

The euro, five years later : what has happened to prices ?

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Introduction

Now that the euro notes and coins have been in circulation for over five years, it seems a good time to analyse any effect which the euro has had on prices. Even today, the introduction of the euro⁽¹⁾ is often linked to price rises, whereas in reality inflation measured by the harmonised index of consumer prices (HICP) has remained moderate since the changeover, especially in view of the fact that crude oil prices have risen very steeply in the past few years, something which has nothing to do with the euro. Surveys have shown that the fear of price rises was already present even before the introduction of the euro. In November 2001, 70 p.c. of consumers in the euro area were afraid of being adversely affected by the changeover. In Belgium, the figure was 64 p.c. After the changeover in 2002, over 80 p.c. of consumers in the euro area did in fact feel that they had been adversely affected by the switch, or that prices had often been rounded up. The changeover generated a similar impression among Belgian consumers. Even today, more than five years after the introduction of the euro notes and coins, that feeling is still very persistent. At the end of 2006, the great majority of the population, both in the euro area as a whole and in Belgium, were still convinced that the euro had undeniably driven up prices. This subject recently became highly topical once again, particularly when Slovenia joined the euro area on 1 January 2007.

The changeover to the euro therefore seems to have severed the link between measured inflation and perceived inflation. This article intends to examine this issue in depth, looking at both the euro area and Belgium. Where more data are available for Belgium, the analysis is confined to the Belgian economy.

The article is arranged as follows. First, it analyses the movement in prices over the five years following the changeover to the euro. Certain microeconomic aspects of the price adjustments are also examined, namely the trend in the frequency of the price changes, the switch to new attractive prices in euro and the impact of the changeover on the diversity of prices in the economy. These points are important because they show just how fundamental are the implications of the euro changeover. The second section analyses the trend in inflation perceptions as indicated by the European Commission's consumer survey, and shows that the switch to the euro actually severed the link between measured inflation and perceived inflation. It also considers a number of factors which may have contributed to the breaking of that link. The final section presents the conclusions.

(1) In this article, the introduction of the euro and the changeover refer to the introduction of the euro notes and coins on 1 January 2002.

1. What has happened to prices?

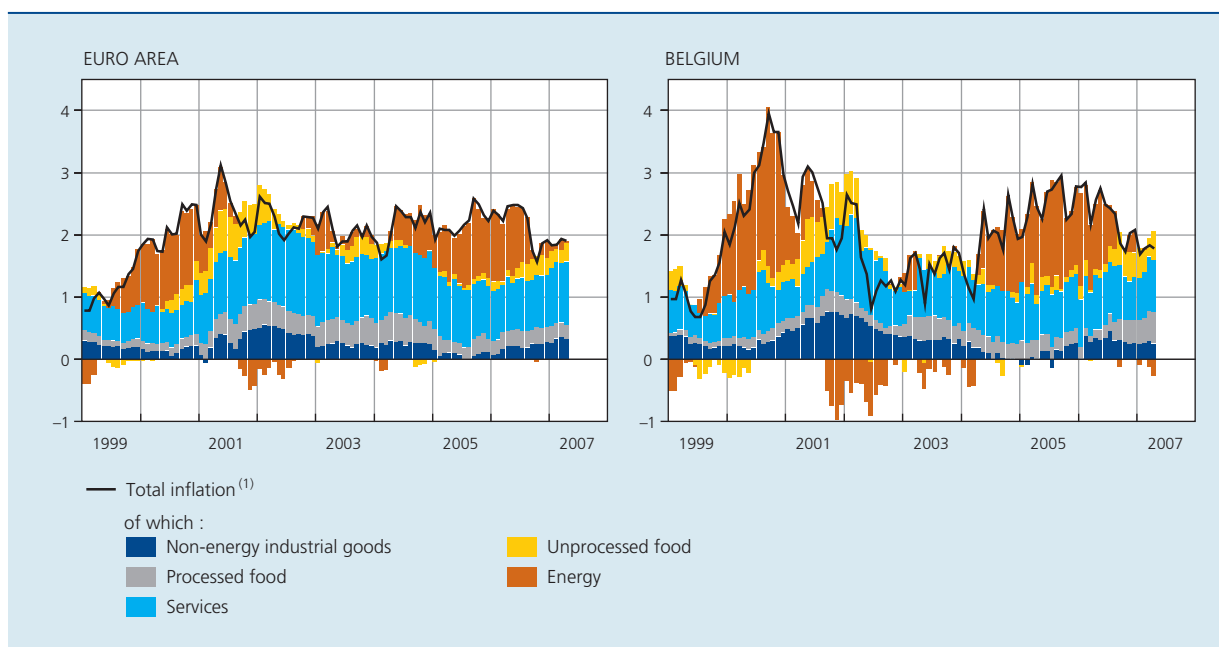
1.1 Inflation has remained low but the dispersion of relative price movements has increased

In the five years following the introduction of the euro, i.e. the period from 2002 to 2006, euro area inflation averaged 2.2 p.c. Although this is relatively low in historical terms, inflation slightly exceeded the 2 p.c. threshold characterising the definition of price stability in the euro area. This is due primarily to the fact that the energy component, propelled by crude oil prices, made a substantial positive contribution to inflation, especially in the period 2004-2006. The underlying trend in inflation, which excludes the prices of energy and unprocessed food, slowed during the period, falling from 2.5 p.c. in 2002 to 1.5 p.c. in 2006, mainly as a result of moderate wage growth and the euro's appreciation. Nevertheless, the initial impact of these factors was masked to some extent, because underlying inflation was pushed up by a series of administrative price changes, which were particularly marked in 2004. In 2007, this last factor again exerted considerable upward pressure following the increase in VAT in Germany.

In Belgium, inflation followed much the same pattern as in the euro area over the same period, although the average rate was slightly lower at 2 p.c. compared to 2.2 p.c. in the euro area. Yet there are two major differences. First, inflation in Belgium is more sensitive to crude oil price changes, both up and down, owing to the greater weight of petroleum products in the Belgian consumption basket, and the lower level of excise duty on those products. Second, primarily administrative price changes essentially exerted downward pressure, as a result of the abolition of the radio and television licence fee in Flanders (2002) and Brussels (2003), and its reduction in Wallonia (2003), and the liberalisation of the network industries.

During the five years following the introduction of the euro, inflation remained low and was only a little higher than in the preceding five years – averaging from 1.6 p.c. to 2.2 p.c. in the euro area –, but in contrast there was a substantial increase in the dispersion of relative price movements. The standard deviation of price changes for the various products, which is a measure of dispersion, in fact increased from 2.5 to 3.1 between the two periods in the euro area. In Belgium, the increase was actually even more marked, as the standard deviation went up from 2 to 5.1. The interval of two times two standard deviations

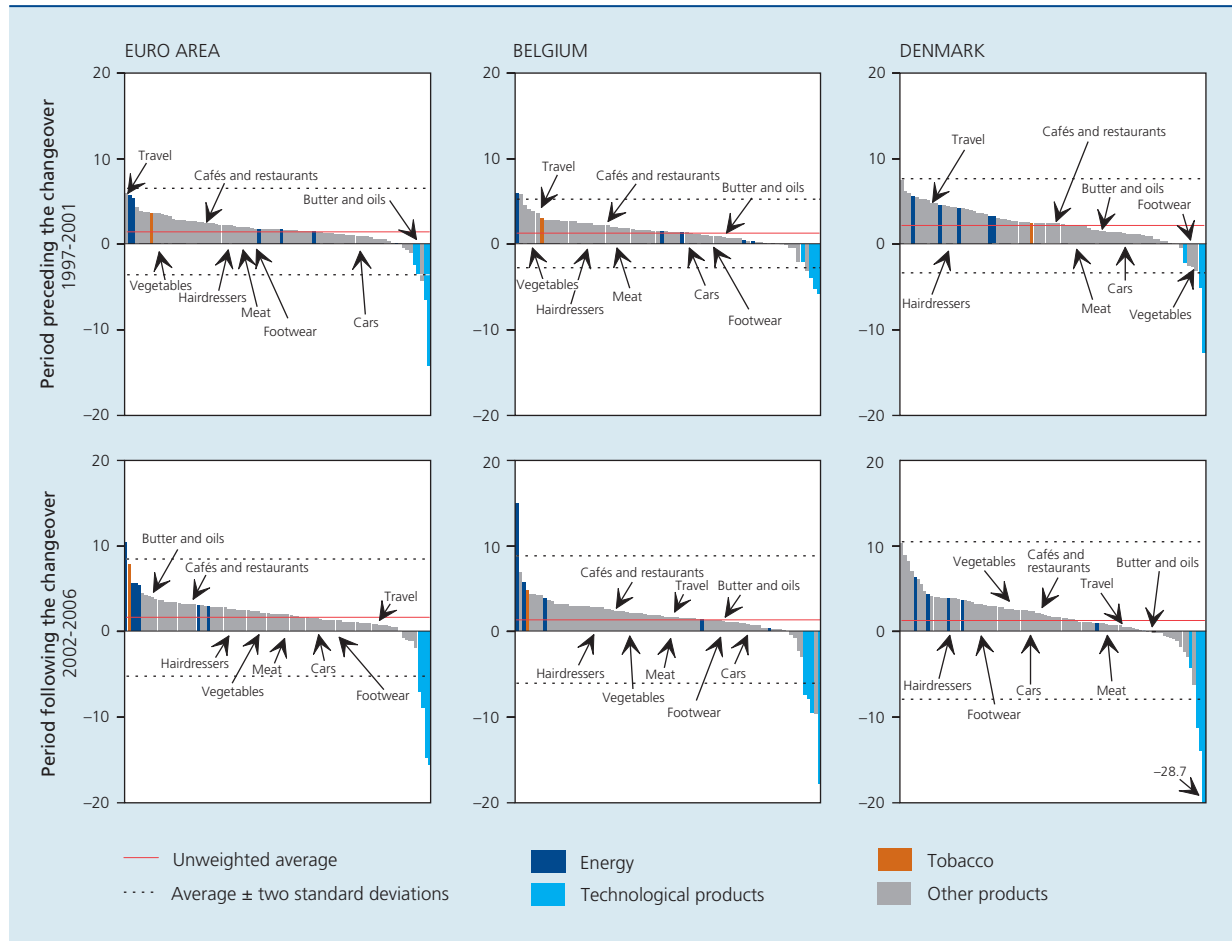
CHART 1 INFLATION
(contribution of the various components, percentage points, unless otherwise stated)



Sources : EC, ECB, NBB.

(1) Percentage changes of the HICP compared to the corresponding month of the previous year.

CHART 2 DISPERSION OF RELATIVE PRICE MOVEMENTS
(annual percentage changes)



Sources : EC, NBB.

around the average – also known as the 95 p.c. confidence interval, since it contains 95 p.c. of observations in the case of a normal distribution – therefore also increases significantly. Both the number of products for which the price has risen sharply and the number for which the price has fallen sharply displayed an upward trend in the past five years compared to the period 1997-2001. That phenomenon is evident for both the euro area and Belgium, but also for countries outside the euro area such as Denmark. It can therefore be classed as a structural phenomenon which has nothing to do with the euro but can be attributed partly to the progressive globalisation, whose impact on inflation primarily takes the form of changes in relative prices: higher prices for commodities (particularly crude oil) and lower prices for manufactured goods. Over the past five years, there have indeed been more energy products among the goods recording substantial price increases, while ever larger price reductions

are apparent for a growing number of high technology products. Apart from the impact of cheaper imports from the emerging economies, this situation also reflects the rising productivity in those sectors and the fact that the prices of these products are being measured increasingly accurately, i.e. with adjustments for quality improvements. These findings may have an influence on inflation perceptions if consumers are more selective in dealing with information on price reductions than in the case of information on price rises, or if their perceptions tend to be based more on the observed movement in prices at sales outlets, i.e. before adjustment for quality changes (cf. also section 2 of this article).

1.2 Inflation in 2002: impact of the euro changeover was limited, but concentrated in certain sectors

An acceleration in inflation from 2.0 p.c. in December 2001 to 2.6 p.c. in January 2002 is apparent in both the euro area and Belgium. However, it is largely attributable to a smaller negative contribution by the energy component – that contribution had become negative following the fall in oil prices after 11 September 2001 – and a rapid acceleration in the rate of price increases for unprocessed food, especially fruit and vegetables, as a result of adverse weather conditions. The acceleration in inflation caused by these factors cannot reasonably be attributed to the euro changeover.

Nonetheless, that does not prevent numerous studies from concluding that the euro changeover did in fact drive inflation up in 2002. But all those studies also point out that this influence was relatively limited, since it was confined to a certain number of sectors. The European statistical institute (Eurostat, 2003) thus established that the inflationary effect had been concentrated in the service sector, whereas the impact on the general price level in 2002 was most likely between 0.12 and 0.29 percentage point. The national central banks of the Eurosystem conducted similar exercises and generally arrived at comparable orders of magnitude. For Belgium, the impact of the euro changeover on inflation in 2002 was estimated at around 0.2 percentage point; it was similarly concentrated in the service sector (Cornille, 2003). Even in the countries where the estimated impact was greatest – e.g. the Netherlands, where it was assessed at 0.6 percentage point (Folkertsma, 2002) – it is still limited overall in relation to the increase in perceived inflation following the euro changeover (cf. section 2).

The factors often cited in the literature to explain the price rises linked to the euro changeover are as follows: the lack of price transparency and competition in certain sectors (Dziuda and Mastrobuoni, 2006), the complexity of the conversion rates (Ehrmann, 2006) and the existence of price adjustment costs – also called menu costs, by analogy with the cost of amending restaurant menus – which, at the time of the euro changeover, led to a concentration of price changes which would otherwise have been spread over a longer period (Gaiotti and Lippi, 2004; Hobijn, Ravenna and Tambalotti, 2006 and Angeloni, Aucremanne and Ciccarelli, 2006).

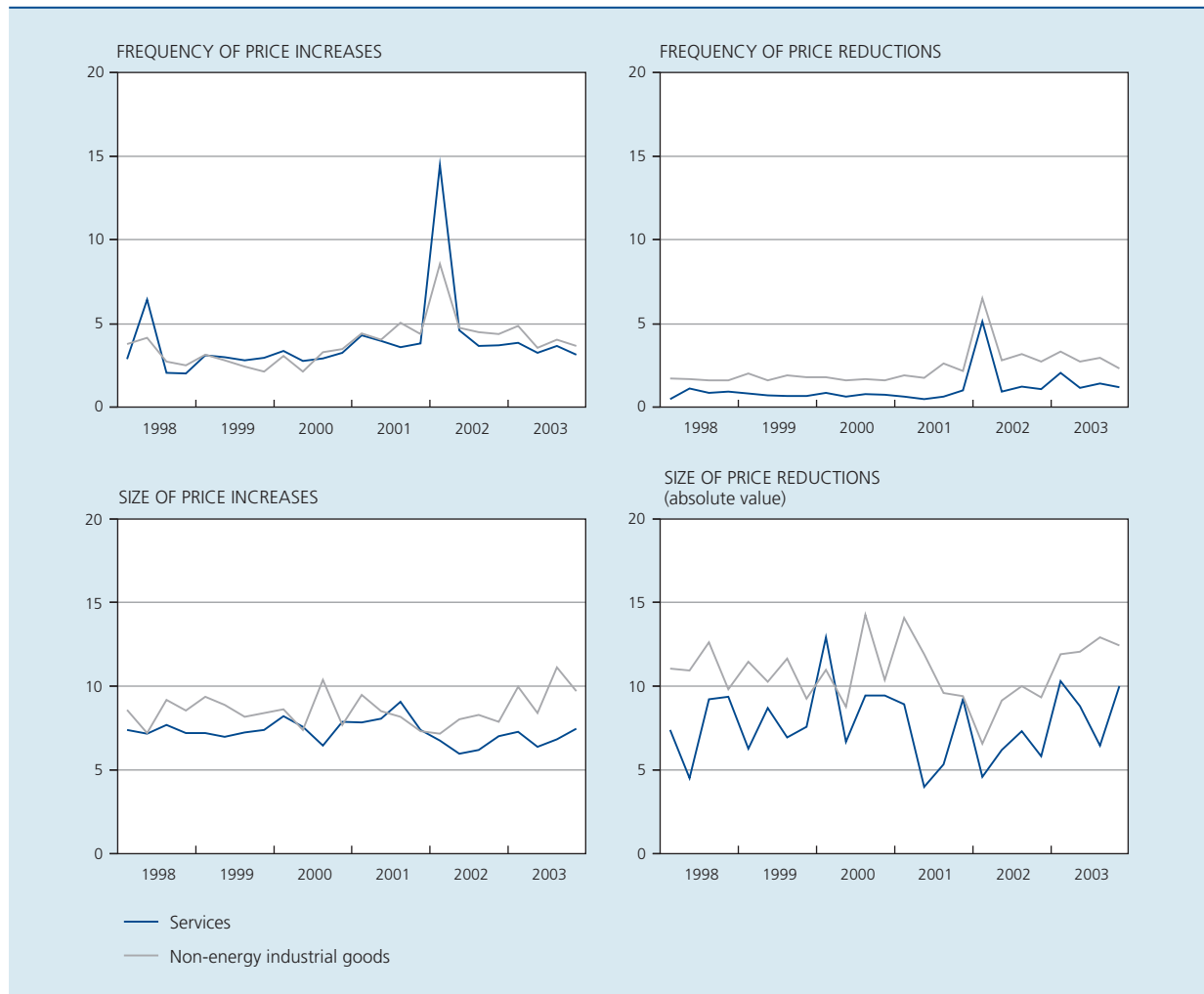
Thus, on the basis of a representative sample of 50 products included in the HICP for various euro area countries (Austria, Belgium, Italy and Germany), which cover 60 p.c. of the euro area, Angeloni, Aucremanne and Ciccarelli

(2006) established that the frequency of price changes – reflecting the proportion of prices changed during a given month – generally presents a fairly flat profile. Conversely, it was observed that, precisely during the euro changeover period – and especially in the first quarter of 2002 – the number of both increases and reductions in prices was considerably greater, albeit for a short period. The increase in price changes was accompanied by a slight fall in their average size as measured by the average percentage change of the prices actually adjusted during the month considered⁽¹⁾. That is compatible with the existence of fixed costs associated with price changes, implying that prices are only adjusted when the benefits outweigh the costs involved. Price changes will therefore be relatively infrequent, but their size will be relatively large. The obligation to convert all prices to the new currency unit following the euro changeover implies the temporary disappearance of the price adjustment costs associated with genuine price changes (i.e. changes extending beyond straightforward conversion). It is therefore logical to see a short-lived increase in the number of price changes and a reduction in their size.

The number of price changes observed for non-energy industrial goods displayed a relatively symmetrical pattern in that the increase in the number of price increases more or less equalled the increase in the number of price reductions. However, the situation is different in the case of services, where the sudden though short-lived increase in the frequency of price changes at the time of the switch to the euro is not only far more marked than in the case of non-energy industrial goods, but is also highly asymmetrical in that especially the price increases were far more numerous than usual. That is consistent with the studies of the euro's impact on prices, which universally showed that the impact was concentrated mainly in the service sector. That is also the sector generating the most complaints about unjustified price increases, originating both from the general public and from the media. But even in the case of services, it must be said that this was a temporary phenomenon; following the euro changeover, price adjustment rapidly returned to normal.

(1) It should be pointed out that these price changes between December 2001 and January 2002 were duly calculated as all changes in excess of normal rounding off (to the second decimal place or euro cent), associated with a simple conversion of national currencies into euro. The increase in the number of price changes and the reduction in their size are therefore not the artificial result of normal rounding off.

CHART 3 FREQUENCY AND SIZE OF PRICE CHANGES ⁽¹⁾
(percentages)



Source: Angeloni, Aucremanne and Ciccarelli (2006).

(1) Weighted average for the following countries: Austria, Belgium, Italy and Germany, which together represent almost 60 p.c. of the euro area.

1.3 A structural change in pricing practices

Although the analyses presented above suggest that the changeover had only a minor impact on inflation in 2002, that certainly does not mean that there has been no major structural change in pricing practices.

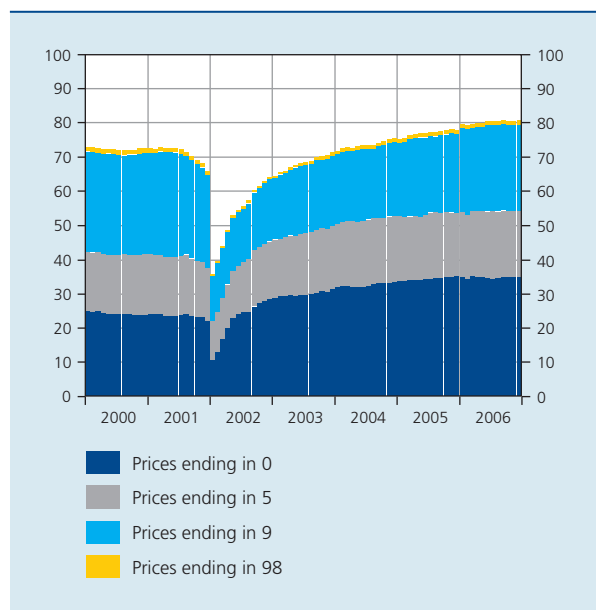
The modification of pricing practices following the introduction of the euro can be illustrated by the change in the proportion of prices ending in 0, 5, 9 and 98. There is empirical evidence, not only in Belgium but also in Europe and elsewhere, that these figures are used more often than others in the final position, to create what are called "attractive prices"⁽¹⁾. Since the final figure changes once prices are converted to euro, it is logical to expect prices to be progressively adjusted so that 0, 5 or 9 is again in

the last position. Consequently, the change in the proportion of attractive prices offers a measure of the degree to which prices have been adapted to their new scale. Since these data are not available for the other euro area countries, the analysis is confined in this case to Belgium.

In view of the change in the proportion of attractive prices in Belgian francs within a representative sample of prices charged in the economy – namely over 100,000 monthly price readings underlying the price index and covering

(1) Two reasons are normally given for the very widespread use of these figures. First, round figures which are easy to add up and make it easy to give change where required are said to make transactions simpler. This generally refers to prices ending in 0 or 5. The second reason often mentioned concerns the psychology of the customers who, taking no notice of the final figure(s), are said to give the sellers an indirect incentive to maximise their profit by using prices ending in 9 or 99. In practice, prices ending in 98 are also considered to be psychological prices. Overall, prices ending in 0, 5 or 9 – to which must be added prices ending in 98 – are generally referred to as attractive prices.

CHART 4 PROPORTION OF ATTRACTIVE PRICES IN BELGIUM⁽¹⁾
(percentages)



Source: NBB.

(1) Prices comprising three or four decimals are excluded from the analysis, as are prices comprising one or two decimals in Belgian francs, because they are considered to be little affected by the use of attractive prices.

about 70 p.c. of the basket of products included in the index – it seems likely, as already pointed out in the past, that the adjustment to the euro had already begun in mid 2001. However, the percentage of prices adjusted as a result of that was relatively small, since in January 2002 the proportion of attractive prices in euro was only 36 p.c., compared to 73 p.c. of prices in Belgian francs in the year 2000.

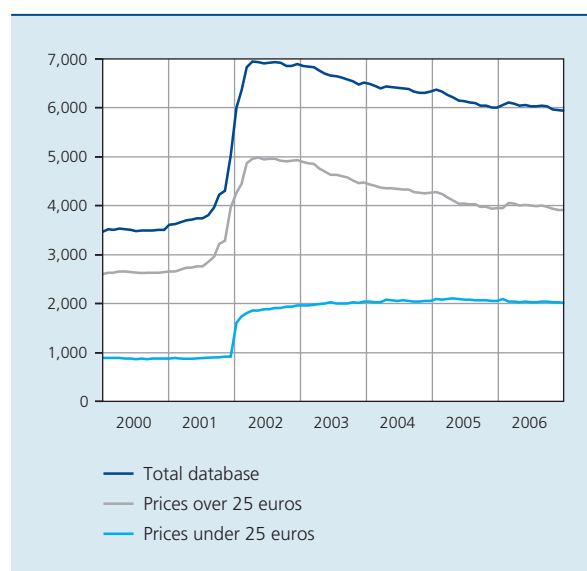
Price adjustment continued after the introduction of the euro. Initially, during the first five months of 2002, the adjustment process was rapid (the share of attractive prices increasing by an average of 4 percentage points per month), but subsequently slowed down. In February 2004, i.e. twenty-four months after the introduction of the euro, the proportion of attractive prices was twice as high as in January 2002, thus reaching 73 p.c., or a level similar to that prevailing in 2000 in Belgian francs. Twenty-nine months later, in June 2006, the proportion of attractive prices totalled 81 p.c., a level which remained unchanged for the rest of 2006. The services and processed food components account for most of the difference compared to the situation in Belgian francs for the total proportion of attractive prices. These are also the two components where price adjustments were the most rapid. Although this more or less stable level is higher than that prevailing in Belgian francs, it seems that the

adjustment to attractive prices has now practically come to a halt. Nevertheless, the full adjustment process will have taken almost five years.

Furthermore, the prices with the biggest increase in share are those ending in 0, which represent over one-third of all euro prices. In euro, some of these correspond to prices without any decimals, which are often used for “high” prices. Prices ending in 5 are also more common, but to a lesser extent. Conversely, the proportion of prices ending in 9, like those ending in 98, is still below that seen for prices in Belgian francs. The growing number of prices ending in 0 is due mainly to non-energy industrial goods, at the expense of prices ending in 9. The increased prevalence of prices ending in 0 and 5 – over half of the prices recorded, compared to around 42 p.c. before the introduction of the euro – may also be connected with the issue of the use of 1 and 2 cent coins, although that does not explain the causality. It is probable that, while prices end in 0 or 5 to avoid their use, it is also the case that some people consider the 1 and 2 cent coins to be useless because the majority of prices end in 0 or 5.

Another illustration of the change in the structures of prices charged following the introduction of the euro is the difference in the degree of use of the range of available prices. In this connection, we look at the change in the number of prices used in Belgium, on the basis of the number of different prices in the database analysed, regardless of the products to which they correspond. The

CHART 5 NUMBER OF PRICES USED IN BELGIUM⁽¹⁾



Source: NBB.

(1) Prices comprising three or four decimals are excluded from the analysis, as are prices comprising one or two decimals in Belgian francs.

number of different prices rose from around 3,500 in 2000 to just under 7,000 from 2002, which means that almost twice as many different prices were recorded in the databank from 2002. That indicates that a considerable change took place in the price structure, a change to which consumers have had to become gradually accustomed. However, the increase in the number of different prices is less than the rise in the number of possible prices, which was multiplied by around 2.5 at the time of the switch to the euro⁽¹⁾. One can therefore deduce that the degree of use of the range of available prices is less in euros than it was in Belgian francs.

That is particularly apparent in the case of prices under 25 euros. Their number increased from just under 1,000 in 2000 to just over 2,000 in 2002, or again roughly double. In Belgian francs, almost all prices between 1 and 1,000 francs were used, whereas around 500 potential prices in euros are not used; there are in fact 2,500 prices between 0.01 and 25.00 euros. The same analysis, but confined to attractive prices below 25 euros, indicates that 100 p.c. of possible attractive prices in Belgian francs were used, compared to only 80 p.c. of available attractive prices in euros. However, the latter are more numerous and therefore more diverse than was the norm before 2002.

The number of different prices also presents a striking picture: from July 2001 there was a gradual increase, followed in January 2002 by a strong surge, which clearly illustrates the regime shift represented by the switch to the euro, and similarly the scale of the potential effort which consumers have to make to adjust to this new system. While the number of different prices is relatively stable in the case of prices under 25 euros, it starts to diminish slowly after the final quarter of 2002 in the case of prices over 25 euros. This suggests that the adjustment continued throughout the period, but the stabilisation seen in 2006 nevertheless indicates that the very great majority of prices were gradually adapted to the new range of prices in euros.

Changes in the price structure following the introduction of the euro were also seen in other euro area countries; however, data on attractive prices are rarely available. In Germany (Hoffmann and Kurz-Kim, 2006), the euro changeover reduced the number of prices potentially available. Nonetheless, the number of different prices increased, but to a lesser extent than in Belgium so that the proportion of attractive prices declined. Moreover, these adjustments to the new price ranges were more rapid in Germany than in Belgium. In Austria (Glatzer and Rumler, 2007), the situation is more like that in Belgium

in regard to the speed of price adjustments. Conversely, the proportion of attractive prices in mid 2006 is more or less the same as that seen in the years preceding the introduction of the euro. Moreover, there does not appear to be any divergence between the various types of attractive prices, the percentage of each remaining relatively stable.

Summarising this section, it is apparent that the generally limited impact of the introduction of the euro on inflation in 2002 was concentrated in certain sectors. Since then, inflation has remained low but there has been greater dispersion in the movement in relative prices, both in the euro area countries and in countries outside. At micro-economic level, the process of price adjustment, which seems relatively slow, gave rise to a new attractive price structure and an increase in the number of prices used in the economy. The problems experienced by consumers in getting used to the euro are probably linked to such structural changes. These observations taken together also suggest that the process of adjusting prices to the euro is correctly reflected in the data used to measure inflation, so that the HICP is an accurate measure of inflation even if consumers may see things differently.

2. What has happened to perceived inflation ?

This section of the article analyses the movement in perceived inflation and investigates whether the euro changeover severed the link between inflation and perceived inflation. Perceived inflation is subjective, by definition, and reflects how consumers themselves perceive or observe the movement in prices. Perceived inflation will therefore not depend solely on the actual inflation picture, but also on the degree to which consumers are sensitive to price movements. That sensitivity may vary, both between individuals and over time. Perceived inflation cannot be observed directly and is therefore difficult to measure.

2.1 Perceived inflation according to the European Commission consumer survey

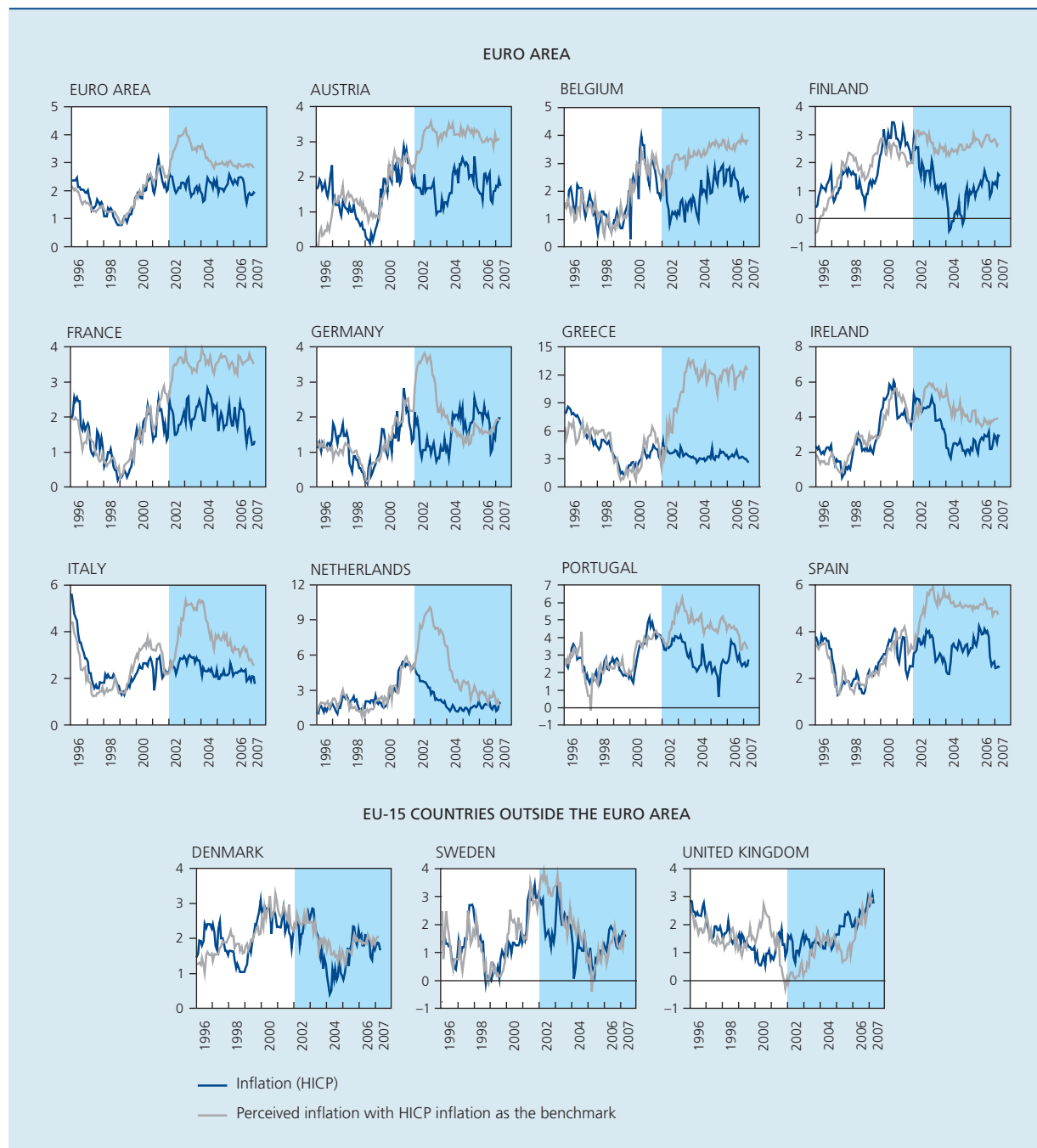
The survey conducted by the European Commission (EC), which questions around 23,000 consumers in the euro area every month – including about 1,600 in Belgium – contains a question which aims to ascertain the consumer's opinion on how prices have moved in the past year. The actual question is: "*How do you think that consumer prices have developed over the last 12 months? They have A(1) risen a lot, A(2), risen moderately, A(3),*

(1) Since there are 40 possible prices in Belgian francs between 1 and 40, compared to 100 in euros between 0.01 and 1.00 euro.

CHART 6

INFLATION AND PERCEIVED INFLATION ⁽¹⁾

(percentage changes compared to the corresponding month of the previous year)



Sources : EC, NBB.

(1) Standardised balance of opinions obtained from the EC survey, with HICP inflation as the benchmark.

risen slightly, A(4), stayed about the same, A(5), fallen, A(6) don't know". For each country i in period t , a balance of opinions B_{it} is calculated as the difference between a weighted average of the percentage of persons who responded that prices have increased in the past twelve months and a weighted average of the percentage of persons who responded that prices have stayed the same

or fallen. The weightings of the various possible responses are the same for all countries. The options "risen a lot" and "fallen" are accorded twice the weighting of the options "risen moderately" and "stayed the same". The possible responses "risen slightly" and "don't know" are not explicitly included in the balance of opinions, which is calculated as follows :

$$B_{it} = A_{it}(1) + 0,5A_{it}(2) - 0,5A_{it}(4) - A_{it}(5) \quad (1)$$

The balance of opinions, which may vary between -100 and 100, provides a qualitative indication of the direction in which consumers consider that inflation has moved in the preceding year. However, that qualitative indicator can be converted by a relatively simple standardisation procedure into a quantitative indicator of perceived inflation (Aucremanne, Collin and Stragier, 2007). That indicator is therefore accorded the same average value and the same scale as HICP inflation :

$$\pi_{it}^P = \frac{(B_{it} - \bar{B}_i)}{S_{B_i}} S_{\pi_i} + \bar{\pi}_i \quad (2)$$

π_{it}^P corresponds to perceived inflation quantified for country i in period t . $\bar{\pi}_i$ and S_{π_i} are respectively the average and the standard deviation of HICP inflation, while \bar{B}_i and S_{B_i} are the corresponding statistics for the balance of opinions for country i . These averages and standard deviations are calculated over a reference period for which there is considered to be a stable relationship between measured and perceived inflation. In the present case, that is the period between January 1996 and December 2001 which is regarded as neutral and which predates the changeover. The averages and standard deviations are specific to each country, as the general public's sensitivity to inflation may vary from one country to another⁽¹⁾. The data conversion formula thus explicitly takes account of differences in inflation sensitivity.

2.2 Impact of the euro changeover on perceived inflation⁽²⁾

If the calibrated measure of perceived inflation is shown in chart form alongside HICP inflation for the various euro area countries, it is apparent that the two more or less coincide during the reference period. Since the euro changeover in January 2002, however, these two series clearly diverge. While HICP inflation in the euro area continued to hover around 2 p.c. between 2002 and 2006, perceived inflation increased very sharply during

2002. It later subsided, though without reverting to a level corresponding to the relation between both variables prevailing during the reference period. On the basis of the quantitative indicator of perceived inflation defined earlier, the perception gap in the euro area peaked at over 2.5 percentage points at the beginning of 2003. Perceived inflation subsequently declined steadily, becoming stable from the second quarter of 2004, although it was still around 0.8 percentage point above the level which the HICP inflation figure for that period would have implied during the reference period.

While the link between inflation and perceived inflation was broken in 2002 in all the euro area countries, there are nevertheless significant mutual variations. In broad terms, three scenarios can be identified. The perception gap was totally eliminated in Germany and the Netherlands by the end of the period under review. It has recently narrowed significantly in Ireland, Italy and Portugal, while in Austria, Belgium, Finland, France, Greece and Spain it has remained substantial so far. In a number of countries, including Belgium, the perception gap has even widened of late, because perceived inflation did not mirror the fall in inflation recorded in the autumn of 2006.

If the same chart analysis is conducted for Denmark, Sweden and the United Kingdom, which are not members of the euro area, we find a close correlation between inflation and perceived inflation, both before and after January 2002. This clearly indicates that it was indeed the introduction of the euro which caused the break in inflation perception in the euro area. In that regard, it is interesting that, after the introduction of the euro in Slovenia on 1 January 2007, perceived inflation also began to diverge from HICP inflation (see box 1).

(1) Increased sensitivity in a particular country may be reflected in an average value for the balance of opinions which is high relative to average inflation (in that country, inflation perception is greater on average) and/or a standard deviation for the balance of opinions which is high relative to that for inflation (a change in inflation of a given magnitude leads to a more pronounced change in inflation perception).

(2) Standardised balance of opinion from the EC survey, with HICP inflation as the benchmark.

Box 1 – Inflation and perceived inflation following the introduction of the euro in Slovenia

On 11 July 2006, the Council of the European Union (EU) accepted Slovenia's application to become the thirteenth member country of the euro area from 1 January 2007. Slovenia was thus the first new Member State to change to the euro, which became legal tender there on 1 January 2007, replacing the Slovenian tolar.

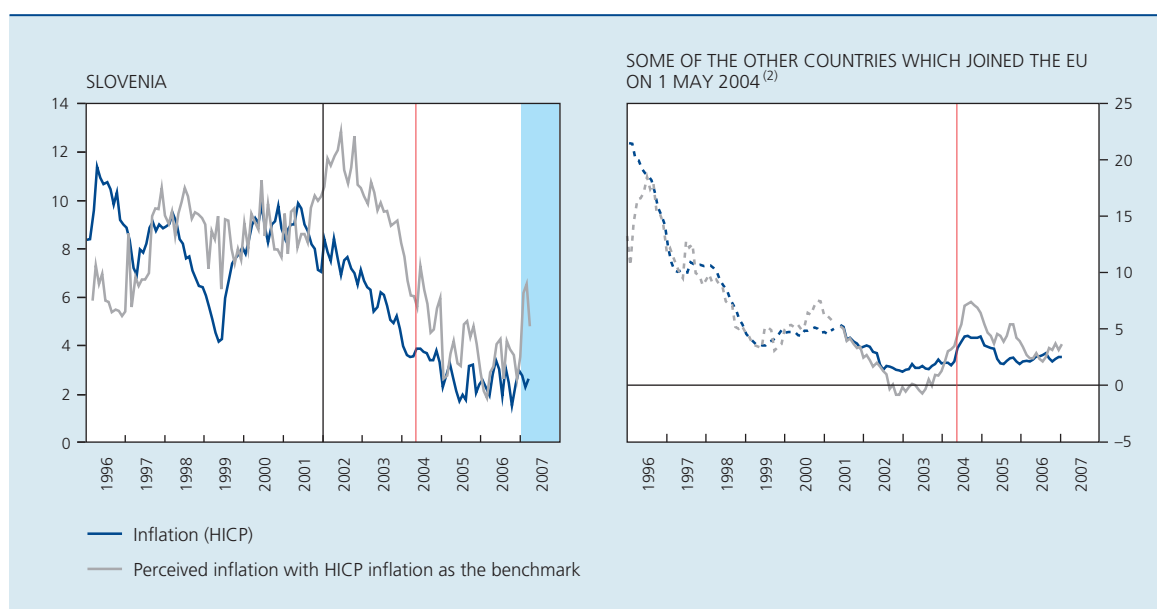


When the euro was introduced in Slovenia, several lessons were drawn from the experience of introducing the euro on 1 January 2002. Thus, well before the euro changeover, an intensive publicity campaign was launched, during which a non-technical information leaflet was distributed to the population. In addition, dual pricing was made compulsory from May 2006, and price monitoring teams were set up to check that the price conversion was applied correctly. Finally, it was decided that the period in which the euro and the tolar were both legal tender should be limited to two weeks.

According to a recent European Commission report (2007), the introduction of the euro in Slovenia can be classed as successful, partly thanks to the measures taken but also because the euro notes and coins were already in widespread use in the Slovenian economy before the launch. The price increases associated with the euro were moderate, and were concentrated in a few sectors. According to Eurostat calculations, the introduction of the euro had an impact of no more than 0.3 percentage point on inflation, and according to the Slovenian Institute of Analysis and Macroeconomic Development (IMAD), that impact came to 0.24 percentage point (IMAD, 2007). These estimates are very similar to the 2002 findings in the euro area.

INFLATION AND PERCEIVED INFLATION ⁽¹⁾ IN SLOVENIA AND IN A NUMBER OF OTHER NEW MEMBER STATES ⁽²⁾

(percentage changes compared to the corresponding month of the previous year)



Sources : EC, NBB.

(1) Standardised balance of opinions obtained from the EC survey, with HICP inflation as the benchmark.

(2) Owing to the limited availability of data, only Estonia, Hungary and the Czech Republic were included in the analysis (indicated by a dotted line in the chart) for the period between January 1996 and May 2001. From May 2001 the analysis was supplemented by data for Cyprus, Latvia, Lithuania, Poland and Slovakia. However, for Malta the data available are insufficient, even after May 2001, to be included in the analysis.

Despite the detailed publicity campaign which preceded the introduction of the euro in Slovenia, the Slovenians were also very much afraid that prices would rise. An EC survey indicates that at the end of 2006, two-thirds of the Slovenian population feared that the introduction of the euro would lead to unfair pricing and cheating; that percentage was comparable to that recorded in the euro area countries. In Slovenia, too, the switch to the euro led to a break between inflation and perceived inflation.



Slovenia differs from the other countries which joined the EU on 1 May 2004 in that a perception gap had already appeared there when the euro was introduced in the euro area countries; that gap gradually diminished, but suddenly reappeared in January 2007 when the euro was actually introduced in Slovenia. One factor which may have encouraged this phenomenon was that the Slovenian economy had already been largely converted to the euro before the official launch in 2007.

Immediately after their accession, most of the countries which joined the EU in May 2004 experienced a short-lived surge in inflation, due essentially to indirect taxes and other administrative price changes. In addition, integration into the EU's common agricultural policy and the abolition of the remaining trade barriers triggered a substantial increase in food prices. This caused consumers in the majority of those countries to consider that the price increases were greater than those indicated by the official inflation figures. In other words, joining the EU created a perception gap, but it was less persistent than that seen in the euro area countries after the introduction of the single currency.

Nonetheless, the chart comparing actual inflation and perceived inflation is often called into question since a comparison is being made between two different concepts, namely perceived inflation, which is qualitative, and a quantitative inflation rate (cf. in particular Brachinger, 2006). However, the approach presented here – as described above – is based on explicit quantification of the EC balance of opinions. Moreover, the econometric approach used by Aucremanne, Collin and Stragier (2007), presented in box 2, confirms that inflation and the quantification of perceived inflation were very closely linked during the reference period, both in the panel of

euro area countries and in the control panel comprising Denmark, the United Kingdom and Sweden. While this relation was preserved in the control panel, it displayed a statistically significant break in the panel of euro area countries as soon as the data relating to the period after the euro changeover were taken into account in the analysis. These results therefore fully confirm the observations described earlier, which are based purely on a chart analysis and clearly indicate a break in the link between inflation and perceived inflation in the euro area after the changeover.

Box 2 – Econometric testing of the emergence of a perception gap following the introduction of the euro

Numerous studies have analysed how the introduction of the euro influenced consumers' perception of inflation by showing charts comparing the EC balances of opinions and HICP inflation. The majority of these studies are confined to a single euro area country. Conversely, Aucremanne, Collin and Stragier (2007) conduct an econometric test for all euro area countries to ascertain whether the introduction of the euro caused a break in the link between inflation and perceived inflation. The test used, which is based on the standardised balances of opinions mentioned above, can be broadly divided into two phases.

Before studying the existence of a break in the link between inflation and perceived inflation, it is vital to check whether the quantified measure of perceived inflation tracks HICP inflation during the reference period. For that purpose, it is sufficient to examine whether the difference between the two – known as the "perception gap" – is stationary around a zero average value. In other words, if the standardised balances of opinions are to be actually valid as a quantified measure of perceived inflation, they must not deviate systematically in either direction from measured inflation during the reference period, and any differences must be fairly short-lived.

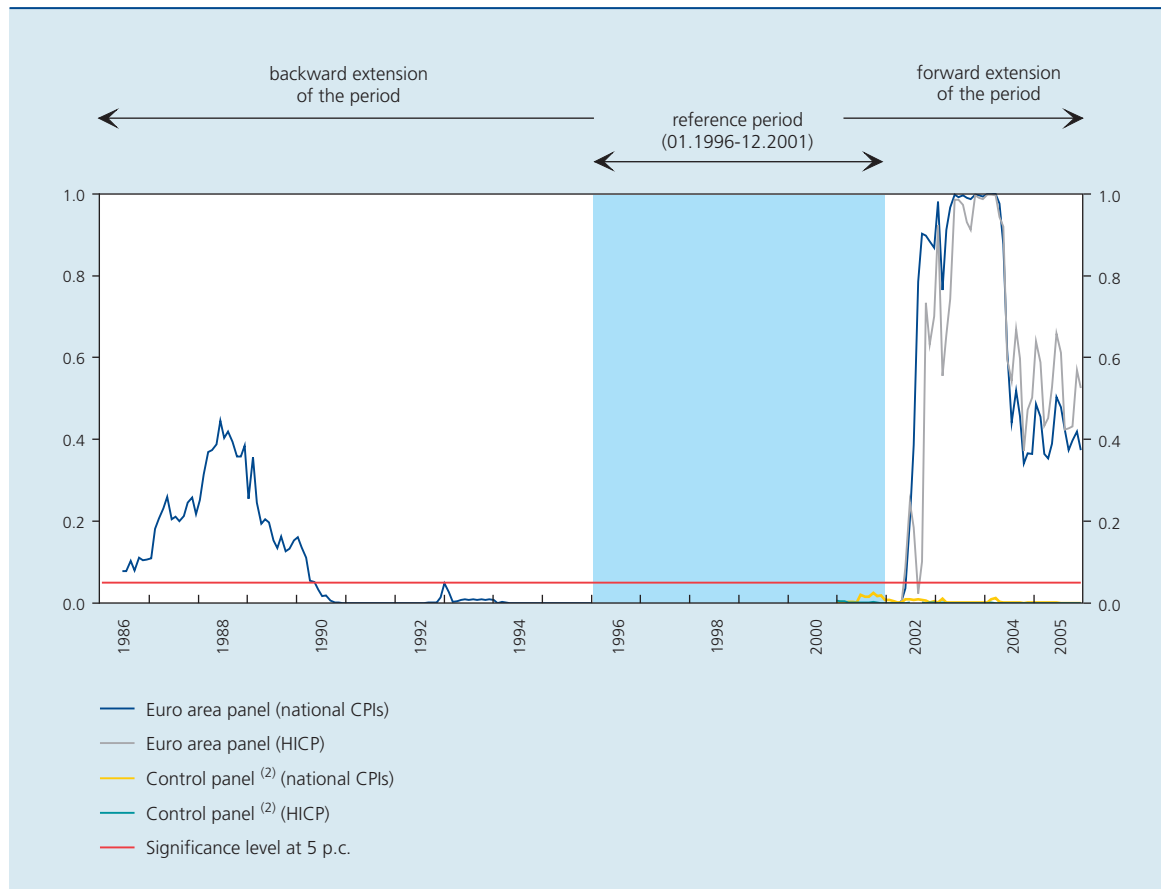


Finally, to examine whether the switch to the euro caused a break, that same stationarity test is repeated for periods to which one month is progressively added. The test period initially extending from January 1996 to December 2001 is thus increased recursively until eventually it covers the period from January 1996 to December 2005. Here it should be pointed out that the conversion of the balances of opinions is based solely on the data relating to the reference period, including for the longer horizons. It is therefore assumed that the general public's inflation sensitivity has remained unchanged, so that any differences in sensitivity will ultimately be reflected in deviations of perceived inflation from its pattern during the reference period. If those deviations are substantial, the perception gap will no longer be a stationary variable and a break will occur in the link between inflation and perceived inflation. The sooner the break occurs after January 2002, the greater the probability that it is actually due to the euro changeover⁽¹⁾. To highlight any role played by the changeover, exactly the same analysis is conducted for Denmark, the United Kingdom and Sweden. These countries form a control panel: in principle, no break is expected.

(1) However, it should be noted that this method cannot be expected to detect immediately a break caused by the changeover in January 2002. Instead, it will probably need a minimum number of data (like other statistical methods) before it can distinguish between a temporary gap and a structural break.

FORMAL TEST FOR THE EMERGENCE OF A BREAK BETWEEN INFLATION AND PERCEIVED INFLATION

(probability of a break ⁽¹⁾)



Sources : EC, NBB.

(1) The existence of a break results from non-rejection of the null hypothesis whereby the gap between inflation and inflation perception is non-stationary. The null hypothesis is not rejected if the probability is over 5 p.c.

(2) The control panel consists of Denmark, Sweden and the United Kingdom.

Such stationarity tests can be conducted both for the euro area as a whole and for each country individually. However, in practice only eleven countries have been analysed, as the time series for Luxembourg is too short to be taken into account. The availability of data on the other countries is also fairly limited⁽¹⁾, so that problems of statistical significance might arise. If the samples are small, stationarity tests tend to give a false indication that the series is not stationary. That is why stationarity was also tested for a panel of euro area countries, instead of only for each country individually. That approach makes more efficient use of the available data, alleviating the problems of statistical significance. However, it does have one drawback: the resulting conclusions apply only to the whole of the panel considered, and not necessarily to each of the constituent countries.

What can we learn from the formal stationarity tests? As expected, it was difficult to show that the perception gap was stationary for the individual countries, even for the reference period. It was only for Belgium, Germany, the Netherlands and Portugal that the perception gap could be regarded as a stationary variable during the reference period. However, the panel analysis results undeniably tend towards stationarity, but if the test period is gradually extended (forward) it very soon becomes apparent that the perception gap is no longer a stationary variable. That is true of the gap between perception and HICP inflation for the euro area panel as soon as data relating to the period beginning in May 2002 are taken into account. That result does not really depend on the use of the HICP as the measure of inflation. The same conclusions can be drawn if this exercise is repeated using the national CPIs as the measure of inflation. In the case of the control panel, similar tests show that, whatever the underlying data (HICP or national CPIs), the perception gap is a stationary variable during the reference period and remains so if data extending beyond 2002 are progressively taken into account.

In order to measure the accuracy of the method used, the same test was conducted by progressively extending the test period into the past. Thus, beginning with the reference period, the period examined will ultimately extend from June 1986 to December 2001. The robustness test on the method used could only be conducted for the national CPIs, since the HICP did not exist until recently. In principle, the perception gap is expected in that case to remain a stationary variable. If that is not so, that implies that the link between real and perceived inflation has also been unstable in the past (and that it is therefore intrinsically unstable), so that no definite conclusions can be drawn from the instability which followed the changeover. This exercise shows that, for the euro area panel, the perception gap is stationary until data from before February 1990 are taken into account, i.e. after almost six years of observations have been added to the reference period. Instability is also evident on going even farther back into the past, albeit less marked than after 2002. The addition of pre-1987 data causes the probability of a break to fall again. This exercise therefore demonstrates that the instability seen in the period 1986-1995 (i.e. almost ten years) is less than that recorded over the period 2002-2005 (four years), which provides formal confirmation that the perception gap after the euro changeover is unusually large and persistent.

These findings are exactly what one might expect from a break in the link between real and perceived inflation following the switch to the euro. They are also validated by alternative quantification methods of the EC consumer survey results. These findings therefore support the conclusions drawn earlier on the basis of straightforward chart analysis, but are based on an econometric approach and are therefore less subject to criticism.

(1) This analysis measures inflation according to the HICP. As the inflation rates calculated on the basis of that index are available only from 1996 onwards, the analysis is confined to the period since 1996.

2.3 Attempts to explain the perception gap

It is therefore beyond dispute that the changeover contributed to the emergence of a persistent perception gap in the euro area. However, it is worth examining why this had such a significant impact on inflation perceptions, and whether other factors may have played a role.

Difficulties due to the new reference scale

A first key factor is undeniably the difficulties that consumers experience in getting used to the new reference scale. The analysis of the price adjustment process at microeconomic level shows that it had substantial implications (for example, it led to a large increase in the number

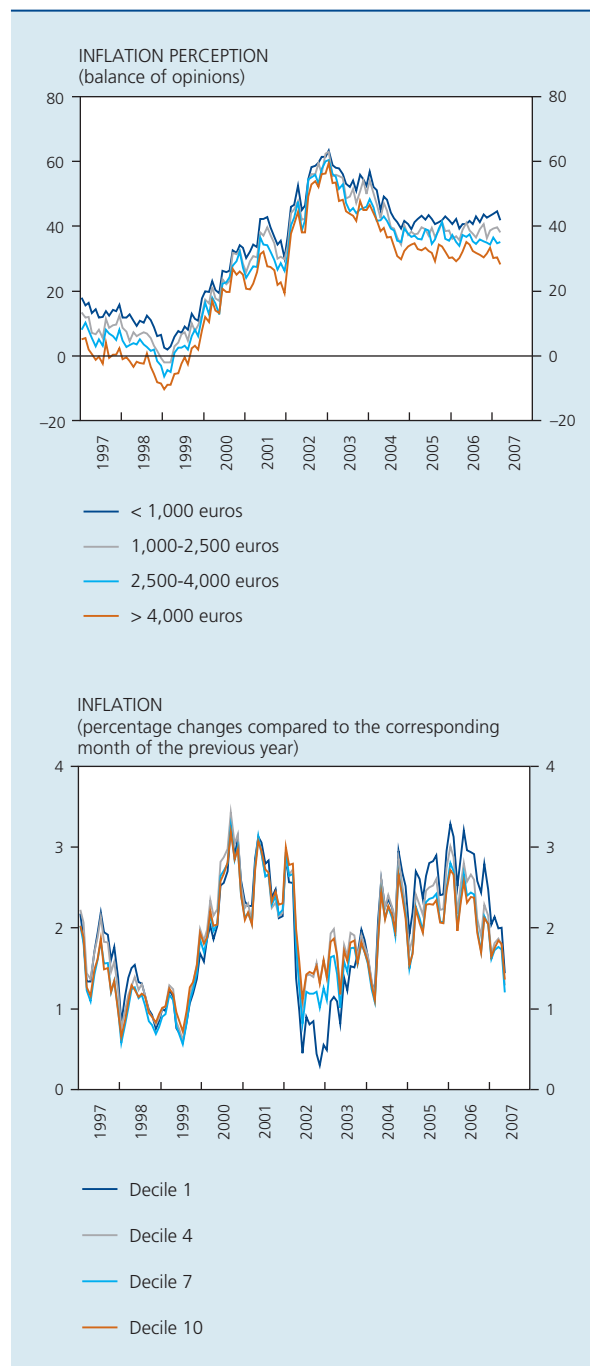
of different prices in the economy) and that it was a long drawn-out process. It is therefore not surprising that the adjustment process is also slow and difficult for consumers. For instance, surveys indicate that almost half the population has trouble getting used to the euro. That proportion did not start to decline until 2005, and then only very slowly. In addition, many people still convert prices into their old national currency. They are therefore actually comparing current prices with pre-2002 prices, and in so doing they cumulate the inflation and get the impression that inflation is very high. This automatically leads to persistence in the perception gap (cf. in particular Dziuda and Mastruboni, 2006 and Stix, 2006). European Commission surveys show that, in 2006, over half of consumers were still converting prices of more expensive purchases into their old national currency, and one-third were also doing so in the case of minor purchases. Moreover, they often use a simplified conversion rate, which may represent an additional source of error (Ehrmann, 2006). Until such time as the new reference scale is firmly entrenched, inflation perceptions may still be influenced by the introduction of the euro.

Role of socio-economic characteristics

It is therefore possible that the inflation perceptions of the population groups for whom the adjustment process is slowest may be more significantly affected than those of other groups. That could apply to the elderly, but also to women and people in low-income groups, since they are generally more sensitive to inflation, probably because they are more vulnerable to it or because they are confronted by it more often. The question whether the break in the link between inflation and perceived inflation is more marked among certain consumer categories can be answered by analysing the inflation perceptions obtained from the EC consumer survey according to the consumers' socio-economic characteristics. It is evident that there are in fact differences in inflation perceptions. Persons with a higher standard of education, higher incomes and a corresponding occupation (self-employed or clerical and office employees), working full time, belonging to the younger age groups and of the male gender have a lower inflation perception, on average, than those in lower income groups, less skilled, manual workers, persons working part time, the unemployed, the elderly and women.

However, it is apparent that these differences of perception tend to be permanent, and that they were only influenced to a small extent by the introduction of the euro in January 2002, even if, in the case of Belgium – in contrast to the other euro area countries – the difference between the perceptions of the lowest and highest income groups widened somewhat after the changeover to the euro.

CHART 7 INFLATION AND INFLATION PERCEPTION FOR DIFFERENT INCOME GROUPS IN BELGIUM



Sources : EC ; FPS Economy, SMEs, Self-employed and Energy ; NBB.

The EC consumer survey data therefore indicate that, in 2002, the inflation perception of all groups increased to a similar extent, subsequently declining slowly but only partially. A more formal analysis based on stationarity tests also confirms the existence of a relatively uniform break in perception (Aucremanne, Collin and Stragier, 2007).

The differences in inflation perception might perhaps come about because each group has its own specific spending pattern which may, in principle, be subject to price movements that deviate up or down from overall inflation. It is a well-known fact that the consumption structure varies considerably according to income. Expenditure on food, housing and health care represents a high proportion of the budget of less well-off households. Conversely, prosperous households spend relatively more on clothing, transport and leisure. However, there is no official indicator of inflation specific to the various classes of consumers in Belgium.

Nonetheless, since the household budget surveys used to structure the weightings of the consumer price index (CPI) distinguish between consumers according to their income group, it is possible to calculate CPIs specific to each of those groups. As an approximation, series were calculated by modifying the weightings used for the CPI (index with base 1996 and new index with base 2004) in line with the differences observed in the 2004 household budget survey between households in general and the various classes of households. The calculations were performed at a fairly detailed level for 115 products or product groups. Since there is no price survey specific to each income group, it was necessary to assume that the various groups are confronted by the same price movements for each individual product.

This exercise shows that, although there are slight differences in inflation rates between the various income groups, the variations are fairly minor overall. No significant systematic difference was found between the various groups: inflation is thus not systematically higher for low incomes than for high incomes. The conclusions obtained in regard to non-significant differences between income groups are also confirmed by Bodart and Hindriks (2006). It is therefore not possible to see this factor as a valid explanation for the systematic divergence in inflation perceptions. Moreover, during the period following the introduction of the euro in January 2002, the inflation rate facing low income groups tended to be lower than overall inflation, because at that time the downward effect of the declining oil prices had a greater impact on this population group for whom heating oil has a particularly high weighting. This factor also accounts for the positive divergence for this population group in 2005 and 2006. The movements in the prices of a basket of goods and services specific to low income consumers therefore cannot explain why they tended to be acutely aware of inflation in Belgium at the time of the euro changeover.

Naturally, the results presented here are only an approximation of the real indices per income group. One of the limitations is that, in using weightings which are fixed in time (except for the switch to the new index in 2006), no account is taken of the possibility of substituting one product for another, e.g. if the price becomes too high. More accurate calculation of these indices, offering all the statistical guarantees, is well beyond the scope of this article, and if it proved to be appropriate it should preferably be conducted by CPI experts at the NSI. Some countries have taken such calculations to a fairly advanced stage, with the aim of demonstrating that the overall consumer price index is entirely credible, even though the inflation which affects one particular household may deviate to a greater or lesser extent from that overall index, according to the particular structure of the household's expenditure. Thus, the INSEE in France and the German statistical institute offer on their respective websites a personal inflation calculator based on the specific characteristics of the budget of each household (to be entered) for twelve product categories⁽¹⁾.

A priori expectation that prices would rise

Another possible reason for the perception gap is that, before the introduction of the euro, many people believed that prices would increase sharply, and they apparently tend to consider that this expectation was borne out. This theory is hard to verify, but an experiment along those lines was conducted in Germany (Traut-Mattausch et al, 2004). People were given different menus with prices in euros and in marks. They showed a systematic tendency to think that the euro prices were higher than they really were. Even where the menu prices had been converted correctly, they had the impression that the euro prices were higher.

Movement in the prices of frequently purchased goods and services

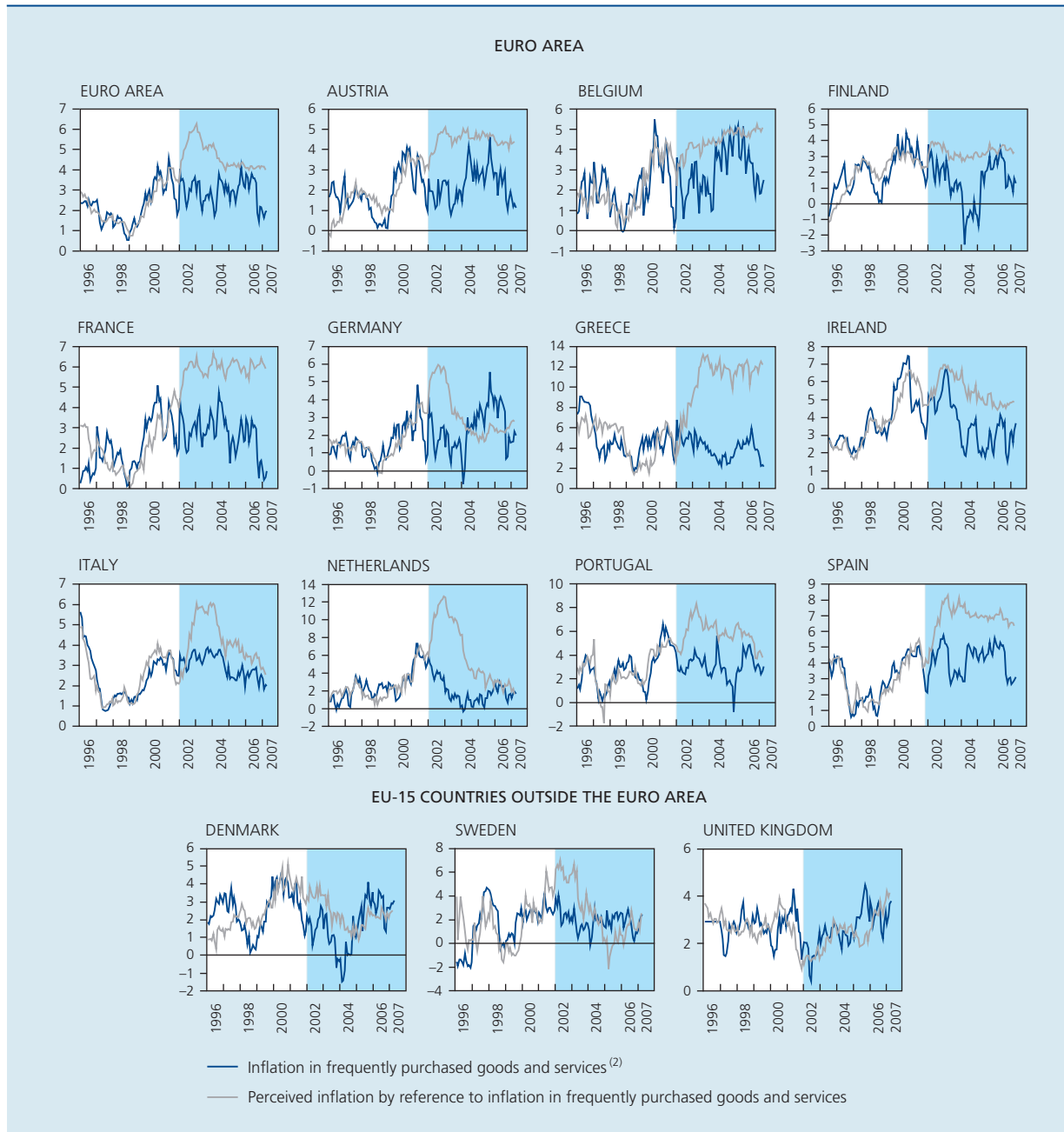
Some people also claim that the perception gap may be due to the fact that inflation perceptions are based mainly on daily purchases, and that price increases are noticed more than price reductions. This theory was formalised by Brachinger (2005 and 2006). In principle, this factor is totally unconnected with the euro changeover, and may also cause a perception gap at other times. However, this factor can be assumed to have played a specific role at the time of the euro changeover, as numerous increases in the prices of frequently purchased goods and services were recorded at that period. They were not necessarily due to the changeover: for example, food prices rose sharply as a result of bad weather. However, as already stated, the switch to the euro caused an unusual concentration

(1) See the corresponding websites: <http://www.insee.fr> and <http://www.destatis.de>.

CHART 8

INFLATION AND INFLATION PERCEPTIONS ⁽¹⁾ BASED ON FREQUENTLY PURCHASED GOODS AND SERVICES

(percentage changes compared to the corresponding month of the previous year)



Sources: EC, ECB, NBB.

(1) Standardised balance of opinions obtained from the EC survey, with inflation in frequently purchased goods and services as the benchmark.

(2) Food, beverages, transport services, fuel, postal services, hotels, cafés and hairdressers.

of price rises in the first quarter of 2002. Furthermore, those price rises concerned goods and services frequently purchased on their own and paid for in cash, so that they were particularly noticeable.

To examine this question in more detail, an index of frequently purchased goods and services was calculated on the basis of a study previously conducted by the ECB (2003). It comprises the HICP components which can be considered to be frequently purchased: food, beverages, transport services, fuel, postal services, hotels, cafés and hairdressers. They represent around 40 p.c. of the total

basket of goods used to calculate the HICP. On the basis of that index, the balances of opinions were converted in a manner similar to that described earlier.

When this measure of perceived inflation is compared with the inflation data for this smaller basket of goods and services, most of the previous conclusions remain valid. While they are relatively close together for the period prior to January 2002, these two series diverge very widely in the various euro area member countries after the introduction of the euro. One more, perceived inflation in the euro area increases until the beginning of 2003, then gradually declines and becomes stable at the beginning of 2004 at a level well above the inflation figure for frequently purchased goods and services, although below the level prevailing immediately after the switch to the euro. Owing in particular to the steep rise in energy prices, which also explains why inflation for frequently purchased goods and services is much more volatile than overall inflation, the gap was practically eliminated at the end of 2005 and during much of 2006. Since perceived inflation did not mirror the decline in energy prices, the gap widens again to reach a level close to that recorded immediately after the switch to the euro. Differences between euro area countries are also apparent here, and are comparable to those which had been seen previously for the link between overall inflation and perceived inflation. The stationarity tests similarly confirm that, when this index of frequently purchased goods and services is used as the reference, a break occurs in the link between inflation and perceived inflation after the switch to the euro. They also demonstrate that it was difficult, even for the reference period, to find a close link between perceived inflation and this alternative measure of inflation (Aucremanne, Collin and Stragier, 2007).

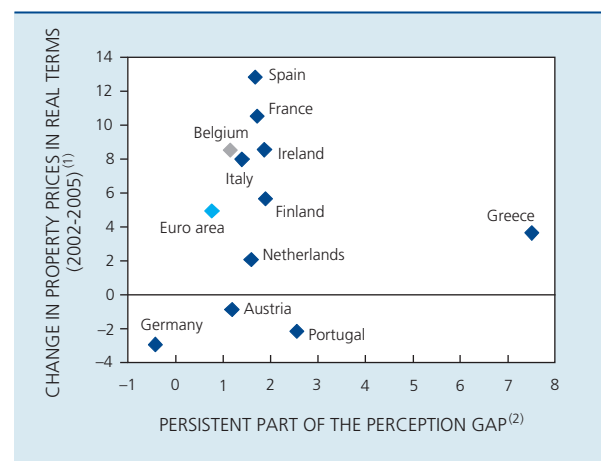
This evidence suggests that the special attention which consumers pay to frequently purchased goods and services played only a minimal role in the emergence and persistence of a perception gap in the euro area. However, it must be said that this is only one part of Brachinger's theory, and that the asymmetric weighting associated with price increases and reductions respectively was disregarded here. That factor may be of some importance since, as already stated, the dispersion of relative price changes increased in the period 2002-2006. Owing to our empirical strategy, we were also unable to check whether the euro changeover itself encouraged consumers to pay more attention to frequently purchased goods and services. That could be so if the consumers' difficulties in getting used to the new currency encouraged them to concentrate more than in the past on those purchases in order to collect and process information on prices.

Specific character of inflation measured by the HICP

It is therefore apparent that the broad coverage of the HICP (the products monitored concern the whole consumption basket, and not just frequently purchased goods and services, and they reflect the consumption habits of the population as a whole, and not necessarily those of specific groups) is not the real reason why perceived inflation diverged after the euro changeover. However, that does not exclude the possibility that other aspects specific to the HICP may have played a role. Moreover, it could be that the HICP is not sufficiently familiar as a measure of inflation for the general public, or that it does not inspire sufficient confidence, possibly because the HICP was introduced recently and is therefore not yet sufficiently firmly anchored, and because the national statistical institutes still tend to centre their announcements on the national consumer price index, considering the HICP as a secondary indicator. The latter is clearly the case in Belgium. Finally, the measure of perceived inflation used in this article is based on a question relating to the movement in consumer prices formulated in general terms, without explicit reference to any particular index or to the HICP.

It is therefore worth repeating the analysis by substituting the national CPI for the HICP as the reference index. However, that analysis leads to the same conclusions as those presented above. Thus, box 2 clearly indicates that the link between national CPI inflation and perceived inflation is broken shortly after the introduction of the euro, just as in the case of HICP inflation.

CHART 9 INFLUENCE OF THE NON-INCLUSION OF COSTS OF OWNER OCCUPIED HOUSING IN THE HICP



Sources: EC, ECB, NBB.

(1) No property prices are available for Portugal for 2005; for that country, the figure shown is an average up to 2004.

(2) Average perception gap in 2005.

One peculiarity of the HICP is that it does not include the costs of owner occupied housing, despite the fact that house purchase is by far the largest financial transaction for any household, and has a major impact on purchasing power. Furthermore, property prices in the majority of euro area countries have risen much faster than HICP inflation, and the property price boom has received very widespread media coverage. It is therefore possible that this phenomenon may have had some influence on consumers' inflation perceptions. Moreover, the average consumer is perhaps unaware that these costs are not included in the HICP figures.

To assess the impact of the non-inclusion of the costs of owner occupied housing, a direct comparison between the size of the perception gap and the movement in property prices in real terms was made for all euro area countries. Comparison over the period 2002-2005 between the average perception gap and the movement in house prices revealed no evident link between the two. Since the average perception gap for that period is greatly influenced by the direct effect of the switch to the euro, it seemed worth checking whether it was possible to draw a parallel between the more persistent part of the perception gap (approached via the average perception gap in 2005) and the property market developments. If Greece is disregarded, a small positive link is apparent: thus, strong price movements in the property sector tend to be accompanied by a fairly large perception gap in 2005. All the same, the correlation is rather weak. Even without Greece, it is only 30 p.c. and does not differ significantly from zero.

However, this does not imply that there is no justification for including owner occupied housing costs. That would extend the HICP's coverage and would improve its comparability between countries. Experts are currently examining the inclusion of owner occupied housing costs, but it has not yet been decided whether the HICP will incorporate these costs in the future. Moreover, there is no consensus so far on the methodology to be used if these costs are taken into account.

Another methodological aspect sometimes put forward to explain the perception gap is the fact that the HICP is adjusted for quality changes. As a result, the inflation figure is somewhat lower than it would be on the basis of the prices recorded at sales outlets. However, adjustments for quality changes are nothing new, and were already used in the HICP before 2002. It is therefore rather unlikely that they are the reason for the divergence between perceived and actual inflation. The Belgian case provides some indication of the potential impact. Thus, both in 2004 and 2005 inflation calculated according to

the national CPI, which at that time was not adjusted for quality, was 0.2 percentage point above HICP inflation. These differences are not negligible, but they are nonetheless relatively minor in relation to the total size of the perception gap recorded after 2002.

Overall, the specific characteristics of inflation measured by the HICP do not appear to have played a significant role in the emergence of the perception gap in the euro area. The fact that the accuracy and credibility of the HICP per se are not in doubt is reassuring from the point of view of monetary policy, taking account of the HICP's central role in the strategy.

Finally, it is sometimes also suggested that the inflation concept used by survey participants might be broader than just the movement in prices. For example, it is possible that the rise in perceived inflation since 2002 in fact reflects the rather pessimistic view of people's disposable income, their personal financial situation or the economic situation in general, rather than the actual price movements (Del Giovane, Lippi and Sabbatini, 2005, and ECB, 2007).

Conclusion

The analysis clearly demonstrated that the euro changeover in January 2002 led to a severing of the link between inflation and perceived inflation throughout the euro area. Nevertheless, inflation itself remained relatively low during that period, certainly in view of the fact that it was undeniably driven upwards by the sharp rise in crude oil prices and the increases in direct taxes and administered prices. The direct impact of the euro changeover on inflation in 2002 was also small, but was concentrated in certain less competitive sectors and was therefore fairly visible. The changeover's role in the development of the persistent perception gap cannot be denied. In Denmark, Sweden and the United Kingdom, which are outside the euro area, inflation perceptions corresponded very closely to inflation both before and after January 2002.

However, when it comes to finding more specific explanatory factors, it is difficult to identify their exact contributions. The statement that consumers tend to form their perceptions on the basis of the movement in prices of frequently purchased items is not sufficient to explain a persistent perception gap. The socioeconomic characteristics of consumers did not play a dominant role either, while the influence of more psychological factors, such as the problems which consumers experience in incorporating the euro into their reference framework, is difficult to assess.

The specific character of the HICP inflation measure does not appear to have played a significant role in the emergence of the perception gap in the euro area. A similar gap arises if the national CPIs are used as the reference instead of the HICP. The non-inclusion in the HICP of the costs of owner occupied housing was not a key factor either. The fact that the accuracy and credibility of the HICP per se are not at stake is reassuring from the point of view of monetary policy, considering the HICP's central role in the strategy.

Despite its size and persistence, the perception gap seems to have had few if any macroeconomic consequences, in terms of either wage costs or consumption. One effect of the common monetary policy has been to ensure that

inflation expectations are firmly anchored at a level compatible with price stability.

The perception gap is therefore essentially a challenge for communication aimed at the general public. The bodies responsible for measuring inflation, namely the national statistical institutes and Eurostat, have a primary role here. The same applies, of course, to the central banks of the Eurosystem. Finally, it should be pointed out that the current experience in the euro area is not fundamentally different from what happened in the United Kingdom following the decimalisation of the pound sterling in 1971. There are indications that on that occasion, too, prices were perceived to have risen considerably, whereas the effect on actual inflation was minimal (cf. Moore, 1973).

Bibliography

Angeloni I., L. Aucremanne and M. Ciccarelli (2006), "Price setting and inflation persistence: did EMU matter?", *Economic Policy*, No. 46, April, pp. 353-387.

Aucremanne L., M. Collin and T. Stragier (2007), *Assessing the Gap between Observed and Perceived Inflation in the Euro Area: Is the Credibility of the HICP at Stake?*, National Bank of Belgium Working Paper, WP 112.

Bodart V. and J. Hindriks (2006), "Les Belges sont-ils tous égaux face à l'inflation?", Ininera institute, *Memo 1/2006*, May 22, 2006.

Brachinger H. W. (2005), "Der Euro als Teuro? Die wahrgenommene Inflation in Deutschland", *Wirtschaft und Statistik* (9), pp. 999-1013.

Brachinger H. W. (2006), "Euro or "Teuro"? : The Euro-induced Perceived Inflation in Germany", *Department of Quantitative Economics Working Paper Series*, No. 5, University of Fribourg, Switzerland.

Del Giovane P., F. Lippi and R. Sabbatini (2005), *L'euro e l'inflazione*, Il Mulino, Bologna.

Dziuda W. and G. Mastrobuoni (2006), "The euro changeover and its effects on price transparency and inflation", *Princeton University*, July.

Ehrmann M. (2006), "Inattentive consumers, inflation developments and perceptions after the euro cash changeover", *ECB WP series*, No. 588.

European Central Bank (2007), "Measured inflation and inflation perceptions in the euro area", *Monthly Bulletin*, May, pp. 63-72.

European Commission (2007), "The introduction of the euro in Slovenia", *Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee, the Committee of the Regions and the European Central Bank* – Brussels, 4 May 2007, COM(2007) 233 final.

Eurostat (2003), "Euro changeover effects", annex to press release dated 18 June 2003, http://epp.eurostat.cec.eu.int/cache/ITY_PUBLIC/2-18062003-AP/FR/2-18062003-AP-FR.HTML.

Folkertsma C. K. (2002), "Getting used to the euro", *DNB Research Memorandum WO&E*, No. 697.

Gaiotti E. and F. Lippi (2004), "Pricing Behavior and the Introduction of the Euro: Evidence from a Panel of Restaurants in Italy", *Giornale degli Economisti e Annali di Economia* 63(3/4), pp. 491-535.

Glatzer E. and F. Rumler (2007), "Price Setting in Austria before and after the Euro Cash Changeover: Has Anything Changed in the Last Five Years?", *Monetary Policy & The Economy Q1/07*, OENB.

Hobijn B., F. Ravenna and A. Tambalotti (2006), "Menu Costs at Work: Restaurant Prices and the Introduction of the Euro", *The Quarterly Journal of Economics*, No. 121, pp. 1103-1131.

Hoffmann J. and J. Kurz-Kim (2006), "Consumer Price Adjustment under the Microscope: Germany in a Period of Low Inflation", *ECB Working Paper series*, No. 652.

IMAD (2007), *Euro Changeover Effect in Inflation in Slovenia*, Institute of Macroeconomic Analysis and Development, Government of the Republic of Slovenia.

Moore, N.E.A. (1973), *The decimalisation of Britain's currency*, H.M. Stationery Office, London.

Stix H. (2006), *Perceived Inflation and the Euro: Why High? Why Persistent?*, paper presented at the 81st Annual Conference of the WEAI, San Diego.

Traut-Mattausch E., S. Schulz-Hardt, T. Greitemeyer and D. Frey (2004), "Expectancy confirmation in spite of disconfirming evidence: The case of price increases due to the introduction of the Euro", *European Journal of Social Psychology*, Vol. 34, 6, pp. 739-760.