
Implications of the conversion of prices into euro for inflation

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1. THE CONVERSION OF PRICES INTO EURO: POSSIBLE EFFECTS ON THE RATE OF INFLATION

As is well known, 1 January 1999 marked the start of Stage Three of Economic and Monetary Union and the euro became the common currency of a group of eleven European countries, now twelve, of which Spain is one. However, money in circulation has continued to consist of the notes and coins of the pre-existing national currencies. Therefore, although the euro is now, and has been for almost three years, the common currency of the euro area, and the single monetary policy, implemented by the Eurosystem, determines the common monetary conditions for the area as a whole, most consumer prices continue to be denominated in the various national currencies, even though the practice of dual labelling has spread very rapidly.

The introduction of euro banknotes and coins on 1 January 2002 constitutes the culmination of the process of monetary union that commenced with the signing of the Maastricht Treaty in 1992. Following two months of co-existence with the national currencies, the euro will be the only legal-tender currency in circulation, although it will still be possible to exchange peseta banknotes and coins until 30 June and, thereafter, at the Banco de España. The shared use of the same currency in different countries of the Union will bring the euro close to the people and enable them to identify more strongly with this common project. From this viewpoint, the introduction of the euro is another necessary step to harness the benefits of Monetary Union and in particular to obtain a greater degree of transparency and integration between the markets of the economies of the area. The greater competition between the firms that operate in these markets and the lower transaction and information costs facing them will help to reduce price pressures and to entrench a lower level of inflation.

Obviously the introduction of the euro requires the immediate conversion of prices that have until now been denominated in pesetas (and other national currencies) into prices denominated in euro. The conversion operation is a simple algebraic transformation which, if done using a sufficient number of decimal places and

(1) This article is a summary of the forthcoming Working Paper "Implications of the introduction of the euro for inflation".

a strict rounding rule, cannot have significant effects on the general price level and even less on the dynamics of inflation. This is the aim of the law on the implementation of the euro (Law 46/1998) which provides that when prices in pesetas are converted into euro by applying the irrevocable conversion rate (ESP 166.386/euro), they shall be rounded up or down to the nearest cent, so that for each price in pesetas there is only one legally equivalent price in euro. Furthermore, Law 91/2001 provides that the conversion into euro of unit rates, prices or duties to be applied to a particular base (which are normally small amounts as, for example, in the case of telephone and electricity rates) must be up or down to the nearest sixth decimal place.

Even if the rules for conversion and rounding are properly applied, the price revisions that arise continuously during the normal course of economic activity may be affected by the extraordinary nature of the conversion process. It is therefore necessary to analyse the factors that may potentially affect price revisions at the time of conversion, and to evaluate their possible impact on the general price level and on the short-term behaviour of inflation.

First to be mentioned, among these factors, are the costs for firms involved in making the necessary adjustment to the new currency, in areas as diverse as accounting, the conversion of labelling, the adaptation of machinery (vending machines, ATMs, cash registers, etc.), and even personnel training, which they may pass through to their final selling prices. Second, it is a well known fact that firms do not update the prices of their products continuously, but rather every so often, or when market circumstances are favourable. This is because there are certain costs involved in changing prices, known as "menu costs", which range from changing labels (as in the case of a restaurant menu, which is the origin of the name of this theory) to the cost of obtaining the necessary information to set the correct price. It is possible that, since these menu costs will be unavoidably incurred when prices are converted into euro, firms will tend to concentrate at the time of conversion a number of price changes which, had this process not taken place, would have been made sooner or later. Third and last, it should be taken into account that many firms attempt to ensure that the prices they set have features that make them attractive to consumers.

It should be noted that, were they to arise, the possible impact these factors might have on the rate of inflation would be temporary, since they would only affect prices for a short period of time. Moreover, there is no reason why the hypothetical pass-through of the costs of adapt-

ing to the euro to prices, or the conversion to euro itself, or the adjustment to attractive prices must necessarily take place on 1 January 2002. In fact, this date hardly seems the most propitious, since greater vigilance can be expected at that time due to the changeover. Firms have already been adjusting to the euro for some time, so that the pass-through of the costs they may have incurred is probably taking place already, and the available estimates indicate that this effect will in any case be moderate. Furthermore, dual labelling limits the scope for revising prices at the time of conversion.

In principle, the process of converting prices to euro, whether merely by rounding to the nearest euro cent, or with the ultimate aim of setting attractive prices, is in itself, a neutral process as far as the rate of inflation is concerned. This article will demonstrate this fact, by describing various simulations that have been carried out using two different sets of prices, in which it is seen that, provided adjustments are symmetric, the effect on the price level (approximated by the CPI) is close to zero. Only if all suppliers of consumer products should decide to adjust their prices upwards (which is rather unlikely) would significant – albeit moderate – effects on inflation be observed. General asymmetric upward adjustment of prices is severely limited by competitive market forces, and this constraint is all the more powerful when the economy is slowing and the trend of inflation is downwards.

Before considering the simulations, the next section discusses the reasons for the extensive use of so-called "attractive" prices in the economy. Section 3 then analyses the results of such simulations, under alternative scenarios for the adjustment of prices in pesetas to prices in euro, using two price samples. The conclusions are presented in Section 4.

2. ATTRACTIVE PRICES

International evidence shows that across economies the final digits of transaction prices tend to be concentrated among three figures: 0, 5 and 9. This is not by accident, but rather a result of firm's price setting strategies, which consider those figures that, in one way or another, may appeal to consumers. Among what we call attractive prices, three groups can be distinguished on the basis of their different characteristics: round prices, fractional prices and psychological prices.

Round prices owe their name to the fact that their final digit or digits are zero, as in the case of 90, 120 or 1300. This type of price is attrac-

tive because, from a psychological point of view, figures ending in round numbers are easier for consumers to process and can be better stored and compared with the prices of other products. Moreover, these prices involve more convenient transactions when cash is used, since they require the exchange of fewer banknotes and/or coins. This type of price is usually seen in those above a certain level, such as hairdressing services, cinema tickets, electrical appliances, etc.

Convenience in transactions, defined in terms of the number of coins involved, is a basic aspect of choosing a price. The prices that are attractive from this viewpoint (i.e. that involve payment with few coins and/or notes, and with one or no coins of change) will depend on the structure of denominations of notes and coins. In the case of the peseta, the structure of denominations facilitates transactions carried out with prices ending in 0 and 5 pesetas, which include not only round prices, but also what are known as fractional prices. The existence of 25- and 50-peseta coins means that fractional prices are characterised by ending in 25, 50 and 75, which are very common prices in bars, tobacconists and newsagents, i.e. among low-priced and frequently consumed products. With the replacement of peseta coins by euro coins this set of fractional prices is no longer valid, since there is no 25-cent coin, but rather a 20-cent one, so that these prices will end in 20, 40, 50, 60 and 80 euro.

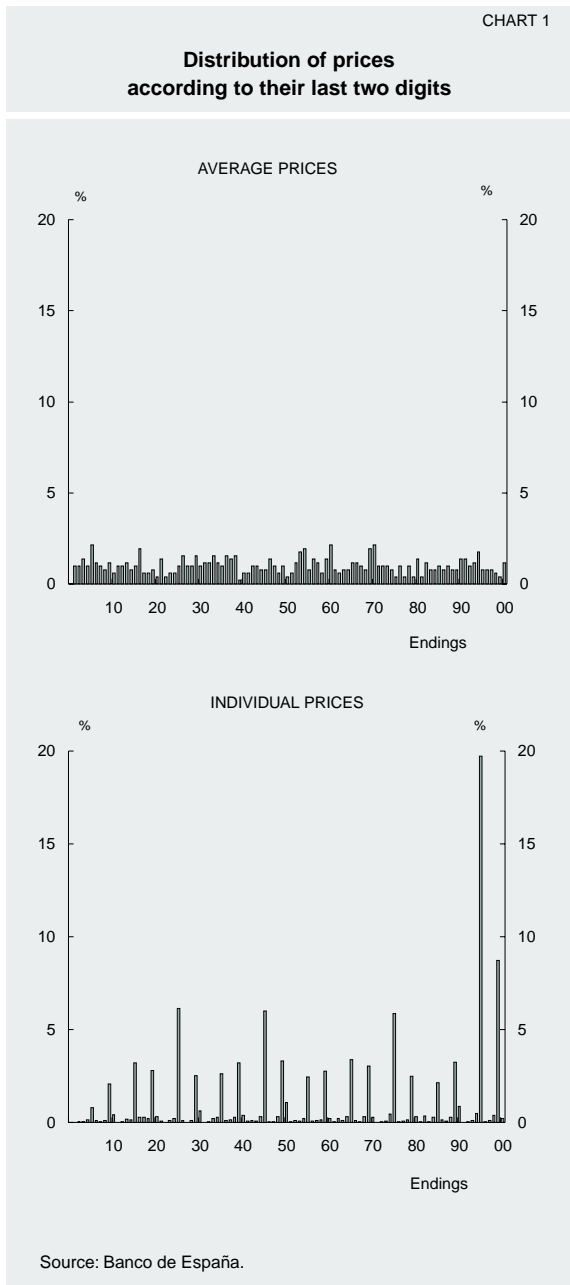
The third category of attractive prices, psychological ones, includes prices that are normally close to a round price, a small sum having been subtracted therefrom, e.g. 199 as opposed to 200, or 1,995 as opposed to 2,000. The reason for setting prices of this kind is that they give the sensation of being lower than they really are. Since storing information entails costs for consumers, they tend to store it in summary form, starting with the important digits, which are the first ones and taking no notice of the later ones. Thus, when comparing a price of 199 with another of 200, consumers perceive a much larger difference than actually exists; in the first case, the most important figure is 1, while in the second it is 2. It is possible that they may even take the comparison no further, directly selecting the first product. The discount made in relation to the associated round price usually corresponds to the value of a single coin, so as not to make the transaction excessively inconvenient. Thus, this discount is usually 1 or 5 pesetas, so that these prices tend to end in 9, 99 or 95. Examples of this kind of price are 99, 999 or 4,995, and they are usually found in food products, clothes and even small electrical appliances.

Attractive prices are seen regularly across time and space, in different countries and different periods. Accordingly, we can expect to see a significant presence of attractive prices in the new prices in euro. However, the mere conversion of prices in pesetas by applying the irrevocable exchange rate (ESP 166.386/euro) will not generally give rise to attractive prices. For example, the equivalent price in euro of the psychological price ESP 4,995 is EUR 30.02, which does not come in any of the three categories of attractive prices described above. The search for an attractive price may lead to further adjustments. In the above example, the firm may set a price of EUR 29.95, equivalent to ESP 4,983. The size and direction of these further adjustments will be important in determining the final impact on inflation.

3. ESTIMATING THE EFFECT OF PRICE CONVERSION

Quantification, by means of simulations, of the potential effect of the conversion of prices in pesetas into prices in euro (including in the event that attractive prices are set) on the rate of inflation is subject to a large degree of uncertainty, since it will depend on the hypotheses established for essential aspects (such as the definition of attractive prices in euro) for which no concrete information is available. At the same time, the reliability of the results obtained will also depend on the representativeness of the price sample used. In the simulations presented in this article two datasets have been used, whose characteristics will be described below, and four scenarios have been defined, characterised by different hypotheses regarding the type of prices in euro which firms wish to adjust to. In each case, in order to bound the range of possible effects on the rate of change of prices, the possibility has been envisaged that adjustments will be made symmetrically or systematically upwards. The scenarios considered are:

- *Scenario I.* Rounding to euro cents: prices in pesetas are converted to euro by applying the irrevocable conversion rate and then adjusting to the nearest euro cent, upwards or downwards, in one case, and only upwards in the other.
- *Scenario II.* Rounding to tenths of a euro: in this case the adjustment is to the nearest tenth of a euro. Decimals have not been used in consumer prices in the Spanish economy for decades, with the exception of certain products such as petrol, telephone services and electricity. This fact may mean that firms tend to adjust their prices to tenths of a euro, thus avoiding the second decimal place.



- **Scenario III.** Conversion to attractive prices in euro. The starting hypothesis is that if a price in pesetas is attractive, the price eventually set in euro will also be attractive. To simplify, it is only required that the resulting price be attractive, not that it be the same type as the one in pesetas. Thus a fractional price in pesetas may become a round, fractional or psychological price in euro, depending on which is closest. Attractive prices have been defined as those ending in 0, 5 or 9, those ending in 0 being round prices, those ending in 5 being fractional prices and those ending in 9 being psychological ones. Although attractive prices could be defined more strictly, the definition used here is the most convenient, given the uncertainty over which prices will eventually be considered attractive in euro.

The results of the simulations corresponding to the above scenarios shall be all the more instructive the wider and more representative the set of prices used. Ideally a representative sample of the set of prices that make up the Consumer Price Index and its five main components (unprocessed food, processed food, non-energy industrial goods, energy and services) would be used. However, the two sets of prices that we have used in this exercise have certain shortcomings that will have to be taken into account when assessing the results. The first set of prices consists of 4,586 prices of different products sold by a representative hypermarket, and was obtained from its website. The second set of prices consists of the average prices compiled monthly by the Ministry of Economy for 515 products.

As mentioned above, both samples suffer from certain problems: in the case of the individual hypermarket prices, products with low prices are over-represented, while energy products and services are completely absent. The representativeness of the other three categories of consumer prices varies, being especially high in the case of processed food. It should be pointed out that a relatively high presence of low prices distorts the results of the simulations upwards, since it is these prices that are subject to the largest adjustments, in relative terms. On the other hand, as we are dealing with the prices of a single hypermarket, the results reflect the actual consequences of conversion, given the price setting policy of this firm. In any event, the weight of attractive prices in the sample, at 51%, does not seem far from that for the economy as a whole.

As regards the sample of average prices, which has the advantage over the previous one that all the categories of consumer goods are represented, its main drawback lies in the fact that the prices are averages of individual prices, so that their endings do not have the specific characteristics of individual prices (see Chart 1). Certain exercises performed previously using fictitious prices showed the importance of the endings of prices in determining the fact of conversion on the price level. Moreover, it is the ending of a price that enables it to be identified as attractive. To resolve this problem, the distribution of endings observed in the sample of individual prices has been extrapolated to the sample of average prices, using econometric techniques (2).

Each of the above scenarios has been simulated using both price samples and considering

(2) However, the endings extrapolated to the average prices give rise to smaller effects of conversion on the rate of change of prices than with the endings observed in the case of the individual prices.

TABLE 1

Results of simulations
Contribution to rate of change of CPI

Percentages

	Symmetric adjustment		Upward adjustment	
	Individual prices	Average prices	Individual prices	Average prices
Scenario I. Conversion to euro cents	0.0	-0.0	0.2	0.2
Scenario II. Conversion to tenths of a euro	0.3	-0.2	1.3	1.7
Scenario III. Conversion to attractive prices	-0.3	-0.0	0.4	0.2

Source: Banco de España.

two types of attitude on the part of firms. First, the case has been analysed in which firms decide to make all the adjustments to the desired prices in euro symmetrically, that is moving to the nearest price with the required features, irrespective of whether the adjustment is upwards or downwards. Second, the extreme case has been considered in which all firms decide to make their adjustments upwards. The results of these simulations provide a range within which the size of the effects on the rate of change of the CPI may actually lie, depending on the proportions of firms that adopt the first and the second attitudes. That said, given the shortcomings of the datasets for the purpose for which they are used here, the results of these simulations should not be taken as reliable quantitative estimates of the impact of the conversion. Moreover, the results of the simulations presented here reflect the impact of the simultaneous revision of all the prices of the sample, whereas in practice not all firms will change their prices at the same time, so that the impact will be distributed over time.

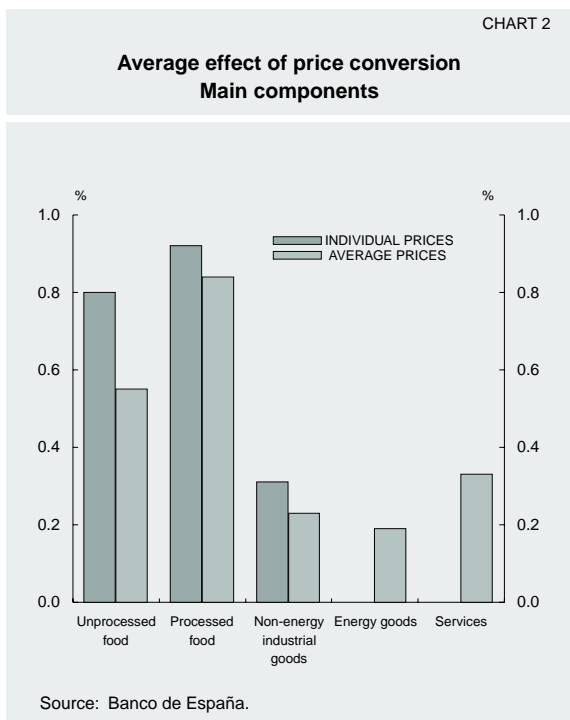
The results obtained are set out in Table 1. As can be seen, when the adjustments are made symmetrically, the estimated effects on the rate of change of the CPI are generally very small and deflationary effects even predominate. When the extreme situation is considered of across-the-board upward adjustments, the estimated effects are in all cases positive, albeit generally moderate: the smallest impacts (of around 0.2 percentage point) are obtained under the first scenario of rounding up to euro cents, while the largest effects (exceeding one percentage point) naturally correspond to the scenario of rounding to tenths of a euro, which shows how important it is that cents are used in the conversion process. The scenario which considers the adjustment to attractive prices gives slightly higher results than rounding to euro cents. We can therefore say that only in the case of across-the board upward revisions to tenths of a euro, this being the upper limit es-

timated by the simulations performed, might the impact on the path of inflation reach a significant size, albeit temporarily. The small magnitude of the results obtained in relatively extreme responses indicates the limited impact that the conversion of prices to euro should have on inflation.

Chart 2 shows the estimated impact of the conversion to euro on the price level of each component of the CPI, obtained as an average of the results of the simulations for the four scenarios. The effects are different because, within each component, the average level of prices or the distribution of attractive prices differs from the others. As can be seen, the largest effects are recorded for food and, especially, processed food. The relatively low levels of food prices and the extensive presence of attractive prices among them are the reasons for this greater impact.

4. CONCLUSIONS

The introduction of the euro (with the consequent conversion of prices expressed in pesetas to prices in euro) will certainly have a moderating effect on the rate of inflation of the Spanish economy in the medium term. The higher degree of integration with the markets of other euro area countries, and the increase in transparency and competition which this integration will bring about, will help to reduce the pressures on prices. However, there are a number of factors that could, in principle, generate a temporary upward effect on the rate of inflation, at around the time of introduction of the new currency. The conversion itself may lead firms to set prices in euro that are attractive to consumers. Also worth mentioning are the possible pass-through to consumer prices of firms' costs of adaptation to the new currency and the possibility that, simultaneously with the conversion to euro, price revisions will be made for other reasons, so taking advantage of the opportunity to reduce menu costs.



This article has analysed in detail the first of these elements, that is the inflationary risk that may arise from firms' pricing policy, under different hypotheses regarding their behaviour. As for the other factors mentioned, they are not expected to have a large impact, and it should be borne in mind, in any case, that their effect on prices will be distributed over a number of months. Indeed, it is very likely that they have already begun to occur and they may extend beyond 1 March 2002.

As for the results presented in this article, it must be repeated once more that they should be interpreted as being merely orientative and qualitative, since the statistical base on which they rest is not the most appropriate, and the figures obtained largely depend on the hypotheses used, in particular, those relating to the specific characteristics of attractive prices in euro. However, there are certain relatively robust conclusions: the neutral nature of the symmetric adjustments and the relatively small size of potential inflationary effects, even in the case of upward adjustment across the board, with the possible exception of the extreme case of cross-the-board rounding to tenths of a euro. Also, these estimates do not consider the possi-

ble distribution of the adjustments over time.

The key elements behind the potential inflationary effects of the conversion are the attitude of firms as regards the sign of the price adjustments they have to make (upward or symmetric), whether the rounding is to the nearest cent or to the nearest tenth of a euro, and the presence of attractive prices. While attractive prices exist in all countries, and will remain a feature of the distributions of individual prices following the conversion, the other two potential inflationary factors (wholesale upward adjustment by firms and rounding to tenths of a euro) do not need to be substantiated. The possible desire on the part of firms to adjust prices upwards will be curbed by market competition, especially when demand is slowing, as will probably be the case in the early months of 2002. Only if the firms themselves expect adjustments to be generally upward will they be so, because any increase in prices that is not followed by competitors would be more or less costly in terms of market share. Likewise, the vigilance of consumers and their associations, which would be aided considerably by the extension of the dual labelling period for as long as possible, will also discourage price rises exclusively due to the currency changeover. In this respect, the example of general government in the conversion of its prices and rates is important. As regards rounding to tenths of a euro, it is necessary to make consumers aware that prices without cents, although they may seem more convenient, tend to be higher because they facilitate significant increases in prices, especially the smallest ones.

In short, the conversion of prices in pesetas to euro associated with the replacement of the legal-tender notes and coins should not have a significant impact on the dynamics of the rate of inflation. The limited size of the potential effects estimated under extreme assumptions, the conjunction of various factors conducive to the containment of prices and the responsibility of firms themselves are elements that will tend to reduce any inflationary risk. Meanwhile, the advantages in terms of growth and inflation that this culmination of the European Community Economic and Monetary Union project will bring are undeniable.

22.10.2001.