Inflation differentials in a monetary union

The single monetary policy is directed at maintaining price stability in the euro area as a whole. The move to the single currency and the adoption of the euro were based on the successful completion of a convergence process towards low inflation rates in all participating countries. However, monetary union per se does not necessarily imply that, at any given point in time, all of the participating countries will experience the same rate of inflation. At present, differences in the rate of change of the Harmonised Index of Consumer Prices (HICP) across euro area countries can be observed, although they are very small by historical standards.

Moreover, by comparison with the experience within the United States, a long-established monetary union of comparable size, current levels of inflation differentials do not appear to be unusually high. With regard to the factors explaining the current pattern of inflation differentials across the euro area, it is concluded that – in addition to cyclical factors – the convergence of price levels resulting from greater market integration, enhanced price transparency and real convergence appears to play an important role. However, if sizable and protracted inflation differentials not justified by the effects of market integration and real convergence were to emerge, this could result in disproportionate changes in competitiveness and in economic imbalances in individual euro area countries. In such cases, a national policy response – especially in terms of structural policy – would be warranted.

1 Inflation differentials across the euro area

As documented in the July issue of the Monthly Bulletin, differences in inflation rates across euro area countries following the convergence process in the run-up to Stage Three of Economic and Monetary Union (EMU) are, by historical standards, remarkably small. As of July this year, the difference between the highest and the lowest national rate of HICP increase (measured by the 12-month average of annual rates) is 2 percentage points (see Table 1). This is substantially below the differences of over 10 percentage points recorded in the 1980s.

While the pattern of inflation differentials across euro area countries can be linked to a number of "fundamental" economic factors, a detailed examination of the differences across product categories also suggests that "erratic" factors have played a role in generating cross-country differences in the rate of HICP increase. For example, the

Table 1

HICP inflation for the euro area

(12-month average, July 1998-99/July 1997-98)

	BE	DE	ES	FR	IE	IT	LU	NL	AT	PT	FI	Euro area
Overall index	0.8	0.4	1.8	0.4	2.3	1.6	0.5	1.8	0.4	2.4	1.1	0.9
Goods prices	0.3	0.1	1.1	-0.2	1.4	1.2	0.2	1.2	-0.3	2.0	0.3	0.4
Food prices	0.8	0.1	1.6	1.0	3.7	1.5	2.2	2.3	0.1	3.9	0.5	1.0
Unprocessed food	1.1	-0.9	1.5	0.3	4.7	1.9	2.3	3.9	-0.6	4.9	1.5	0.9
Processed food	0.6	0.7	1.6	1.5	3.3	1.2	2.2	1.5	0.6	2.7	0.1	1.1
Industrial goods prices	-0.0	0.0	0.7	-0.9	-0.6	1.0	-0.6	0.7	-0.5	0.7	0.1	0.1
Non-energy industrial goods	1.0	0.6	1.6	-0.1	-0.2	1.6	0.1	1.1	0.3	1.2	0.4	0.8
Energy	-3.2	-1.7	-3.1	-3.4	-1.7	-2.1	-4.6	-1.1	-3.4	-1.0	-0.7	-2.3
Services	2.1	0.9	3.6	1.5	3.8	2.6	1.2	2.8	1.5	3.4	2.7	1.8

Sources: Eurostat and ECB calculations.

largest dispersions across countries are evident in the case of the two categories (food and energy) which are considered the most erratic components of price indices in that they are strongly influenced by special factors such as weather conditions, oil prices and indirect taxes. Excluding these volatile components, which have a weight of just over 30% in the HICP, differences across countries in the rate of HICP increases are more marked in the case of services prices than in the case of non-energy industrial goods prices.

2 The euro area compared with the United States

Given that Monetary Union represents a major change by comparison with the past, in that all euro area Member States are now subject to a single monetary policy directed towards price stability, past differentials are not an appropriate benchmark against which to assess inflation differentials which may occur across Member States in Stage Three of EMU. A more relevant benchmark is obtained by examining the pattern of regional inflation differentials within a long-standing monetary union. For this purpose, the experience of the United States provides a useful basis for comparison.

Fortunately, data on regional (specifically major city) inflation rates are available for the United States from 1919 onwards (see Box 1). These data suggest that substantial differences in inflation rates can arise even within a long-standing monetary union. While inflation differentials recorded in the United States are typically persistent, they are not generally permanent, and the evidence suggests that price levels in the regions of the United States tend to revert to their initial relative levels. The magnitude of these differentials observed in recent years (measured using both the range and the standard deviation of inflation) is very close to the magnitudes currently prevailing within the euro area.

The similarity of these results in the two areas is to an extent surprising. The United States is highly integrated politically and economically, shares a common language and culture and shows a high level of labour mobility. All these factors would be expected to reduce the scope for large and protracted inflation differentials. The current euro area is notably less integrated than the regional economies in the United States. Furthermore, fiscal policy remains predominantly a national responsibility, and productivity levels and living standards are more divergent across euro area countries than they are in the United States. Thus, it could be argued that the scope for the emergence of inflation differentials in the euro area is likely to be larger than in the case of the regional economies in the United States. By contrast, it may also be argued that euro area countries are more diversified economically than US regions and thus less vulnerable to sector-specific shocks. This might imply that the scope for inflation differentials within the euro area would be more limited than within individual countries.

Nonetheless, the US experience is telling, indicating that differences in inflation rates in different regions are normal even in a long-established monetary union. Viewed against the background of the US experience, the current size of the inflation differentials within the euro area (of around 2 percentage points between the highest and the lowest rate of HICP increase) does not appear particularly large or unusual.

Box 1

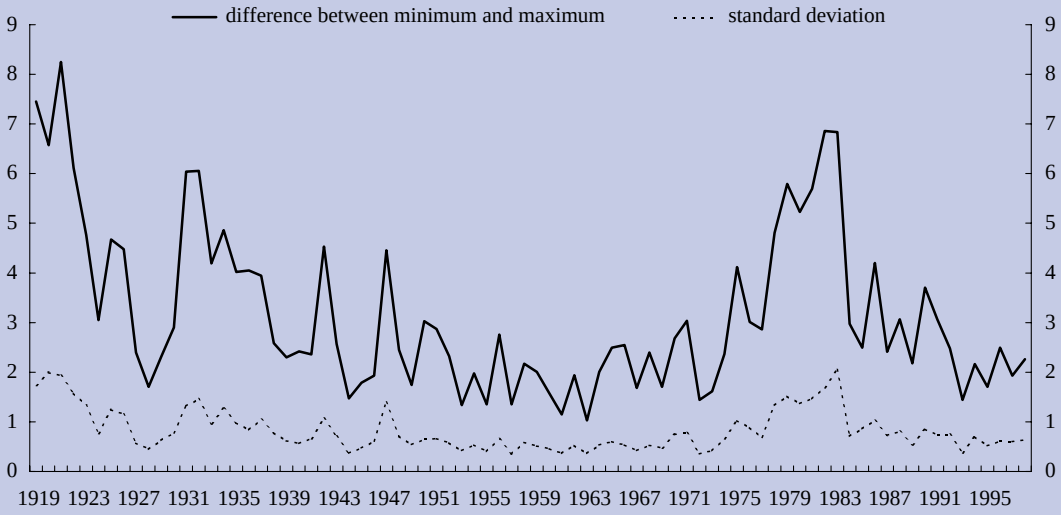
Inflation differentials across the United States

It is interesting to compare the pattern of inflation differentials across the euro area with the US experience. The Bureau of Labor Statistics (BLS) has published a dataset of annual observations on consumer price indices in 17 US cities for the period 1919-98. A graphical presentation of the extent of inflation dispersion across the US cities is given in the chart below, which shows, on an annual basis, the range (i.e. the difference between the highest (maximum) and lowest (minimum) city inflation rate) and the standard deviation of inflation across these cities.

As is clear from the chart, inflation differentials within the United States have been, at times, very substantial, with divergences of 7 percentage points being recorded in the early 1980s. In the more recent past, the divergences (as measured by the range) in consumer price inflation rates have been over 2 percentage points. Over the same period the standard deviation of inflation across US cities has been 0.6%. Both figures are almost identical to the corresponding current values for the euro area.

Interestingly, empirical studies of the behaviour of US inflation divergences suggest that such divergences are persistent. However, they are not permanent, and there is a tendency for price levels in individual cities to converge back towards their initial levels relative to the national average.

Inflation dispersion across US cities



Sources: Bureau of Labor Statistics (US) and ECB calculations.

3 Factors underlying inflation differentials within a monetary union

There are a number of special factors which could be expected to generate differences in the rate of HICP increase across euro area countries. First, since patterns of consumption are not the same in all participating countries, the weights used in the construction of the national HICP components differ. This could mechanically generate measured differentials across countries even if inflation rates for individual goods were equal in all these countries. Second, a lack of synchronisation of national policy actions could also play a role. In the euro area, for example, changes in indirect

taxation, liberalisation measures and administrative price changes are typically not of the same magnitude in all countries, nor is their timing synchronised. Finally, country-specific factors such as different weather conditions could also create "noise" in national consumer price indices, giving rise to differences in measured inflation rates, which would be of limited economic significance.

However, it is also likely that a number of deeper economic factors are currently playing a role in contributing to different rates of HICP increase across euro area countries. If prices are initially different across countries in the monetary union, the convergence of prices to a common level could give rise, in the transition period, to differences in inflation rates. Such price level convergence could be expected to take place in the euro area for two reasons. First, the completion of the internal market and increased cross-border price transparency contribute to reducing differences across countries in the prices of traded goods (i.e. goods which, in principle, can be easily traded across borders). Second, with regard to goods which are less easily traded across national borders (e.g. housing and many kinds of services), convergence of productivity and living standards across the euro area would create a tendency towards price level convergence. This latter effect is commonly known as the Balassa-Samuelson effect after the two economists, B. Balassa and P. A. Samuelson, who introduced the hypothesis simultaneously in 1964 (see Box 3). In both cases, convergence of *price levels* within the euro area would, of course, give rise to some differentials in *inflation rates* across countries in the transition period, with "low price level" countries tending to experience somewhat faster rates of price increase than "high price level" countries. In addition to price level convergence, differences in demand determinants, in particular cyclical positions, could play a role in generating differences in inflation across euro area countries.

Price level convergence: market integration and price transparency

Surveys of price levels in different euro area countries have been carried out by a number of international organisations and private sector institutions. These surveys involve detailed comparisons at the level of individual products and services (e.g. well-known consumer brands, specific car models and standard services such as hairdressing). The evidence shows that – even for fairly standard consumer goods which are homogeneous and, potentially, easily transferred across borders – substantial differences in prices (adjusted for differences in indirect taxes) can be observed across countries. Indeed, in a small number of cases the differences between high and low prices for particular commodities can be observed to exceed 50%. The differences across countries are far higher than those which are typically found within individual countries.

In principle, the observed magnitudes of the difference in prices for standard products which are easily tradable across borders cannot be expected to be sustained in a monetary union in which markets are integrated. Ultimately, the ability in a single market to make use of arbitrage across national borders would severely limit the scope for the existence of substantial price differentials. Indeed, the limited evidence available indicates that some convergence in the prices of "traded goods" is already taking place. One example of such price convergence which has attracted considerable public attention of late relates to car prices; this is discussed more fully in Box 2. Of course, there are a number of reasons why such price convergence may not be fully completed. For example, continuing differences in indirect taxes across the euro area could prevent full convergence of tax-inclusive "traded goods" prices across countries.

Box 2

Car prices in the euro area

The behaviour of car prices in the euro area in recent years provides one example of the effect of increasing market integration on reducing price differentials across countries. Traditionally, car manufacturers charged significantly different prices for the same models in different national markets. In so doing, they took into account factors such as relative income levels and differences in indirect taxes. In practice, this usually meant that higher prices were charged in high income countries. From a profit maximisation point of view, this strategy of segmenting markets was clearly advantageous to the manufacturers.

For this pricing strategy to be sustainable over the longer term, however, the capacity to segment markets and to minimise opportunities for arbitrage (reselling) across borders was essential. This was ensured by a number of practices which, inter alia, placed restrictions on the applicability of warranties, servicing, the sale of spare parts and dealer arrangements. However, in order to promote the integration of the retail car market, in 1995 the European Commission adopted Regulation (EC) No. 1475/95 of 28 June 1995 on the application of Article 85 (3) of the Treaty establishing the European Community to certain categories of motor vehicle distribution and servicing agreements. This Regulation prohibits a number of these practices. At the same time, a burgeoning industry of resellers – i.e. companies which buy cars in the cheaper national markets and sell them to consumers in more expensive markets – emerged and consumers became increasingly aware of the possibilities of purchasing bargains across borders.

The result of this new environment is that car price differentials have declined sharply across countries in the euro area. Since 1997 the European Commission has conducted surveys of prices for over 70 of the best selling models. These surveys show that car manufacturers applied pricing strategies which in many cases resulted in lower price differentials. However, contrary to the popular view that price convergence will generally result in the lowest prices being the point of convergence, the European Commission notes that "there are indications that many car producers increased prices in so-called cheap markets rather than reducing prices in expensive markets".[1]

Looking forward to the impact of the single currency on car price differentials, the Commission notes that "the introduction of the euro on 1 January 1999 is going to increase price transparency in 'euroland' and should thereby promote cross-border trade and further diminish price differences".[1]

1 *European Commission DG IV, "Car prices in the European Union on 1 November 1998 – differences decrease sharply", DN: IP/99/60.*

Price level convergence: convergence in productivity and living standards

While market integration and increased price transparency can be expected to lead to a narrowing of divergence in "traded" goods prices, a large part of the HICP is accounted for by goods and services which cannot readily be traded across borders, i.e. "non-traded" goods and services. Prominent examples are housing and a number of services such as, to take a simple example, hairdressing. The process of market integration and enhanced price transparency cannot be assumed to lead automatically to greater convergence of this group of prices.

In the euro area, however, there are forces at work which can still be expected to lead to a degree of convergence, even of these prices. To understand why, it is necessary to consider why non-traded goods prices differ across countries in the first place. Here a number of factors play a role (e.g. differences in taste and demand conditions), but the empirical evidence available suggests that over longer periods the dominant factor which explains cross-country differences in non-

Box 3

The Balassa-Samuelson effect

In theory, if all goods and services were freely tradable across borders, arbitrage would lead to a situation in which price levels (expressed in common currency) would be equal and strict purchasing power parity would hold. However, this is rarely the case in practice and a number of studies have shown that price levels do differ markedly across countries. These differences cannot be accounted for by factors such as transport costs, taxes and tariffs. In fact, there is a systematic tendency for prices to be lower in poorer countries than in richer countries and, when examined more closely, this pattern seems to be accounted for by differences in the prices of "non-traded" goods and services, e.g. housing and personal services. Moreover, there is a tendency for countries which are experiencing more rapid growth of productivity – and, therefore, improvements in living standards – to experience faster rates of increase in their price levels (again, correcting for exchange rate movements). The Balassa-Samuelson approach[1] explains these differences by linking the behaviour of non-traded goods prices to productivity growth.

In order to explore this issue in more detail, let us take the case of two countries within a monetary union denoted as country A and country B. Looking first at what happens within one of the countries (A), let us consider the simple example of an economy with two goods (one traded and the other non-traded), two factors of production (capital and labour), competitive markets, constant returns to scale production functions in the two sectors and free access to global capital markets. On the basis of these assumptions, it can be shown that the rate of price increase in non-traded goods compared with traded goods in any country will be given by:

$$\Delta(P_{NT} - P_T) = \frac{SL_{NT}}{SL_T}\Delta PROD_T - \Delta PROD_{NT}$$

where ΔP_{NT} and ΔP_T are the rates of change in non-traded and traded goods prices respectively, $\Delta PROD_{NT}$ and $\Delta PROD_T$ are the productivity growth rates in the two sectors, and SL_{NT} and SL_T are the shares of labour in each sector's output. Since non-traded goods production (e.g. services) is more labour-intensive than traded goods production (e.g. manufacturing), the ratio SL_{NT}/SL_T typically exceeds 1. However, for ease of exposition, we shall assume that this ratio is unity, implying:

$$\Delta(P_{NT} - P_T) = \Delta PROD_T - \Delta PROD_{NT}$$

This equation states that if productivity growth in the traded goods sector is faster than in the non-traded goods sector, non-traded goods prices will tend to rise more rapidly than traded goods prices. The mechanism through which this occurs is straightforward. A rise in productivity in the traded goods sector will tend to drive up wages in this sector, but since this increase in wages is matched by increased productivity, it will not give rise to higher traded goods prices. However, since labour is assumed to be mobile across sectors, firms in the non-traded goods sector will have no option but to offer higher wages in order to retain their workers. In the non-traded goods sector the increase in wages will not be matched by a productivity increase, thereby raising costs. This increase in costs will lead to an increase in prices in the non-traded goods sector.

By construction, the overall rate of change in the consumer price index (ΔPC) in this country will be given by a weighted average of the rates of change in traded and non-traded goods prices:

$$\Delta PC = \alpha\Delta P_T + (1-\alpha)\Delta P_{NT} = \Delta P_T + (1-\alpha)(\Delta PROD_T - \Delta PROD_{NT})$$

where α is the share of traded goods in consumption. Thus, the overall increase in the consumer price index will be determined by the increase in traded goods prices and by the difference in productivity growth between the two sectors. The more rapid the growth in productivity in the traded goods sector (relative to the non-traded goods sector), the higher the increase in the consumer price index will be (ceteris paribus).

1 *B. Balassa (1964), "The purchasing power parity doctrine: a reappraisal", Journal of Political Economy, 72, and P. A. Samuelson (1964), "Theoretical notes on trade problems", Review of Economics and Statistics, 46.*

Similar relations can be derived for country B. By definition, the rate of increase in traded goods prices will be equal across countries. For the sake of simplicity, two additional assumptions are made: first, that productivity growth in the non-traded goods sector is equal in the two countries and, second, that the share of traded goods in consumption is also identical in both countries. In this case, the difference in the rate of change in consumer prices between country A and country B will be given by:

$$\Delta PC - \Delta PC^{B} = (1-\alpha)(\Delta PROD_{T} - \Delta PROD^{B}{}_{T})$$

Thus, the difference between the rates of change in consumer prices between the two countries will, given the assumptions made, depend on differences in the rate of productivity growth between the traded goods sectors of both countries. If productivity growth in the traded goods sector is higher in country A, wages will be rising more rapidly and, for the reason given above, non-traded goods prices will be increasing at a faster pace. As a result, overall inflation will be higher in country A than in country B.

A number of recent papers have found evidence in favour of the Balassa-Samuelson hypothesis. Typically, these studies have used econometric techniques to detect the existence of long-run relationships (co-integration) between relative price levels and relative productivity. In this framework, the direction of the applied studies has been twofold. A first class of studies focuses on the relationship between long-run changes in relative prices and productivity differentials across countries, while others analyse the link between the productivity differentials and inflation differentials across sectors within countries. The general conclusion of the first approach is that there is evidence of a relationship between the evolution of the relative price levels across countries and that of productivity differentials. Following the second approach, a clear causality between productivity growth in the traded goods sector and inflation in the non-traded goods sector has been identified.

Indeed, recent studies show that, while some of the more restrictive assumptions of the hypothesis are not supported by the data, there is still clear evidence that the Balassa-Samuelson effect has been at work within the euro area.

traded prices is that of differences in the level of economic development (or living standards) across countries. Countries with higher levels of economic development tend to have higher non-traded prices. The reason for this is that high living standards are largely a reflection of high levels of productivity in the traded goods sector of the economy (e.g. manufacturing, agriculture and internationally traded services). Given integrated national labour markets, this implies that wages in the economy as a whole will typically be higher in more developed countries. However, in the non-traded goods sector the scope for increasing productivity growth is usually more limited than in the traded goods sector (compare, for example, the personal services sector with automobile production). Thus, a general increase in wages, as a result of increased productivity in the traded goods sector, will raise the cost of producing non-traded goods, leading to higher relative prices for non-traded goods. This is a static picture. In a dynamic context in which a less developed country is catching up with its neighbours (i.e. is experiencing more rapid growth in productivity and living standards), costs in its non-traded goods sector will be rising more rapidly than in other countries (i.e. in accordance with the aforementioned Balassa-Samuelson effect). As a result, the overall level of prices will be increasing – in relative terms – at a faster pace.

In the European context this argument implies that any process whereby differences in productivity levels and living standards are reduced over time would lead to non-traded prices increasing more rapidly in those countries which are catching up and to their

converging towards the levels prevailing in the more advanced economies. There is clear evidence from the experience of the past 20 years that such a "catching-up" process has been in operation in the euro area, with productivity and living standards in the less prosperous countries growing more rapidly than in the other countries. Given the increasing integration of markets, and more specifically the introduction of the single currency, the free movement of capital and technology transfer should facilitate further "real convergence". In this case, it can be expected that those countries which are catching up will experience a faster pace of increase in non-traded goods prices. Since traded goods prices should be increasing at a broadly uniform rate across the European Union, this would imply that the overall price level (which is a weighted average of traded and non-traded prices) in those countries which are catching up should be increasing at a faster pace.

Indeed, the empirical studies available show that the Balassa-Samuelson factor has been of relevance in the past within the euro area.

Cyclical conditions

Focusing on the demand side of the economy, it is clear that there are a number of factors which could generate inflation differentials within a monetary union in the short term. In particular, differences in cyclical positions across the countries participating in a monetary union could give rise to differences in price behaviour. The bulk of such effects would come via impacts on non-traded goods prices which, in the short run, depend on domestic rather than external demand. By contrast, since, by definition, traded goods prices should be closely linked to developments in the area as a whole rather than to the situation in a specific country, domestic cyclical conditions could be expected to have a more limited effect on traded goods prices. As is well known, the measurement of the cyclical position of an economy presents considerable difficulties, which tend to be aggravated when cross-country comparisons are made. Despite the fact that cyclical movements have become more synchronised over time in the euro area, as indicated in the July issue of the ECB Monthly Bulletin, the available evidence does point to some dispersion of cross-country cyclical positions within the area.

4 Explaining the current pattern of inflation differentials in the euro area

As outlined above, the principal factors underlying potential inflation differentials are, apart from a number of erratic factors, price level convergence (due both to market integration and to the Balassa-Samuelson effect) and cyclical divergence.

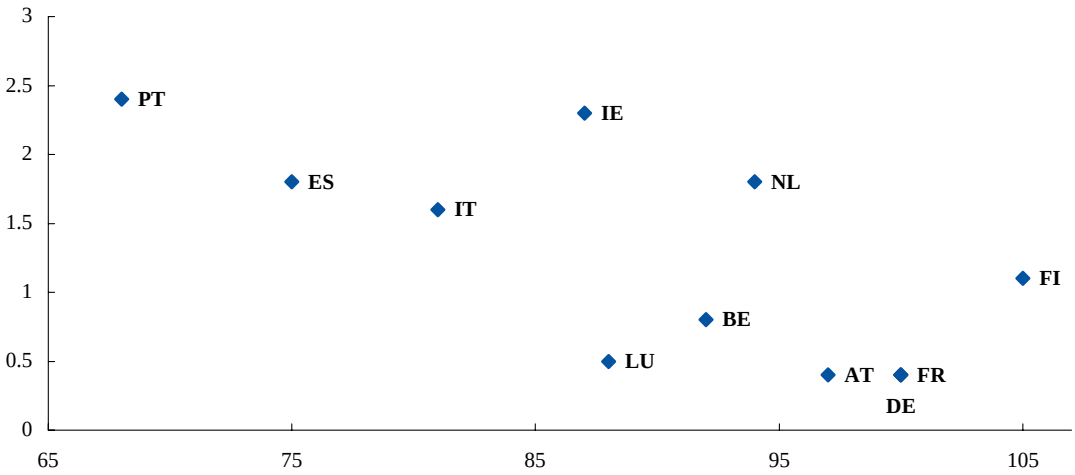
With regard to price level convergence, Chart 1 compares inflation rates in euro area countries with the comparative level of consumer prices (on the basis of OECD data). There is a strong and significant negative relation between this measure of relative price levels and relative inflation rates in the euro area (with a correlation coefficient of -0.7). This evidence supports the idea that price level convergence does indeed play an important role in explaining different rates of HICP inflation across the euro area countries.

With regard to cyclical divergence, the appropriate measure of the relative cyclical position would, in principle, be the relative output gaps (i.e. the differences between actual and potential output). There are, however, serious measurement problems relating to the calculation of output gaps, and different approaches can yield significantly different measures. In view of these problems, the relationship between inflation and real GDP growth rates is considered here. Chart 2 compares individual country inflation rates with the growth in GDP in 1998. As can be seen from the chart, there is some evidence of a

Chart 1

Relative consumer price levels and inflation in the euro area

(inflation rate: 12-month average, July 1998-99/July 1997-98; price level: January 1999 (Germany = 100))



Sources: Eurostat and OECD.

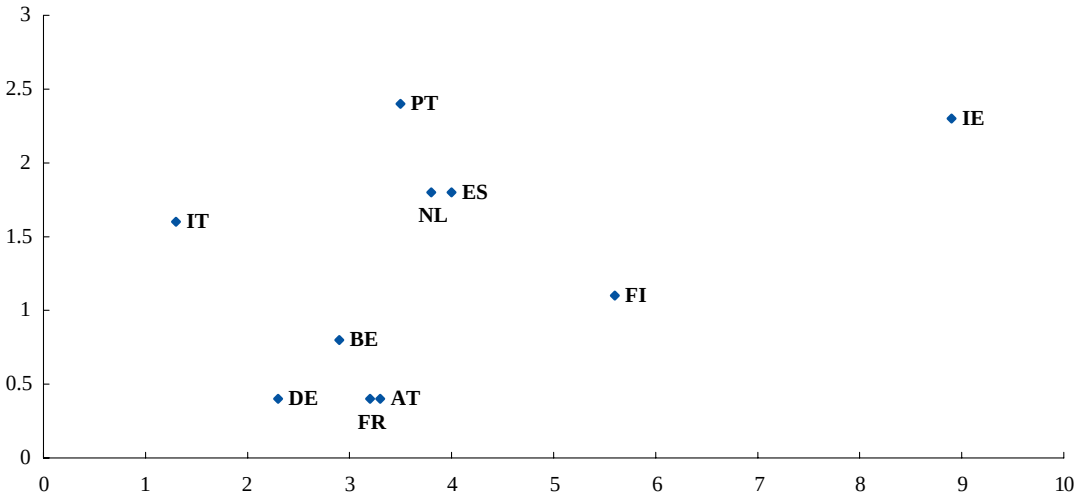
positive relationship between inflation rates and real growth in individual euro area countries, but it is relatively weak and, on its own, not statistically significant (with a correlation coefficient of 0.4).

Taken together, both factors – price level convergence and differences in cyclical positions – appear to account for a substantial proportion of the current differences in HICP inflation rates across countries. A simple equation linking relative HICP inflation to relative price levels and cyclical conditions can explain around 80% of the variation of HICP inflation across euro area countries, with both factors proving highly significant.

Chart 2

Output growth and inflation in the euro area

(inflation rate: 12-month average, July 1998-99/July 1997-98; output growth 1998)



Source: Eurostat.

5 Concluding remarks

While the adoption of the single currency will ensure that the evolution of the euro area price level will ultimately be determined by the single monetary policy of the Eurosystem, this does not imply that inflation rates in individual countries will always be identical to the common area-wide rate. Indeed, different rates of HICP increase can already be observed within the euro area and have attracted increasing public attention. However, these differentials are small by historical standards, and a comparison with the United States suggests that their magnitude is by no means atypical even for a long-established monetary union. A number of statistical and erratic factors could generate noise in price indices, which would show up as differences in measured inflation rates across countries. However, deeper economic forces also play a role. In the current circumstances, two main generic factors can be identified under this heading. First, the convergence of price levels towards a common level due to greater market integration, enhanced price transparency and real convergence could give rise to inflation differentials. To the extent that convergence of prices is a natural consequence of the integration of markets, the resulting inflation differentials need not be viewed as posing problems for economic policy. Second, cyclical divergences across countries may also play a role in generating inflation differentials. In practice, the evidence available suggests that both factors play an important role in explaining the current pattern of inflation differentials across the participating countries.

While the analysis of such cross-country differences is of interest in the context of assessing the evolution of the economy both on a cyclical and longer-term basis, it has to be stressed that the single monetary policy of the Eurosystem can only be geared towards the objective of price stability on an area-wide basis. As a result, monetary policy is not in a position to influence the dispersion of rates of HICP increase across euro area countries. However, if sizable and protracted inflation differentials not justified by the effects of market integration and real convergence were to emerge, this could result in undue changes in competitiveness and in economic imbalances in individual euro area countries. In such cases, a national policy response – especially in terms of structural policy – would be warranted.