



CROATIAN NATIONAL BANK

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Effects of the Adoption of the Euro on  
Consumer Prices and Inflation Perceptions:  
An Overview of Experiences and Assessment  
of the Possible Impact in Croatia

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Andreja Pufnik

Zagreb, November 2017





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**PUBLISHER**

Croatian National Bank  
Publishing Department  
Trg hrvatskih velikana 3, 10000 Zagreb  
Phone: +385 1 45 64 555  
Contact phone: +385 1 45 65 006  
Fax: +385 1 45 64 687

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## Abstract

Numerous research results show that the effect of the conversion of national currencies to the euro on the growth of consumer prices in euro area countries was generally mild and one-off. A slightly more pronounced increase in prices due to conversion was registered for a small number of products, mostly in the services sector, such as services in restaurants and cafés. In accordance with these experiences, the effect of the conversion of the kuna to the euro on the overall level of consumer prices in Croatia is expected to be mild. The paper also examines the main determinants of the growth in perceived inflation in the aftermath of the conversion and measures that proved to be effective in limiting the effect of euro adoption on the rise in consumer prices and perceived inflation.

**Keywords:**

euro, inflation, perceived inflation

**JEL:**

D12, D84, E31, F33

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## 1 Introduction

During the introduction of the euro, prices expressed in the domestic currency are converted to the euro according to the predetermined conversion rate, which is a technical operation that should not affect relative prices, i.e. increase in the price level. Price increases are prevented by market forces, i.e. competition, while lower transaction costs and the absence of exchange rate risk have a downward effect on prices. Nevertheless, there are factors present during conversion that may spur a short-term increase in the price level. An increase in prices in the course of conversion is most often due to the rounding up of prices to a higher figure so that they reach a new attractive level, to the spillover of conversion costs onto consumers, and to the efforts of some corporations to increase their profit margins in the situation in which citizens are getting used to the new currency. Numerous research results show that the effect of the conversion of national currencies to the euro on the growth of consumer prices in euro area countries was mild and one-off. In addition, country experiences point to the importance of measures to limit the possible short-term effect of conversion on the increase in prices and perceived inflation,

such as the obligation of dual price display in shops, measures promoting fair price setting by corporations, information campaigns, etc.

The paper is structured as follows. The second section provides an analysis of the key factors behind price increases triggered by the conversion of the national currency to the euro and an overview of papers that quantify the impact of conversion on overall inflation in euro area countries and on developments in prices of particular groups of products. The third section offers an overview of developments in perceived inflation relative to developments in official inflation in old and new euro area member states and considers the main determinants of the inflation growth perceived by consumers in the post-conversion period. The fourth section provides an assessment of the possible effect of the adoption of the euro on developments in the overall level of consumer prices and inflation perceptions in Croatia and highlights the measures to limit the effect of the conversion on price growth. The main conclusions of this overview paper are given in the fifth section.

## 2 An overview of experiences of euro area member states with the effect of the conversion of national currencies to the euro on consumer prices

The effect of the conversion of national currencies to the euro on the overall consumer price inflation in euro area countries was mild. A slightly more pronounced increase in prices was registered mostly in the services sector and for a small number of frequently bought products. The literature lists several important factors behind price increases triggered by the conversion of the national currency to the euro. One of the reasons mentioned is the spillover of conversion costs, which, for instance, include menu costs and costs of IT services, onto consumers. Furthermore, it is known that a significant portion of prices is formed at the so-called attractive level,<sup>1</sup> which implies price rounding so that payment is practical (not too many coins/banknotes required as change), or price formation ending in the figure 9 (so-called psychological prices), which affects consumers by leading them to underestimate the cost of purchased products. Therefore, the next factor that may result in price increases at the time of conversion is the possibility that corporations do not round up prices symmetrically (that is, sometimes upwards and sometimes downwards), so that their amount in euro reaches a new attractive level, but rather round them up to a higher figure. With reference to the intensity of this effect on inflation, Aucremanne and Cornille (2001), and Folkertsma (2002) estimated that, under the worst-case scenario in which corporations round up all attractive prices in the national currency to reach a new attractive

level in euro, the effect of conversion on the consumer price index in Belgium and the Netherlands might amount to 0.7 percentage points.<sup>2</sup> The analysis which Folkertsma et al. (2002) carried out after the conversion shows that the estimated effect of the conversion on price growth in the Netherlands ranged from 0.2 to 0.4 percentage points, with two-thirds of the increase being related to the effect of the upward price rounding, and the rest related to the transmission of conversion costs to consumers.

Prices may also be driven up if the prevailing opinion among corporations is that, in order to make things easier, consumers will not use the exact conversion rate to recalculate new prices into the old currency, but simplify their calculations and thus obtain imprecise results. It is also assumed that consumers ignore minor changes in prices. Corporations may use this situation to increase the prices of their products, i.e. their profit margins. More precisely, in order to be able to compare euro prices with the prices in the national currency to which they are used, consumers should recalculate prices to the national currency, which imposes certain costs of information processing. Ehrman (2011) showed that there is a tendency for the inflationary effect of the conversion of the national currency to the euro to be smaller in countries where the conversion rate is simple and enables fast and relatively accurate conversion from one currency to the other, and in countries

<sup>1</sup> In practice, the level of prices that is considered attractive differs from one currency to the next, which is strongly influenced by their denomination structure. For instance, Aucremanne and Cornille (2001) stated that before euro adoption in the Netherlands, prices of more expensive products (in guilders) were usually rounded up to figures without decimals, whereas in Belgium round prices would rather be multiples of 100 (in Belgian francs).

<sup>2</sup> Similar results were obtained in the case of Slovakia (NBS (2006)).

**Table 1** Estimated effect of the conversion of national currencies to the euro on the inflation rate in percentage points (p.p.)

Paper	Country	Period	Estimated effect on total HICP (p.p.)
<b>Old Member States</b>			
Eurostat (2003)	Euro area	12/2001-1/2002	0.09 – 0.28
Hüfner and Koske (2008)	Euro area	7/2001-7/2002	0.34
Sturm et al. (2009)	Euro area	12/2001-1/2002	0.05 – 0.23
Attal-Toubert et al. (2002)	France	12/2001-4/2002	0.2
Banco de España (2003)	Spain	12/2001-6/2002	0.4
Deutsche Bundesbank (2004)	Germany	1/2002	0.3
Folkertsma et al. (2002)	Netherlands	1/2002	0.2 – 0.4
Mostacci and Sabbatini (2008)	Italy	12/2001-12/2002	0.1 – 0.6
National Bank of Belgium (2002)	Belgium	6/2001-4/2002	0.2
Santos et al. (2002)	Portugal	1/2002-3/2002	0.21
<b>New Member States</b>			
Eurostat (2007)	Slovenia	12/2006-1/2007	0.3
Eurostat (2009)	Slovakia	12/2008-2/2009	do 0.3
Eurostat (2011)	Estonia	12/2010-3/2011	0.2 – 0.3
Eurostat (2014)	Latvia	12/2013-1/2014	0.12 – 0.21
Eurostat (2015)	Lithuania	12/2014-1/2015	0.04 – 0.11
IMAD (2007)	Slovenia	12/2006-2/2007	0.24
Room and Urke (2014)	Estonia	7/2010-6/2011	0.0 – 0.5

Sources: given in the first column.

where the conversion rate is very complex, consumers tend to rely more on pocket calculators and rely less on imprecise rules of recalculation.

It is impossible to make a precise assessment of the effect of the euro conversion on overall inflation because of numerous factors that simultaneously affect price developments. For example, in early 2002, many euro area countries recorded an increase in prices of fruits and vegetables due to the extremely cold winter, an increase in excise duties on tobacco products, and so on. Analyses focused on assessing the intensity of conversion effects suggest that the effects on aggregate inflation were weak (up to 0.3 percentage points according to Eurostat's estimates) and one-off (they were most pronounced a month prior to the very beginning of conversion and the month set for conversion). According to Eurostat's estimates, the effect of the conversion of national currencies to the euro on the overall harmonised index of consumer prices for the euro area as a whole totalled between 0.1 and 0.3 percentage points in December 2001 and January 2002, respectively.<sup>3</sup> Studies

of the effect of conversion on inflation in particular countries also show a mild contribution, which was, for example, estimated at 0.2 percentage points in France, Belgium and Portugal, 0.3 percentage points in Germany and 0.1–0.6 percentage points in Italy (Table 1). Further, the upper bound of the effect of conversion on the overall HICP in the new member states also remained under 0.3 percentage points, according to Eurostat's estimates. Eurostat applied statistical techniques to identify HICP components whose monthly change in prices at the time of conversion departed from that indicated by the data on movements in these prices in the same months of the previous years and the data on price developments in other EU countries at the time of conversion. The difference between the expected and the actual change in the prices of particular components was considered an unusual change in prices. In cases in which an unusual change in prices could not be attributed to a particular factor (e.g. bad weather conditions, growth in energy prices, administrative decisions, increase in excise duties, etc), Eurostat considered it to be the consequence of the conversion to the euro.

Other research covering the euro area as a whole estimated that the effect of conversion was 0.34 percentage points (Hüfner and Koske (2008)), or between 0.05 and 0.23 percentage points (Sturm (2009)). The effect of conversion differed among countries. The risk of price increases was lower in countries with a subdued growth in demand. Furthermore, research show that the effect of conversion on inflation growth was weaker in countries that laid down the obligation of dual price display in shops for some time prior and after the conversion (among the old member states, this was the case in Austria, Finland, Greece and Portugal).<sup>4</sup> It was also shown that a higher degree of competition in the market subdues the conversion-induced increase in prices.<sup>5</sup>

Research results show that a somewhat more pronounced increase in prices due to conversion was registered for a small number of products, mostly in the services sector, such as services in restaurants and cafés (Figure 1), accommodation services, hairdressing services, various repairs, dry-cleaning services, recreational and sporting services, etc. As their share in the basket for the calculation of the consumer price index is relatively small, the effect of the said price increases on the overall index was mild. Such movements were present in both the old and new member states.<sup>6</sup>

A significant monthly increase in restaurant prices following the conversion was seen in most old euro area member states, and it was most pronounced in the Netherlands (3.5%), Germany (2.2%) and Finland (2.0%).<sup>7</sup> On the other hand, Austria, Belgium and Greece recorded a mild growth (from 0.2% to 0.5%). Hobijn et al. (2006) showed that the price increase in the sector of restaurants and cafés following the changeover in the euro area may be explained by the so-called menu cost model.<sup>8</sup> Substantial price rigidity is specific for this sector and changes in prices are relatively rare. The cost of price

<sup>3</sup> The overall annual consumer price inflation (HICP) in the euro area stood at 2.6% in January 2003.

<sup>4</sup> Eife (2006).

<sup>5</sup> For example, see Hüfner and Koske (2008) in case of the old member states.

<sup>6</sup> For an overview of the groups of products that recorded a significant increase in prices broken down by country, see the table in Annex 1.

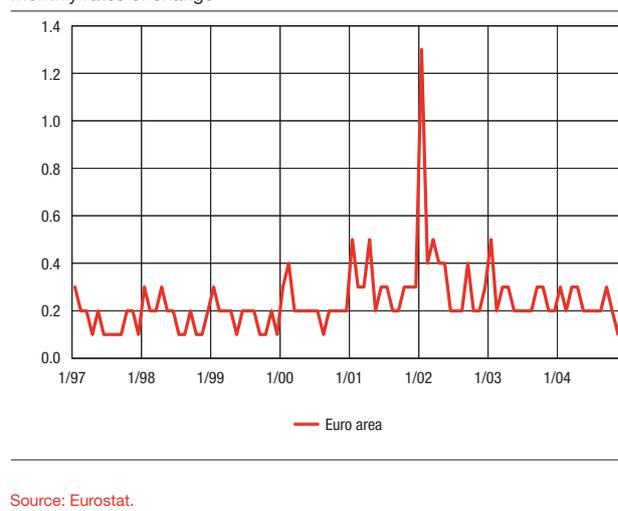
<sup>7</sup> The increase in accommodation prices triggered by the conversion was most noticeable in Italy.

<sup>8</sup> A model of rigid prices with a fixed cost of price changes (the so-called menu cost model).

changes in the restaurant sector includes, above all, the printing of new menus. The model estimates that, due to the conversion, a larger share of restaurants would concentrate price changes in the month of the beginning of the conversion to the euro, while under normal circumstances, the share would be distributed over a longer time period. As an above-average number of restaurants change prices, aggregate inflation in this sector grows in the first two months<sup>9</sup> after the conversion. In addition, the growth rate of restaurant prices in the months preceding the conversion is lower than the long-run average as prices to a lesser extent include future costs because there will soon (at the time of conversion) be another opportunity for price adjustment. This mitigates the upward pressure on prices in the period preceding the conversion and raises it in the period following the conversion, when these costs are included in the price. The research by Gaiotti and Lippi (2008) made on the basis of the data on prices in 2500 restaurants in Italy showed that the increase in the overall price level in restaurants was due to the fact that a larger share of restaurants revised prices at the beginning of 2002 than in “normal” years.

On the other hand, prices of goods did not normally increase significantly due to conversion.<sup>10</sup> However, a slightly more pronounced effect of conversion on the intensity of price growth was seen in relation to goods that are bought more frequently (e.g. bakery goods and newspapers) and are at the same time relatively cheap, so that the rounding of their

Figure 1 Developments in consumer prices in restaurants and cafés in the euro area (HICP 0111) monthly rates of change



prices to new attractive levels led to substantial price increases. On the other hand, there is a tendency for prices of goods of higher value, such as durable consumer goods, to be rounded down, which is attributed to intense competition on these markets and technological advancement.

### 3 Effects of the adoption of the euro on inflation perceptions

Although the conversion had mild effects on overall inflation in the countries that introduced the euro, the majority of their citizens felt that the adoption of the euro triggered a significant increase in prices. This is evident from the considerable increase in the gap between the inflation level perceived by consumers and actual inflation measured by the official consumer price index in the period after conversion. Among the reasons why perceived inflation was much higher than actual inflation in the period after the euro changeover in January 2002, it was mentioned that citizens usually base their perceptions about inflation levels on the trends in prices of cheaper products they buy frequently, and it has been shown that the increase in prices of these cheaper products at the time of conversion was often more pronounced. The increase in the gap between perceived and actual inflation after conversion may spur negative attitudes towards the euro. Nevertheless, the experiences of countries that have introduced the euro thus far indicate that consumers considered this increase to be one-off, given that it was not accompanied with an increase in inflationary expectations. This did not threaten price stability as the absence of an increase in expected inflation (vs perceived) did not fuel demands for higher wages and set in motion the upward spiral of wages and prices.

#### 3.1 Inflation perceptions in euro area countries

Following the conversion in the old euro area member states, there was a substantial increase in perceived inflation, i.e. in the share of consumers that felt that prices had grown strongly in the last year. By contrast, numerous analyses showed that the euro changeover in January 2002 had a very mild effect on the price increase in euro area countries. At the same time, officially measured inflation, i.e. inflation rate measured by the harmonised index of consumer prices, indicated a mild average annual increase, of 2.2%, in 2002. These developments prompted numerous research efforts to establish the main determinants of the upsurge in perceived inflation, bearing in mind its importance for movements in other economic variables. For example, ECB (2002) points out that, if consumers overestimate current inflation, they may simultaneously underestimate changes in real wages and their purchasing power, which may result in less than optimum decisions on spending, i.e. a decrease.

Perceived inflation is a subjective impression about price movements that is shared by the general public. Consumers perceive price signals (e.g. while shopping or through the media), which they process and, based on that personal

<sup>9</sup> National currencies of the old euro area member states were legal tender to the end of February 2002.

<sup>10</sup> See ECB (2003). By contrast, using the example of Estonia, which introduced the euro in early 2011, Rõdm and Urke (2014) showed that a significant positive effect on inflation growth triggered by the euro changeover was also made by goods prices (some subcategories of the price index for food and non-alcoholic beverages, clothing materials, motor cars).

experience, create their inflation perception. Data on inflation perceptions of the general public in individual EU countries are usually calculated based on monthly consumer confidence surveys and are published by the European Commission. Used for that purpose are responses to question 5 from the survey: “How do you think that consumer prices have developed over the last 12 months?”<sup>11</sup> The aggregate indicator of perceived inflation, which is called the balance statistics, is the difference (measured in percentage points) between the share of respondents that thought that prices had risen a lot or moderately in the past twelve months and the share of respondents that thought that prices had fallen or stayed the same.<sup>12</sup> Based on the developments in the balance statistics, which is a qualitative indicator of inflation perception, conclusions may be drawn on changes in the direction of perceived inflation (i.e. whether a smaller or a larger share of consumers believe that prices have risen in the last twelve months), but not about the level of perceived inflation, so that the values obtained cannot be directly compared with the officially measured inflation rate.

The relatively coordinated movements in actual and perceived inflation were interrupted at the time of conversion. Figure 2 shows that the directions of perceived and official inflation in the euro area countries were aligned before conversion, with both indicators mostly falling from 1997 to 1999 and rising afterwards. However, the two series started to move in divergent directions in early 2002; the indicator of perceived inflation in the euro area recorded a sharp increase that continued throughout the year and peaked in January 2003. After that, perceived inflation decreased through to the end of 2004. At the same time, official inflation went down from 2.6% in January 2002 to 2.1% in January 2003. Overall, the annual

Figure 2 HICP inflation and inflation perceptions in the euro area

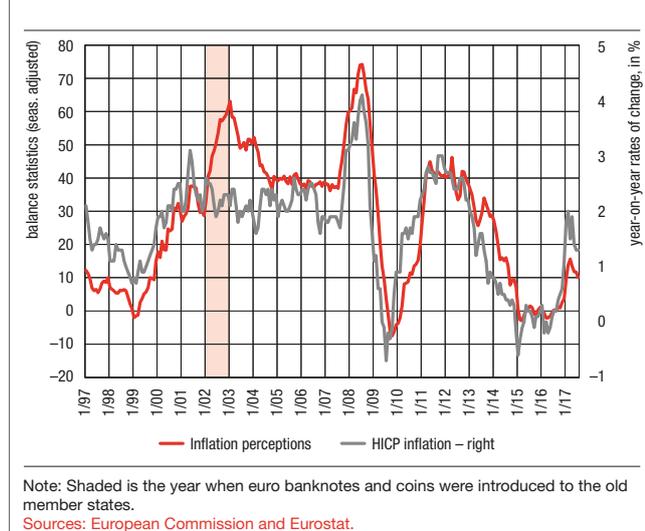


Table 2 HICP inflation and inflation perceptions

	HICP inflation				Inflation perceptions			
	Average year-on-year rate of change				Balance statistics, seas. adjusted			
	2001	2002	2003	2004	2001	2002	2003	2004
Belgium	2.4	1.5	1.5	1.9	39	41	46	49
Germany	1.9	1.4	1.0	1.8	39	68	46	30
Greece	3.6	3.9	3.4	3.0	26	37	67	67
Spain	2.8	3.6	3.1	3.1	30	46	58	55
France	1.8	1.9	2.2	2.3	21	43	45	47
Ireland	4.0	4.7	4.0	2.3	46	54	59	48
Italy	2.3	2.6	2.8	2.3	29	41	65	50
Luxembourg	2.4	2.1	2.5	3.2	-	35	39	39
Netherlands	5.1	3.9	2.2	1.4	59	89	87	55
Austria	2.3	1.7	1.3	2.0	14	32	37	39
Portugal	4.4	3.7	3.2	2.5	44	50	57	52
Finland	2.7	2.0	1.3	0.1	-13	0	-7	-8
<b>Euro area</b>	<b>2.3</b>	<b>2.2</b>	<b>2.1</b>	<b>2.1</b>	<b>32</b>	<b>51</b>	<b>53</b>	<b>44</b>
Denmark	2.3	2.4	2.0	0.9	-13	-15	-22	-29
Sweden	2.7	1.9	2.3	1.0	-21	-15	-20	-20
United Kingdom	1.2	1.3	1.4	1.3	-4	-9	-2	2

Sources: European Commission and Eurostat.

HICP inflation rate in the euro area moved within a narrow range around the average of 2.2% from 2002 to 2004.

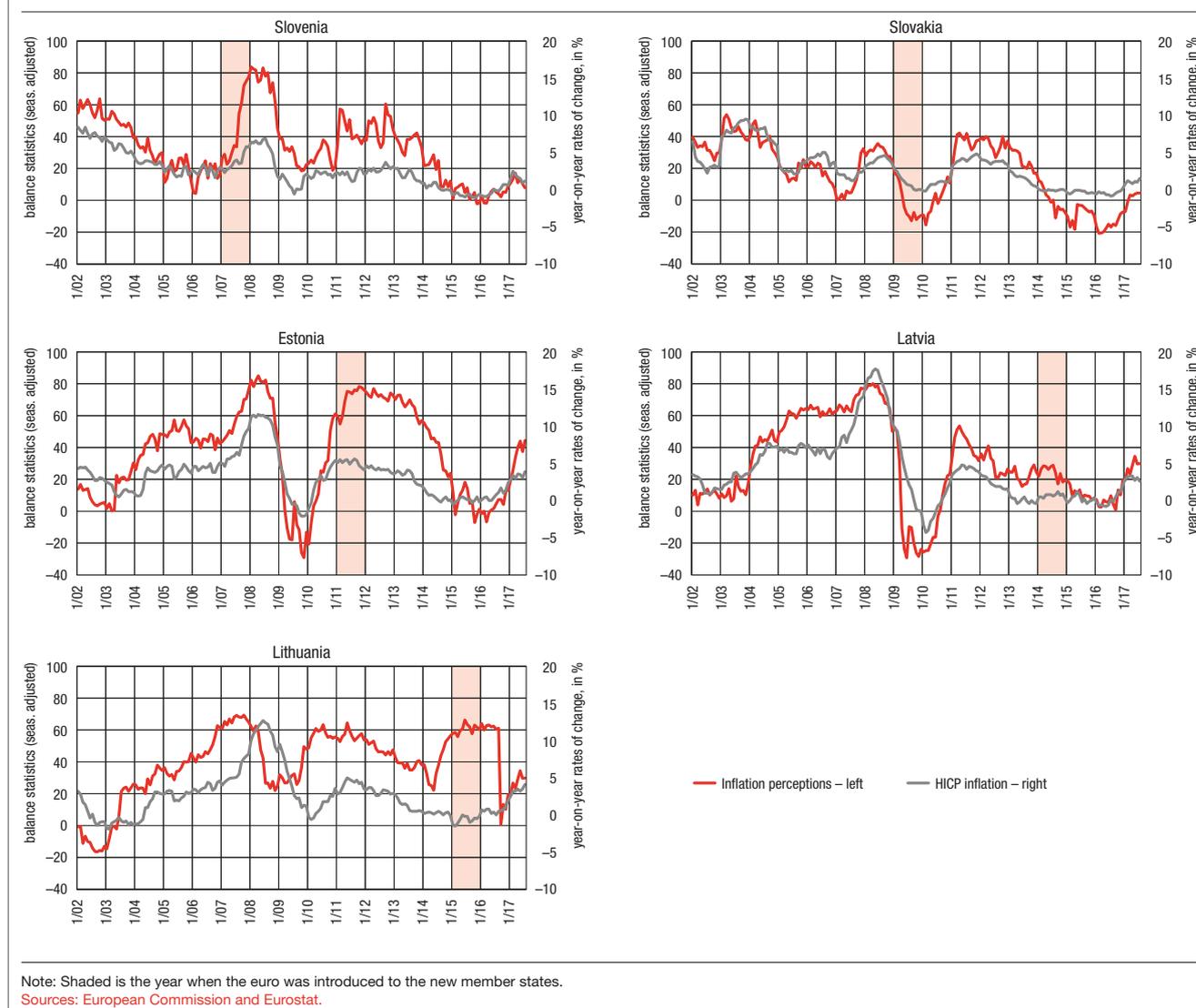
Perceived inflation rose after the changeover in January 2002 in all euro area countries (Table 2), but not in EU countries that did not adopt the euro (United Kingdom, Denmark, Sweden). In mid-2002, inflation growth perceived by consumers was particularly pronounced in Germany, where the share of consumers who felt that prices had increased was around 76 percent higher than the share of those who felt that prices had stayed the same or decreased (in late 2001, this share was higher by around 38 percentage points). In 2003, perceived inflation dropped substantially in Germany and the Netherlands. Nevertheless, in most countries inflation perceived by consumers was still higher in 2004 than in the pre-conversion period.

Against the backdrop of relatively stable inflation, perceived inflation in the new euro area member states grew sharply after the conversion only in Estonia, while Lithuania recorded a substantial increase in perceived inflation a year before the conversion (Figure 3). Trends in perceived and official inflation in Slovenia were aligned in the pre-conversion period. Inflation perceptions grew mildly after the euro was introduced in Slovenia at the beginning of 2007. Both perceived and official inflation started to grow sharply in mid-2007, but the increase in

11 The following responses are offered: consumer prices have (1) risen a lot; (2) risen moderately; (3) risen slightly; (4) stayed about the same; (5) fallen; (6) don't know.

12 If the share of consumers who chose one of the six offered responses on price movements over the last year is denoted with  $U_i$  (where  $i = 1, 2, 3, 4, 5$  and  $6$ ), the balance statistics ( $B$ ) is calculated by weighing individual shares as follows:  $B = (U_1 + 0.5U_2) - (0.5U_4 + U_5)$ . The shares of respondents who chose a slight price increase and who don't know are not taken into consideration in the calculation of the balance of responses. The balance statistics can range from  $-100$  to  $100$ . The value of  $100$  would indicate that all respondents believe that consumer prices have risen a lot over the last twelve months. On the other hand, the balance statistics would be  $-100$  if all respondents choose the answer that consumer prices have fallen in the last twelve months.

Figure 3 HICP inflation and inflation perceptions in the new euro area member states



consumer prices was largely due to higher prices of crude oil and other raw materials in the global market and larger domestic demand. Jemec (2010) points out that developments in perceived inflation were affected favourably by the fact that, before the adoption of the euro, consumers in Slovenia were well informed about the new currency and experiences of the old member states with euro adoption, and mentions the well-organised campaign during which consumers were warned about excessive price increases of individual products. On the other hand, perceived inflation grew strongly in Estonia after January 2011, despite the information campaign and other measures taken to prevent the conversion-related increase in prices.

### 3.2 Determinants of inflation perceptions

In the literature dealing with the determinants of perceived inflation, the following are listed among the most important

factors that might influence increases in perceived inflation following the conversion of the domestic currency to the euro: changes in the prices of frequently bought products, asymmetric influence of price increases or decreases, reduced transparency of prices, expectations regarding price movements after the conversion, the quantity of news about inflation in the media and a comparison of current prices with outdated prices in the national currency.

Brachinger (2006) states that consumers perceive changes in prices during daily shopping and outlines a hypothesis<sup>13</sup> that changes in prices of goods frequently purchased by consumers have a stronger influence on their inflation perceptions than changes in the prices of rarely purchased goods. It follows that perceived inflation may rise in periods when prices of goods frequently bought by consumers grow faster than the prices of goods bought less frequently. A descriptive analysis made by Fluch and Stix (2005) showed that, for example, in Austria, the growth in prices of goods frequently purchased

<sup>13</sup> Both Brachinger's hypotheses are underpinned by the so-called Prospect Theory developed by Kahneman and Tversky.

by consumers was above average in the period after January 2002,<sup>14</sup> so that consumers probably felt that price growth was sharper than it actually was (statistically measured).

Furthermore, Brachinger (2006) claims that consumer perceptions about inflation are more influenced by price increases than price reductions, i.e. price growth and fall have an asymmetrical effect on consumers' perceptions about inflation. In particular, as consumers have a loss aversion they perceive losses (price increases) more strongly than gains (price reductions). While the official price index assesses price increases and price cuts symmetrically, it is possible that consumers perceive price increases more powerfully than equal price reductions. Therefore, at any given inflation rate, inflation perceptions may be affected by dispersion of price changes on a disaggregated level. For example, it may happen that an increase is recorded in both the share of goods whose prices grew sharply and the share of goods whose prices decreased sharply, and that in the calculation of the official aggregate consumer price index these changes are offset against each other. On the other hand, if consumers react more sensitively to price increases than to price reductions, indicators of perceived inflation may increase at any given rate of inflation. Findings of the research by Del Giovane and Sabbatini (2006) confirm that the euro changeover in Italy was accompanied by a very substantial change in relative prices, which is not evident from movements in the aggregate price index. In particular, disaggregated data show that Italy recorded very sharp increases and reductions in prices of particular products (some of which have a very minor share in the price index basket) in 2002 and 2003, which could explain the rise in perceived inflation in the context of asymmetrically formed perceptions.

Dziuda and Mastrobuoni (2009) point out that inflation growth perceived by euro area consumers after the euro changeover was strongly affected by lower price transparency, which implies that consumers use prices in old national currencies as reference prices for comparison and experience problems with remembering prices, a more difficult comparison of prices among shops, and accurate recalculation of new prices into the old currency. Competition among retailers decreases in such conditions as differences in the price level are not always easily discernible, which may encourage retailers to increase prices. As the costs borne by consumers due to incorrect price recalculations are small for low-priced products, it is assumed that the incentive to raise prices is inversely proportional to the price level. Therefore, the model the authors developed shows that after the euro changeover a higher price growth was experienced by relatively cheaper goods, which have a stronger effect on inflation perceptions.

Research in the area of psychology indicate the importance

of expectations for the formation of inflation perceptions. The factor of expectations becomes more important if one bears in mind that survey results showed that a large share of euro area residents expected a significant price increase during the euro changeover. The survey taken by the European Commission in November 2001 shows that 70% of respondents expressed concerns about possible cheating on prices.<sup>15</sup> Traut-Mattausch et al. (2004) believe that initial prior expectations that the changeover would be accompanied by price increases created biased perceptions on the part of consumers about the actual inflation after the euro changeover. In particular, consumers less strictly check or correct data, even those that are incorrect, that confirm their expectations<sup>16</sup> compared with data that disconfirm those expectations (the so-called selective-outcome correction). Therefore, if consumers expect the changeover to be accompanied by price increases, it is more likely that, when the time of euro introduction comes, they have an impression that prices increased, even if no such increase actually took place. These claims were confirmed by the results of an experiment made on three groups of respondents in Germany. Participants received two menus, one with German mark prices and one with euro prices. They were asked to estimate the average change in prices.<sup>17</sup> A positive impact of expectations on inflation perceptions was confirmed by Stix (2006), who used data from a survey conducted in Austria.

The media affect public opinion because people mostly turn to information sources that do not require significant effort. Also, the media try to interpret economic phenomena they describe and thereby perform a part of information processing. Lamla and Lein (2015) studied the relationship between media reports and inflation perceptions in Germany<sup>18</sup> and established that the quantity of news on inflation growth had a statistically significant impact on inflation perceptions and contributed to their sharp rise in the aftermath of the euro changeover. A similar conclusion about a positive relationship between the quantity of news about inflation and the level of inflation perceptions (but based on a descriptive analysis) in Italy was reached by Del Giovane and Sabbatini (2006), who had at their disposal only the data on the quantity of news on inflation, without differentiating whether it was about inflation acceleration or deceleration.

As a possible reason for an overestimated perception of inflation after the introduction of the euro, Stix (2006) and ECB (2007) mention the fact that consumers use outdated prices in the national currency (which remained frozen) as reference for comparison with prices after the changeover, while current prices normally rise in line with usual inflation developments. In addition, the recalculation to the old national currency may influence the level of perceived inflation depending on whether

14 In the period from 2001 to 2004, the average annual inflation for the basket of goods bought on a daily or weekly basis stood at 3.3% and 2.5%, respectively, while the official inflation rate stood at 1.8%.

15 Flash Eurobarometer November 2001, question 8.b.

16 It was shown that when consumers convert reference prices in the old currency to euro, they detect and correct mistakes in converted prices if calculations are not in line with their expectations, and fail to do so if the incorrect outcomes are in line with their expectations.

17 The first group of respondents received a menu in which euro prices of several dishes were reduced, whereas prices of other dishes were raised, but the overall average price level in that restaurant remained the same. The other group had a menu in euro with 15% lower prices compared with German mark prices, while the third group received a menu with prices 15% higher in euro than in German marks. It turned out that respondents believed that prices had increased even when they actually remained stable. Furthermore, if the prices in euro were lower, they were perceived as having remained stable, while respondents who received a menu in which the prices had in fact been raised, overestimated the magnitude of the price increase.

18 It is indicative of the attitude towards the euro that German media used the term "Teuro" instead of the euro, combining the noun "euro" and the German adjective "teuer" (meaning expensive), which was widely used and chosen the word of the year 2002.

one uses the accurate conversion rate or an approximate rate that enables easier recalculation. For example, the application of an approximate conversion rate<sup>19</sup> in recalculating prices raised the price level by 1.7% in Austria. Furthermore, results of the survey by Cestari et al. (2007) showed that only a minor

share of consumers remembered exact prices prior to the euro introduction (in the case of cinema tickets, in Italy), and that the average level of prices recalled by consumers was lower than the actual prices before euro introduction.

## 4 Assessment of the effects of the adoption of the euro on consumer price inflation and inflation perceptions in Croatia

In line with the experiences of other EU member states that have converted their national currencies to the euro, the effect of the conversion of the kuna to the euro on the increase in the overall consumer price inflation in Croatia is expected to be mild. It is estimated that the effect of conversion in Croatia may come up to around 0.20 percentage points (increase in the consumer price index), and around 0.37 percentage points (increase in the harmonised index of consumer prices), in the period of a half a year prior and after the conversion. The estimate used the average of estimated effects of conversion on the growth of prices of individual components of the harmonised index of consumer prices in the old euro area member states<sup>20</sup> and the weights these components have in the index of

consumer prices in Croatia in 2017 (Table 3). Conversion may have a more pronounced effect on overall inflation measured by the HICP, primarily due to the greater share of accommodation services in that index. It is estimated that the largest contribution to the overall conversion-induced increase in prices could come from accommodation and catering services (as regards HICP) and recreational and cultural services, and catering services (as regards CPI).

In addition, the introduction of the euro may have a slightly more pronounced effect on citizens with higher incomes, given that the share of goods and services whose prices may significantly increase (for instance catering services, recreational and cultural services) accounts for a relatively greater portion of

**Table 3 Estimated effect of the conversion of the kuna to the euro on inflation in Croatia**  
in % or percentage points (p.p.)

	COICOP	Change in prices due to conversion, in %	Share in HICP in 2017, in %	Share in CPI in 2017, in %	Contribution to HICP, p.p.	Contribution to CPI, p.p.
09.5	Newspapers, books and stationery	2.066	2.26	1.38	0.05	0.03
12.6	Financial services n.e.c.	1.974	0.56	0.45	0.01	0.01
11.2	Accommodation services	1.752	7.26	0.39	0.13	0.01
03.2	Footwear	1.621	1.56	2.07	0.03	0.03
09.4	Recreational and cultural services	1.520	1.92	2.42	0.03	0.04
09.6	Package holidays	1.453	1.47	0.50	0.02	0.01
11.1	Catering services	1.217	5.46	3.51	0.07	0.04
09.3	Other recreational items and equipment, gardens and pets	1.177	1.40	1.13	0.02	0.01
07.1	Purchase of vehicles	1.010	1.67	1.84	0.02	0.02
12.7	Other services n.e.c.	1.003	0.37	0.55	0.00	0.01
02.1	Alcoholic beverages	0.912	3.31	1.20	0.03	0.01
	<b>Total</b>		27.2	15.4	0.39	0.21
	<b>Total (adjusted)*</b>				<b>0.37</b>	<b>0.20</b>

\* Downward adjustment, taking into account the estimated effect of the conversion on the decline in certain prices in the old member states.

Sources: Hübner and Koske (2008), CBS and CNB calculations.

19 The accurate conversion rate was EUR 1 = ATS 13.1603, and the simplified rate was EUR 1 = ATS 14.

20 The components whose prices grew significantly at the time of conversion of national currencies have been adopted from Hübner and Koske (2008). In case of Croatia, they have been adjusted not to encompass administrative prices whenever possible (the component 12.4 Social protection has been left out). In their empirical analysis, Hübner and Koske (2008) used disaggregated harmonised indices of consumer prices in the old member states and took into account only those subcategories whose prices are regulated by the market. They identified the sectors with substantial price increases by estimating the following system of equations for all old member states:  $\pi_{ijt} = \alpha_{ij}\pi_{ijt-1} + \beta_{ij}\pi_{NEURijt} + \gamma_{ij}GAP_{it} + \delta_{ij}D_{ijt} + \epsilon_{ijt}$  where  $\pi_{ijt}$  is the change in the price index in country  $i$  and sector  $j$  between July year  $t-1$  and July year  $t$ ,  $\pi_{NEURijt}$  is the average of the respective price index in sector  $j$  in the United Kingdom, Sweden and Denmark,  $GAP$  is the average output gap of year  $t-1$  and  $t$ ,  $D$  is a dummy variable equal to 1 for the period July 2001 to July 2002 and equal to 0 in other months. To obtain an estimate of the average changeover effect, the coefficients on the changeover dummy are restricted to be equal across countries (so that  $\delta_{ij} = \delta_j$  for all  $i$ ).

**Table 4** Estimated effect of the conversion of the kuna to the euro on developments in the prices from the consumer basket of individual consumer groups in Croatia percentage points

	Contribution to growth in prices
Average household	0.19
Household whose head is:	
Manual worker	0.18
Non-manual worker	0.25
Self-employed	0.21
Unemployed	0.16
Retired	0.16
Inactive (other)	0.17

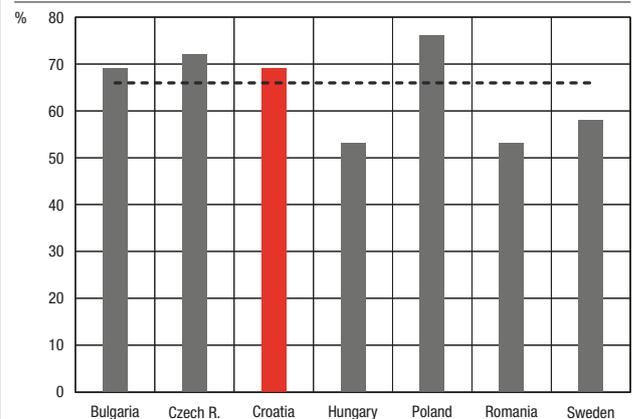
Note: A calculation based on the data from the Household Budget Survey in 2014.  
Sources: Hűfner and Koske (2008), CBS and CNB calculations.

their consumer basket. On the other hand, conversion to the euro should to a lesser extent contribute to the increase in the price of the basket of goods and services purchased by citizens with lower income, for instance pensioners and unemployed persons (Table 4).

Results of the survey published by the European Commission<sup>21</sup> show that citizens in Croatia, as in other EU member states that committed to introduce the common currency, very much fear that the introduction of the euro may lead to price increases and abuses in price setting (Figures 4 and 5). Some measures that proved to be efficient in the countries that have already adopted the euro are planned to be taken in order to limit the effect of the conversion on price increases.<sup>22</sup> One of the effective ways to prevent price increases due to currency conversion was the obligation of dual price display in the old and new currency for some time before and after the euro changeover, which reduced the efforts of individuals related to price recalculation and facilitated the detection of unfounded price increases. Furthermore, it is useful to make detailed instructions for the rounding of prices to be followed by corporations. A good measure is also an agreement between the Government and the private sector on fair price setting. In some countries, the chamber of commerce led a media campaign and assigned an official logo to retailers that adhered to fair price setting. Efficient were information campaigns that closely examined the prices listed by individual retailers and informed the public about unfair price recalculations. It has been established that, in efforts to avoid the negative publicity that may be generated by unjustified price increases, some corporations, particularly the large ones, leave their prices unchanged or even reduce them.

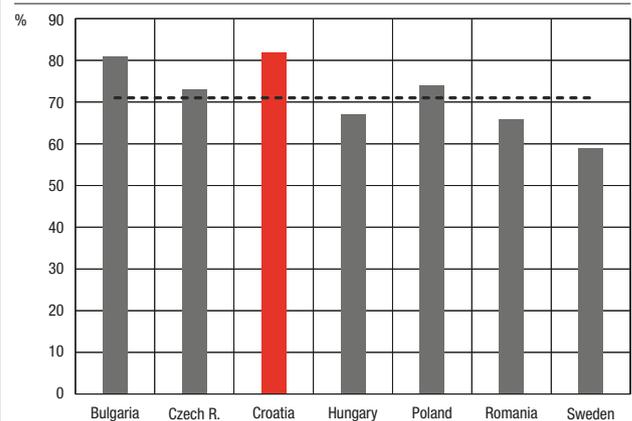
Eife and Coombs (2007) highlight the role of appropriate information campaigns, i.e. good communication with the public to avoid as much as possible people's misperceptions about price developments during the changeover to the euro. In their opinion it crucial to assign one institution with enough integrity and credibility to have a leading role in providing the public with timely information on price developments. In addition, the institution should monitor the conversion of prices to

**Figure 4** Share of respondents who believe that euro adoption in their country would lead to price increases



Note: The dotted line denotes the average.  
Source: European Commission, Flash Eurobarometer 453, May 2017.

**Figure 5** Share of respondents who fear possible abuses in price setting during the conversion



Note: The dotted line denotes the average.  
Source: European Commission, Flash Eurobarometer 453, May 2017.

the new currency and contact the firms that are suspected of unjustified price increases, so as to verify these increases.

The survey conducted by Lolić et al. (2017) showed that the quantity of news on developments in prices of individual products and overall inflation published by the media in Croatia contributes to bringing inflation perceptions closer to the officially recorded inflation rate. The exception was the period after Croatia's accession to the EU in July 2013, when officially recorded inflation decreased, and early 2014, when it entered the negative territory, while inflation perceptions remained at high levels, which was associated with media reports on a possible significant effect of EU accession on domestic price increases. For this reason, the authors stress the importance of a proper strategy for communicating with the public during the euro changeover process to avoid such situations in the future.

<sup>21</sup> Flash Eurobarometer 453, May 2017.

<sup>22</sup> Details regarding the measures for the protection of citizens from an unjustified rise in prices in Croatia will be subsequently provided in the National Euro Changeover Plan.

## 5 Conclusion

Numerous research results show that the effect of the conversion of national currencies to the euro on the growth of consumer prices in euro area countries was generally mild and one-off. According to Eurostat's estimates, the effect of the conversion of national currencies to the euro in January 2002 on the overall HICP for the euro area as a whole totalled between 0.1 and 0.3 percentage points. Further, the upper bound of the conversion effect on the overall HICP in the new member states also remained under 0.3 percentage points, according to Eurostat's estimates. Price increases during conversion are most often triggered by the spillover of conversion costs onto consumers, frequent rounding up of prices to a new attractive level and the belief of corporations that consumers ignore small changes in prices while getting used to the new currency, which requires additional efforts in terms of price recalculation, recalling old prices, etc, and seek to use this situation to raise their profit margins. On the other hand, there are factors that may push prices down, stemming from greater competition within the euro area and enhanced transparency of prices, as well as the reduction of transaction costs and exchange rate risk.

A more pronounced increase in prices due to conversion was registered for a small number of products, mostly in the services sector, such as services in restaurants and cafés, accommodation services, hairdressing services, various repairs, dry-cleaning services, recreational and sporting services, etc. As their share in the basket for the calculation of the consumer price index is relatively small, the effect of the said price increases on the overall index was mild.

Although the analyses showed that the euro changeover in January 2002 had a very mild effect on price growth, perceived inflation grew sharply in the old member states after the conversion, i.e. there was an upsurge in the share of consumers who felt that prices had grown significantly over the last year. The increase in the gap between perceived and actual inflation after the conversion may spur negative attitudes towards the euro. In addition, it is considered that, if consumers overestimate current inflation, they may simultaneously underestimate

changes in real wages and their purchasing power, which may lead their deciding to reduce spending. Experiences of the countries that have introduced the euro thus far mostly indicate that consumers considered this increase to be one-off, given that it was not accompanied with an increase in inflationary expectations, which means that price stability was not threatened. The increase in perceived inflation was less pronounced during the conversion in the new member states, which is in part attributed to credible information campaigns and other measures to inform and protect consumers and encourage corporations to fair price setting.

In accordance with these experiences, the effect of the conversion of the kuna to the euro on the increase in the overall level of consumer prices in Croatia is expected to be mild. It is estimated that the effect of conversion in Croatia may come up to around 0.20 percentage points (increase in the consumer price index), and around 0.37 percentage points (increase in the harmonised index of consumer prices), in the period of a half a year prior to and after the conversion. It is estimated that the largest contribution to the overall price increase attributable to conversion may come from catering services, accommodation services and recreational and cultural services. In addition, the introduction of the euro may have a slightly more pronounced effect on citizens with higher incomes, given that the share of goods and services the prices of which increase slightly more accounts for a relatively greater portion of their consumer basket. As regards price movements in the longer run, it should be noted that the relatively high level of prices (compared with other countries with similar income levels) and low inflation in Croatia suggest that the process of price convergence should not have significant effects on price increases in the future.

To limit the possible short-term effect of conversion on the increase in prices and perceived inflation, measures will be introduced in Croatia that proved to be effective in the countries that have already adopted the euro (obligation of dual price display in shops, measures promoting fair price setting by corporations, information campaigns, and so on).

## Annex 1 Groups of products the prices of which grew significantly due to the conversion

Country	Product group
Euro area	Cleaning, repair and hire of clothing Repair of audio-visual, photographic and information processing equipment Restaurants, cafés and the like Hairdressing salons and personal grooming establishments
Belgium	Restaurants, cafés and the like
Finland	Fruit Refuse collection Services for the maintenance and repair of the dwelling Recreational and sporting services Restaurants, cafés and the like
France	Cleaning, repair and hire of clothing Repair of audio-visual, photographic and information processing equipment Newspapers and periodicals Restaurants, cafés and the like Hairdressing salons and personal grooming establishments
Germany	Cleaning, repair and hire of clothing Repair of audio-visual, photographic and information processing equipment Restaurants, cafés and the like Hairdressing salons and personal grooming establishments
Ireland	Recreational and sporting services
Italy	Passenger transport by road
Netherlands	Financial services n.e.c.
Spain	Motor cycles, bicycles and animal drawn vehicles Other services in respect of personal transport equipment Gardens, plants and flowers Hairdressing salons and personal grooming establishments
Slovenia	Restaurants, cafés and the like Footwear including repair Repair of household appliances Transport services Recreational and sporting services
Slovakia	Food and non-alcoholic beverages Transport services Domestic services and household services Medical products Restaurants, cafés and the like Services for the maintenance and repair of the dwelling
Estonia	Cleaning, repair and hire of clothing Recreational and sporting services Catering services Hairdressing salons and personal grooming establishments Services for the maintenance and repair of the dwelling
Latvia	Repair of household appliances Dental services Restaurants, cafés and the like Hairdressing salons and personal grooming establishments
Lithuania	Canteens Actual rentals for housing Hairdressing salons and personal grooming establishments Services for the maintenance and repair of the dwelling

Notes: For the old member states only those products that recorded a significant increase in prices during the introduction of the euro are mentioned, according to each of the applied statistical methods of estimation. A more detailed table which includes the products whose price increase proved to be significant at least under one method, see Sturm (2009), p. 23.

Sources: Sturm et al. (2009), p. 18 for the old member states; Eurostat for the new member states.

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