HAS THE PASS-THROUGH OF MOVEMENTS IN THE EURO EXCHANGE RATE
INTO IMPORT PRICES CHANGED SINCE THE START OF EMU?

Has the pass-through of movements in the euro exchange rate into import prices changed since the start of EMU?

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Introduction

The degree of exchange rate pass-through into an economy's domestic prices is an important area of analysis from the standpoint of a price stability-geared monetary policy. High pass-through rates of exchange rate changes into import prices, and from these to final costs in the economy, mean that nominal exchange rate fluctuations can give rise to significant changes in the relative prices of goods and in the level of inflation. Unsurprisingly, this issue has been subject to continuous analysis since, in the early seventies, the Bretton Woods exchange regime broke down and exchange rates in the Western economies were allowed to float. Since then, analysis of the determinants of the degree of pass-through has addressed both the relative significance of the macroeconomic determinants – such as the behaviour of inflation – and more microeconomic aspects, which highlight the importance of the structure of import markets and, in particular, of the degree of competition they display.

An earlier paper [Campa and González Mínguez (2002)] estimated the rates of exchange rate pass-through into import prices and final prices in euro in the euro area countries. The main conclusions drawn from this analysis were that, in the short term, the pass-through to import prices is incomplete and varies significantly depending on the type of product imported and on the country of destination, tending to be higher for commodities. In the long run, however, it could not be rejected that for the industries examined the exchange rate pass-through rates to import prices were 100% and the same across the different countries. It was also seen that the main determinant of the differences between euro area countries regarding the overall impact of exchange rate movements on final consumer prices and on input costs was the different degree of openness of each economy. Indeed, this factor prevailed over differences arising from the product composition of imports in the face of different estimated pass-through rates for each industry.

The foregoing paper used a monthly data set ending in March 2001. The shortage of observations subsequent to the start of EMU prevented any evaluation of the extent to which the single currency might have marked a structural change in the pass-through of exchange rate movements to import prices in the euro area. The enlargement of the sample with the latest data should allow sounder conclusions to be drawn about the possible existence of such a structural change, which is the main purpose of this article, whose sample period concludes in May 2004.

There are three main reasons why the elasticity of pass-through might be expected to have diminished following the inception of the euro. Firstly, the process of monetary union has entailed a certain convergence of the member countries' average inflation rates towards the levels of those economies where such rates have traditionally been lower. Since the higher-inflation tradition of a country has been associated in the literature with higher pass-through rates, these have foreseeably declined in a large number of members. Secondly, there are arguments suggesting that the creation of EMU may have encouraged intra-area trade at the expense of trade with the rest of the world. Were this confirmed, it might have led to a lesser pass-through into import prices (via the relative reduction in the market power of exporters outside the euro area) and to final prices (since the proportion of final demand in the area met

by non-euro area imports would have fallen). Thirdly and finally, it has been argued that the exchange rate pass-through to prices is smaller the greater the percentage of imports denominated in local currency. Insofar as the creation of a large monetary zone, such as the euro area, has promoted the expansion of the euro as a currency of denomination for its foreign trade, the rates of pass-through to import prices would have tended to diminish.

The following section analyses these three arguments whereby the inception of EMU may have reduced the pass-through rates of the euro area countries, placing particular emphasis on the last two arguments. To do this, changes in the degree of exposure to imports from outside the area are studied and developments in the use of the euro as a reference currency for setting import and export prices within the euro area are analysed. The conceptual consequences such use entails for the degree of pass-through of exchange rate movements to import prices are also studied. After this, the presence of changes in pass-through rates to import prices since the introduction of the euro is empirically studied. The third section shows the methodological framework used to this end, while the fourth presents the main findings and evaluates the extent to which there is evidence of a structural change in the transmission of exchange rate movements to domestic prices. The final section draws the conclusions.

Possible reasons for lower transmission since the start of EMU
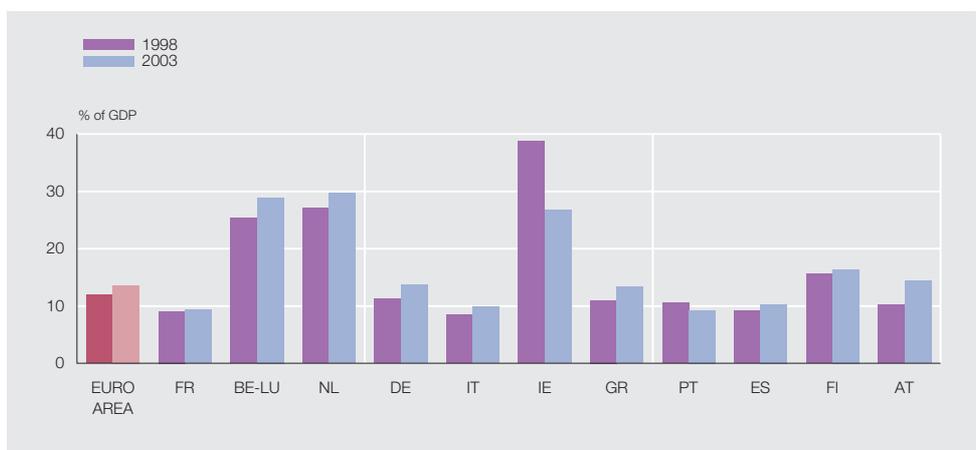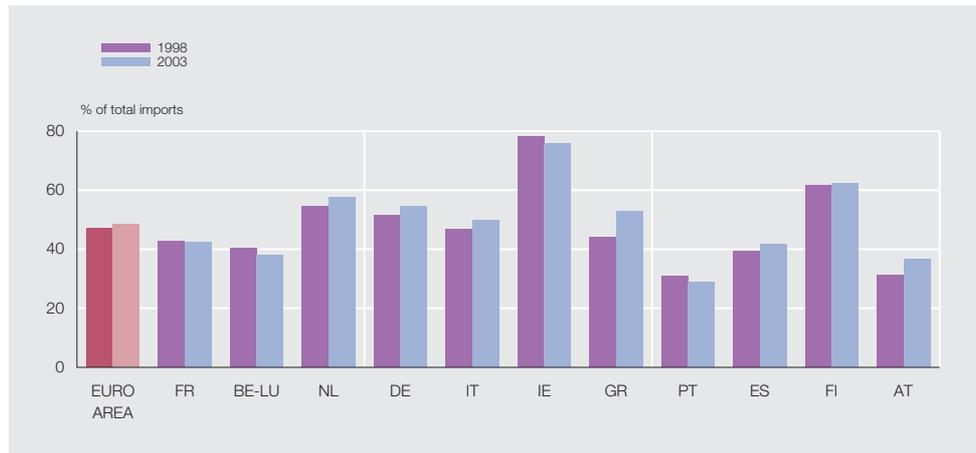
THE CONVERGENCE
OF INFLATION RATES

As indicated, one of the causes to which the literature has attributed the differences across countries in the degree of transmission of exchange rate movements to prices has been the inflationary track record of a country and how this has been subsequently reflected in the changes in its nominal exchange rate. In this respect, Campa and González Mínguez (2002) find that, with the exception of Greece, the euro area countries that saw their nominal exchange rate depreciate during the eighties and nineties tended to have higher pass-through rates in the short run. Conceivably, now that these countries share the same currency, the differences between them in transmission rates in the short run will have tended to recede.

THE RELATIVE WEIGHT
OF EXTRA-EURO AREA IMPORTS

The introduction of the single European currency might have marked a change in the proportion of trade that each euro area member respectively has with the other euro area economies and with the rest of the world. In particular, factors such as the elimination of the risk associated with nominal exchange rate fluctuations in intra-euro area trade or the reduction of transaction costs suggest that the Monetary Union may have fomented trade among the euro area countries. Thus, small companies, for which the existence of these costs was an obstacle to their embarking on international trade, might have decided to gear up internationally following the onset of EMU. This has been termed the "trade creation" effect. Further, since these costs persist as far as extra-euro area trade is concerned, a portion of such trade will conceivably have been replaced by intra-euro area flows, given their increased relative attractiveness (the "trade diversion" effect).

The evidence accumulated in the five years since the introduction of the euro does not indicate that there have been very significant changes in the composition of the area's import flows. Indeed, the changes witnessed appear to run counter to those suggested by the above-mentioned arguments. Indeed, the share of imports from outside the area has increased in 7 of the 11 members (see Chart 1). As a consequence, the weight of imports from outside the euro area as a proportion of GDP has risen for all the area's members, with the notable exception of Ireland and, to a lesser extent, Portugal. One possible cause of this is the breakthrough of new countries (such as China) into international trade. In any event, while there have been no substantial changes in the total proportion of euro area imports from the rest of the world, there may well have been changes in the good-by-good composition of these flows. Hence, if the elasticities of transmission of exchange rate changes to import prices differ substantially on the basis of the type of product, changes in the structure of imported goods since the start of

% of total imports

Legend: 1998, 2003

Categories: EURO AREA, FR, BE-LU, NL, DE, IT, IE, GR, PT, ES, FI, AT

% of GDP

Legend: 1998, 2003

Categories: EURO AREA, FR, BE-LU, NL, DE, IT, IE, GR, PT, ES, FI, AT

SOURCES: Eurostat and national statistics.

EMU might have a significant bearing on total transmission rates. However, these changes have been on a relatively minor scale between 1998 and 2003. Moreover, they have been in the same direction in most countries. In particular, the share of mineral fuel and, to a lesser extent, of machinery and transport equipment in the total has increased, while that of food, other commodities and basic manufactures has fallen.

CURRENCY OF DENOMINATION IN INTERNATIONAL TRADE

The currency in which trade contracts with the non-euro area countries are denominated is a determinant of the impact of euro exchange rate movements on the economy. If foreign exporters tend to set their prices in their own currency, the degree of transmission of exchange rate movements to prices in euro will also tend to be high. As a result, inflation in the euro area will be affected and, as a consequence of the changes in relative prices, there will be a demand shift between goods produced within the area and outside it. If, conversely, extra-euro area exporters tend to set their price in euro, a relatively limited transmission of exchange rate movements to prices and activity in the area will be seen.

The theoretical literature on the factors behind the currency in which exporters set their prices has identified two main determinants: the macroeconomic stability of each currency and the degree of competition prevailing in markets. Regarding the first aspect, Devereux and Engel (2001) show, in a general equilibrium model, that countries with less volatile monetary policies enjoy a greater use of their currencies in the setting of prices in international trade. Moreover, the currency in which import and export flows are denominated is also important for determin-

ing the optimal monetary and exchange rate policies the authorities should pursue. Several papers in recent years have highlighted the implications of the currency in which foreign trade flows are denominated for the optimal strategies of economic authorities.

In addition to these macroeconomic aspects, other technical papers have underscored aspects relating to the industrial competitive structure. Bacchetta and Van Wincoop (2004) show that a fundamental determinant of the decision on the currency for setting prices is the degree of competition in markets. The lesser the elasticity of export demand in the end-market, the greater the probability that exporters will set their prices in their own currency and not in that of the importer. The factors underlying this elasticity of demand are also those that explain the currency in which the export contracts are denominated. For instance, foreign producers tend to set their prices in the currency of the market of origin if the imported goods show a high degree of differentiation vis-à-vis domestically produced goods and if the share of exports is high. These authors further show how, in a monetary union, the relevant market shares are not those of domestic and foreign producers within each country; rather, it is the share of the producers from the set of countries that share a single currency and that of exporters from the rest of the world. In this respect, the bigger the area of influence of a currency, the higher the percentage of international trade denominated in that currency will be. For this reason, the creation of EMU should have resulted in euro-denominated imports accounting for a higher proportion of total imports, when compared with the overall share of the currencies of the countries making up the euro area.

The evidence on the use of the euro as a currency of denomination in international trade is incomplete. Nonetheless, the scant data available point clearly to a progressive increase in the use of the single European currency (see Table 1). In particular, for all member countries for which information is available, there has been an increase since the onset of EMU in the percentage of imports from outside the area whose price is determined in euro. As regards merchandise trade, this share has grown in the 2000-2002 period by more than 20% for the four countries on which data are at hand. The rising tendency for the use of the euro as a currency of denomination has also been seen in trade in services. Evidently, since the change in habits of companies that export to the euro area is a lengthy process, it is possible that the effects of the inception of the euro will emerge but gradually. In this respect, the latest evidence suggests that the above-mentioned trend has continued in 2003 and 2004 as well.

This propensity for the growing use of the euro as a billing currency for the area's trade flows is also seen in euro area exports. For all countries for which there is evidence, the percentage of euro-denominated goods exports to outside the euro area has increased in the 2000-2002 period. In the latter year, with the exception of Greece, all member countries denominated almost 50% of their extra-euro area exports in the single European currency. The use of the euro to set services prices has followed a similar trend, with substantial increases during the period (except in the case of France). Significantly, the fact that, for each country, the proportions of local-currency-denominated imports and exports are very similar tends to contradict the so-called "Grassman law" under which each exporter would tend to bill in its own currency, though it is true that this law holds less when the size of the importer is much greater than that of the exporter.

This evidence should, however, be viewed with due caution. It is necessary to take into account the difference between billing currency and payment currency. From the standpoint of the impact on the importing country's prices and on the volume of its cross-border trade flows, what is really relevant is the decision on the currency in which contracts are denominated, and not the unit of account in which payment is made. That is because the unit of account may

SHARE OF THE EURO AS A CURRENCY OF DENOMINATION OF EURO AREA TRADE FLOWS WITH THE REST OF THE WORLD (% of total) (a)

TABLE 1

	Imports					
	Goods			Services		
	2000	2001	2002	2000	2001	2002
Belgium-Luxembourg	43.6	47.2	52.8	44.4	50.0	53.3
France	35.0	39.8	46.8	47.6	54.0	54.7
Germany	-	-	48.0	-	-	-
Greece	-	29.3	35.8	-	15.3	16.8
Italy	-	40.8	44.2		49.9	56.1
Portugal	47.0	53.6	57.6	53.7	55.6	59.2
Spain	44.0	49.7	55.8	42.4	45.3	48.7

	Exports					
	Goods			Services		
	2000	2001	2002	2000	2001	2002
Belgium-Luxembourg	42.0	46.7	53.4	45.4	50.5	54.6
France	48.0	49.2	55.3	57.3	60.4	56.9
Germany	-	-	49.0	-	-	-
Greece	-	23.5	39.3	-	11.3	13.3
Italy	-	52.7	54.1	-	50.7	57.0
Portugal	40.1	43.5	48.5	37.4	37.4	46.4
Spain	49.0	52.0	57.6	50.5	52.9	59.7

SOURCE: ECB (2003).

a. The data refer to the use of the euro as a payment currency, except in the case of Germany, where it is as an invoicing currency.

simply be the result of the conversion, at a previously agreed exchange rate, of the price into the currency in which billing is being conducted. Nonetheless, in virtually all cases the information available refers to the payment currency and not to the billing currency. In addition, the appreciation of the euro during the period considered may have prompted an increase in the value of euro-denominated trade, for a given volume.

The creation of EMU may, in principle, have had differing effects on different imported goods with regard to the currency of denomination of trade and, therefore, to the degree of exchange rate pass-through. In the commodities markets trade is with highly homogenous goods, for which there is a single world market in which the euro area's imports are not denominated either in euro or in the exporter's currency, but habitually in dollars. What are involved are markets in which the location of buyers and sellers is irrelevant for the purposes of the price of transactions. In this case, it is unlikely that the creation of EMU has entailed, so far, significant changes in the currency of denomination of this type of trade, although the setting up of a monetary area rivalling the United States in terms of size may have important longer-term effects. Consequently, the transmission of exchange rate movements to the import prices in euro of these goods will foreseeably have remained as high after the introduction of the new European currency as it was before[1]. In the case of imported manufactures, whose degree of differentiation compared with that of their domestically produced counterparts is relatively high and for which demand therefore evidences limited price elasticity, it is to be expected that, prior to the onset of EMU, non-euro area exporters would have tended to set their contracts

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1. In any event, it has recently been seen that periods of oil price rises tend to coincide with dollar depreciations.

in the currency of the country of origin. Hence the degree of transmission of exchange rate movements to euro-denominated import prices would be relatively high. In this case, by prompting an increase in the share of the area's internal producers, EMU would have entailed (or might with time entail) a reduction in this degree of transmission. Finally, for similar reasons, in the case of manufactures with a high degree of homogeneity to those produced within the area (and for which, therefore, the degree of pass-through was comparatively lower prior to EMU), an additional reduction would likewise be expected.

Empirical analysis: methodological framework and data used

The methodology used to evaluate to what extent the creation of the single currency has entailed a change in the rates of transmission of exchange rate movements to import prices is the same as that in Campa and González Mínguez (2002). In particular, the basic framework is the price-setting equation of foreign exporters. This equation relates the price of imported goods in national currency to the product of the import price in foreign currency and the nominal exchange rate expressed in units of the importer's currency for each unit of the exporter's currency.

The evaluation of the rate of transmission of euro exchange rate movements to the prices of imports from outside the area is performed using the following econometric specification:

$$\Delta \ln P_t^{i,j} = \sum_{l=0}^{4} a_l^{i,j} \Delta \ln E_{t-l}^{ij} + \sum_{l=0}^{4} b_l^{i,j} \Delta \ln P_{t-l}^{*ij} + v_t^{i,j} \qquad [1]$$

where E_t is the nominal exchange rate and P_t and P_t^* are, respectively, the measures of the import price in domestic and foreign currencies (the latter depends on the costs of the foreign exporter and on its profit margin on these costs). Finally, the superscripts i and j refer to the country of destination of the imports and to the type of good, respectively. In this equation, expressed in rates of change, it is permitted, first, that the price of imports expressed in domestic currency does not react fully to changes in the exchange rate and to the prices set in the exporter's currency; and further, that this response does not take place fully at the outset. More specifically, four monthly lags of the independent variables are included to allow for the possibility that there is a partial adjustment with lags in the reaction of domestic-currency import prices to movements in the exchange rate or in international goods prices. Lastly, the estimated equation includes a correction of the first-order residual autocorrelation found in the ordinary least squares estimation.

After performing the appropriate tests, this specification proved preferable to an alternative model containing the long-run cointegration relationship along with an error-correction mechanism that captures the short-term transmission adjustment of the exchange rate to import prices. More specifically, the series stationarity tests reveal that the hypothesis of the presence of a unit root in approximately two-thirds of the variables cannot be rejected, which warrants the search for cointegration relationships. Nonetheless, in the sample used the evidence on the presence of cointegration is relatively weak[2]. Given the absence of this relationship in the data and the limited length of our sample period (around fifteen years) for estimating long-run relationships, the estimation of equation [1] was opted for, as it has a less restricted form.

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2. Specifically, cointegration tests were performed to determine whether, for each country and industry, there is a long-run relationship in levels between import prices, exchange rates and foreign prices. The results indicated that the existence of such a relationship cannot be rejected solely in one-third of cases (34 out of a total of 99). The lengthening of the sample compared with that of the original paper results in somewhat greater evidence of the existence of cointegration, which is not only consistent with econometric theory but is also so with economic theory. However, the results obtained indicate that an even longer sample is needed to be able to conduct an appropriate cointegration analysis.

The parameter a_0^{ij} measures the contemporaneous exchange rate pass-through into import prices, which we call short-run pass-through elasticity, while the sum of the contemporaneous and lagged coefficients of the exchange rate, $\sum_{l=0}^{4} a_l^{i,j}$, measures long-run pass-through elasticity.

The sample period includes monthly series of the dependent and independent variables for the period from January 1989 to May 2004. The import unit value index data are drawn from the Comext database, developed by Eurostat. The sample is similar to that used in Campa and González Mínguez (2002). However, there are two differences. First, the period is longer by somewhat over three years (in the former case, the sample ended in March 2001). Second, the breakdown by product is also different[3].

The data relating to the dependent variable used in the estimation consist of time series of import unit value indices for goods from outside the euro area. The advantage with these series is that they are available by importer country and by type of product, which allows transmission rates to be estimated that may vary on the basis of these two dimensions. It is possible with this level of breakdown to attempt to ascertain the extent to which the differences in pass-through rates are due mainly to specific effects, either of each industry or of each importer country[4].

The two exogenous variables are the nominal exchange rate and the price of the imported product in foreign currency. To measure these variables use is made of the nominal exchange rate of the currency of the importer country against the US dollar, and the unit value index of imports of the good by the euro area as a whole expressed in dollars. The assumption implicit in this definition of the independent variables is that, for the set of internationally tradable goods, there is a global competitive market in the US currency and that the relevant opportunity cost for an exporter of these goods is the price in dollars of this good on the world market[5].

To evaluate the potential existence of a structural change in the equation of exchange rate transmission to import prices, two types of tests were performed. First, the methodology proposed by Andrews (1993) and Andrews and Ploberger (1994) was followed, the aim of which is not only to detect whether there is a significant structural change in the sample but also to determine the time at which it occurs. Essentially, the procedure selects the sample observation for which there is empirically a bigger difference between the transmission rates estimated in the two sub-periods prior and subsequent to that time, and it then determines whether this difference between the transmission rates in the two sub-periods is statistically significant or not.

The second test takes into consideration the fact that the irrevocable parities between the currencies of the countries participating in EMU were pre-set in May 1998, in view of the possibility that

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3. For reasons of data availability, a breakdown into nine categories of goods is used, compared with thirteen in the original paper. Seven of the categories now used correspond to those of the former sample.   **4.** The use of this database with information by product and country of destination also has some drawbacks. The import price data are unit value indices, instead of prices in the true sense of the term, which makes them susceptible to potential changes in the definition of the categories of goods due to improvements in quality or to composition effects arising from changes in the relative demand for the different products making up each category. Nor is there any guarantee that the weights among the goods included in a category will be the same across different countries, which may give rise to consistency problems.   **5.** This description of world trade in terms of the existence of integrated markets for each type of product is superior, from an empirical standpoint, to an alternative specification in which these markets are segmented on the basis of the country of origin and of destination. In this case, the relevant exchange rates are the bilateral ones between both countries, since the prices of imports in foreign currency are constructed on the basis of the prices of goods in the countries of origin.

Country	(1) Short-term	(2) Long-term	Proportion of total industries for which the hypothesis specified can be rejected (a)			
			Short-term		Long-term	
			(3) Rate of transmission is zero	(4) Rate of transmission is one	(5) Rate of transmission is zero	(6) Rate of transmission is one
France	0.77 (c)(d)	0.79 (c)(d)	0.89	0.78	0.89	0.44
Belgium-Luxembourg	0.58 (c)(d)	0.83 (c)(d)	1.00	0.89	1.00	0.11
Netherlands	0.76 (c)(d)	0.79 (c)(d)	0.89	0.89	1.00	0.11
Germany	0.63 (c)(d)	0.75 (c)(d)	1.00	0.89	1.00	0.33
Italy	0.69 (c)(d)	0.94 (c)	0.89	0.78	1.00	0.00
Ireland	0.50 (c)(d)	0.56 (c)(d)	0.67	0.67	0.56	0.22
Greece	0.47 (c)(d)	0.78 (c)(d)	0.33	0.67	0.33	0.33
Portugal	0.80 (c)(d)	0.82 (c)	0.89	0.44	0.78	0.11
Spain (b)	0.81 (c)	1.04 (c)	1.00	0.88	0.88	0.25
Finland	0.75 (c)(d)	0.77 (c)(d)	0.89	0.78	0.78	0.33
Austria	0.54 (c)(d)	0.77 (c)(d)	0.78	1.00	0.44	0.56
Average	0.66	0.81				

SOURCES: Eurostat and Banco de España.

a. There are a total of nine industries.
b. Excluding the beverages and tobacco industry.
c. A transmission rate of zero can be statistically rejected.
d. A transmission rate of one can be statistically rejected.

the transmission of exchange rate movements to import prices may have changed following the introduction of the euro. Consequently, Chow tests for structural change were performed, taking this date as the possible point in time in which the relationship may have changed[6].

Results

Tables 2 and 3 contain the results of the estimation of equation [1]. The first two columns of each table show the estimates of the elasticity of transmission of the exchange rate to import prices, in the short and long run (i.e. the estimations of the parameters $a_1^{i,j}$ y $\sum_{l=0}^{4} a_l^{i,j}$), under the assumption that this pass-through rate is constant for all industries in a single country (see Table 2) or for each industry in all countries (see Table 3)[7]. These columns also include the re-sults of the tests of the hypotheses that each pass-through elasticity is zero, i.e. if the produc-ers set the price in the importer country's currency and refrain from adjusting it in the face of exchange rate movements, and that each pass-through elasticity is one, i.e. if the producers set the price in their own currency, adjusting the price in the importer country's currency when faced with any exchange rate movement. Finally, the last four columns of each table summa-rise the result of estimating specific pass-through elasticities for each industry and country.

Broadly, the conclusions drawn from these estimations are very similar to those obtained in Campa and González Mínguez (2002). Firstly, the transmission of exchange rate movements to import prices is incomplete in the short run. The average rates by country and by industry (0.66 and 0.56, respectively) scarcely differ from those obtained with the previous sample, which supports the sta-bility of the relationship estimated after the start of Monetary Union. The evidence that pass-through

6. In principle it is possible, however, that the break in the relationship took place earlier, given the pronounced stability of exchange rates in the years prior to the fixing of parities and the deep-seated expectations that this would happen to market exchange rates. **7.** These tables have excluded the beverages and tobacco industry in Spain. The reason is that there is an error in the data in this case.

| Industry | (1) Short-term | (2) Long-term | Proportion of total countries for which the hypothesis specified can be rejected (a) | | | |
| | | | Short-term | | Long-term | |
			(3) Rate of transmission is zero	(4) Rate of transmission is one	(5) Rate of transmission is zero	(6) Rate of transmission is zero
Food	0.54 (c)(d)	0.78 (c)(d)	0.82	0.91	0.82	0.18
Beverages and tobacco (b)	0.31 (c)(d)	0.44 (c)(d)	0.50	0.90	0.50	0.60
Other commodities (except fuels)	0.57 (c)(d)	0.93 (c)	0.91	0.91	1.00	0.09
Mineral fuels	0.85 (c)(d)	1.02 (c)	0.91	0.45	1.00	0.09
Oils, fats and waxes	0.64 (c)(d)	0.84 (c)	0.73	0.55	0.64	0.00
Chemical products	0.62 (c)(d)	0.78 (c)(d)	0.91	0.64	0.64	0.09
Basic manufactures	0.50 (c)(d)	0.87 (c)(d)	1.00	1.00	1.00	0.36
Machines and transport equipment	0.51 (c)(d)	0.76 (c)(d)	0.82	0.82	0.82	0.36
Miscellaneous manufactured goods	0.50 (c)(d)	0.64 (c)(d)	0.91	0.91	0.73	0.45
Average	0.56	0.79				

SOURCES: Eurostat and Banco de España.

a. There are a total of eleven countries.
b. Excluding Spain.
c. A transmission rate of zero can be statistically rejected.
d. A transmission rate of one can be statistically rejected.

is high, but incomplete, in the short run is corroborated by the rejection in all cases of the hypotheses that the elasticities estimated in the first column of tables 2 and 3 are one and zero[8].

Secondly, in the long run the average pass-through elasticities are, at around 0.8 (column 2 of the tables), greater than in the short run. More significantly, it is possible to reject, for a majority of countries and products, that transmission is complete in the long run. Specifically, this hypothesis is not supported by the data in eight of the eleven economies and in six of the nine goods. Moreover, it is interesting to note how the cases in which it is not possible to reject a full transmission coincide with economies with a greater inflationary tradition (Italy, Portugal and Spain) and with industries related to commodities, which is consistent with what was to be expected a priori. These results are in contrast to some extent to those obtained with the sample that ended in early 2001. In that case, however, the specific estimations of the pass-through rates in the long run were only slightly greater than those obtained with the extended sample, and unit elasticity was rejected for only three countries (Germany, Austria and Ireland) and for two industries (electrical and electronic machinery, and home equipment)[9].

Thirdly, the results of the unit and zero transmission tests when the same elasticity is imposed for all the industries in a single country or for all countries taking one industry are replicated fairly closely when the estimated coefficients are allowed to vary in terms of both country and product (see columns 3 to 6 of tables 2 and 3). However, only in one country (Austria) and in one industry (beverages and tobacco) is it possible to reject for more than half of all possible cases the hypothesis that transmission is complete in the long run, which contradicts to some extent the results of the restricted estimations.

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8. Except in Spain's case.   **9.** Nonetheless, it should be borne in mind that the results obtained by industry are not directly comparable, since the classification by product group is not identical.

TESTS OF THE EQUALITY OF PASS-THROUGH ESTIMATES (a) TABLE 4

Country	Equality across countries for a given industry	
	Short-term	Long-term
France	0.00	0.11
Belgium-Luxembourg	0.43	0.39
Netherlands	0.00	0.45
Germany	0.00	0.00
Italy	0.00	0.98
Ireland	0.01	0.08
Greece	0.19	0.45
Portugal	0.47	0.86
Spain (b)	0.00	0.02
Finland	0.00	0.40
Austria	0.72	0.78
Percentage of rejections (at 5% level)	63.6	18.2

Industry	Equality across countries for a given industry	
	Short-term	Long-term
0. Food	0.00	0.28
1. Beverages and tobacco (c)	0.54	0.52
2. Other commodities (except fuels)	0.00	0.52
3. Fuels	0.13	0.83
4. Oils, fats and waxes	0.21	0.89
5. Chemical products	0.00	0.73
6. Basic manufactures	0.02	0.02
7. Machinery and transport equipment	0.00	0.02
8. Miscellaneous manufactured goods	0.04	0.20
Percentage of rejections (at 5% level)	66.7	22.2

SOURCES: Eurostat and Banco de España.

a. The table reports the p-values from a test of the restrictions that the estimated short-run and long-run elasticities are the same for all industries within each country (upper panel) and that they are constant for a given industry in the eleven countries in the sample (lower panel).
b. Excluding the beverages and tobacco industry.
c. Excluding Spain.

In addition, the hypothesis that pass-through rates are equal for all industries in a country or for all countries taking one industry has been tested in the short and long run (see Table 4). In the short run, this hypothesis is rejected for most countries and industries. However, in the long run it is only possible to reject unitary elasticity of transmission across the different industries in Germany and in Spain, and, across the different countries, in two of the nine industries (basic manufactures and machines and transport equipment). This latter result upholds the idea that exporters discriminate prices to a greater extent in manufactures than in commodities.

Finally, little evidence can be found of any structural change in exchange rate pass-through into import prices. Table 5 shows the cases in which we can reject the hypothesis, in the short and long run, that there has been no endogenous structural change according to the Andrews and Ploberger test, indicating in italics the date on which this instrument detects such changes and, in brackets, the p-value of the test. A cell that does not include this information indicates that, for this product-country combination, the hypothesis of a lack of structural change is not rejected either in the short or long run. As can be seen, there is very little evidence in favour of the alternative hypothesis that transmission is not stable (7 out of 198 cases), this evidence being concen-

	Product								
	0 Food	1 Beverages and tobacco	2 Other commodities (except fuels)	3 Mineral fuels	4 Oils, fats and waxes	5 Chemical products	6 Basic manufactures	7 Machines and transport equipment	8 Miscellaneous manufactured goods
France	SR-C						SR-C	SR-C	SR-C
Belgium-Luxembourg	SR-C LR-C				LR-E *1992:9* (0.10)		SR-C	SR-C LR-C	SR-C
Netherlands					LR-E *1998:12* (0.10)		SR-C	SR-C	
Germany	SR-C LR-C						SR-C	SR-C LR-C	SR-C
Italy	LR-C						EP-E *1991:10* (0.03)	SR-C	
Ireland							LR-E *1993:1* (0.02)	LR-E *1993:3* (0.00)	
Greece			SR-C						
Portugal	SR-C								
Spain		SR-C							
Finland			LR-E *2002:10* (0.02) LP-C	LR-E *1998:9* (0.07)					
Austria						SR-C			

SOURCE: Banco de España.

a. SR-E (LR-E) denotes rejection of the null hypothesis of endogenous structural change in the short (long) run.
The change occurs on the date indicated in italics. The p-value of the test is in brackets.SR-C (LR-C) denotes
rejection of the null hypothesis of endogenous structural change in May 1998 in the short (long) run.

trated in the long-run parameters. Further, only two of the cases of structural change took place around the parity-setting dates (oils, fats and waxes in the Netherlands and mineral fuels in Finland). The two breaks in Ireland (in basic manufactures, and machinery and transport) might be linked to the price-setting policy of British exporters following sterling's exit from the exchange-rate mechanism. For the three other cases it is more difficult to find an explanation. In any event, it should be borne in mind that the power of these tests is limited in small samples.

Given the presumption that, had there been a break in the stability of the estimated relationships, this might have taken place at the time Monetary Union was established, Chow tests were performed setting the date of the structural change as at May 1998, when the parities between the currencies to be replaced by the euro were pre-announced. In Table 5, the shaded cells are those industry-country combinations for which this test rejects the stability of the rates of transmission, in the short and long run. This tool does not provide clear evidence either against the hypothesis of stability of the transmission rates, which in the short run may be rejected for 19 of the 99 industry-country combinations. By product group, rejections of the stability of the relationship are more

frequent among manufactured products (basic manufactures, machinery and transport, and other manufactures). By country, stability is rejected with greater frequency (in three or four industries) for the countries that made up the core of the former European Monetary System (France, Germany, Belgium-Luxembourg and the Netherlands). This result contradicts somewhat the idea expressed above that, a priori, it would be the countries with a tradition of high inflation that would have seen a change of regime upon entry into the euro area. As to long-run elasticities, the stability of the relationship can only be rejected in 6 of the 99 cases which is, approximately, what is to be expected statistically at a 5% confidence level. Taken as a whole, this evidence does not appear sufficient to conclude that there has been a significant change in pass-through rates as a result of the introduction of the euro.

Conclusions

The aim of this article is to evaluate to what extent the introduction of the euro has entailed a structural change in the rate of transmission of exchange rate movements in the member states' currencies to their import prices. In principle, this change could have come about for several reasons, including most notably: the move to an environment of greater macroeconomic stability and lower inflation rates for some member countries; a hypothetical expansion of intra-euro area trade at the expense of trade with countries outside the area; potential changes in the structure of markets in which goods produced within the area compete with one another; and the impact the creation of the euro may have had on the currency of denomination of imports from the rest of the world. The evidence to date indicates that the creation of the euro has not signified a loss of weight by extra-euro area imports in proportion to total imports, while the percentage of trade in goods and services with third countries whose prices are set in euro has increased substantially for all the member states.

The empirical analysis of the pass-through of exchange rate movements into euro area countries' import prices includes the estimation of short- and long-run elasticities, allowing these to vary on the basis of the type of product imported. The results obtained confirm that transmission may be characterised as high, though incomplete, in the short run. In the long run, the elasticities are greater, though it tends to be rejected that they are unitary, except in the traditionally more inflationary economies and for commodities. Compared with the results obtained in Campa and González Mínguez (2002), there is less evidence of full transmission in the long run, although this may be related, in part, to the greater power of the tests resulting from the use of a longer sample period. In general, unit elasticity across the different industries of each country and for the different countries taking one industry continues in the long run to be unable to be rejected. Finally, one very relevant conclusion of the analysis is the absence of clear evidence that there has to date been a substantial change in the pass-through of exchange rate movements into import prices since the introduction of the euro.

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REFERENCES

ANDREWS, D. W. K. (1993). «Tests for Parameter Instability and Structural Change With Unknown Change Point», *Econometrica,* 61, pp. 821-856.

ANDREWS, D. W. K. and W. PLOBERGER (1994). «Optimal Tests When a Nuisance Parameter Is Present Only Under the Alternative», *Econometrica,* 62, pp. 1383-1414.

BACHETTA, P., and E. VAN WINCOOP (2004). «A Theory of the Currency Determination of International Trade», *Journal of International Economics,* forthcoming.

EUROPEAN CENTRAL BANK (2003). *Review of the international role of the Euro.*

CAMPA, J. M., and J. M. GONZÁLEZ MÍNGUEZ (2002). *Differences in exchange rate pass-through in the euro area,* Working Paper no. 0219, Banco de España.

DEVEREUX, M., and C. ENGEL (2001). *Endogenous Currency of Price Setting in a Dynamic Open Economy Model,* manuscript, June.