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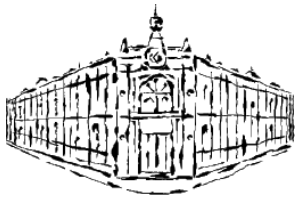

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DIFFERENCES IN EXCHANGE RATE PASS-THROUGH IN THE EURO AREA*

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Abstract

This paper focuses on the pass-through of exchange rate changes into the prices of imports made by euro area countries originating outside the area. Using data on import unit values for thirteen different product categories for each country, we estimate industry-specific rates of pass-through across and within countries for all euro members. In the short-run, pass-through rates differ across industries and countries and are less than one. In the long-run neither full pass-through nor equality of pass-through rates across industries and countries can be rejected. Differences exist across euro area countries in the degree that a common exchange rate movement gets transmitted into consumer prices and costs of production indices. Most of these differences in transmission rates are due to the distinct degree of openness of each country to non-euro area imports rather than to the heterogeneity in the structure of imports.

Resumen

Este trabajo se centra en la transmisión (pass-through) de los movimientos del tipo de cambio a los precios de las importaciones realizadas por los países del área del euro y procedentes de fuera de la misma. Haciendo uso de datos de índices de valor unitario para trece categorías distintas de productos para cada país, se estiman tasas de pass-through específicas para cada industria para los distintos países miembros de la Unión Económica y Monetaria (UEM). A corto plazo, las tasas de pass-through difieren entre industrias y países y son menores que uno. A largo plazo no se puede rechazar ni que el pass-through sea completo ni que sea el mismo para todas las industrias y países. Sin embargo, existen diferencias entre los países del área del euro en cuanto al grado de transmisión de una variación dada del tipo de cambio a los índices de precios de consumo y a los costes de producción. La mayor parte de estas diferencias en las tasas de transmisión se deben al distinto grado de apertura de cada país a las importaciones desde fuera del área, y no tanto a la heterogeneidad en la estructura de las importaciones de cada país.

I. INTRODUCTION

Exchange rate pass-through is the rate at which changes in exchange rates get reflected in import prices expressed in the currency of the importing country. This rate of transmission has been the focus of interest in the international literature for a long time. Initially this focus centered in the debate over the law of one price and convergence across countries. Beginning in the late 1980s, exchange rate pass-through studies emphasized industrial organization phenomena and the role that internationally segmented markets and price discrimination played in determining import prices. More recently pass-through issues have played a central role in heated debates over appropriate monetary policies and exchange rate regime optimality.[1] These debates hinge on the issue of the prevalence of producer-currency pricing (PCP) versus local-currency pricing (LCP) of imports, and on whether exchange rate pass-through rates are endogenous to a country's inflation performance. High import price pass-through means that nominal exchange rate fluctuations may lead to higher expenditure switching effects of domestic monetary policy. If pass-through rates are endogenous to a country's relative monetary stability, the extent of this monetary policy effectiveness may be fragile and regime-specific.[2]

A major concern with the creation of the euro area and the establishment of the single monetary policy has been the extent to which the single monetary policy can have differential effects in the economies of the different member countries. Several reasons have been suggested in the literature for these differential effects. These arguments include differences in financial systems (or, more generally, in the national monetary policy transmission mechanisms), cyclical divergences among countries, differing institutional arrangements in the labour markets, the degree of economic development and exposure to international trade. One major source of concern is the differential effects that can accrue to shocks arising from outside the euro area. Such effects can be due to differences in trade exposure or in the structure of trade by products or by partner countries. For instance, a euro depreciation can lead to differences in the degree of consumer price increases due to changes in the euro price of imports. These differences get reflected directly in the indicator used to measure the performance of euro-wide inflation by the European Central Bank (ECB), the Harmonized Index of Consumer Prices (HICP). This index is

[1] The implications of pass-through performance for optimal monetary policy are also explored in Corsetti and Pesenti (2001), Obstfeld (2000), Devereux (2000), and Devereux and Engel (2000), among others.

[2] See Taylor (2001). The role of the invoicing decisions of producers in influencing pass-through rates is explored in recent work by Devereux and Engel (2001) and Bacchetta and van Wincoop (2001).

a broad measure of inflation, in which basket imported goods are included, so that its overall behaviour is affected by changes in commodity and other imports prices. The evolution of these prices is exogenous to the ECB and can affect euro member countries in different ways. In particular, the recent exogenous oil price shock, together with the rise of the dollar, impacted differently on the euro area member economies (Galí, 2001). This was related to factors such as the respective degrees of intensity of use of oil in their economies, the reliance in imported oil and the structure of industrial competition within each country. Therefore, differences in trade structures of the member countries (in a very broad sense) might lead to differential effects of a single monetary policy.

We focus in this paper on the pass-through of exchange rate changes into prices of extra-EMU imports of the twelve countries which are the current members of the euro area (although Belgium and Luxembourg are treated as a single country). We use time series data on import unit values for thirteen different product categories for each country. We focus on imports from non-euro area member countries since this is the part of the total trade of the countries which has continued to be exposed to exchange rate fluctuations after the creation of the euro zone in 1999. Our database has the advantage of focusing explicitly on the composition of imports into the destination country by product and by country of origin, enabling us to account for different rates of pass-through for the different product categories. This variation is important when investigating the transmission of exchange rate changes to aggregate price indicators, such as the HICP or a measure of the intermediate costs of the economy. Further, the possibility to calculate product and country-specific rates of exchange rate pass-through into import prices enables to undertake a meaningful analysis of differences in pass-through rates across and within countries as arising from the product composition of imports exposed to exchange rate fluctuations.

One goal of this paper is to investigate how large could be the differential impact of changes in the euro exchange rate on the inflation rate of the different member countries. This differential effect could arise due to three main channels: different degrees of openness of the member countries economies to non-euro area imports; an heterogeneous product composition of imports coming from outside the euro area for given industry-specific rates of pass-through; or, different product and country-specific rates of pass-through to import prices for any given composition. The paper shows that the differences in inflation rates arising from a common euro

depreciation can be substantial and that most of these differences are due to the degrees of openness of the member states to products coming from non-euro area countries.

The rest of the paper is organized as follows. In the next section, we provide a review of the literature linking exchange rates and import prices. Section 3 describes the data used in the empirical analysis of this relationship. Section 4 presents the main results on the estimated pass-through elasticities to import prices. Section 5 gives a breakdown of the differences in pass-through rates to consumer prices and to the total cost of inputs accounted for by the openness of the country, the product composition of imports and the existence of product- and country-specific pass-through rates. Section 6 brings together some conclusions and points towards some areas for further work.

II. EXCHANGE RATES AND PRICES

Analyses of the linkages between exchange rates and prices have followed numerous paths. Early studies were motivated by the macroeconomic debate on exchange rates and monetarism. More recent studies focus on issues related to the degree of market integration associated with the fulfilment of the law of one price and with the role of market microstructure in the ability and desire of producers to price discriminate[3]. Empirical tests of associated hypotheses revolve around the familiar equation:

$$P_t = E_t P_t^* \qquad (1)$$

where P_t is the domestic price index, E_t is the nominal exchange rate (defined as the number of domestic currency units per unit of foreign currency), and P_t^* represents foreign prices. (Relative) purchasing power parity tests use price indices across countries to test whether this relationship holds. Law of One Price hypotheses test the same equation for individual goods prices traded across countries. As nicely discussed in Goldberg and Knetter (1997), costs of transportation or resale (such as trade barriers) might preclude price equalization but give rise to a stable wedge between price indices expressed in terms of equation (1).

[3] Goldberg and Knetter (1997) provide a very comprehensive overview of this literature.

Exchange rate pass-through studies consider the extent to which exchange rate movements are passed-through into traded goods prices, versus absorbed in producer profit margins or markups. Often these studies look at indices of industrial concentration or market power to explain pass-through differences or pricing-to-market. The textbook definition of exchange rate pass-through (ERPT) is the percentage change in local currency import prices resulting from a one percent change in the exchange rate between the exporting and the importing country. This definition is often empirically implemented as an statistical relationship of the elasticity of import prices to exchange rates. Evidence on tests of this relationship are basically the γ estimates based on a simple equation

$$p_t = g\, e_t + e_t \tag{2}$$

where all lower-cased variables are in logs and ε is an error term.[4] This reduced form equation (whether in log levels or growth rates) is problematic for hypothesis testing because it only represents a non-structural statistical relationship and lacks an economic interpretation. Micro-foundations of pricing behavior are required for generating more economically meaningful specifications that are appropriate for hypothesis testing.

If the dependent variable is the home currency price of imports of product j expressed in domestic currency, $P_t^{m,j}$, the pricing equation of an exporter of product j - and its elasticity of response to an exchange rate movement - depends on the structure of demand and costs confronting the exporter. If the import price $P_t^{m,j}$ is the dependent variable, the pricing rule of the foreign exporter x that drives the determination of the import price is:

$$P_t^{m,j} = E_t P_t^{x,j} = E_t MKUP_t^{x,j}\left(\frac{P_t^{m,j}}{P_t}\right) C^{x,j}\left(W_t^j, Y_t, E_t\right) \tag{3}$$

$$\text{where } MKUP_t^{x,j} \equiv \frac{P_t^{x,j}}{C_t^{x,j}},\ C_w^{x,j} > 0, C_E^{x,j} < 0, C_y^{x,j} > 0\,.$$

[4] The g's are background information for the monetary policy debate discussed in Taylor (2000) and estimated values are provided in studies such as McCarthy (2000). While Taylor argues that exchange rate pass-through elasticities appear to have declined over time for countries that have reduced their inflation levels and inflation variability, there have not been systematic analyses verifying this assertion.

In equation 3 $MKUP_t^{x,j}$ represents the markup rate of prices over costs for the exporter. Markup rates are industry-specific and depend on the demand curve facing exporters x in product j. This demand depends, in turn, on $P_t^{m,j}/P_t$, the prices of imports relative to prices of local competitors. $C_t^{x,j}$ is the marginal cost function of the exporter in its own currency. This exporter marginal cost function is increasing in export market wages, $W_t^{x,j}$, and in product j demand conditions, Y_t^j , and decreasing in the exchange rate measured as the number of units of the currency of the importer per unit of currency of the exporter[5]. The exchange rate is an argument in the exporter's cost function to the extent that the exporter relies on imported inputs or has other costs that move with the relative value of the destination market currency.

Equation 3 shows that empirical specifications seeking to isolate pass-through elasticities should introduce controls for the exogenous cost shifters entering into foreign exporter pricing decisions. Without such controls the measured relationship is a statistical correlation without specific economic interpretation in terms of exchange rate pass-through.

III. DATA DESCRIPTION

We focus in this paper on the pass-through of exchange rate changes into import prices of imports stemming from outside the euro zone into the twelve countries currently belonging to the area[6]. We use time series data on import unit values for thirteen different product categories for each destination country. We look at imports from outside the euro area since this is the part of the total trade of the countries that has continued to be exposed to exchange rate fluctuations after its creation in 1999. The inception of the euro has reduced significantly the degree of exposure to exchange rate fluctuations of the member countries' international trade, as well as altering the respective shares of the different products subject to those fluctuations. Figure 1 shows, for each country of the area, total imports and imports coming from outside EMU in 2000 as a share of GDP. As it can be seen, there are very large divergences among member countries as far as the ratio of non-euro area imports to GDP is concerned. Ireland is the country with the highest share of imports stemming from outside the area to GDP, reaching nearly 40% in 2000. At the other

[5] More precisely, one should include as the appropriate demand variable an index of income levels across the producer's home market and the destination market for its exports. Since we do no have information on the composition of demand facing exporters in different countries, our proxy here is the GDP of the importing country.

[6] In fact, due to data availability reasons, Belgium and Luxembourg are treated as a single country

end, for Italy that figure is only about 11%.

The distribution of non-euro area imports also varies widely across different product categories. Electric and electronic machinery, Basic manufactures and Mineral fuels account for the largest portion of non-euro area imports across all countries in the euro area. However, the shares of the various industries in overall non-euro area imports shows a large degree of heterogeneity with, for instance very large shares for the category Mineral fuels in Portugal, Greece and Spain, but relatively low shares in the category Electric and electronic machinery for these countries (Figure 2).

The database used in this paper includes monthly time series of unit values of imports from non-euro area countries for thirteen product categories. Eight of these categories are defined at the one-digit SITC level of aggregation and the other five are the result of disaggregating the remaining two one-digit categories, namely Manufactured products and Transport equipment, into respectively three and two subcategories[7]. This database has the advantage of focusing explicitly on the product composition of imports into the country and can thus account for different rates of pass-through among different product categories for any given country. Accounting for these divergences is important for any meaningful analysis of differences in pass-through rates across and within countries as divergences arising from the product composition of imports exposed to exchange rate fluctuations can account for a significant amount of the aggregate differences of import price pass-through across countries.

Working with such a large sample of product categories also comes at a cost. The import price data has several limitations for an analysis of pass-through behavior. It is an index based on unit values rather than prices, which poses some problems concerning the comparability of goods over time. These unit value measures do not properly account either for changes in the definition of product categories over time due to changes in quality or for changes in relative demand of similar goods or, finally, for changes in the composition of these imports by country of origin. It is still an aggregate price index, comprising all imported goods in the country within that product category. The definition of a product is determined by *ad hoc* international industry classifications rather than by some underlying economic argument. As a result, different product categories refer to very different shares of a

[7] See the data appendix for details regarding the data.

country's trade[8]. Given the micro evidence suggesting that large differences in pass-through might arise from differences in the product composition of trade (Knetter (1993), Giovannini (1988), Freenberg (1998)), one has to be careful in comparing and interpreting estimates of pass-through elasticities across countries with very different trade patterns. In order to maintain some comparability of the industry estimations across countries, we decided to use the same industry classification for all the countries in the sample.[9]

The other two relevant pieces of data are the nominal exchange rates and the marginal cost, or foreign price, proxy. An appropriate definition of these variables depends on an explicit determination of what is the relevant international market for the product. When world markets for the product are integrated, there exists only a single international market for the product, regardless of product origin, destination market or currency of denomination. In this case, any measure of the world price should be the same when expressed in a common currency. Appropriate measures of the foreign price and the exchange rate would be a proxy of the world price in a common currency and the bilateral exchange rate between the currency in which the foreign price is denominated and the home currency. In our case, the world price will be expressed in U.S. dollars.[10] Therefore, under this assumption of the functioning of international markets we will use, for a given product, the U.S. dollar price of the imports coming from outside the area as our proxy for the foreign price and the bilateral exchange rate between the domestic currency and the U.S. dollar as our exchange rate measure. We will call this specification the integrated market.

An alternative view of the international product markets regards these markets as highly segmented with a significant degree of price discrimination for the product depending on the countries of origin and destination of imports. Under this view of the world, an appropriate measure for the bilateral exchange rate and the foreign price index should be made contingent, for a given destination country, on the countries in which these imports originate. Under this assumption, we use as our proxy for the exchange rate for each industry the geometric weighted averages of the bilateral exchange rates of country j against its five major non-euro zone providers of imports of product i. The weights are given by each exporting country's share within

[8] For instance, product categories Beverages and tobacco and Goods n.e.s account for only 0.9% of trade while Transport and transport equipment accounts on average for 2.7% of each country's trade.

[9] We chose to do this despite the fact that the relative importance of each of these product groups varies significantly across the different member countries of the euro area.

[10] In fact any currency used as a *numeraire* would work. One could also use as a proxy for the world price an international price of the product and not necessarily the import price into the Euro area.

total imports of that good for the year 1996. For the foreign price, a geometric weighted average of the foreign price indices is also used, where the weights are the same as for the bilateral exchange rate. Ideally, a disaggregation of producer prices according to the types of product would have been used. However, these product specific series are not available for many exporting countries even at an aggregate level, which led us to resort to aggregate consumer prices instead. We will call this specification the segmented market.

Given these two alternative views about international markets, we will later perform a set of specification tests to determine which one of them appears to best describe the data from an empirical point of view.

In order to estimate the exchange rate pass-through, we begin with the following equation

$$\Delta \ln MP_t^{i,j} = c^{i,j} + \sum_{l=0}^{4} a_l^{i,j} \Delta \ln ER_{t-l}^{i,j} + \sum_{l=0}^{4} b_l^{i,j} \Delta \ln FP_{t-l}^{i,j} + v_t^{i,j} \qquad (4)$$

where the superscripts indexed by i and j refer, respectively, to an industry and to an importing country. We denote as $MP_t^{i,j}$ the import unit value index denominated in local currency of industry j in country i. $ER_t^{i,j}$ is the nominal effective exchange rate for industry j of country i expressed in terms of units of domestic currency per unit of foreign currency. Finally, $FP_t^{i,j}$ stands for the price index of imports of industry j into country i in the countries of origin of these imports and expressed in foreign currency.

Equation (4) is a generalized direct transformation of equation (1) where we have allowed for the possibility of partial adjustment of the rule setting import prices with a flexible form that includes four lags of the exchange rate and the foreign import price. In principle, the adjustment path of import prices could very well vary by industry according to the characteristics of the product, industry structure and other factors such as distance between trading partners or delivery lags. There could also be an important country-specific effect driven by macroeconomic factors of the country such as expected inflation rates or economic stability. We are not interested in this paper in explaining differences in the speed of price adjustment across industries but rather in capturing a measure of pass-through behaviour that is sufficiently robust to estimation technique by using a flexible functional form for its

estimation. Therefore, we will not try to identify the optimal lagged adjustment process for each industry/country combination in the sample.

We have taken for estimation the first differences of the variables in equation (1) to control for the possibility of nonstationarity and the existence of unit roots in the time series variables contained in these specifications. We selected this model specification over an error correction model after testing for the presence of unit roots in the original series (import unit values, exchange rates and the proxy for the foreign price) and for the existence of cointegration among the variables in equation (4). First, the existence of unit roots was tested by means of the Augmented Dickey Fuller test (with one lag and a trend). We found that we could not reject the null hypotheses of a unit root in about the half of all series. Afterwards, we searched for a long-run relationship between import prices, exchange rates and foreign prices. For that purpose, we performed Johansen tests to check for the number of cointegrating vectors and found that for the vast majority of industries the hypothesis of no cointegration could not be rejected[11]. Given this evidence against the presence of a cointegrating relationship we chose to perform the analysis in a single equation framework.

Short-run exchange rate pass-through estimates are given by the estimated coefficients $a_0^{i,j}$ while long run coefficients are given by $\sum_{l=0}^{4} a_l^{i,j}$. There are two benchmarks of pass-through estimates that we will focus on. A zero pass-through consistent with the idea that exporters fix import prices in the importer's local currency (LCP), and one which is consistent with producers pricing exports in their own currency (PCP).

IV. DISCUSSION OF RESULTS

We start by performing some model specification tests to try to determine which specification of market structure is more appropriate to our data. Two competing specifications were contrasted. The first one is a specification allowing for an integrated world market for tradable products priced in U.S. dollars, while the second advocates for a world of segmented markets in which the country of origin of the imports was important in determining the marginal cost (i.e. the opportunity cost) of imports into EMU.

[11] We allowed for two lags and for an intercept in the cointegrating equation. The existence of a cointegrating relationship could not be rejected in 20 out of 140 cases.

We performed the J-tests suggested by Davidson and McKinnon (1981). This is an specification test for non-nested models that consists in artificially building a nested model that comprises the non-nested alternative specifications. The test consists in introducing in one of the specifications (call it the initial specification) the fitted values from the other specification (the alternative) as an additional explanatory variable. Under the null hypothesis that the initial specification is the correct one and that the alternative does not contain any additional information, the estimated coefficient on the fitted values of the alternative specification should be zero. One can then perform the opposite analysis and introduce in the alternative specification the fitted values from the original specification as an additional explanatory variable. Under the null hypothesis that the alternative specification is the correct one, the estimated coefficient on the fitted values of the original specification should be zero. One of the drawbacks of this J-test is that since we have two null hypotheses, the results can be inconclusive. We can reject both nulls, i.e. both specifications contain information beyond what is explained by the other specification, or we can fail to reject both of the null hypotheses, i.e. neither specification contains information beyond what is contained in the alternative one.

The results from the J-test are reported in table 1 for all the combinations of industry and country in our sample. The test rejects the hypothesis that the specification of the integrated market does not explain the specification of the segmented market in over 50% of the cases. The test can only reject the specification that the segmented market specification does not explain the integrated market specification in 5% of the cases (7 out of 140). For the rest of the cases, the test is inconclusive. In 56 instances, the J-tests rejects both null hypotheses, i.e. that one specification does not explain the other specification. This tendency to reject the null hypotheses too often is one of the well-known weaknesses of this test in finite samples (see MacKinnon, 1992).

Fisher and McAleer (1981) and Godfrey (1983) propose to do a simple adjustment to the initial test and to perform a similar test J_A which has much better finite-sample properties under the null than the ordinary J test.[12] The results from this test are presented in table 2. Again the evidence indicates that the integrated market specification seems more appropriate. The test rejects the hypothesis that the

[12] The difference between this test and the J-test lies in how the fitted values to be used as an additional regressor are estimated. The estimated fitted values of the alternative specification in the J_A test are those resulting from the estimation of a regression in which the dependent variable is the fitted values from the initial specification and the exogenous regressors are those of the alternative specification.

integrated market does not explain the segmented market specification in 55 instances, while the opposite happens in only 3 instances. We conclude from this evidence that the specification that assumes the existence of an integrated world market and uses the U.S. dollar as the non euro currency which is relevant for trade is the most appropriate model.[13]

The kind of reasons for which the model formulated in the effective terms variables does not work properly can be seen most intuitively in the case of product 3 from the SITC (Mineral fuels). This is mainly composed of hydrocarbons. The market for such products (think about oil) is a highly integrated one in which prices are settled in US dollars and trade is invoiced in this currency. Then, for a country belonging to EMU, the fluctuations of its currency which will be relevant when trying to assess the degree of pass-through will be those against the US dollar and not those against the currencies of oil exporting countries (usually, developing countries, say, Saudi Arabia or Iran). In fact, for this particular industry, there is a large variety of exchange rates regimes among exporting countries. These regimes are often characterised by systems of multiple exchange rates and associated import and capital controls and regulations, usually entailing a large degree of complexity[14]. Developments in the exchange rate series resulting from such regimes do not necessarily have an impact on the prices of the imports made by developed countries.

We perform the estimation of equation (4) by ordinary least squares and estimate the short-run and long-run pass-through elasticities for all the different industry/country combinations. The values of these estimated elasticities are reported in Table A1 in the appendix. In the short-run, exchange rate pass-through is positive but incomplete. Columns two and three of table 3 report the estimated short-run and long-run pass-through elasticities when the restriction that these elasticities are the same for all industries within a given country are imposed. In the short-run pass-through is clearly incomplete. Indeed, both the hypotheses of zero pass-through and complete pass-through can be rejected for all countries in the sample except Spain. The short-run elasticities are larger for Spain, Italy and Finland and smallest for Austria and Greece. In the long-run pass-through is much larger. The hypothesis of complete pass-through can only be rejected for Austria, Germany and Ireland. On

[13] We use two additional criteria for model selection: the Akaike Information Criterion and the Schwarz Bayesian Criterion. Both of these confirmed the results from the J-test that the integrated model specification fit the data best.

[14] For instance, Iran had a system of multiple exchange rates until 1993. On the other hand, Saudi Arabia and the remaining Gulf countries have been pegging their currencies to the US dollar from the early or mid eighties.

average for the euro area, short-run pass-through is 0.61, while the estimated long-run rate is 0.81.

Estimated pass-through coefficients vary by industry. A zero short-run pass-through can be rejected for a large majority of industries (Table 3, columns 4 and 5). Across countries, zero pass-through can be rejected for more than 70% of the industries in six of the eleven countries (France, Belgium, Netherlands, Germany, Italy, and Spain). For Ireland and Greece zero pass-through is rejected for only 25% of their industries. However, pass-through is clearly incomplete in the short run. For all the countries in the sample, except Finland, complete pass-through could be rejected in at least 45% of the industries.

In the long-run, pass-through is much higher and basically not different from one. A long-run pass-through of one could not be rejected for more than one industry in seven of the eleven countries in the sample (last two columns of Table 3). Only for France and Germany we do find slight evidence that long-run pass-through might be less than one. For both countries, the hypothesis of complete pass-through could be rejected in 31% of their industries. This evidence of incomplete pass-through for larger countries is consistent with some of the micro evidence that suggests that pricing-to-market and incomplete pass-through are more common for exports to large countries (Knetter 1993 and Yang 1997).

The estimated elasticities also differ by type of product. We estimate the pass-through elasticities by imposing the restriction that they are equal for a given industry across the eleven countries in the sample (columns two and three of table 4). These estimated industry elasticities vary from a low of 0.40 for Electric and electronic machinery, to values above 0.80 for primary commodities such as Food, Animal and vegetable oils and fats and Mineral oils and fuels, and also for the industry producing Precision equipment. Again, pass-through tends to be complete in the long run. A pass-through lower than one in the long run can only be rejected for Electric and electronic machinery and Home equipment.

The equality of pass-through elasticities across countries for a given industry and within a country for the different industries is of considerable interest. The empirical micro evidence suggests the existence of a large extent of international price discrimination. However, most of this literature concludes that the degree of pass-through is primarily industry-specific and fairly constant for a given industry across countries (Goldberg and Knetter, 1997). Campa and Goldberg (2002) also

conclude that pass-through rates have been stable in time and are constant for a given industry across countries. They point that most of the observed variations in aggregate pass-through rates over time in a country can be explained by changes in the product composition of imports. Many of the current literature in international finance also emphasizes macro phenomena as a key driving source for pass-through rates within a country (Devereux and Engel 2001).

We have performed tests for the equality of pass-through rates across countries and industries (table 5). Short-run pass-through rates differ substantially. In general, we can reject that pass-through rates in the short-run are equal for all industries within a given country and for a given industry across the eleven countries in our sample. In the long run, pass-through rates tend to converge. Statistically, it is difficult to reject the null hypotheses that they are constant for a given industry or across industries in a given country. The equality of long-run elasticities can only be rejected for Greece. This lack of rejection is not surprising given that, as discussed above, long-run pass-through rates are not statistically different from one in most cases.

The creation of the monetary union implies a change in the proportion of imports and total sales in each EMU market that is exposed to exchange rate movements. The literature on the determinants of exchange rate pass-through strongly emphasizes the market share of domestic and foreign producers (i.e. the proportion of the market that is subject to an exchange rate change) as one of the key determinants of the pass-through elasticity. The creation of the euro has significantly changed this proportion. Prior to the introduction of the euro a home currency depreciation increased the relative price of imports both from current non-euro and euro members. After the creation of the euro, only the share of imports coming from outside the area is affected by a euro depreciation.

We have tested for the time stability of the estimated parameters in our specification. We performed this test by assuming that a break might have taken place in May 1998, the month in which the decision to fix permanently the exchange rates among the euro constituent currencies was taken. We could not reject in most instances the hypothesis that the parameters were stable. Given the short length of the subsample period after that date, we also performed tests proposed by Andrews (1993) and Andrews and Ploberger (1994) to check for the existence of an

endogenous break any time during our sample period.[15] We only found some statistical evidence for four countries that a structural break might have occurred during the fall of 1998 in the oil industry. This structural break was most probably primarily driven by the large swing in the world price of oil during that period rather than having any link to the creation of the single currency. Also in this case, four instances of a break were found which, for a total of 140 country/industry combinations, lies within what should be statistically expected at the 5% confidence level. We conclude from this evidence that a structural break has not occurred systematically during our sample period.

V. IMPLICATIONS FOR DIFFERENTIAL EFFECTS IN AGGREGATE INFLATION RATES WITHIN A MONETARY UNION

In this section, we attempt to provide a first grasp to the differential impact that movements in the exchange rate of the euro can have on aggregate indicators of inflation across countries. We will focus on two simple exercises: what is the pass-through of exchange rates movements into the aggregate consumer price index of a country (due to goods imported for final consumption) and what is the pass-through into the overall costs of production (due to imported inputs). More precisely, an approximation to the aggregated transmission of exchange rate movements to overall costs of production and to consumer prices can be computed through some weighted aggregation of the pass-through rates obtained for the import prices of each type of product. Our two simple accounting exercises in this section intend to be suggestive of the degree of differential impact among the members of the euro area that can accrue due to the heterogeneities in the structure of their international trade. The objective here is neither to identify the primary sources of these differential effects nor to draw any policy implications for the presence of these differential effects. The goal is much more modest and mainly statistical. We hope to get a broad sense on what is the size of these effects (if they do exist at all) and to determine whether heterogeneous trade structures seem to be a relevant source of inflation differentials within the euro area.

The evidence found in the previous section suggests that, in the long run, the equality of pass-through rates to import prices cannot be rejected neither across the different industries of a given country nor for the same industry across countries.

[15] We computed the three different tests proposed by these papers and computed the p-values for the tests following the method proposed by Hansen (1997). Hansen (2001) provides a good survey of this literature.

These findings suggest that differential pass-through rates across countries due to industry composition are not likely to be big. However, our evidence also suggests that pass-through was better captured by an specification that allowed for the presence of an integrated world market in each industry rather than for the presence of a set of markets segmented by country of origin and destination of the products being traded. This emphasis on the importance of industry structure is consistent with some of the previous evidence suggesting that exchange rate pass-through is an industry phenomenon. This literature highlights industry structure characteristics such as the number of competitors, the international location of the competition and the degree of imperfect competition present in each industry as important determinants of industry pass-through rates (Campa and Goldberg (2001), Knetter (1993)). On these grounds and given our interest in assessing to what extent possible differences in overall pass-through rates are due to an heterogeneous industry composition of trade across countries, we have used for our analysis below the point estimates of long-run pass-through for each industry (imposing equality across countries).

To estimate these effects let us start by conceiving a price index (either for consumer prices or for the aggregate costs of inputs) for country i belonging to the euro area as the result of two successive decompositions. The first decomposition allows us to express the price index as a weighted average of the different products entering the index:

$$PI^i = \prod_j (p_t^{i,j})^{w_t^{i,j}} \qquad (5)$$

where $w^{j,j}$ is the weight of the product category j in the aggregate index of country i. Next, we further disaggregate the component referring to each product category into three subcomponents, which are defined according to the geographical origin of the products. These three product subcategories are a domestic product, a product imported from another euro area member country and a product imported from outside the euro area. Therefore, as a result of this second decomposition, we can express the price index of country i as

$$PI^i = \prod_j (p_t^{i,j})^{w_t^{i,j}} = \prod_{jd} (p_t^{i,jd})^{w_t^{i,jd}} \prod_{je} (p_t^{i,je})^{w_t^{i,je}} \prod_{jn} (p_t^{i,jn})^{w_t^{i,jn}} \qquad (6)$$

where the superscripts jd, je, and jn indicate for product category j, the shares of its final or intermediate consumption which are respectively satisfied by products produced domestically, in other euro area countries and in non-euro area countries.

Taking first differences of the logs of that expression and assuming that the weights are constant over time we obtain that

$$\Pi^i = \sum_{jd} w^{i,jd}\Pi_t^{i,jd} + \sum_{je} w^{i,je}\Pi_t^{i,je} + \sum_{jn} w^{i,jn}\Pi_t^{i,jn} \qquad (7)$$

where Π does not stand any more for the product operator but for inflation.

The effect on aggregate prices can be decomposed in the sum of these three categories. A lower bound of the effect of exchange rate changes on inflation is obtained by considering only the effect due to the last term of the right hand-side of the equation and by assuming that the other two are zero. This is the direct effect arising from the pass-through to the prices of products imported from outside the euro area, i.e. assuming that pass-through to prices of goods produced domestically and in other euro area countries is zero.

The shares of imports from outside the area within total imports have been obtained using the input-output tables for each country (for a date as close as possible to 1995) and the Comext external trade database. In particular, in the case of intermediate consumption, the input-output tables show, for every industry producing final goods, the decomposition of intermediate consumptions between those which are domestically produced and those that are imported. Similarly, in the case of consumption goods, the tables show which part of the demand for each product is satisfied through domestic production and imports. However, among imported products, what the tables do not show is the decomposition according to their origin (other euro area economies vs. third countries). It is at this point that the Comext database is used, since it offers, for our thirteen product categories, the shares of imports coming from outside the area within total imports. Since the degree of product disaggregation in the input-output tables is much larger, it has been necessary to match them with the 13 categories obtained form Comext. Besides, given the lack of more detailed information, we needed to make the assumption that, for each good entering the production process as intermediate consumptions, the share of imports originated outside the area within total imports is the same for all the

industries producing final goods. The same assumption is made when the product enters final instead of intermediate consumption.

As previously stated, our exercise has been performed for two different price indices: the consumer price index and the price index of the products used as intermediate inputs in the production process. The results, which appear, respectively, in Figures 3 and 4 refer to the impact of a 10% depreciation of the exchange rate of the euro. Since we have imposed that, for a given industry, pass-through rates to import prices are the same across countries, divergences in pass-through rates to aggregate price indices can be due to two sources. First, they could be due to the differences in the degree of openness of the member countries (assuming that the composition of imports were the same for all countries). Second, for a given degree of openness, differences in the product composition of imports can also result in differences in aggregate pass-through if product-specific pass-through rates vary a lot by industry. We will distinguish between these two effects by estimating the pass-through rates with each country's own degree of openness and by imposing the same degree of openness (the average for the euro area) in all countries.

The estimated pass-through rates to the aggregate cost of intermediate inputs are depicted in Figure 3 for the EMU member countries. Lighter-colored bars correspond to the aggregate rates calculated for each country under its own degree of exposure to non-euro area imports (what we have called degree of openness). Thus, observed differences in the size of these bars between countries are both the result of the heterogeneity in the degree of openness and in the industry composition of trade. Conversely, darker-coloured bars are calculated by imposing that the degree of openness of all countries is the euro area average. Thus, remaining differences in the dark bars across countries are solely due to the heterogeneity in the structure of their imports of inputs.

Consider first the light-colored set of bars. The average aggregate pass-through rate into the total costs of intermediate production after a 10% euro depreciation is 1.2 for the euro area. By country, Ireland, Belgium and the Netherlands show the highest rates of pass-through. In particular, Ireland’s pass-through of 2.3 is by far the largest, almost doubling the European average. At the other end, Italy, Portugal and Spain have the three lowest pass-through rates, all of them below 0.8%.

Turning now to the darker bars in figure 3, differences in estimated pass-through are much smaller. In this case, differences in pass-through rates across countries are due to differences in the product composition of imports of inputs stemming from outside the area. In particular this shows that Ireland's high pass-through rate is mainly due to its higher degree of openness to non-euro area imports. The range goes from a high of 1.3 for Portugal to a low of 0.8 for the Netherlands. Portugal, Greece and Austria have slightly larger rates, suggesting that they tend to import products with higher pass-through elasticities, while the Netherlands and France show the lowest estimates.

The estimated pass-through rates to consumer price indices are much lower than to costs of production (see figure 4). On the face of a 10% depreciation of the euro exchange rate, the average pass-through rate for the euro area is below 0.5. Compared to the case of intermediate consumption, this lower rate of pass-through is not surprising. Imported products have a lower weight in the basket of final consumption products that in total intermediate inputs used in production. Non-tradable products play a much more important role in the consumer price index. Nevertheless, the same pattern that we saw for production costs applies to consumer prices. Differences in aggregate rates of pass-through are mainly due to divergences in the degree of openness to imports originating in non-euro area countries. Under their own degree of openness (light-colored bars), Ireland and Belgium show again the highest levels of exchange rate pass-through, while Italy, France and Spain have the lowest.

Again, differences among countries almost disappear once we impose that they all have the same degree of openness (dark bars). Portugal and Austria are again among the countries which have a product composition of extra-EMU imports in consumer goods that leads them to slightly higher pass-through rates, while Finland, Germany and the Netherlands have lower rates. The overall range is quite small, from a high of 0.48 for Belgium to a low of 0.24 for Finland.

The effect identified in this section should be considered only a lower bound on the likely impact of exchange rate movements in final consumer prices. Prices of domestically produced goods and of goods imported from other euro area countries competing with imports from outside the area are likely to move in direct response to the behavior of the prices of the later. Furthermore, to the extent that domestic goods and imports from the euro area use imported products from non-euro countries as

inputs in their production process, their production costs will move in the same direction as the price of non-euro imports. This change in production costs for these goods will also probably be transmitted into the price of the final product. These kind of indirect effects have not been taken into account in our exercise. Nevertheless it seems unlikely that accounting for these effects will substantially alter the basic result, mainly that differences in aggregate pass-through rates across countries are primarily driven by differences in the degree of openness to non-euro trade.

VI. CONCLUSIONS

This paper has focused on the pass-through of exchange rate changes to prices of extra-EMU imports into the twelve countries that are the current members of the euro area. The member countries differ substantially in their exposure to imports from non-euro area countries both in terms of the degree of openness to non-euro imports and in the product composition of these imports. We have focused on imports from non-euro area member countries since this is the part of the total trade of the countries which has continued to be exposed to exchange rate fluctuations after the creation of the euro zone in 1999.

We have used time series data on import unit values for thirteen different product categories for each country. The empirical evidence suggested that international goods markets are fairly integrated. An empirical specification that allowed for the presence of an integrated world market fitted the data better than an specification allowing for the presence of a set of segmented markets by country of origin and destination of the products being traded.

Exchange rate pass-through is incomplete in the short-run. Average pass-through in the short run is around 0.6. Pass-through increases in the long-run, when the hypothesis of 100% pass-through cannot be rejected for the majority of industries. Furthermore, long-run pass-through rates do not differ significantly across countries or industries.

Movements in the euro exchange rate have different effects in the evolution of aggregate prices in the member countries. Ireland, followed by Belgium and the Netherlands, experience a quite larger impact on aggregate prices from movements in the euro exchange rate. Southern countries such as Italy, France and Spain tend to show lower effects. This differential is mainly due to differences in the degree of openness of each member country to imports from outside the euro area. Differences

in the product composition of imports and in the rates of pass-through across countries have a smaller effect.

Two important areas of extension of the current exercise can be pursued. The quantitative exercise performed focuses only on the direct effect of euro exchange rate movements on aggregate prices arising from the behaviour of prices of non euro imports. It did not allow for any reaction of the prices of domestically produced goods or of imports from other euro area countries to exchange rate movements. Obviously, to the extent that these goods are competing with each other and substitution exists we should expect the prices of goods produced domestically to be affected. Second, the exercise did not take into account that a large component of value added of imported products is generated in the importing country. To the extent that distribution costs, transportation charges and taxes and margins of distributors are an important part of final import prices, the behaviour of final prices might differ. Some of the recent literature on the persistence of real exchange rate deviations has begun to focus on the importance of these factors.[16] Some empirical evidence on the role that these components of domestic value added have on the adjustment of prices to exchange rate movements is pending and highly desirable.

[16] See for instance, Burnstein, Neves and Rebelo (2001), Corsetti and Lucca, (2002), Engel and Rogers (1996) and Engel (2001).

DATA APPENDIX:

Import Prices: are monthly unit value indices of imports from non-euro area countries of thirteen product categories for eleven countries (Austria, Belgium-Luxembourg, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain) from 1989:1 to 2001:3. The data is not seasonally adjusted. For Austria and Finland the series start in 1995. We have used products at the 1-digit SITC level, with the exception of the product categories 7 and 8, which we have disaggregated into three and two subcategories, respectively, given their overall importance in total imports. The list of products is:

SITC	Product Category
0	Food and live animals chiefly for food
1	Beverages and tobacco
2	Crude materials, inedible, except fuels
3	Mineral fuels, lubricants & related materials
4	Animal and vegetable oils, fats and waxes
5	Chemicals and related products, n.e.s.
6	Manufactured goods classified chiefly by materials
71 to 74	Heavy machinery
75 to 77	Electric and electronic equipment
78 and 79	Vehicles and transport equipment
81 to 85 and 89	Home equipment and clothing
87 and 88	Precision equipment
9	Goods n.e.s.

Exchange Rates: are the monthly nominal exchange rate indices (period averages) expressed in units of domestic currency per unit of foreign currency. Two alternative definitions of the nominal exchange rates have been used. The first one, entering the specification that we have named as "integrated markets" specification, consists of the bilateral exchange rates against the U.S. dollar. The second one, used in the so-called "segmented markets" specification, are multilateral exchange rate indices which, for a given product and importing country, are computed as the geometric weighted average of the bilateral exchange rate indices against the five major trading partners. The top five trading partners are those with the largest amount of exports in each product and importing country in 1996. The source of the exchange rate series is IMF (International Financial Statistics) and the source of the

trade flows to determine the five largest trading partners is the domain "Indices SITC_R2_1D since 1979" of Eurostat's COMEXT database.

Foreign Price Index: is a monthly series of the world price of the product category. This world price is also computed in two different ways. For the integrated markets specification it is the U.S. dollar price of the unit value index of imports of that product category into the euro area. For the segmented markets specification, it is constructed as the geometric weighted averages of the consumer price indices of the top five trading partners for each product and country. Ideally, instead of consumer price indices one would have wished to use producer price indices (possibly even disaggregated into product categories). However, the unavailability of such data forced us to use the CPIs. Weights are the same as for the multilateral exchange rates. The source for the unit value index of imports is COMEXT and for the consumer price indices is IMF (International Financial Statistics).

Input-Output tables: For Finland, France, Germany, Greece, Italy, Netherlands and Spain, the tables come from the OECD Input-Output database and they refer to the year 1995, except for Greece (1994), Italy (1992) and the Netherlands (1996). The data can be downloaded from http://www.oecd.org. For Belgium the data refers to 1990 and it comes from the National Bank of Belgium. For Austria, Portugal and Ireland the data refers to 1995 and the source is Eurostat.

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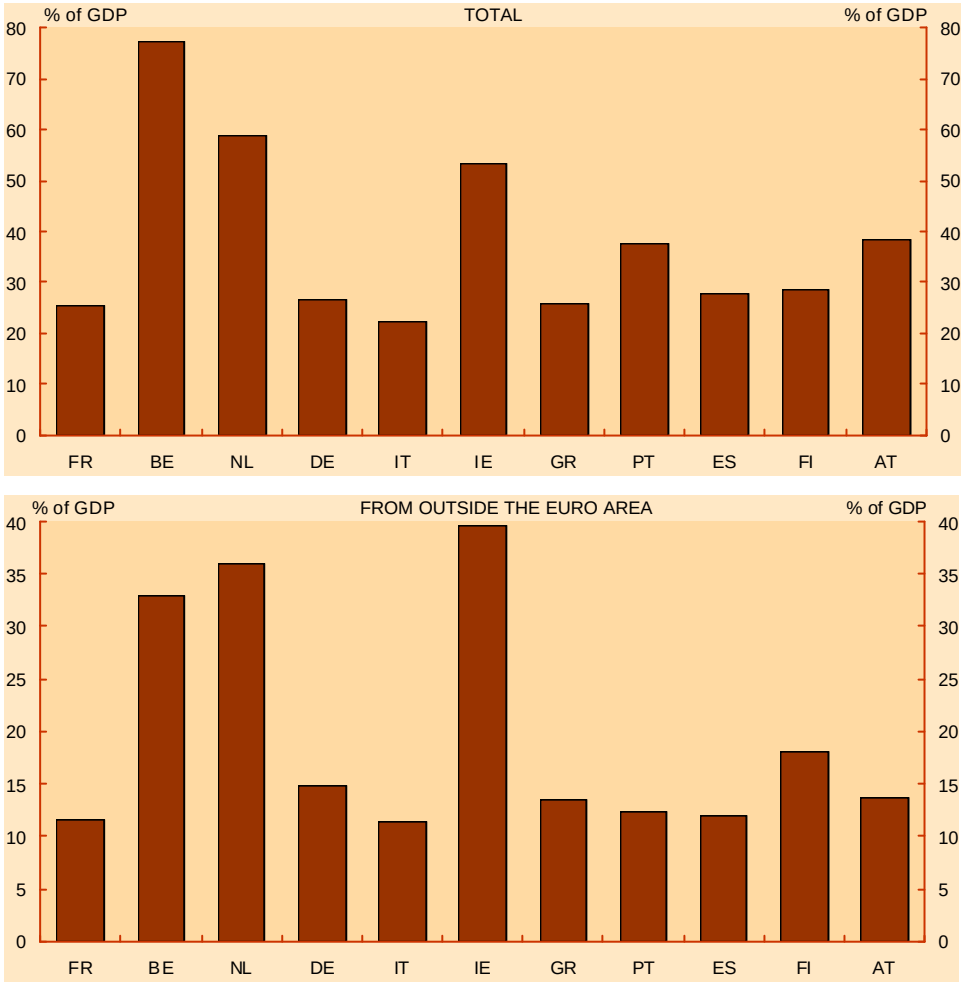
FIGURE 1

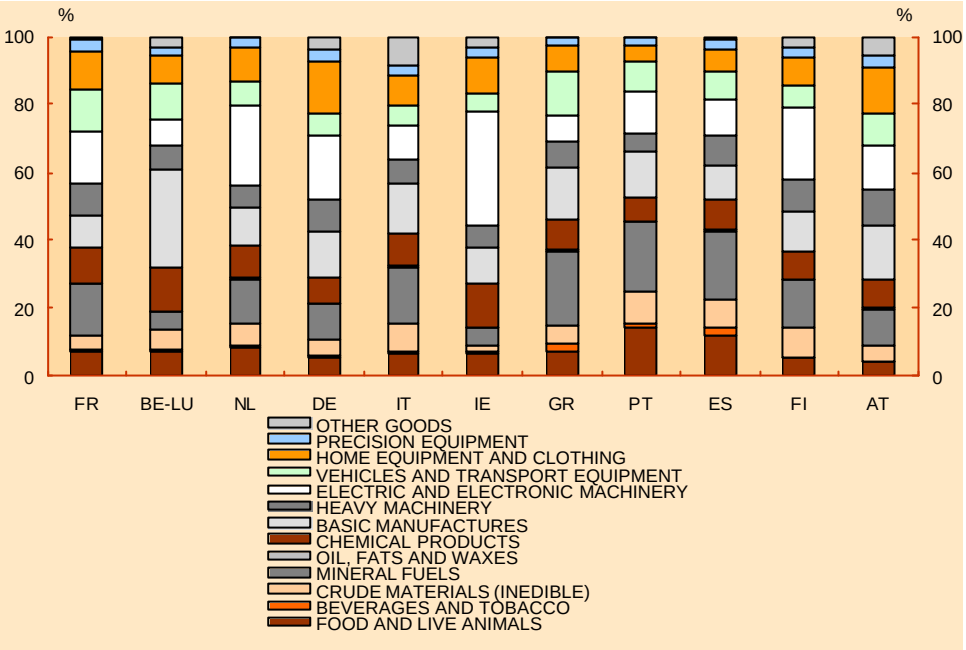
Imports of goods (2000)



Source: Eurostat.

FIGURE 2

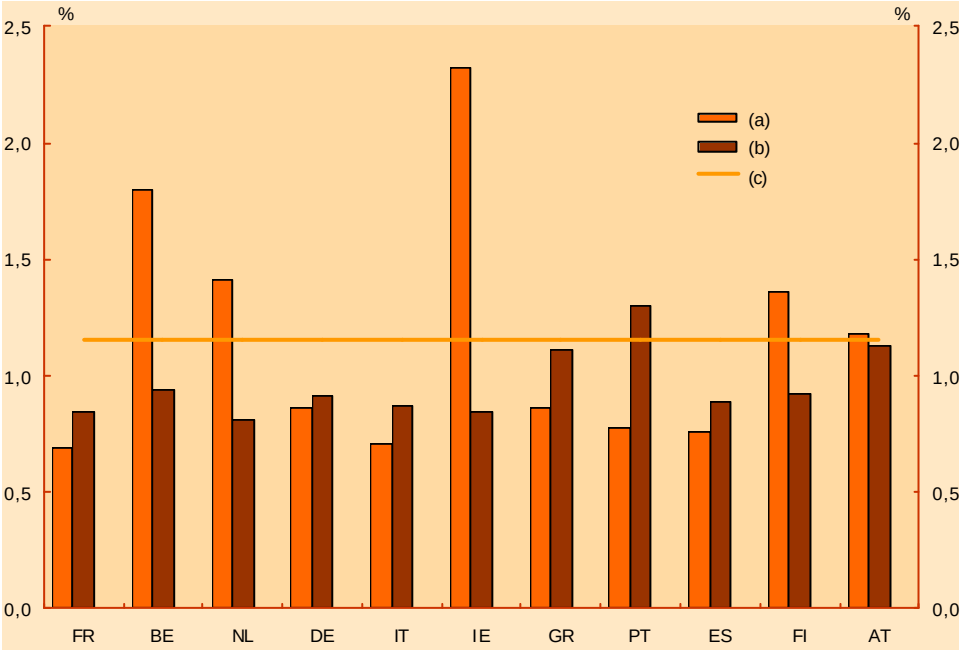
Composition by product of extra-EMU imports of goods (1996)



Source: Eurostat.

FIGURE 3

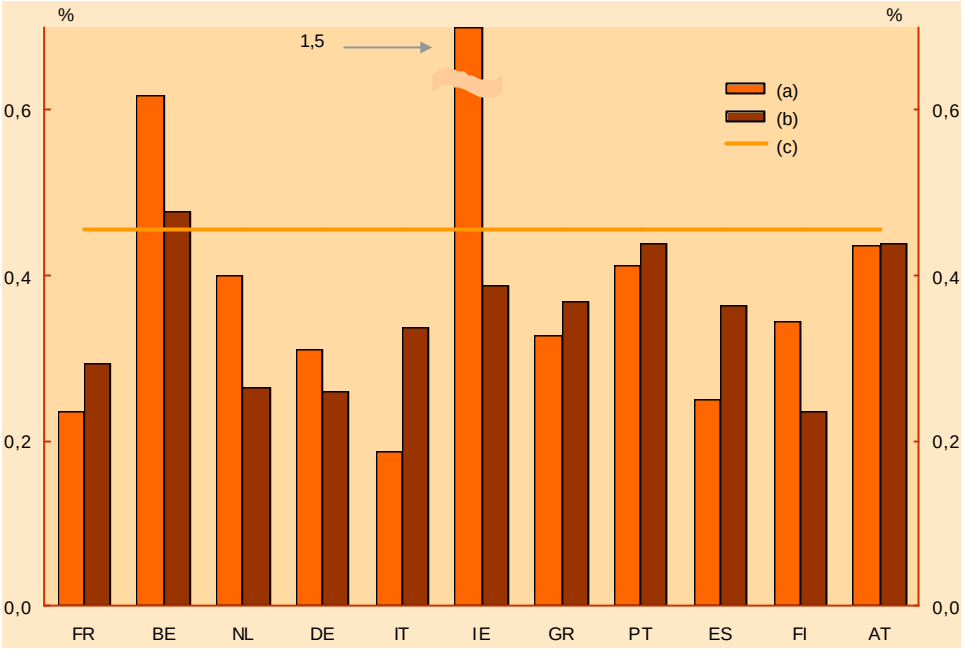
Pass-through rates to the cost of intermediate consumption (for a 10% depreciation)



Source: Own calculations.
(a) Calculated with the own degree of openness.
(b) Calculated with the average degree of openness.
(c) Average of rates calculated with the own degree of openness.

FIGURE 4

Pass-through rates to consumer prices (for a 10% depreciation)



Source: Own calculations.
(a) Calculated with the own degree of openness.
(b) Calculated with the average degree of openness.
(c) Average of rates calculated with the own degree of openness.

TABLE 1: J TEST RESULTS FOR MODEL SELECTION: "INTEGRATED" VS. "SEGMENTED"

This table reports the results from specification tests between two non-nested models of international market integration: the integrated market and the segmented market model. The J test is a test of whether the coefficient α is significantly different from zero in the regression $y_t = (1-a)x_t b_1 + a z_t \hat{b}_2 + u_t$ where x_t and z_t indicate respectively the exogenous variables under the two alternative model specifications, and $\hat{b}_2$ is the estimated coefficient from the regression of y_t on z_t. A rejection of the null hypothesis that the integrated model does not explain the segmented model is a rejection that α is zero when x_t and z_t refer to the segmented and integrated model respectively.

Product	0	1	2	3	4	5	6	7.1	7.2	7.3	8.1	8.2	9
France	I	S/I	S/I	I	S/I	I	I	I	I	I	I	I	S/I
Belgium-Luxembourg	I	I	I	I	S/I	I	I	I	I	-	I	S/I	S/I
Netherlands	I	I	I	S/I	I	S/I	I	S/I	I	S/I	I	I	I
Germany	I	S/I	I	I	I	I	I	S/I	I	S/I	I	I	I
Italy	I	I	I	I	S/I	I	I	S/I	-	S/I	S/I	S/I	I
Ireland	I	S/I	S/I	S/I	S/I	S/I	I	S/I	-	S	I	S/I	No data
Greece	S/I	I	I	S/I	I	S/I	S/I	S/I	S	No data	S/I	S/I	S/I
Portugal	S/I	S/I	I	I	I	S/I	S/I	S/I	I	S/I	S/I	S	S
Spain	I	I	I	S/I	I	I	I	S/I	I	I	S/I	S/I	I
Finland	I	I	I	S/I	S/I	I	S/I	S/I	S	I	S/I	S/I	No data
Austria	S/I	I	I	I	I	S/I	I	S	S	S/I	I	S/I	S/I

I = the null hypothesis that the "integrated" model does not explain the "segmented" model is rejected.
S = the null hypothesis that the "segmented" model does not explain the "integrated" model is rejected.
S/I = both hypotheses are rejected.
- = neither hypothesis is rejected.

TABLE 2: J_A TEST RESULTS FOR MODEL SELECTION: "INTEGRATED" VS. "SEGMENTED"

This table reports the results from the J_A specification test between two non-nested models of international market integration: the integrated market and the segmented market model. The J_A tests whether the coefficient α is significantly different from zero in the regression $y_t = (1-a)x_t b_1 + az_t \hat{b}_2 + u_t$, where x_t and z_t indicate respectively the exogenous variables under the two alternative model specifications, and $\hat{b}_2$ is the estimated coefficient from the regression of $x_t \hat{b}_1$ on z_t when $\hat{b}_1$ is the estimated coefficient from the regression of y_t on x_t. A rejection of the null hypothesis that the integrated model does not explain the segmented model is a rejection that α is zero when x_t and z_t refer to the segmented and integrated model respectively

Product	0	1	2	3	4	5	6	7	8	9
France	I	S/I	I	I	-	-	I	I	I	-
Belgium-Luxembourg	I	I	I	I	I	-	I	-	I	-
Netherlands	I	I	-	I	I	I	I	-	I	-
Germany	I	-	I	I	I	I	I	I	I	I
Italy	I	-	I	I	I	I	I	I	I	I
Ireland	I	-	-	-	-	S	I	-	I	No data
Greece	-	I	-	-	-	-	-	-	-	-
Portugal	-	I	I	I	-	-	-	I	-	-
Spain	I	I	I	I	I	-	I	-	I	-
Finland	-	-	-	I	-	S	-	-	-	No data
Austria	-	-	-	I	-	S	-	-	-	-

I = the null hypothesis that the "integrated" model does not explain the "segmented" model is rejected.
S = the null hypothesis that the "segmented" model does not explain the "integrated" model is rejected.
S/I = both hypotheses are rejected.
- = neither hypothesis is rejected

TABLE 3: DIFFERENCES IN PASS-THROUGH RATES BY COUNTRY

Country	Pass-through rates by country		Percentage of total industries for which the specified hypothesis can be rejected (1)			
			Short-run		Long-run	
	Short-run	Long-run	Pass-through rate is zero	Pass-through rate is one	Pass-through rate is zero	Pass-through rate is one
France	0,63*+	0,80*	0,85	0,62	0,85	0,31
Belgium-Luxembourg	0,48*+	0,87*	0,77	0,46	0,69	0,08
Netherlands	0,69*+	0,77*	0,92	0,46	0,69	0,15
Germany	0,69*+	0,77*+	0,92	0,69	0,77	0,31
Italy	0,75*+	0,96*	0,85	0,62	0,77	0,08
Ireland	0,39*+	0,55*+	0,25	0,58	0,17	0,08
Greece	0,34*+	0,88*	0,25	0,75	0,25	0,00
Portugal	0,68*+	0,80*	0,62	0,46	0,31	0,08
Spain	0,93*	1,20*	0,85	0,54	0,77	0,08
Finland	0,76*+	0,87*	0,50	0,33	0,42	0,00
Austria	0,32*+	0,42*+	0,38	0,62	0,23	0,15
Average	0,61	0,81				

Sources: Eurostat (Comext database) and own calculations.
(1) The total number of industries is 13, except for Greece (where no data for the industry "Vehicles and transport equipment" are available) and Ireland and Finland (no data for "Other goods").
*/+: it can be statistically rejected that the pass-through rate is zero/one.

TABLE 4: DIFFERENCES IN PASS-THROUGH RATES BY INDUSTRY

Industry	Pass-through rates by industry		Percentage of countries for which the specified hypothesis can be rejected (1)			
			Short-run		Long-run	
	Short-run	Long-run	Pass-through rate is zero	Pass-through rate is one	Pass-through rate is zero	Pass-through rate is one
Food	0,84*+	0,92*	0,91	0,36	0,64	0,09
Beverages and tobacco	0,45*+	0,71*	0,27	0,82	0,45	0,36
Crude materials, inedible, except fuels	0,68*+	0,97*	0,73	0,45	1,00	0,00
Mineral fuels	0,82*+	1,04*	0,91	0,45	0,73	0,09
Oils, fats and waxes	0,86*+	0,88*	0,73	0,36	0,64	0,00
Chemicals	0,74*+	0,81*	0,64	0,36	0,45	0,00
Manufactured goods	0,77*+	0,97*	0,91	0,55	1,00	0,18
Heavy machinery	0,58*+	0,75*	0,55	0,64	0,36	0,18
Electric and electronic machinery	0,40*+	0,66*+	0,55	1,00	0,55	0,00
Vehicles and transport equipment	0,49*+	0,57*	0,27	0,64	0,09	0,36
Home equipment and clothing	0,78*+	0,66*+	0,91	0,55	0,55	0,27
Precision equipment	0,86*+	0,82*	0,73	0,36	0,36	0,00
Other goods (miscellaneous)	0,47*+	0,74*	0,33	0,67	0,11	0,00
Average	0,67	0,81				

Sources: Eurostat (Comext database) and own calculations.
(1) The total number of countries is 11, except for the industries "Other goods" (with data just for 9 countries -all but Ireland and Finland-) and "Vehicles and transport equipment" (with no data for Greece).
*/+: it can be statistically rejected that the pass-through rate is zero/one.

TABLE 5: TEST OF THE EQUALITY OF SHORT- AND LONG-RUN PASS-THROUGH ESTIMATES (P-values)

This table reports the p-values from a test of the restrictions that the estimated short-run and long-run pass-through elasticities are the same for all industries within each country (left panel) and that they are constant for a given industry in the eleven countries in the sample (right panel).

COUNTRY	EQUALITY ACROSS INDUSTRIES WITHIN EACH COUNTRY	
	S/R	L/R
France	0.000	0.564
Belgium-Luxembourg	0.008	0.890
Netherlands	0.201	0.929
Germany	0.000	0.612
Italy	0.033	1.000
Ireland	0.005	0.743
Greece	0.001	0.026
Portugal	0.106	0.946
Spain	0.000	0.840
Finland	0.000	0.317
Austria	0.690	0.860
% of rejections (at 5% level)	72.7%	9.1%

INDUSTRY	EQUALITY ACROSS COUNTRIES WITHIN EACH INDUSTRY	
	S/R	L/R
0. Food	0.000	0.658
1. Beverages and tobacco	0.000	0.208
2. Minerals (non fuel)	0.000	0.973
3. Minerals (fuel)	0.145	0.588
4. Oils, fats and waxes	0.460	0.827
5. Chemicals	0.003	0.777
6. Basic manufactures	0.000	0.592
7.1. Heavy machinery	0.006	0.819
7.2. Electric and electronic machinery	0.000	0.758
7.3. Vehicles and transport equipment	0.000	0.191
8.1. Home equipment and clothing	0.004	0.214
8.2. Precision equipment	0.003	0.985
9. Goods not elsewhere specified	0.093	0.998
% of rejections (at 5% level)	84.6%	0.0%

TABLE A.1: PASS-THROUGH ELASTICITIES IN THE SHORT-AND LONG- RUN													
Country / Industry		1 France	2 Belgium - Luxembourg	3 Netherlands	4 Germany	5 Italy	7 Ireland	9 Greece	10 Portugal	11 Spain	32 Finland	38 Austria	Pool
0	S/R	0,90*	0,79*	0,62*+	0,74*+	0,51*+	1,13*	0,41+	1,47*	1,15*	0,81*	0,64**	0,84*+
	L/R	0,67*+	1,01*	0,85*	1,01*	0,87*	0,79	0,68	0,73	1,37*	1,57*	0,42	0,92*
1	S/R	0,26+	0,33+	0,35*+	0,59+	0,20++	-0,00+	0,32+	0,60*+	2,47*+	0,49	-0,47	0,45*+
	L/R	0,52	0,49	0,57*	0,30*+	1,05+	0,23	0,98	1,18*	1,83*++	0,94**	-1,23+	0,71*
2	S/R	0,75*+	0,90*	1,42*++	0,72*	0,71*	0,33+	0,30+	0,62*+	0,78*	1,23*	0,29	0,68*+
	L/R	0,98*	1,10*	0,89*	0,91*	1,11*	0,84**	0,80**	1,11*	1,13*	1,39*	0,59*	0,97*
3	S/R	1,06*	0,59*+	1,20*++	0,88*+	0,96*	0,13++	1,05**	0,71*	0,82*+	1,05*	0,59*	0,82*+
	L/R	1,16*	1,00*	0,65*++	1,01*	1,07*	1,15	2,22*	0,49	1,22*	1,03*	0,66	1,04*
4	S/R	1,19*	0,75*	0,68*+	0,69*+	0,63*++	1,25	0,68	0,77**	1,30*	1,83**	0,12+	0,86*+
	L/R	1,01*	1,14*	1,11*	1,02*	0,86*	-0,55	1,18	1,40**	0,75*	-0,95	-0,28	0,88*
5	S/R	0,89*	1,20*	0,92*	1,09*	0,87*	1,51*	-0,37+	0,67	0,63*++	-0,18+	-0,01+	0,74*+
	L/R	0,77**	1,66*	0,77**	1,18*	1,16*	0,97	0,93	1,02	0,46	-0,11	0,30	0,81*
6	S/R	1,11*	1,21*++	1,18*	0,58*+	0,61*+	0,88*	0,30+	0,73*	0,80*++	0,65*	0,42*+	0,77*+
	L/R	0,98*	1,09*	1,28*	0,74*+	1,09*	0,70*	0,90*	1,05*	1,24*	1,05*	0,51*+	0,97*
7.1	S/R	1,86*+	0,98*	0,78*	0,42*+	0,71*+	0,20	0,13+	0,24+	0,77*	-0,11*	+0,09+	0,58*+
	L/R	2,48*+	1,04*	0,84	0,26+	0,95*	1,14	0,02	0,37	0,79**	-0,06	0,61	0,75*
7.2	S/R	0,66*+	0,43*+	1,56*+	0,72*+	0,58*+	-0,17+	0,19+	-0,10+	0,36**+	0,19+	0,02+	0,40*+
	L/R	0,78*	0,92*	1,59*	0,87*	0,74*	0,15	0,53	0,42	0,62**	0,71	-0,10	0,66*+
7.3	S/R	2,43*+	0,13+	0,98*	0,25*+	0,25+	0,50+	-	-0,07+	0,54	0,27	0,07+	0,49*+
	L/R	2,33*++	0,10+	0,22	0,38+	0,93	-0,17	-	-0,16+	0,41	-0,14	0,58	0,57*
8.1	S/R	0,81*+	0,86*	1,06*	0,83*+	0,78*+	0,16+	0,86*	1,09*	1,05*	0,40*+	0,47*+	0,78*+
	L/R	0,66*++	0,91*	1,52*++	0,88*	0,76*	-0,33+	0,45	0,74	0,99*	0,55	0,37	0,66*+
8.2	S/R	0,72*++	1,20*	0,91*	0,80*	0,95*	-0,25+	1,98*+	1,26**	0,51*+	0,79	1,16	0,86*+
	L/R	0,69**	1,02	0,86	1,13*	0,92*	-0,32	1,22	1,39	1,00*	-0,04	1,81	0,82*
9	S/R	-0,20+	0,20++	0,80	0,91*	1,36*	-	-0,05+	0,12+	-0,46+	-	0,46**++	0,47*+
	L/P	0,46	0,69	0,38	1,02	0,83	-	0,36	0,66	0,93	-	0,85**	0,74*

Source: Own calculations

*(**): the null hypothesis $H_o : b_o = 0 \,(S/R)$ or $H_o : \sum_{i=0}^{4} b_i = 0 \,(L/R)$ is rejected at 95% (90%) level

+ (++): the null hypothesis $H_o : b_o = 1 \,(S/R)$ or $H_o : \sum_{i=0}^{4} b_i = 1 \,(L/R)$ is rejected at 95% (90%) level