to be interpreted with caution, given that sector-specific employment developments tend to lead to an upward bias in labour productivity growth and, thus, a downward bias in ULC growth.

The data for 2002 are projections by the European Commission, which explains the occurrence of relatively large residuals in this year (see detailed country tables). The cut-off date for input data was end-March 2003. Profits have been calculated as a residual, and the income of self-employed has been assumed to be the same as for employees. For a more detailed description, see Meyler (2001).

BELGIUM	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	3.66	4.94	0.73	0.52	0.56	0.18	0.87	1.58	0.40	4.00	2.84
Compensation per employee	5.76	4.72	4.32	2.16	1.37	2.99	1.72	3.31	2.54	3.57	3.62
Reciprocal to productivity	-2.03	0.21	-3.56	-1.63	-0.81	-2.80	-0.85	-1.71	-2.13	0.41	-0.76
Real GDP	1.52	-0.98	3.23	2.37	1.21	3.59	2.01	3.19	3.72	0.77	0.74
Total employment	-0.50	-0.77	-0.32	0.72	0.40	0.77	1.16	1.45	1.56	1.18	-0.02
Contribution to GDP deflator											
GDP deflator	3.44	4.01	2.09	1.26	1.16	1.29	1.67	1.38	1.25	1.97	2.06
ULC	2.36	3.20	0.48	0.33	0.36	0.12	0.54	0.98	0.25	2.48	1.79
Gross operating surplus	0.51	0.06	0.95	1.05	0.20	0.65	0.98	0.02	0.84	-0.22	0.10
Net indirect taxes	0.56	0.76	0.66	-0.12	0.59	0.52	0.15	0.38	0.16	-0.29	0.16
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	1.02	1.34	1.98	1.65	1.72	2.96	0.08	1.11	5.66	1.71	0.81
Domestic costs	1.48	2.28	0.38	0.39	0.39	0.42	-0.27	0.59	-0.36	1.08	1.58
GDP deflator	2.05	2.43	1.30	0.77	0.70	0.77	0.98	0.81	0.73	1.08	1.13
GDP per unit of final demand	-0.56	-0.14	-0.90	-0.38	-0.31	-0.35	-1.22	-0.21	-1.08	0.00	0.44
Import costs	-0.49	-0.95	1.60	1.27	1.33	2.55	0.30	0.51	6.13	0.63	-0.75
Import prices	-1.11	-1.10	0.68	0.88	1.02	2.18	-0.97	0.30	4.92	0.63	-0.27
Imports per unit of final demand	0.63	0.15	0.90	0.38	0.31	0.36	1.29	0.21	1.09	0.00	-0.49

GERMANY	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	6.44	3.84	0.48	2.10	0.22	-0.73	0.18	0.35	0.96	1.53	1.08
Compensation per employee	10.59	4.17	3.05	3.72	1.31	0.83	1.03	1.18	2.03	1.67	2.00
Reciprocal to productivity	-3.90	-0.31	-2.56	-1.59	-1.09	-1.57	-0.85	-0.82	-1.06	-0.14	-0.91
Real GDP	2.24	-1.09	2.35	1.73	0.77	1.39	1.96	2.05	2.86	0.57	0.36
Total employment	-1.59	-1.40	-0.21	0.14	-0.32	-0.17	1.10	1.21	1.78	0.44	-0.55
Contribution to GDP deflator											
GDP deflator	5.04	3.67	2.51	2.03	1.02	0.66	1.11	0.49	-0.25	1.45	1.38
ULC	3.99	2.41	0.30	1.29	0.14	-0.44	0.11	0.21	0.58	0.92	0.65
Gross operating surplus	0.24	0.64	1.71	1.00	0.78	0.86	0.83	-0.34	-0.79	0.51	0.62
Net indirect taxes	0.81	0.62	0.49	-0.26	0.11	0.25	0.17	0.62	-0.04	0.02	0.12
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	3.71	2.68	2.18	1.80	0.92	1.14	0.48	0.16	1.43	1.24	0.79
Domestic costs	4.09	3.64	1.31	1.07	0.47	-0.53	-0.26	-0.68	-1.49	1.02	1.50
GDP deflator	3.98	2.94	2.05	1.65	0.83	0.53	0.88	0.39	-0.20	1.09	1.04
GDP per unit of final demand	0.11	0.68	-0.71	-0.57	-0.36	-1.06	-1.13	-1.06	-1.30	-0.07	0.46
Import costs	-0.38	-0.93	0.85	0.72	0.46	1.70	0.71	0.83	3.02	0.23	-0.70
Import prices	-0.26	-0.20	0.11	0.15	0.10	0.61	-0.42	-0.21	1.66	0.16	-0.23
Imports per unit of final demand	-0.12	-0.73	0.74	0.57	0.36	1.05	1.15	1.05	1.27	0.07	-0.48

GREECE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	11.58	12.44	10.99	11.49	5.90	9.13	6.18	1.08	1.62	0.77	3.32
Compensation per employee	11.53	9.81	10.94	13.02	8.83	13.72	5.34	4.62	6.14	5.38	6.50
Reciprocal to productivity	0.05	2.34	0.05	-1.37	-2.76	-4.21	0.79	-3.51	-4.44	-4.57	-3.08
Real GDP	1.38	-1.39	1.81	2.29	2.36	3.63	3.31	3.53	4.27	4.22	3.39
Total employment	1.43	0.98	1.87	0.91	-0.40	-0.55	4.13	0.02	-0.16	-0.34	0.30
Contribution to GDP deflator											
GDP deflator	14.11	14.05	11.50	9.66	7.38	6.80	5.30	3.04	3.40	3.27	3.36
ULC	7.07	7.43	6.47	6.73	3.52	5.36	3.71	0.65	0.96	0.45	1.89
Gross operating surplus	4.69	6.23	3.90	1.61	2.36	0.16	0.77	1.27	1.65	3.09	1.19
Net indirect taxes	2.29	0.55	1.09	1.23	1.51	1.28	0.82	1.11	0.79	-0.28	0.28
Residual	-0.07	0.16	-0.04	-0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	13.74	12.68	10.28	9.18	6.91	5.95	4.92	2.75	4.09	3.20	2.61
Domestic costs	11.17	10.76	9.22	6.72	5.14	3.67	3.12	2.33	0.86	3.64	2.81
GDP deflator	11.11	11.11	9.17	7.79	5.91	5.42	4.17	2.37	2.66	2.48	2.59
GDP per unit of final demand	0.04	-0.30	0.05	-0.98	-0.72	-1.64	-1.00	-0.04	-1.74	1.13	0.21
Import costs	2.58	1.90	1.07	2.44	1.76	2.21	1.79	0.42	3.28	-0.44	-0.19
Import prices	2.63	1.53	1.12	1.36	1.01	0.57	0.81	0.38	1.57	0.66	0.01
Imports per unit of final demand	-0.05	0.35	-0.05	1.01	0.72	1.60	0.94	0.04	1.60	-1.07	-0.20

SPAIN	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	8.64	5.41	0.73	2.74	3.40	1.42	2.54	2.07	3.01	3.77	3.64
Compensation per employee	11.13	7.50	3.37	3.37	4.63	2.53	2.96	2.90	4.03	4.11	4.20
Reciprocal to productivity	-2.30	-1.98	-2.62	-0.61	-1.19	-1.10	-0.41	-0.82	-0.98	-0.32	-0.54
Real GDP	0.93	-1.03	2.38	2.76	2.44	4.03	4.35	4.20	4.18	2.67	1.89
Total employment	-1.34	-2.95	-0.23	2.13	1.23	2.89	3.92	3.36	3.17	2.34	1.34
Contribution to GDP deflator											
GDP deflator	6.71	4.54	3.88	4.94	3.52	2.32	2.40	2.74	3.48	4.16	3.88
ULC	5.44	3.47	0.47	1.72	2.09	0.87	1.54	1.26	1.82	2.27	2.18
Gross operating surplus	-0.09	2.11	2.62	2.96	0.98	0.84	0.25	0.65	1.24	1.73	1.15
Net indirect taxes	1.36	-1.04	0.79	0.25	0.45	0.61	0.61	0.83	0.41	0.16	0.55
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	5.83	4.82	4.17	4.85	2.99	2.50	1.81	2.24	4.80	3.28	2.72
Domestic costs	4.78	4.42	2.02	2.87	2.02	0.48	0.49	0.72	1.56	2.98	3.42
GDP deflator	5.61	3.79	3.26	4.07	2.87	1.88	1.91	2.15	2.70	3.14	2.95
GDP per unit of final demand	-0.78	0.60	-1.19	-1.15	-0.82	-1.37	-1.38	-1.39	-1.10	-0.15	0.45
Import costs	1.00	0.39	2.17	1.98	0.95	2.03	1.29	1.49	3.30	0.29	-0.68
Import prices	0.20	1.01	0.93	0.77	0.13	0.66	-0.07	0.15	2.17	0.14	-0.25
Imports per unit of final demand	0.79	-0.58	1.17	1.15	0.82	1.33	1.36	1.33	1.03	0.15	-0.43

FRANCE	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	1.65	2.01	-0.44	1.27	1.17	0.57	-0.26	1.06	0.66	2.80	2.44
Compensation per employee	3.94	2.41	1.47	2.48	1.85	2.23	1.65	2.37	2.05	2.56	2.74
Reciprocal to productivity	-2.25	-0.39	-1.92	-1.20	-0.68	-1.65	-1.91	-1.29	-1.39	0.24	-0.30
Real GDP	1.47	-0.85	2.05	1.67	1.10	1.91	3.42	3.22	3.77	1.82	0.93
Total employment	-0.77	-1.24	0.13	0.46	0.42	0.26	1.48	1.90	2.36	2.07	0.63
Contribution to GDP deflator											
GDP deflator	2.02	2.28	1.69	1.68	1.45	1.28	0.92	0.54	0.76	1.44	1.94
ULC	1.00	1.21	-0.26	0.74	0.68	0.33	-0.15	0.61	0.38	1.61	1.42
Gross operating surplus	1.09	0.68	1.01	0.38	0.08	0.73	0.90	-0.11	0.55	0.01	0.20
Net indirect taxes	-0.07	0.40	0.95	0.56	0.69	0.22	0.17	0.04	-0.17	-0.16	0.18
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	-0.15
Contribution to final demand deflator											
Final demand deflator	1.12	1.28	1.52	1.48	1.60	1.33	0.29	0.16	1.56	1.09	1.33
Domestic costs	1.61	2.29	0.61	0.53	1.12	0.35	-0.42	-0.01	-0.99	1.42	1.63
GDP deflator	1.65	1.89	1.42	1.39	1.19	1.06	0.75	0.43	0.61	1.13	1.54
GDP per unit of final demand	-0.04	0.39	-0.79	-0.85	-0.07	-0.70	-1.16	-0.45	-1.59	0.28	0.09
Import costs	-0.50	-0.98	0.89	0.93	0.48	0.98	0.67	0.17	2.61	-0.33	-0.31
Import prices	-0.54	-0.57	0.08	0.07	0.40	0.27	-0.47	-0.26	1.01	-0.04	-0.21
Imports per unit of final demand	0.05	-0.42	0.81	0.86	0.07	0.70	1.17	0.44	1.52	-0.28	-0.09

IRELAND	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	4.65	4.14	-0.48	-2.68	-0.90	-1.12	5.39	-0.18	3.89	7.10	5.79
Compensation per employee	6.98	6.37	2.46	2.38	3.55	4.22	4.65	5.16	8.85	9.24	7.90
Reciprocal to productivity	-2.22	-2.14	-2.95	-5.20	-4.49	-5.40	0.70	-5.35	-4.78	-2.00	-1.99
Real GDP	3.17	2.81	6.21	10.58	8.23	11.29	7.84	11.65	9.68	5.04	3.32
Total employment	0.93	0.65	3.17	5.11	3.58	5.58	8.59	5.98	4.68	2.98	1.31
Contribution to GDP deflator											
GDP deflator	2.86	5.11	1.20	1.79	2.43	3.79	5.30	4.65	4.16	6.02	5.54
ULC	2.79	2.52	-0.29	-1.59	-0.51	-0.62	2.82	-0.10	1.94	3.53	2.91
Gross operating surplus	-0.93	3.05	0.09	3.82	2.76	3.58	3.31	3.08	1.62	2.79	1.79
Net indirect taxes	1.09	-0.54	1.46	0.27	-0.30	0.86	1.05	0.67	0.95	-0.41	0.83
Residual	0.09	-0.08	0.06	0.70	-0.49	0.03	1.88	-1.00	0.35	-0.10	-0.01
Contribution to final demand deflator											
Final demand deflator	1.47	4.89	1.56	2.51	1.27	2.54	3.95	3.75	5.33	4.91	2.62
Domestic costs	0.78	2.25	-1.22	-0.13	0.53	1.08	-0.89	2.56	-0.33	2.99	2.50
GDP deflator	1.88	3.35	0.78	1.12	1.48	2.29	3.18	2.65	2.39	3.26	3.02
GDP per unit of final demand	-1.06	-1.04	-1.97	-1.23	-0.92	-1.17	-3.86	-0.09	-2.61	-0.26	-0.49
Import costs	0.64	2.63	2.81	2.66	0.71	1.43	4.72	1.18	5.72	1.91	0.09
Import prices	-0.42	1.57	0.84	1.41	-0.20	0.28	0.99	1.10	3.20	1.67	-0.35
Imports per unit of final demand	1.08	1.02	1.91	1.20	0.92	1.14	3.64	0.08	2.34	0.24	0.45

ITALY	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	4.05	2.46	0.02	1.38	5.03	2.50	-2.36	1.54	1.86	2.52	3.58
Compensation per employee	5.12	4.54	4.11	4.83	5.16	4.30	-1.51	1.92	2.77	2.61	2.91
Reciprocal to productivity	-1.04	-2.04	-4.09	-3.41	-0.12	-1.75	-0.87	-0.38	-0.89	-0.09	0.64
Real GDP	0.76	-0.88	2.21	2.92	1.09	2.03	1.79	1.59	2.87	1.78	0.44
Total employment	-0.27	-2.86	-1.80	-0.47	0.97	0.27	0.92	1.20	1.96	1.69	1.09
Contribution to GDP deflator											
GDP deflator	4.55	3.93	3.48	5.03	5.28	2.39	2.71	1.69	2.15	2.64	2.44
ULC	2.59	1.57	0.02	0.84	2.95	1.47	-1.38	0.86	1.04	1.40	1.98
Gross operating surplus	1.31	1.41	2.92	3.18	2.14	-0.05	0.79	0.80	0.83	1.29	0.06
Net indirect taxes	0.65	0.95	0.54	1.01	0.19	0.97	3.30	0.03	0.28	-0.05	0.40
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	3.88	5.92	3.64	6.01	3.76	2.13	1.88	1.37	3.88	2.42	1.70
Domestic costs	2.83	4.95	2.08	3.17	4.52	0.75	1.08	0.76	0.64	2.36	2.00
GDP deflator	3.83	3.30	2.93	4.18	4.30	1.98	2.22	1.37	1.74	2.07	1.93
GDP per unit of final demand	-0.96	1.59	-0.82	-0.95	0.22	-1.19	-1.10	-0.61	-1.08	0.28	0.06
Import costs	1.02	0.83	1.57	2.89	-0.75	1.36	0.76	0.61	3.34	0.07	-0.29
Import prices	0.17	2.38	0.77	1.88	-0.54	0.24	-0.24	0.08	2.29	0.34	-0.23
Imports per unit of final demand	0.84	-1.34	0.76	0.90	-0.22	1.10	1.01	0.53	0.94	-0.26	-0.06

LUXEMBOURG	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	7.21	3.08	2.61	2.46	0.84	-1.91	-1.23	2.43	1.54	9.10	6.28
Compensation per employee	6.50	5.73	3.93	1.30	1.94	2.51	1.64	3.38	4.72	4.37	3.50
Reciprocal to productivity	0.67	-2,56	-1,28	1.14	-1.09	-4.51	-2.91	-0.93	-3.13	4.33	2.61
Real GDP	1.82	4.20	3.82	1.33	3.73	7.69	7.55	5.96	8.95	1.03	0.13
Total employment	2.51	1.60	2.50	2.49	2.62	3.05	4.51	4.99	5.64	5.60	2.82
Contribution to GDP deflator											
GDP deflator	3.73	5.97	3.54	2.44	1.62	3.29	2.07	3.12	2.80	2.28	0.84
ULC	4.19	1.85	1.52	1.42	0.49	-1.09	-0.67	1.28	0.81	4.71	3.46
Gross operating surplus	-0.98	2.04	2.04	0.50	1.26	3.64	2.54	0.27	1.31	-2.14	-2.22
Net indirect taxes	0.53	2.08	-0.02	0.51	-0.13	0.75	0.20	1.57	0.68	-0.28	-0.41
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	3.17	4.64	2.83	2.11	2.00	3.88	1.73	3.40	6.07	0.83	-0.14
Domestic costs	3.10	2.81	1.11	0.44	0.20	0.48	-0.67	-0.13	0.29	0.07	0.94
GDP deflator	1.85	3.05	1.83	1.25	0.82	1.64	1.00	1.46	1.27	0.98	0.36
GDP per unit of final demand	1.21	-0.23	-0.69	-0.79	-0.61	-1.12	-1.63	-1.55	-0.95	-0.89	0.58
Import costs	0.08	1.82	1.71	1.66	1.81	3.41	2.39	3.54	5.87	0.73	-1.07
Import prices	1.38	1.55	1.01	0.81	1.18	2.24	0.68	1.86	4.41	0.00	-0.69
Imports per unit of final demand	-1.27	0.26	0.68	0.83	0.61	1.12	1.69	1.62	1.35	0.74	-0.39

NETHERLANDS	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	4.52	2.09	-0.26	0.60	0.72	1.48	2.06	1.77	3.08	5.55	5.28
Compensation per employee	4.57	2.94	1.95	1.16	1.44	2.09	3.77	3.11	4.25	4.90	5.10
Reciprocal to productivity	-0.05	-0.84	-2.21	-0.56	-0.71	-0.61	-1.67	-1.32	-1.13	0.61	0.17
Real GDP	1.40	1.16	2.86	2.85	3.04	3.86	4.35	3.97	3.39	1.28	0.11
Total employment	1.35	0.32	0.63	2.28	2.31	3.23	2.64	2.62	2.23	1.90	0.28
Contribution to GDP deflator											
GDP deflator	2.64	1.57	2.06	2.12	1.17	1.99	1.71	1.58	4.10	5.26	3.89
ULC	2.77	1.30	-0.16	0.37	0.43	0.89	1.23	1.06	1.85	3.30	3.15
Gross operating surplus	-0.34	-0.71	2.13	0.59	0.27	0.96	0.05	-0.14	1.76	0.82	0.32
Net indirect taxes	0.21	0.98	0.10	1.17	0.47	0.15	0.43	0.65	0.49	1.14	0.42
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	1.37	0.38	1.47	1.54	1.17	2.07	0.56	1.18	5.56	3.53	2.23
Domestic costs	1.75	1.14	0.06	-0.21	0.48	0.07	0.18	0.60	0.96	3.08	2.80
GDP deflator	1.75	1.06	1.41	1.43	0.77	1.31	1.10	1.01	2.63	3.24	2.43
GDP per unit of final demand	0.00	0.08	-1.32	-1.60	-0.29	-1.21	-0.90	-0.41	-1.60	-0.15	0.36
Import costs	-0.38	-0.76	1.38	1.71	0.69	2.00	0.35	0.58	4.67	0.44	-0.56
Import prices	-0.38	-0.67	0.01	0.08	0.40	0.76	-0.55	0.18	3.00	0.29	-0.22
Imports per unit of final demand	0.00	-0.09	1.37	1.63	0.29	1.21	0.91	0.39	1.54	0.15	-0.34

AUSTRIA	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	3.68	3.33	1.18	1.75	-1.31	0.25	-0.85	0.41	-0.34	1.55	1.36
Compensation per employee	5.69	4.61	3.70	3.84	1.27	1.14	2.09	1.73	2.27	1.45	2.26
Reciprocal to productivity	-1.94	-1.24	-2.49	-2.06	-2.61	-0.89	-2.96	-1.32	-2.62	0.10	-0.88
Real GDP	2.16	0.59	2.35	2.04	2.00	1.41	4.02	2.73	3.40	0.55	0.98
Total employment	0.21	-0.63	-0.13	-0.02	-0.60	0.51	1.02	1.40	0.76	0.65	0.09
Contribution to GDP deflator											
GDP deflator	3.81	3.03	2.70	2.56	1.25	0.90	0.64	0.87	0.90	1.83	1.47
ULC	2.56	2.32	0.82	1.20	-0.89	0.16	-0.56	0.26	-0.22	0.99	0.87
Gross operating surplus	0.69	0.04	1.38	1.10	2.06	0.13	1.33	-0.05	1.95	0.70	0.47
Net indirect taxes	0.53	0.41	0.77	-0.21	0.15	0.78	-0.34	0.46	-0.17	0.08	-0.19
Residual	-0.03	-0.27	0.28	-0.48	0.06	0.18	-0.21	-0.19	0.66	-0.06	-0.32
Contribution to final demand deflator											
Final demand deflator	2.81	2.40	2.34	2.01	1.50	1.16	0.49	0.60	1.64	1.17	0.91
Domestic costs	2.90	2.54	0.90	1.17	0.33	-1.42	0.11	-0.67	-1.07	0.04	1.60
GDP deflator	2.75	2.21	1.99	1.87	0.91	0.64	0.45	0.60	0.61	1.21	0.96
GDP per unit of final demand	0.15	0.32	-1.06	-0.68	-0.57	-2.04	-0.34	-1.26	-1.66	-1.16	0.62
Import costs	-0.09	-0.13	1.42	0.83	1.17	2.60	0.38	1.26	2.74	1.11	-0.67
Import prices	0.07	0.21	0.31	0.13	0.58	0.50	0.04	-0.02	1.02	-0.07	-0.05
Imports per unit of final demand	-0.16	-0.33	1.10	0.69	0.57	2.06	0.34	1.28	1.67	1.19	-0.63

PORTUGAL	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	13.29	8.06	3.96	7.39	4.01	3.51	3.44	3.29	4.47	5.67	5.03
Compensation per employee	15.86	8.85	5.50	9.18	5.97	5.90	5.33	5.22	6.14	5.96	5.27
Reciprocal to productivity	-2.57	-0.79	-1.54	-1.79	-1.96	-2.39	-1.89	-1.93	-1.67	-0.29	-0.24
Real GDP	3.13	-0.69	1.49	2.31	3.55	3.96	4.58	3.80	3.70	1.67	0.40
Total employment	0.56	-1.48	-0.05	0.52	1.58	1.57	2.69	1.87	2.03	1.38	0.16
Contribution to GDP deflator											
GDP deflator	9.01	5.31	6.83	5.64	3.03	3.70	3.79	3.08	3.15	5.32	4.56
ULC	8.04	5.08	2.57	4.66	2.59	2.24	2.25	2.14	2.91	3.71	3.31
Gross operating surplus	-0.83	0.18	3.03	0.14	-0.02	0.91	0.71	0.31	-0.44	1.58	0.03
Net indirect taxes	1.80	0.05	1.23	0.84	0.46	0.55	0.83	0.63	0.68	0.03	1.22
Residual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contribution to final demand deflator											
Final demand deflator	4.89	4.03	5.81	4.53	2.59	3.37	2.30	2.08	4.73	3.75	2.51
Domestic costs	4.95	4.05	3.40	2.77	1.82	1.56	0.84	1.28	1.84	3.83	3.44
GDP deflator	6.50	3.89	5.09	4.15	2.21	2.74	2.73	2.20	2.24	3.71	3.23
GDP per unit of final demand	-1.55	0.16	-1.69	-1.38	-0.39	-1.18	-1.89	-0.92	-0.40	0.12	0.21
Import costs	0.12	-0.07	2.50	1.81	0.77	1.82	1.55	0.83	2.87	-0.08	-0.95
Import prices	-1.48	0.10	0.76	0.41	0.38	0.64	-0.34	-0.09	2.47	0.04	-0.74
Imports per unit of final demand	1.60	-0.17	1.74	1.40	0.39	1.18	1.89	0.92	0.40	-0.12	-0.21

FINLAND	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	-1.76	-4.23	-2.42	0.62	1.21	-2.28	0.02	1.48	-0.81	5.89	2.07
Compensation per employee	2.21	0.89	3.09	3.91	2.69	1.75	4.10	2.09	3.67	4.49	3.30
Reciprocal to productivity	-4.04	-5.34	-5.64	-3.27	-1.46	-4.12	-4.08	-0.60	-4.52	1.32	-1.21
Real GDP	-3.49	-1.24	4.44	4.93	2.90	7.52	6.26	3.33	6.77	-0.20	1.43
Total employment	-7.24	-6.25	-1.14	1.61	1.42	3.27	2.09	2.71	2.15	1.14	0.21
Contribution to GDP deflator											
GDP deflator	0.90	2.01	1.54	3.50	0.97	0.70	2.53	-0.12	1.93	3.63	1.61
ULC	-1.18	-2.75	-1.48	0.36	0.69	-1.31	0.01	0.80	-0.45	3.16	1.13
Gross operating surplus	2.52	5.07	2.69	2.68	-0.31	1.15	1.93	-0.51	2.86	0.50	-0.11
Net indirect taxes	-0.31	0.12	0.30	-0.03	0.47	1.04	0.16	0.26	-0.47	0.24	0.02
Residual	0.13	0.43	-0.03	-0.48	-0.12	0.20	-0.43	0.66	0.02	0.26	-0.57
Contribution to final demand deflator											
Final demand deflator	2.12	3.28	1.17	2.74	0.84	0.65	1.22	-0.54	2.94	2.17	0.80
Domestic costs	0.05	1.19	-0.09	2.23	0.16	-0.09	1.55	-0.21	-0.13	2.67	1.20
GDP deflator	0.73	1.60	1.21	2.70	0.75	0.54	1.93	-0.09	1.49	2.72	1.22
GDP per unit of final demand	-0.68	-0.41	-1.28	-0.46	-0.59	-0.62	-0.37	-0.12	-1.58	-0.05	-0.03
Import costs	2.12	2.12	1.23	0.50	0.68	0.74	-0.35	-0.33	3.14	-0.50	-0.40
Import prices	1.43	1.68	-0.10	0.02	0.09	0.12	-0.71	-0.44	1.58	-0.55	-0.42
Imports per unit of final demand	0.63	0.41	1.35	0.48	0.59	0.62	0.37	0.11	1.46	0.05	0.02

EU12	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
ULC decomposition											
ULC	4.70	2.12	-0.28	1.68	1.88	-1.37	-0.28	1.78	1.23	2.66	2.53
Compensation per employee	7.16	2.98	2.45	3.43	2.77	0.22	0.79	2.80	2.67	2.72	2.94
Reciprocal to productivity	-2.34	-0.84	-2.75	-1.72	-0.88	-1.61	-1.07	-1.00	-1.43	-0.06	-0.39
Real GDP	1.41	-0.86	2.39	2.23	1.41	2.38	2.90	2.79	3.51	1.44	0.78
Total employment	-0.91	-1.68	-0.34	0.51	0.53	0.76	1.81	1.77	2.05	1.38	0.39
Contribution to GDP deflator											
GDP deflator	3.93	1.95	1.98	2.45	2.88	-0.19	1.17	1.78	1.24	2.37	2.28
ULC	2.96	1.34	-0.18	1.04	1.15	-0.83	-0.17	1.06	0.73	1.58	1.51
Gross operating surplus	0.39	0.27	1.59	1.12	1.30	0.38	0.61	0.25	0.45	0.76	0.49
Net indirect taxes	0.58	0.34	0.58	0.26	0.42	0.27	0.73	0.47	0.09	0.04	0.25
Residual	0.00	0.00	0.01	-0.02	-0.01	0.01	0.01	-0.01	0.03	0.01	-0.03
Contribution to final demand deflator											
Final demand deflator	2.95	1.71	1.86	2.49	2.48	-0.02	0.41	1.43	2.80	1.93	1.45
Domestic costs	2.81	2.10	0.66	1.06	1.93	-1.26	-0.33	0.53	-0.49	1.75	1.97
GDP deflator	3.10	1.55	1.59	1.94	2.26	-0.15	0.90	1.37	0.94	1.74	1.68
GDP per unit of final demand	-0.28	0.54	-0.91	-0.86	-0.32	-1.11	-1.21	-0.82	-1.41	0.01	0.28
Import costs	0.13	-0.39	1.19	1.43	0.54	1.25	0.70	0.88	3.38	0.18	-0.51
Import prices	-0.17	0.16	0.27	0.55	0.22	0.15	-0.48	0.10	1.94	0.19	-0.24
Imports per unit of final demand	0.30	-0.55	0.91	0.85	0.32	1.09	1.20	0.78	1.33	-0.01	-0.28

Annex 3

The causality between dispersion in wages and prices and productivity

Table A.3-1
Causality tests between the dispersions in wage growth, inflation and productivity growth [1]

	No of lags	F Statistics
Dispersion of HICP inflation		
does not cause		
Dispersion of growth in nominal compensation per employee	2	0.72
Change in dispersion of HICP inflation		
does not cause		
change in dispersion of growth in nominal compensation per employee	3	1.82
Change in dispersion of labour productivity gains		
does not cause		
change in dispersion of growth in nominal compensation per employee	2	0.55
change in dispersion of growth in real compensation per employee	2	1.2
Dispersion of growth in nominal compensation per employee		
does not cause		
dispersion of HICP inflation	2	1.07
Change in dispersion of growth in nominal compensation per employee		
does not cause		
change in dispersion of HICP inflation	3	5.00 [2]
change in dispersion of labour productivity gains	2	2.22
Change in dispersion of growth in real compensation per employee		
does not cause		
change in dispersion of labour productivity gains	2	0.19

Sources: Eurostat, national central banks and ECB calculations.
1)   No causality hypothesis rejected at the 5% level.
2)   No causality hypothesis rejected at the 1% level.

Annex 4

## Wage drift developments in euro area countries and links to business cycle developments [1]

At the euro area level, stylised facts suggest that wage drift appears to closely track the business cycle, as measured by the deviation of real GDP growth from trend. Chart 1 shows that the two variables have been linked very closely since 1992, with the exception of 1995 when wage drift turned strongly negative, despite the moderate improvement in output growth.[2] From 1998 to 2002, wage drift was again more closely correlated with the output gap. As to country-specific results, wage drift appears to have been relatively strongly correlated with output gap developments in Germany, the Netherlands, Ireland and Portugal since 1992, and in Finland since 1998. However, in other countries the link between the two variables remains elusive. The correlation is even slightly negative in Belgium, probably because the wage drift is also affected by the impact of the two-year wage norm on wage settlements, and in Spain, probably because of the efforts until 2001 to reduce wage growth despite real GDP growth well above potential.

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1   This section is a preliminary and limited attempt to find some link between wage drift and the business cycle. Stylised facts presented here provide some evidence of a link between wage drift and the business cycle in the euro area and in EU Member States. However, the absence of such a link is not proof that wage drift is unrelated to the business cycle. In particular, an analysis focused on the private sector only may show the existence of such a link.

2   The weakening of the link between the two variables appears to have been caused by the outcome of wage negotiations in Germany, which led to relatively high growth of negotiated wages, compensated by employers via a strongly negative wage drift.
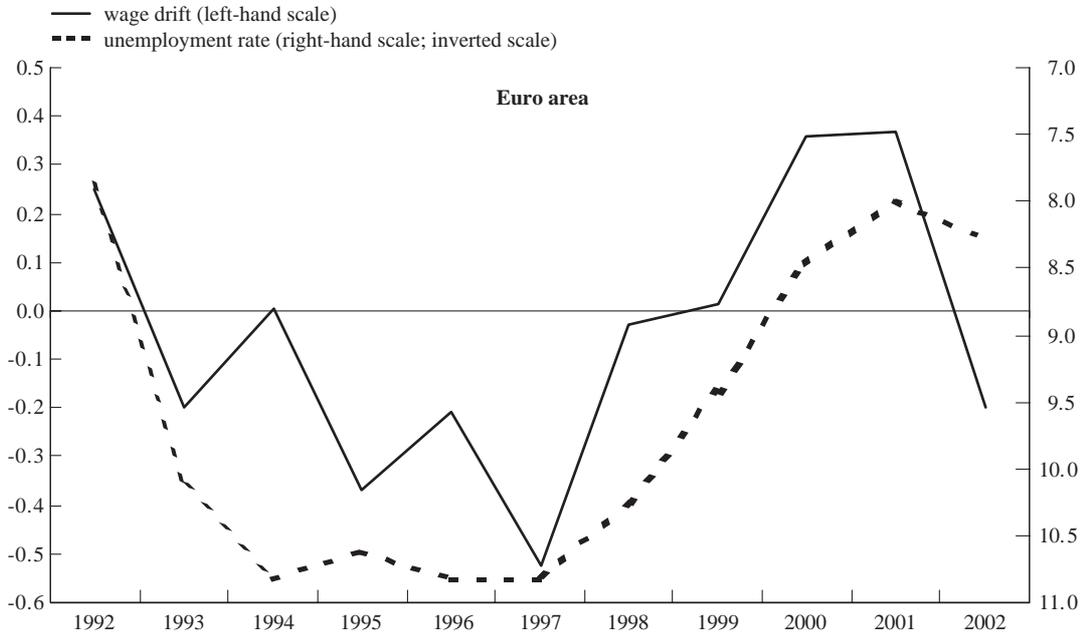

Chart A.4-1
Wage drift and output gap in %
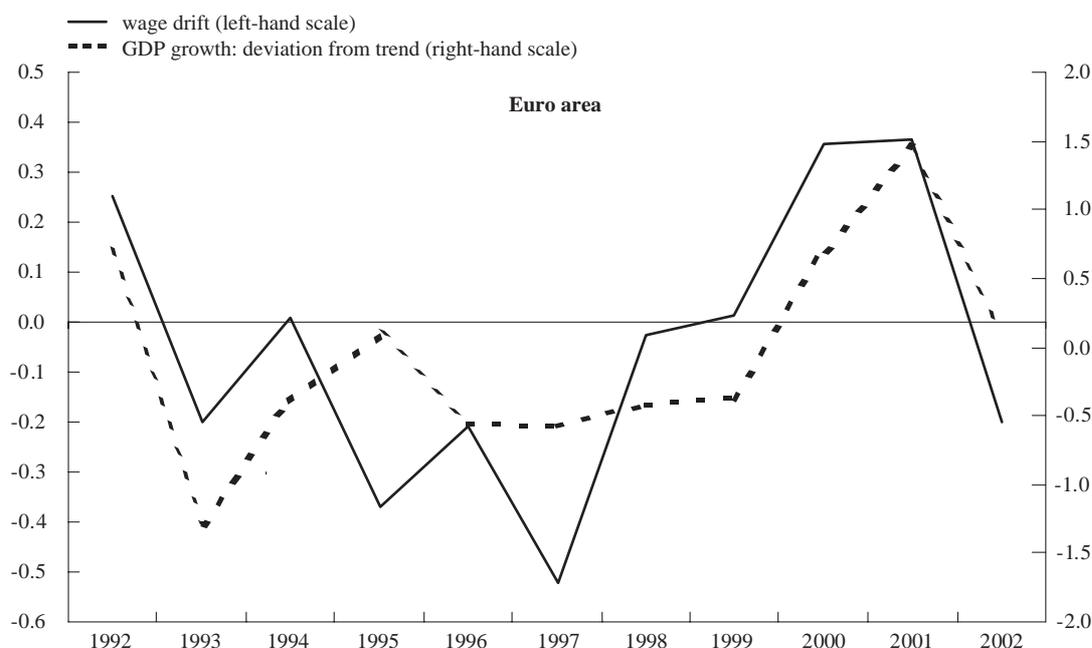
Sources: National central banks and ECB calculations.

Wage drift and unemployment rate in %

— wage drift (left-hand scale)
▪▪▪ unemployment rate (right-hand scale; inverted scale)

Euro area

Sources: National central banks and ECB calculations.

As to the link between wage drift and the unemployment rate, at the euro area level there appears to have been a close negative correlation since 1992 (see Chart 2). However, in 2002 wage drift declined strongly relative to the unemployment rate.

At the national level, the correlation between wage drift and the unemployment rate has been strong in the Netherlands, Portugal and Luxembourg since 1992, and in Greece and Germany since 1998.

Turning to employment growth, the correlation with wage drift is lower than 0.5

at the euro area level. Wage drift has been positively correlated with employment growth in France and Luxembourg since 1992. In Austria, the correlation between wage drift and employment growth was 0.5 from 1992 to 2002 but has become weaker since 1998. The correlation between wage drift and employment growth is strongly negative in Spain. A reason for this negative correlation might be that wage drift became more moderate as lower wage growth was seen as a means of reducing domestic inflation, whereas employment growth improved gradually through the 1990s, becoming very strong from 1997 on.

Table A.4-1

Wage drift and measures of the economic cycle in euro area countries between 1998 and 2002

		Euro area	BE	DE	GR	ES	FR	IE	IT	LU	NL	AT	PT	FI
1998	**Wage drift**	**0.0**	**-0.9**	**-0.9**	**0.1**	**0.2**	**0.4**	**1.3**	**0.2**	**0.5**	**0.4**	**0.7**	**0.6**	**1.6**
	GDP growth													
	deviation from trend	**-0.4**	-0.6	-0.4	-0.3	-0.2	-0.5	-1.9	-0.2	-0.1	0.1	0.0	0.2	0.8
	Unemployment rate	**10.2**	9.3	9.1	10.9	15.2	11.4	7.5	11.7	2.7	3.8	4.5	5.2	11.4
	Employment growth	**2.7**	2.3	1.0	4.8	4.1	1.5	8.3	1.2	4.8	3.2	1.5	2.6	2.9
1999	**Wage drift**	**0.0**	**2.0**	**-1.3**	**-0.7**	**-0.4**	**0.8**	**1.5**	**0.5**	**0.5**	**0.8**	**-0.3**	**0.1**	**0.6**
	GDP growth													
	deviation from trend	**-0.4**	0.0	-0.4	-0.5	0.4	-0.1	0.3	-0.6	-0.5	1.0	0.2	0.4	0.2
	Unemployment rate	**9.4**	8.6	8.4	11.8	12.8	10.7	5.6	11.3	2.4	3.2	4.0	4.5	10.2
	Employment growth	**3.4**	1.8	1.5	2.2	4.4	2.0	7.3	1.7	5.3	3.6	1.8	3.3	2.5
2000	**Wage drift**	**0.4**	**-0.8**	**-0.3**	**0.0**	**0.0**	**0.9**	**3.1**	**1.0**	**-0.1**	**1.4**	**0.9**	**2.1**	**2.3**
	GDP growth													
	deviation from trend	**0.7**	1.8	1.4	-0.2	1.1	1.5	3.1	0.7	4.8	1.9	1.8	1.5	2.6
	Unemployment rate	**8.5**	6.9	7.8	11.0	11.3	9.3	4.3	10.4	2.3	2.8	3.7	4.1	9.7
	Employment growth	**2.9**	2.5	1.8	0.8	4.1	2.8	5.3	2.1	6.0	2.5	1.3	2.5	2.5
2001	**Wage drift**	**0.4**	**-0.5**	**-0.1**	**0.6**	**0.7**	**0.3**	**2.2**	**0.2**	**0.9**	**1.9**	**-1.1**	**1.7**	**2.1**
	GDP growth													
	deviation from trend	**1.5**	0.6	0.8	0.0	0.7	0.9	1.7	1.0	1.9	1.1	0.5	1.1	0.0
	Unemployment rate	**8.0**	6.7	7.8	10.4	10.6	8.5	3.9	9.4	2.0	2.4	3.6	4.1	9.1
	Employment growth	**1.8**	1.9	0.2	1.7	2.7	2.5	3.5	2.4	6.0	2.3	0.7	1.7	1.6
2002	**Wage drift**	**-0.2**	**0.0**	**-1.1**	**0.7**	**0.8**	**0.1**	**0.0**	**0.4**	**-0.2**	**0.6**	**0.0**	**0.6**	**0.6**
	GDP growth													
	deviation from trend	**0.1**	-0.7	-0.2	0.0	-0.1	-0.1	0.6	-0.3	-1.1	-0.2	-0.3	-0.1	-0.8
	Unemployment rate	**8.3**	7.3	8.2	10.1	11.4	8.7	4.4	9.0	2.4	2.7	4.3	5.0	9.1
	Employment growth	**0.5**	-0.3	-0.7	0.4	2.0	1.0	1.5	1.9	3.0	1.0	-0.3	0.7	0.6

Sources: National central banks and ECB calculations.