Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon?

Abstract

Exchange rate regime optimality, as well as monetary policy effectiveness, depend on the tightness of the link between exchange rate movements and import prices. Recent debates hinge on the issue of the prevalence of producer-currency-pricing (PCP) versus local currency price (LCP) stability of imports, and on whether exchange rate pass-through rates are endogenous to a country's inflation performance. We provide cross-country and time series evidence on both of these issues for the imports of 25 OECD countries. Across the OECD and especially within manufacturing industries, there is compelling evidence of partial pass through – rejecting both PCP and LCP as a short-run phenomenon. Over the long run, PCP is more prevalent for many types of import goods. Higher inflation and exchange rate volatility are associated with higher pass-through of exchange rates into import prices. However, for OECD countries the most important determinants of changes in pass-through are microeconomic and related to the industry composition of a country's import bundle.

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1. Introduction

While exchange rate pass-through has long been of interest, the focus of this interest has evolved considerably over time. After a long period of debate over the law of one price and convergence across countries, beginning in the late 1980s exchange rate pass through studies emphasized industrial organization and the role of segmentation and price discrimination across geographically distinct product markets. More recently pass-through issues play 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. Low import price pass-through means that nominal exchange rate fluctuations may lead to higher expenditure switching effects of domestic monetary policy, thereby leaving monetary policy more effective for dealing with real shocks. 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]

The first goal of our paper is to provide extensive cross-country and time-series evidence on pass-through performance into the import prices of 25 OECD countries. Using quarterly data from 1975 through 1999, we document the prevalence of PCP and LCP in short-run and long-run pass through elasticities. We use an economically meaningful estimation approach, meaning that we estimate pass-through rates after controlling for exporter marginal cost shifters.

At the level of an aggregated import bundle, the evidence across countries is strongly supportive of partial exchange rate pass through in the short run (defined as one quarter). The average pass through elasticities across the OECD countries are about 60 percent over one quarter, and about 75 percent over the longer term. The United States has among the lowest pass-through rates in the OECD, at about 25 percent in the short run and 40 percent over the longer run. Corresponding rates of pass through into German import prices are approximately 60 percent in the short run and 80 percent in the long run. We find that rankings of elasticities

[1] The implications of pass-through performance for optimal monetary policy also is 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 vanWincoop (2001).

are not tightly correlated with country size, especially when the composition of country import bundles differs substantially.

At a more disaggregated industry level, similar results on partial pass-through arise. There is strong evidence against both PCP and LCP as short-run descriptions of pass-through into Manufacturing and Food import prices, driving the partial pass-through observed in almost all countries. Non-manufacturing and Raw Material imports generally reject LCP, and are mixed on rejections of PCP.

The second goal of our paper is to provide insights into the forces underlying cross-country differences in pass-through rates and changes in pass-through elasticities over time but within countries. An intriguing hypothesis posed by John Taylor (2001) is that pass-through of costs into markups is endogenous to a country's inflation performance. The important implication is that there is a virtuous – but fragile -- circle wherein low inflation (variability) leads to reduced markups, less inflationary implications of monetary expansions, and continued low markups. Taylor argues that if declines in pass-through are a product of the low inflation environment of recent years (which in turn is associated with less persistent inflation), recent gains in price stability can be fragile and potentially eliminated by adverse price shocks. As an alternative to this view, if pass-through rates decline due to more structural reasons such as declining pricing power of firms, the recent regime of price stability may be more robust. Similarly, even without changes in the competitive structures of industries, the pass-through elasticities on import baskets can change purely in line with changes in the composition of the import basket if the component products have distinct pass-through elasticities.

Ultimately, we conclude that while the Taylor argument has some statistical merit when properly tested, it is not of first order importance for the low and medium inflation countries of the OECD. First, it is not appropriate to argue that declining exchange rate pass-through into import prices is a general feature of the countries within the OECD. *Levels* of pass-through by country are significantly higher in countries with higher nominal exchange rate variability – consistent with recent theoretical advances on the optimal choice of invoiving currency -- but largely uncorrelated with levels of inflation, money growth rates, or aggregate country size. Although changes in some of these macro series are weakly correlated with changes in pass through, these macro variables are not of first order importance in explaining pass-through evolution within the OECD over the past 25 years. Far more

important for overall pass-through rates are changes in the composition of industries in a country's import basket. In particular, the move away from energy as a high proportion of the import bundles, to a much higher share for manufactured products, has been the primary driver behind recent pass-through into import prices among numerous OECD countries.[3]

The industry composition of trade is more structural than is inflation performance. Consequently, those OECD countries that have brought down their pass-through elasticities through changes in trade composition have pass-through gains (and consequent implications for monetary policy) that are more robust to the inflation regime. Some of the increased reliance on manufacturing imports occurred because of increased globalization of production input markets,[4] thereby changing exchange rate pass-through without requiring industry-specific changes in price-over-cost markups. Monetary policy transmission therefore is expected to be robust to the extent that industry pass-through rates remain stable, mainly evolving with the product mix of each country's trade.

2. Exchange Rates and Prices: Similar Equations, Different Interpretations

Analyses of exchange rates and price linkages have followed numerous paths, ranging from early macroeconomic debate on exchange rates and monetarism, to studies of market integration or segmentation associated with the law of one price, to studies of the role of market microstructure in the ability and desire of producers to price discriminate.[5] 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 domestic currency per unit of foreign), 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 traded across countries. As

[3] Our focus should not be confused with that of related recent papers that attempt to explain the pass-through of exchange rates into country CPI. In these papers, exchange rate movements lead to import price pass-through. These enter with weights into the aggregate CPI of countries, with the weights possibly to be adjusted to reflect distribution costs as in Burstein, Neves, and Rebelo (2001), or central bank reaction functions as in Gagnon and Ihrig (2001).

[4] See Campa and Goldberg (1997), Feenstra (1998), and Hummels, Ishii and Yi (2001) for evidence on increasing reliance on imported inputs and vertical integration of production across countries.

[5] Goldberg and Knetter (1997) provide a very nice overview of this history.

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 indices.

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 ERPT is the percent change in local currency import prices resulting from a one percent change in the exchange rate between the exporting and importing country. Evidence on tests of this relationship are basically the γ estimates based on a simple equation

$$p_t = \gamma e_t + \varepsilon_t \qquad (2)$$

where all lower-cased variables are in logs and ε is an error term.[6] 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. 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 *m* from country *j*, $P_t^{m,j}$, the pricing equation of a exporter from country *j* -- and its elasticity of response to an exchange rate movement -- depend on the structure of demand and costs confronting the exporter. If the import prices of country *j* are the dependent variables, the pricing rules of the foreign exporters x as the drive their determination:

$$P_t^{m,j} = E_t P_t^{x,j} = E_t Mkup_t^{x,j}\left(P_t^{m,j}/P_t\right)C^{x,j}\left(W_t^j, Y_t, E_t\right) \qquad (3)$$

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

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

[6] The γ's are background information for the monetary policy debate discussed in Taylor (2000) and 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 had not been systematic analysis verifying this assertion.

exporters *x* in country *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 his own currency. This exporter marginal cost function is increasing in export market wages, $W_t^{x,j}$, and increasing in country *j* demand conditions *Y*.[7] 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 move with the relative value of the destination market currency.

Differentiation of (3) yields an expression of the form

$$\dot{P}_t^{m,j} = \left(1 + \frac{E_t C_E^{x,j}}{C_t^{x,j}}\right) \cdot \dot{E}_t + M\dot{K}UP_t^{x,j} + \left(\frac{W_t^{x,j} C_w^{x,j}}{C_t^{x,j}}\right) \cdot \dot{W}_t^{x,j} + \left(\frac{Y_t C_y^{x,j}}{C_t^{x,j}}\right) \cdot \dot{Y}_t \qquad (4)$$

where "." over a variable represents a percentage change. Equation 4 clearly demonstrates that empirical specifications which seek 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.

Further manipulation of (4) gives microfounded intuition behind pass-through elasticities into import prices. [8] Multiplying through by $E_t/P_t^{m,j}$ and rearranging terms, the exchange rate pass through elasticity γ is a function of the markup and foreign marginal cost elasticities, η and λ :

$$\gamma = \frac{1+\lambda}{1-\eta} \qquad (5)$$

where $\gamma = \dfrac{\dot{P}_t^{m,j}/P_t^{m,j}}{\dot{E}_t/E_t}$, $\eta = \dfrac{M\dot{k}up_t^{x,j}/Markup_t^{x,j}}{\left(\dot{P}_t^{m,j}/\dot{P}_t\right)/\left(P_t^{m,j}/P_t\right)} \leq 0$ (negative for "normally shaped" demand, which is less convex than constant elasticity curves), and $\lambda = \dfrac{\dot{C}_t^{x,j}/C_t^{x,j}}{\dot{E}_t/E_t} \leq 0$.

Any force that makes foreign marginal costs more sensitive to exchange rates makes local currency import prices less sensitive to exchange rates. The inseight is that an exporter

[7] 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.

that relies more on imported inputs will have a smaller share of local value-added in costs which can fluctuate with exchange rates. The markup derivation underscores the point that exporters facing highly elastic demand have with smaller exchange rate pass-through into destination market prices. A small exporter supplying a large market populated with local competitors will not be able to pass as much of the exchange rate fluctuation through to local prices. The extent to which exchange rate pass-through coefficient also is differs from one (and these concepts of endogeneity of markups) has been exposited simply and eloquently in Dornbusch (1987) and Marston (1990), among others. Knetter (1993) and Yang (1997) provide supportive empirics and document how pass-through into local currency import prices is lower when local products are less differentiated.

3. Exchange Rates and Import Prices: The Evidence

A. The Data and Estimation Methodology. We capture the arguments of equation (4) through a log-linear regression specification similar to that tested throughout the exchange rate pass-through literature:

$$p_t = \alpha + \delta x_t + \gamma e_t + \varphi Z_t + \varepsilon_t \qquad (6)$$

where p_t are local currency import prices, x_t is a primary "control" variable representing exporter costs, and Z_t is a vector of other control variables, including real GDP of the destination market.[9] A regression may generate biased estimates of pass through if foreign wages or GDP are correlated with exchange rates but omitted from the regression.

Our approach considers pass-through into import prices of specific countries, as opposed to other careful empirical studies of exchange rate pass-through that focus exclusively on the export prices of individual products or baskets from a single country to a number of destination markets.[10] We pursue the import price approach because it is the more relevant dependent variable in the debate on the inflationary consequences of exchange rate

[8] Our thanks to Richard Marston for suggesting the inclusion of this elasticities interpretation.

[9] Goldberg and Knetter (1997) provide a very nice overview of the relationships between these studies. Beyond the industrial organization themes, there also are a range of studies that allow for pass-through elasticities to differ between appreciation and depreciation periods (Swamy and Thurman 1994) or to be distinct for anticipated versus unanticipated exchange rate changes (Marston 1990).

[10] Knetter (1993), Marston (1990), Goldberg and Knetter (1996), and Kasa (1992), among others, uses export prices or export unit values from specific countries to multiple destinations with the intent of identifying price

fluctuations. Our dependent variables are import unit value indices (aggregated across all imports, and disaggregated into major industry groups) for 25 OECD countries. For each of these country indices we estimate short-run and long-run elasticities γ based on the statistical specification in equation 6 (short run is one quarter, long run is four quarters).[11] We provide estimates of levels and paths of these elasticities across countries, including tests for structural changes in pass-through rates. We then run second stage regressions to explain cross-country and time series differences in pass-through performance with explanatory variables that include monetary aggregates and also emphasize the importance of the composition of a country's import bundle.

The OECD compiles quarterly data on *import unit values* for OECD countries, with our series generally commencing around 1975 and ending in 1999.[12] In addition to the country aggregates, the OECD also reports disaggregated import prices at the country level for five product categories: Food, Energy, Raw Materials, Manufacturing, and Non-Manufacturing products. Since we ultimately find that energy pass-through elasticities exhibit anamolous behavior, we delve further into the prices of disaggregated energy imports. For cross country comparisons, available further disaggregations permit analysis of Gaseous Natural Gas, Steam Coal, and Crude Oil (data source: International Energy Agency).

Nominal exchange rates are from the International Financial Statistics (series *neu*), defined in our regressions as domestic currency per unit of foreign currencies (1/*neu*), so that home currency depreciations appear as increases in the nominal exchange rate series. The real GDP series used are those of the importing countries (source: International Financial Statistics). It is more difficult to find a primary control variable that captures the shifting relative costs of a country's trading partners. We construct a consolidated export partners cost proxy by taking advantage of the IFS reporting of both real *reu* and nominal *neu* exchange

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discrimination or pricing to market activity. While important in cross-country research, price discrimination across markets also is a theme within countries and across cities. For example, see Engel and Rogers (1996).

[11] These elasticities have a direct *economic* interpretation, in contrast with the statistical measures that would be generated by an equation such as (2). We nonetheless also generated statistical pass-through elasticities to determine whether these differed substantially from the economic elasticities. The differences were sometimes substantial, but were not systematically positive or negative biased across countries. We include up to three lags of exchange rates and foreign prices/production costs in the regression. Most of the pass-through response occurs over the first and second lags after an exchange rate change, so the interpretation of four quarters as long run is empirically validated. An alternative specification, which used a lagged dependent variable and relied on a partial adjustment model, generated very similar empirical results (not reported in this version of the paper).

[12] Data Source: OECD Statistical Compendium. 10 of the 27 country series had import price data ending in 1999. 5 countries had data ending in 1998, 1 in 1997, 2 in 1996, and 2 in 1995. We use 25 countries for the empirical work, excluding Korea, Turkey and Mexico for lack of effective exchange rate indices.

rate series and computing $W_t^{x,j} = neu_t^j \cdot P_t^j / reu_t^j$ by country in our sample. This gives us a measure of trading partner costs (over all partners *x* of importing country *j*), with each partner weighted by its importance in the importing country's trade.

The first-stage regressions are specified to generate pass through elasticities and to follow equation (6), with the addition of lagged exchange rate and foreign production cost terms to allow for the possibility of gradual adjustment of import prices to exchange rates:

$$\Delta p_t^j = a_1^j \Delta e_t^j + a_2^j \Delta w_t^{x,j} + a_3^j \Delta e_{t-1}^j + a_4^j \Delta w_{t-1}^{x,j} + ... + a_5^j \Delta gdp_t^j + v_t^j \qquad (7)$$

The short-run relationship between exchange rates and the import prices of country *j* is given by the estimated coefficient a_1^j. The long run elasticity is given by the sum of the coefficients on the contemporaneous exchange rate and three lags of exchange rate terms.[13]

The estimation methodology applied is ordinary least squares on variables in log differences, selected after we performed extensive checks on the stationarity of series and on appropriateness of a cointegration approach.[14] We were unable to reject the hypothesis that the (log) series of import prices, foreign costs, and effective exchange rates were nonstationary. We performed additional tests to determine whether these three variables were cointegrated, i.e. whether a linear combination of these variables resulted in a stationary process.[15] Abstracting from the issue of low power of these tests, and despite predictions of theory, we rejected the cointegration cointegration hypothesis and consequently did not apply an error correction model.

[13] Note that while the theoretical antecedents of this equation are log-level relationships among variables, for estimation the variables in these equations are first-differenced to control for the possibility of unit roots in the time series variables contained in these specifications.

[14] Dickey Fuller Unit root tests on the logarithmic values of the import price, foreign costs, and exchange rate series in an econometric specification, with time trends, reject the unit root hypothesis at the 5% level in only 3 of 150 instances. This is clearly below the statistical error for 150 specifications which would be 7.5 rejections. We therefore accept that the (log) series of import prices, foreign costs, and effective exchange rates are nonstationary, with the strong caveat that these stationarity tests have low power.

[15] First, we test whether the (log) real exchange rate, defined as the (nominal exchange rate)*(foreign price)/(import price), is stationary. The values of the Dickey Fuller test rejected the hypothesis that the real exchange rate was nonstationary at the 5% level in 8 instances of 150. This is exactly what the statistical error for a 150 specifications would suggest (7.5 rejections). Therefore, we reject that the log real exchange rate is stationary, and that the vector (1,1,-1) is a cointegrating vector as suggested by the theory on the real exchange rate. Of course, if there is a cointegrating vector it may differ from what this theory predicts. We run a model where Import price (t) = a + b exchange rate(t) + c*foreignprice(t) + u(t), and compute fitted[u(t)] = rho* fitted[u(t-1)] + e(t). We test whether the rho are different from unity, and rejected for only 11 cases the hypothesis that rho is different from unity at the 5% level. This is slightly higher than the 7.5 instances that statistical error would suggest, but still very low.

Table 1: Exchange Rate Pass-through into Import Prices

Country	Full Sample Pass-Through Elasticities		Change in Pass-through Elasticities 1999 versus 1989	
	Short Run	Long-Run	Short-Run	Long-Run
Australia	0.55*+	0.69*+	-0.05	0.09
Austria	1.22*	1.25	0.68	0.24
Belgium	0.16+	0.71	1.02*	0.18
Canada	0.65*+	0.68*+	0.20	-0.23
Switzerland	0.67*+	0.94*	-0.09	0.09
Czech Republic	0.38*+	0.61*	n.a.	n.a.
Germany	0.59*+	0.79*	-0.32	-0.12
Denmark	0.56*+	0.68*	-0.42	-0.80*
Spain	0.66*+	0.56*+	-0.40	-0.94*
Finland	0.69*+	0.82*	-0.15	-0.02
France	0.53*+	1.21*	-0.82*	-1.00
United Kingdom	0.39*+	0.47*+	0.11	0.11
Greece	0.40+	-0.02+	-0.61	-1.24
Hungary	0.58*+	0.85*	0.87*	0.93*
Ireland	0.79*	1.37*	-0.03	-1.17
Iceland	1.18*	0.76*	0.41	0.19
Italy	0.67*+	0.62*	-0.52	-0.65
Japan	0.88*	1.26*	-0.36*	-0.76*
Netherlands	0.75*+	0.77*	-0.18	-0.17
Norway	0.51*+	0.79*	-0.18	-0.19
New Zealand	0.47*+	0.62*+	-0.39*	-0.53*
Poland	0.50	0.99*	0.75	0.22
Portugal	0.60*+	0.88*	-0.04	-0.26
Sweden	0.67*+	0.59*+	-0.62*	-0.45
USA	0.26*+	0.41*+	0.18	0.10
Average	0.61	0.77	-0.04	-0.27
Pass through increase (# countries significant)			8 (2)	9 (1)
Pass through decline (# countries significant)			16 (4)	15 (5)

* Significantly different from zero at 5 percent level. + Significantly different from one at 5 percent level. Table revised 12/07/01 using summed lags method.

B. Exchange Rate Pass-Through into Import Prices. Estimates of exchange rate pass-through into import prices for the OECD countries are presented in Table 1. Taking unweighted averages across countries, we find that average pass through into import prices is 0.61 in the short-run and 0.77 in the long-run. These averages mask interesting cross-country differences in pass through into import prices. The United States has relatively low pass-through, at approximately 25 percent within one quarter and about 40 percent over the longer run. Pass through estimates for countries such as France, Germany, and Switzerland are closer to 60

percent in the short run and 80 percent over the longer run. Smaller European countries typically have even higher pass through rates, but a precise relationship between pass through and country size is not empirically significant.

A recurrent issue in the macroeconomics literature is the prevalence of local currency price stability (LCP) versus producer currency pricing (PCP). Table 2 summarizes tests over import price data in the OECD for the existence of local currency pricing (zero pass through), producer currency pass through (complete pass through), or partial pass through.

Table 2: Rejection of LCP or PCP for Import Prices
(Entries in table show number of countries for which hypothesis is rejected.
Total number of countries is 25 for all imports, 24 for disaggregated products)

	All Imports	Food	Energy	Raw Materials	Manufact.	Non-Manufact.
Short run						
Reject =0	22	17	8	16	21	14
Reject =1	20	14	7	10	21	10
Reject =0 & =1	18	10	2	6	19	4
Average elasticity	.61	.43	.70	.64	.49	.64
Long run						
Reject =0	22	16	4	16	21	8
Reject =1	8	9	7	8	10	7
Reject =0 & =1	7	5	2	7	9	2
Average elasticity	.77	.61	.73	.89	.71	.81

For countries in the OECD we overwhelmingly reject both complete pass-through (or producer currency pricing, an elasticity equal to 1) and zero pass through (or local currency price stability) as a description of aggregate import prices in the short run. Partial pass is the best description for import price responsiveness in the first quarter: elasticities of overall import prices are significantly different from zero in 22 out of 25 countries and significantly different from one for 20 out of 25 countries. In the longer run, pass through elasticities are larger and closer to one, although complete pass-through or producer currency pricing is still

rejected in 9 out of 25 countries. Thus, while PCP is better supported as longer run characterization, it still rejected in many OECD countries.

Numerous discussions have speculated that pass-through rates have recently been declining. We address this issue directly and more rigorously by performing two types of structural change tests. One method relies on Chow tests that assume an exogenously imposed break point. A second set of tests that we conduct allows for endogenously determined structural break points.[16]

In our implementation of familiar Chow-tests, we compare elasticities estimated over the first half of the sample, 1977 through 1989, with those from the full sample through 1999. The results from this split sample approach (shown in the rightmost columns of Table 1 and summarized in the bottom two rows of the table) tell a mixed story on the direction of change in pass-through across countries. Short run exchange rate pass-through declined for 16 countries – including 4 cases if statistically significant declines– and increased in 8 countries. A similar pattern appears in the long run elasticities. Thus, while Chow tests suggest that there has been a bias toward declines in exchange rate pass-through across OECD countries, these tests also point to only a limited number of cases where these declines were statistically significant. Declining pass-through was not evident in the aggregate import prices of the United States. By contrast, Japan registered large declines in exchange rate pass through into import prices. Overall, the Chow tests (with mid-point stability breaks) significantly reject structural stability for 6 countries of the 25 countries for pass-through coefficients over the aggregate import price series.

For the second set of tests for the stability of the passthrough relationship into aggregated import prices, we test for the presence of a structural break as developed by Andrews (1993) and Andrews and Ploberger (1994). The power of these tests is quite limited by the number of observations in our import price series (generally around 100 quarters per series). Indeed, we can never reject stability of long run pass-through according to these tests. While short run pass-through stability is also reject for 9 countries, it is difficult to assign the timing of instability to a particular break date, suggesting that the instability is gradual rather than associated with a distinct point in time. The sample of 9 countries for which stability is indicated overlaps with, but is not identical to, the Chow test instability countries.

Table 3: Pass-Through Parameter stability (Entries in table show number of countries for which stability hypothesis is rejected. Total number of countries is 25 for all imports, 24 for disaggregated products)						
	All Imports	Food	Energy	Raw Materials	Manufact.	Non-Manufact.
Chow Test						
Short run instability	9	2	2	3	5	3
Long run instability	6	4	1	3	4	2

Next, we consider the degree of exchange rate pass-through into the prices of disaggregated goods, along with the stability of these elasticities. We estimate the (constant marginal cost) pass-through elasticities for the five available sub-aggregates of import prices reported by the OECD: Food, Energy, Raw Materials, Manufacturing Products, and Non-manufacturing Products (Appendix Table 1 provides these estimates, by country).[18]

Most industries exhibit a striking degree of partial pass-through. These results on LCP versus PCP, and on average elasticities across countries, are summarized in the last five columns of Table 2. For all product categories --- with the exception of Energy--- we reject the hypothesis of zero exchange rate pass-through or local currency price stability for more than half of the countries. For Manufacturing and Food, we similarly reject complete pass through (PCP). The evidence in support of partial pass-through is strongest for Manufacturing imports, for which short-run pass through differs significantly from both zero and one in 19 out of 24 countries. Food also exhibits partial pass through in the short run. Local currency pricing is often rejected for Non-Manufacturing and Raw Materials, but rejections of producer currency pricing are more mixed across countries.

Energy imports have the most anomalous behavior among all the product categories. Country experiences vary considerably, with our evidence showing that these pass-through elasticities calculated using *effective* exchange rates are noisy, but cluster either around zero

[16] Hansen (2001) provides a good critique of different types of structural change tests.

[17] Another important issue with respect to monetary policy is the pass-through comparison for final goods prices versus imported intermediate goods prices (Obstfeld 2000). Energy and Raw Materials can be viewed as being closer to classification as imported intermediate goods than Food, Manufacturing, and Non-manufacturing Products.

[18] Another important issue with respect to monetary policy is the pass-through comparison for final goods prices versus imported intermediate goods prices (Obstfeld 2000). Energy and Raw Materials can be viewed as being closer to classification as imported intermediate goods than Food, Manufacturing, and Non-manufacturing Products.

(rejected in short run for only 8 of 24 countries) or around one (rejected for 7 of 24 countries). Energy pass-through rates can be quite high for some countries. Further examination of the Energy series, as well as examination of disaggregated import price series for Oil, Coking Coal, and Steam Coal,[19] leads us to conclude that the noise surrounding pass-through elasticity estimates is greatly reduced in regressions that include real bilateral exchange rates against the U.S. dollar, instead of country-specific effective exchange rate series. Dollar pass-through into Energy prices is near one in all countries.

The finding of stability of pass-through into disaggregated import prices contributes to a deeper understanding of the sources of fluctuations in pass-through into aggregate import prices. Indeed, the aggregate import price series could potentially evolve over time because of changes in the composition of the import bundles, rather than because of changes in the underlying pass-through elasticities on component products. For the underlying classes of imports we formally test for the stability of these pass-through elasticities by country, with the sample period divided into two intervals (1975:1 to 1986:4, and 1987:1 to 1999:4). As summarized in Table 3, we never reject stability of the disaggregated pass-through coefficients for more than 5 countries, and the number is closer to 2 or 3 in any product category across 24 countries.[20] By contrast, the basic Chow test rejects stability in 9 of the 25 cases aggregate import price series. These results as an indicate that exchange rate pass-through rates for the sub-indices are more stable than the exchange rate pass-through for aggregated import prices.

[19]See Appendix Table 3 for detailed results. The countries for which Oil import price data are included are: Australia, Austria, Belgium, Canada, Germany, Denmark, Spain, France, U.K., Greece, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, and Sweden. We do not report pass-through for the U.S. import prices, since these tests are for currencies vis-à-vis the U.S. dollar.

[20] Many of these instances of product category instability are attributed to data from New Zealand and Japan. Excluding these two countries, the number of countries for which there are rejects in the disaggregated data typically falls to 1 or 2.

[21]*See Appendix Table 3 for detailed results. The countries for which Oil import price data are included are: Australia, Austria, Belgium, Canada, Germany, Denmark, Spain, France, U.K., Greece, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, and Sweden. We do not report pass-through for the U.S. import prices, since these tests are for currencies vis-à-vis the U.S. dollar.*

[22] An interesting observation is that the short run pass-through elasticities of Energy import prices with respect to the dollar are higher than the long run elasticities in 16 out of the 19 countries examined. Future research could investigate whether substitution into alternative sources of energy or lower cost products, as discussed in Burstein, Neves, and Rebelo (2001), is occurring over longer horizons following real dollar fluctuations vis-a-vis the local currency.

4. Exchange Rates and Import Prices: A Macro or Micro Phenomenon?

The previous section demonstrated the prevalence of partial exchange rate pass through into import prices, and the large cross-country and time-series variation in some elasticities. In this section we explore which hypotheses, posed in recent debates over the link between macroeconomic variables and pass-through and focusing on the endogeneity of markups to the macroeconomic environment, are borne out in the data. We also pose an alternative explanation for time series changes in aggregate import price pass-through. Specifically, we consider the degree to which changes in aggregate import elasticities are attributable to movements over time in the composition of imports.

A. Macro determinants of pass-through. Taylor (2000) hypothesized that the decline in average inflation rates in the developed world has also resulted in a decline in the degree in which firms pass-through changes in costs into prices for their final goods. All else equal, lower inflation leads to lower import price pass-through. The relationship between more stable monetary policy and pass through, explored via optimal invoicing currency choics is also explored in recent theoretical work by Devereux and Engel (2001) and Bacchetta and van Wincoop (2001). If exporters set their prices in the currency of the country that has the most stable monetary policies, import prices in local currency terms would be more stable in countries with more stable monetary policy. All else equal, exchange rate pass-through would be higher for countries with more volatile monetary policy.

Another reason for macro variables to influence pass through is due to exporter competition for market share. As discussed in Froot and Klemperer (1989), exchange rate pass-through may be lower when nominal exchange rate variability is high and exporters to a country try to maintain local market share.

Country size may be another important factor in ranking pass-through elasticities of countries. Exchange rate pass-through may be higher if the exporters are large in number relative to the presence of local competitors. As a first pass at this issue, we posit that pass-through elasticities would be inversely related to country real GDP, although we recognize that introducing measure of sector-specific openness may be an alternative way to proceed.

[23] Many of these instances of product category instability are attributed to data from New Zealand and Japan. Excluding these two countries, the number of countries for which there are rejects in the disaggregated data typically falls to 1 or 2.

To test for the importance of these alternative hypotheses, we run a second stage regression to explore the determinants of short-run and long-run pass-through elasticities of specific countries, with right hand side variables of country-specific average inflation rates, money growth rates, exchange rate volatility, and real GDP. The bivariate and multivariate panel regressions use weighted least squares regressions of short and long run elasticities. In this weighted least squares method, where we use as weights the inverse of the standard error of the estimated pass-through elasticities, noisy estimates receive less weight in the second stage specifications.

The time series variables used in constructing these macro variables are all measured quarterly over the sample period 1975:1 to 1999:4. *Money* is the average annualized growth rate of the money supply (in logs): *Inflation* is average annualized inflation rate, based on consumer price indices (in logs). *Exvol* is the average of the quarterly squared changes in the nominal exchange rate; *GDP*: is the value, in 1996 US dollars, of the GDP of each country measured in 1978 (period 1), 1984 (period 2), 1990(period 3), 1996 (period 4). The 1996 US Dollar value is the nominal value in national currency deflated using the CPI deflator and converted into U.S. dollar at the average 1996 nominal exchange rate.

The second stage regression is given by

$$\gamma^{i}_{sr \text{ or } lr} = \alpha + \beta x^{i} + \varepsilon^{i} \qquad (8)$$

Despite the observation that U.S. pass-through rates are quite low, across the OECD there is no systematic relationship between pass-through and country real GDP. Some large countries have high pass through (Japan) while some small countries have low pass through (Czech Republic). These panel tests, which do not have a time series component, show that country-specific rates of exchange rate pass-through into import prices are not significantly correlated with inflation or money growth. However, short-run elasticities are correlated with nominal exchange rate volatility histories of countries: countries with more nominal volatility also have higher pass through rates. The results are reported in Table 4 (Panel A: short run elasticities, Panel B: long run elasticities).

Table 4 Determinants Pass-Through Elasticities: Cross Country Panel A. Short Run Elasticities of Aggregate Import Prices					
Constant	0.536** (0.237)	0.640** (0.145)	0.571*** (0.042)	0.656*** (0.180)	0.683** (0.333)
Money	0.022 (0.237)				0.173 (0.167)
Inflation		-0.026 (0.074)			-0.252* (0.135)
ExVol			4.737*** (1.686)		5.875*** (1.828)
Real GDP				-0.011 (0.030)	-0.011 (0.030)
AdjR2	-0.04	-0.038	0.223	-0.037	0.273

B. Long Run Elasticities of Aggregate Import Prices					
Constant	0.737** (0.277)	0.912*** (0.171)	0.744*** (0.054)	0.770*** (0.208)	0.657 (0.488)
Money	0.003 (0.113)				0.432 (0.229)
Inflation		-0.088 (0.086)			-0.435** (0.181)
ExVol			0.184 (2.041)		0.788 (2.220)
Real GDP				-0.004 (0.034)	-0.022 (0.040)
AdjR2	-0.043	0.020	-0.043	-0.043	0.071
Nobs	25	25	25	25	25

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares. 12/7/01 updated regression results using summed lags approach.

While these panel tests provide results that are especially interesting for currency invoicing hypotheses, the tests are not the most appropriate ones for testing the type of pass through endogeneity exposited by Taylor (2000). For the latter goal, we abstract from other country-specific determinants of pass-through rates and ask whether in-country pass-through *changes* are systematically associated with *changes* in macroeconomic performance. In other words, more appropriate empirics take the form of time-series panel specifications with controls for country fixed effects.

For most countries the macroeconomic variables have moved substantially during the past three decades. Inflation rates and money growth were substantially larger during the first part of the sample than during the second. Since the average behavior of some of these exogenous variables over the full period is not representative of behavior over shorter

intervals, we split the sample period into four periods (1975:1 to 1980:4, 1981:1 to 1986:4, 1987:1 to 1992:4, 1993:1 to 1999:4). For each interval we estimate the short and long-run pass through elasticities of aggregated import prices for each country. We perform second stage specifications that are a time-series panel version of equation 8. Estimated elasticities are regressed against the countries macroeconomic variables of the respective time periods, again using weighted least squares with pass-through observation weighted by the inverse of its estimated standard error. The second stage regressions include country and time dummies to account for other country and period-specific effects not controlled for by the exogenous variables.

The time-series panel results presented in Table 5 show the role of changes in macroeconomic determinants in driving changes in short run and long run pass-through elasticities. Consistent with Taylor's (2000) arguments, short-run pass through is lower when a country achieves lower inflation, less money growth, or less exchange rate variability. Lower and more stable monetary conditions induce producers to pass on a smaller percentage of cost shocks into final goods prices. While money growth and exchange rate volatility do not appear to be statistically important in these multivariate regressions, this is mainly due to their high correlation with inflation (which is picking up the statistical contribution of both terms).

Despite their joint statistical significance, these macroeconomic variables account for a negligible amount of the variation over time in pass-through elasticities across countries. The order of magnitude of inflation changes on pass-through changes is low, especially in the context of inflation ranges observed with the OECD: a one percentage point increase in the average inflation rate for a country is associated with a 0.0023 increase in pass-through. Indeed, F-tests show that these macro variables have no explanatory power for long-run pass through rates across our OECD country sample.

Table 5 Macroeconomic Determinants of Pass-Through: Time Series Panel Regressions				
	Short-Run Pass-Through (Levels)		Long-Run Pass-Through (Levels)	
time dummies	√	√	√	√
Country dummies	√	√	√	√
Money	-0.018 (0.105)		-0.099 (0.175)	
Inflation	0.231** (0.103)	0.229** (0.101)	0.335* (0.165)	0.322* (0.162)
Exchange rate volatility	33.71 (37.97)	32.315 (36.696)	6.903 (58.29)	-0.867 (53.25)
Real GDP	0.010 (0.021)	0.010 (0.021)	-0.017 (0.036)	-0.016 (0.036)
Adj. R2	0.244	0.259	0.055	0.068
Adj. R2 from specification with only Macro variables	-0.030	-0.018	-0.021	-0.011
# obs	80	80	80	80

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares. 12/7/01 updated regression results using summed lags approach.

B. The Role of the Composition of Trade. Changes in the composition of country imports is an alternative explanation for changes in exchange rate pass-through into import prices. We previously demonstrated that different categories of products have different import-price pass-through elasticities. Then, to what extent were there systematic changes in the composition of trade? If a country shifts the content of its trade from industries with high pass-through elasticities into industries with lower elasticities, overall import pass-through elasticities will decline. Conversely, a shift to higher pass-through products would raise the overall pass-through elasticity of aggregated import prices.

To explore the importance of the changing composition of trade for each country, we decompose import trade into their five different product categories.[24] Data from 1980 and 1992 dramatically illustrate an important feature of OECD trade over these decades. In 1980 manufacturing imports comprised more that 50 percent of the overall (merchandise) import bill for most countries (see Appendix Table 4). The clear exceptions were countries heavily reliant on imported energy, notably Japan, followed by Italy and France.

(insert Figure 1)

Japan also stood out among OECD countries for the relatively large share of raw materials in its imports. However, due to lower energy prices, changes in energy policies, and a dramatic growth of manufacturing trade, by the 1990s there was a striking cross-country shift in the composition of imports. By 1992 manufactured products became more than 70 percent of the imports of many OECD countries, and often closer to 80 percent of the import bill. For France, manufactured products grew from 45 to 79 percent of imports. At the same time these countries experienced a clear decline in the share of Energy Products in total imports, as illustrated in Figure 1, and an almost identical increase in the share of Manufacturing Products. Since product categories have distinct (and relatively stable) pass-through rates, this shift in the relative importance of Energy and Manufacturing products in import volumes will be shown to account for a significant fraction of the changes observed in the pass-through elasticities into aggregated import prices across OECD countries.

To make this point econometrically by constructing an "imputed trade elasticity" measure for each country. This construct capture the changes in a country's aggregate pass-through elasticities specifically attributable exclusively to changes its composition of imports. Using constant full sample elasticities for each of the five industry groupings for each country, we apply time-specific shares of each industry in the country's total imports of at 1980, 1986, 1992, and 1998. (The resulting elasticities are shown in Appendix Table 5.[25])

This approach tracks reasonably well the pattern of pass-through declines observed in the actual pass-through estimates for the sample of countries for which comparisons are possible. The imputed measure generates declines for 10 of the 14 cases where declines were

[24] These categories are defined by the availability of cross-country data on import prices.

observed in the actual data. The imputed measure generates pass-through increases in 5 of the 7 cases where increased pass-through was observed in the actual data.

The main reason for this decline in the aggregate import price elasticity is due to the decline in the relative weight in overall imports of energy and raw materials, the two products for which the import price elasticities were often highest, and the increase in the other product categories with lower pass-through rates. Between 1980 and 1998, the aggregate pass-through elasticity for the United States would have declined from 0.37 to 0.25 over this period solely due to the change in the product composition of imports. For Italy, the decline would have been far more dramatic, from 0.87 to 0.62.

C. Micro v. Macro Determinants of Exchange Rate Pass-Through. As a final exercise we run a horse race to statistically compare the explanatory power of the micro versus macro variables for exchange rate pass-through movements over time and across countries. For most countries we have pass-through estimates at four intervals. We have imputed elasticities (from the disaggregated import data) for the 21 countries that had adequate trade share decompositions for our purposes.

Our regression is of the form:

$$\Delta\gamma^{j}_{sr\,\text{or}\,lr,t} = \beta_1 \Delta \ln money^{j}_{t} + \beta_2 \Delta \ln \text{inf}\, lation^{j}_{t} + \beta_3 \Delta \ln exchVol^{j}_{t} + \beta_4 \Delta \ln GDP^{j}_{t} + \beta_5 \Delta \ln constructedPT^{j}_{sr\,\text{or}\,lr,t} + \mu^{j}_{t} \tag{9}$$

where country and time dummies are included, and weighted least squares estimation is again applied.

These specifications, reported in Table 6, show that common time dummies, macro variables and imputed trade shares explain about 20 percent of the observed differences over time in the short-run pass-through elasticities of countries. Almost all of the explanatory power is from the imputed trade elasticity variables, even though this composition argument is made with only the coarse disaggregate series available in the data. In fact, the hypothesis of the joint insignificance of the macro variables cannot be reject at the one percent level. We conclude that trade composition effects dominate as explanations for movements over time in the short-run sensitivity of import prices to exchange rates.

[25] Availability of the appropriate disaggregated import data reduced the number of countries included in this section.

Table 6 Macro versus Micro Determinants of Pass-Through: Time Series Panels

	Short-Run Pass-Through (log Levels)		Long-Run Pass-Through (log Levels)	
Time dummies	√	√	√	√
Country dummies	√	√	√	√
Money	-0.169 (0.125)		-0.310 (0.202)	
Inflation	0.101 (0.147)	0.108 (0.148)	0.220 (0.233)	0.212 (0.237)
Exchange rate volatility (x100)	3.965 (3.203)	3.873 (3.236)	-0.171 (4.915)	-0.508 (0.499)
Trade Imputed Elasticity	2.505** (1.115)	2.549** (1.126)	1.643*** (0.848)	1.590*** (0.861)
Real GDP	0.011 (0.022)	0.013 (0.022)	-0.010 (0.040)	-0.005 (0.040)
Adj. R2	0.21	0.19	0.24	0.21
Adj. R2 from specification w/only Macro variables	-0.03	-0.02	-0.02	-0.01
Adj.R2 from trade imputed elasticity only	0.19		0.19	
# obs	68	68	69	69

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares. 12/7/01 updated regression results using summed lags approach.

5. Conclusions

In this paper we have provided cross-country, time-series, and industry-specific evidence on the pass-through of changes in exchange rates into import prices across a large sample of OECD countries since 1975. The cross-country average is that import prices in local currencies reflect 60 percent of exchange rate fluctuations in the short run, and nearly 80 percent over the long-run. Rates of exchange rate pass-through into U.S. import prices are about half the OECD average on pass-through rates. Partial pass is the best description for import price responsiveness in the first quarter following an exchange rate movement. In the longer run, pass through elasticities are larger and closer to one, although complete pass-through or producer currency pricing is still rejected in many cases. We conclude that PCP is better supported as longer run characterization, but caution PCP is nonetheless rejected in many OECD countries.

While there is some evidence that pass-through rates have been declining over time in some countries, this pattern does not generalize across the OECD. Macroeconomic variables play a significant but limited role in explaining cross-country differences in *levels* of pass-through elasticities. Most notably, pass-through into import prices is lower for countries with low inflation variability. However, time series panels confirm that short-run exchange rate pass-through elasticities rise with price inflation (or higher money growth rates). Despite statistical correlations, the quantitative importance of these effects have been small in the OECD. We conclude that recent arguments for virtuous cycles between inflation, money policy effectiveness and pass-through have not been of first-order importance within the OECD countries.

Observed increases or decreases in pass-through rates into aggregate import price series more closely reflects changes over time in the composition of import bundles of OECD countries. Pass-through elasticities for manufacturing products and food products are generally partial, so that both local currency price stability and producer price stability are rejected for most countries. By contrast, energy imports appear to have the most polar and noisiest import price elasticities among the different product categories. The shift in the import composition toward manufactures and away from energy and raw materials imports have contributed significantly to pass-through declines in about half of the OECD countries examined. These types of changes in pass-through into import prices –associated with widespread changes in the composition of industrial activity and trade --- are likely to be

more durable than those associated with the types of changes in macroeconomic policy environments observed in the OECD in recent decades.

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Data Appendix:

OECD import price series

Quarterly time series of import price indices in local currency for 1975:Q1 to 1999:Q4. For each country prices exist for five different product categories: Food, Energy, Raw Materials, Manufactured, Non-Manufactured. The countries for which the data exists are: Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Iceland, Italy, Japan, Republic of Korea, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, Turkey, United States.

Effective Exchange Rate Indices

The nominal and real measures are index numbers defined in terms of domestic currency per units of foreign currency. The real effective exchange rate is calculated from Unit Labour Costs for developed countries by the IMF. *Code in IFS database:* neu (reu).

Money Supply:

Defined as money in national currency, seasonally adjusted, with the exception of Sweden and the U.K: for which we have used a somewhat broader definition (money and quasi-money or M0). *International Financial Statistics*.

Inflation Rate

Annual inflation rate based on the consumer price indices from the *International Financial Statistics*.

Disaggregated Energy Prices

International Energy Agency.

Appendix Table 1: Import Pass-through Elasticities (Statistical), 1975 - 1999

Country	Full Sample Pass-Through Elasticities		Change in Elasticities 1999 versus 1989	
	Short Run	Long-Run	Short-Run	Long-Run
Australia	0.548*+	0.596*+	-0.010	0.161
Austria	1.079*	1	0.600	0.469
Belgium	0.658*	1.307*	0.154	0.021
Canada	0.704*+	0.706*+	0.114	-0.235
Switzerland	0.597*+	0.735*+	-0.121	0.142
Czech Republic	0.494*+	0.801*	n.a.	n.a.
Germany	0.497*+	0.734*	-0.272	0.021
Denmark	0.701*+	1.419*+	-0.582*	-0.919*
Spain	0.727*+	0.780*	-0.281	-0.382
Finland	0.587*+	0.450*+	-0.002	0.324
France	0.562*+	1.569*+	-0.479	-1.279*
United Kingdom	0.314*+	0.564*+	0.112	0.063
Greece	0.300+	0.268	-0.489	-0.93
Hungary	0.464*+	0.595*+	0.903*	1.053*
Ireland	0.802*	1.443*	0.016	-1.105
Iceland	-0.012+	-0.028+	1.142*	0.441
Italy	0.747*	1.124*	-0.429	-0.934*
Japan	0.841*	1.177*	-0.397*	-0.725*
Netherlands	0.737*	1.122*	-0.362	-0.401
Norway	0.377*+	0.337+	-0.270	-0.26
New Zealand	0.582*+	0.767*	-0.410*	-0.703*
Poland	0.495*+	0.887*	0.163	0.31
Portugal	0.559*+	1.086*	0.007	0.374
Sweden	0.678*+	0.676*	-0.595*	-0.41
USA	0.184*+	0.292*+	0.256	0.28
Average	0.569	0.816	-0.128	-0.224

* Significantly different from zero at the 5 percent level. + Significantly different from one at 5 percent level.
12/07/01 table revision.

Appendix Table 3A. Exchange Rate Pass-Through into Energy Import Components
(Constructed using Local Currency Import Price and LC/US$ exchange rate and world dollar price for the energy product)

	ALL ENERGY	OIL		Coke coal		Steam Coal	
Country		Short run	Long run	Short run	Long run	Short run	Long run
Australia		1.29*	1.11*				
Austria		0.67*	0.92				
Belgium		0.68*	0.91*	0.88*	1.08*	0.87*	1.18*
Canada		1.42*	0.85				
Switzerland							
Germany		0.87*	0.97*	0.14+	0.39+	0.73*+	1.04*
Denmark		0.96	0.92	2.90	-4.01	0.90*+	1.05*
Spain		0.94*	.975*	1.09*	1.15*	.82*	.80*
Finland				0.75	1.57	1.06*	0.19
France		1.05*	1.07*	.36*+	.99*+	.93*	.70*
U.K.		.88*	0.78*	.18+	.98*	.84*	.96*
Greece		.84*	0.76*				
Ireland				3.70	1.65	.59*	.70*
Italy		.88*	.94*	.85*	1.04*	1.07*	1.24*
Japan		.98*	1.42*	.96*	1.09*	.94*	1.06*
Netherlands		.84*	.96*	.89*	.95*	.99*	1.39*
Norway		1.38	2.93				
New Zealand		1.54*	1.03*				
Portugal		1.62*	0.41				
Sweden		.91*	1.09*				
U.S.A.		---	---	---	---	---	---
		1.04	1.06	1.16	0.63	0.89	0.94
				.68#	1.03#		

Significantly different from zero (5%); + Significantly different from one (5%). 12/07/01 table revision.
#excludes Denmark and Ireland

Appendix Table 3B: Rejection of LCP or PCP for Energy Import Prices on dollar movements
(Entries in table show number of countries for which hypothesis is rejected)

	All Energy (of 19 countries)	Oil (of 17 countries)	Coking Coal (of 11 countries)	Steam Coal (of 11 countries)
Short run				
Reject =0	18	15	6	11
Reject =1		0	3	2
Reject =0&=1	0	0	1	2
Average	1.06	1.04	1.15	0.89
Long run				
Reject =0	19	12	7	10
Reject =1		0	2	0
Reject =0& =1	0	0	1	0
Average	0.90	1.06	0.63	0.94

Appendix Table 4: Share of total imports by major product category

	Food		Energy		Raw Materials		Manufacturing		Nonmanufacturing	
Country	1980	1992	1980	1992	1980	1992	1980	1992	1980	1992
Australia	5.38	4.61	13.78	5.83	4.72	2.88	74.31	84.51	1.81	2.17
Austria	5.97	4.89	15.44	5.13	7.09	4.32	71.34	85.61	0.16	0.06
Belgium	10.25	9.93	17.49	7.58	7.69	5.36	61.61	70.83	2.96	6.29
Canada	0.00	6.11	19.17	4.34	9.65	3.30	71.18	82.96	0.00	3.29
Switzerland										
Czech Republic										
Germany	10.86	9.63	22.53	7.46	8.29	4.74	55.83	75.99	2.50	2.18
Denmark	10.24	12.85	22.49	6.14	6.57	4.23	59.41	73.98	1.30	2.80
Spain	n.a.	10.93	n.a.	10.06	n.a.	5.35	n.a.	73.36	n.a.	0.29
Finland	6.77	5.82	28.58	12.85	5.57	7.55	58.82	73.75	0.27	0.03
France	0.00	9.44	55.45	7.97	0.00	3.50	44.55	78.81	0.00	0.29
U. Kingdom	12.02	10.65	13.29	5.57	7.46	4.06	64.35	78.38	2.88	1.34
Greece										
Hungary	n.a.	5.50	n.a.	15.01	n.a.	4.11	n.a.	75.36	n.a.	0.01
Ireland	11.61	11.29	14.80	5.19	3.59	2.52	67.50	78.17	2.49	2.83
Iceland	n.a.	9.44	n.a.	8.31	n.a.	5.06	n.a.	76.98	n.a.	0.21
Italy	0.00	11.80	55.76	8.46	0.00	7.23	40.74	67.80	3.50	4.72
Japan	10.45	15.97	49.79	22.65	16.91	11.11	21.75	47.97	1.10	2.30
Netherlands	12.60	11.77	23.79	8.53	7.14	4.88	55.08	74.60	1.38	0.21
Norway	6.63	6.13	17.31	3.42	8.89	7.13	66.80	83.21	0.37	0.11
New Zealand	n.a.	6.62	n.a.	6.54	n.a.	4.08	n.a.	82.69	n.a.	0.07
Poland	n.a.	10.65	n.a.	16.81	n.a.	6.12	n.a.	66.35	n.a.	0.07
Portugal	n.a.	11.07	n.a.	8.16	n.a.	4.58	n.a.	75.77	n.a.	0.43
Sweden	6.78	7.13	24.17	8.67	4.61	3.80	64.03	79.76	0.41	0.64
United States	7.58	5.27	33.86	10.28	4.51	2.82	51.10	77.84	2.95	3.79

Share of food includes imports in SITCs 0 and 1, Raw Materials includes SITCs 3 and 4, Energy includes SITC 3, Manufacturing includes SITCs 5, 6, 7, and 8, and Non-Manufacturing includes SITC 9.

Appendix Table 5: Imputed Pass-Through Elasticities
constructed using varying trade shares with constant industry parameters.

	Short run Elasticities				Long run Elasticities			
	1980	1986	1992	1998	1980	1992	1986	1998
Australia	0.532	0.538	0.547	0.549	0.602	0.696	0.681	0.706
Austria	1.073	1.028	1.015	1.001	1.138	0.833	0.946	0.814
Belgium-Lux.	0.148	0.181	0.186	0.202	0.338	0.498	0.462	0.548
Canada	0.693	0.700	0.702	0.701	0.506	0.663	0.659	0.677
Czech Republic	.	.	.	0.400	.	.	.	0.590
Germany	0.693	0.566	0.510	0.507	0.908	0.658	0.736	0.654
Denmark	0.717	0.610	0.601	0.577	0.709	0.648	0.662	0.647
Spain	.	0.685	0.644	0.672	.	0.724	0.769	0.745
Finland	0.352	0.116	0.078	-0.005	1.115	0.830	0.888	0.757
France	0.464	0.450	0.446	0.443	1.408	1.093	1.114	1.081
United Kingdom	0.338	0.359	0.367	0.380	0.451	0.498	0.487	0.517
Hungary	.	.	0.455	0.496	.	0.742	.	0.713
Ireland	0.735	0.719	0.708	0.700	1.388	1.312	1.346	1.302
Italy	0.870	0.684	0.642	0.623	0.186	0.626	0.576	0.659
Japan	0.922	0.852	0.810	0.774	1.490	1.137	1.253	1.041
Netherlands	0.802	0.566	0.490	0.443	0.844	0.511	0.595	0.465
Norway	0.365	0.435	0.447	0.451	0.608	0.728	0.716	0.734
New Zealand	.	0.395	0.405	0.408	.	0.608	0.606	0.610
Poland	.	.	0.343	0.411	.	0.693	.	0.823
Portugal	.	0.627	0.630	0.639	.	0.886	0.827	0.911
Sweden	0.702	0.657	0.652	0.641	0.518	0.623	0.608	0.648
United States	0.368	0.262	0.265	0.249	0.234	0.391	0.418	0.333

Appendix Table 2: Disaggregated Import Price Indices, Full Data Sample

	FOOD		ENERGY		RAW MATERIALS		MANUFACTURING		NON-MANUFACTURING	
	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run
Australia	0.326*+	0.364*+	0.454	-0.301+	0.379*+	0.519*+	0.573*+	0.804*+	0.468*+	0.114+
Austria	0.018	0.388	1.582	3.063	1.385	2.619	1.019*	0.634	1.513*	2.747*
Belgium	0.107+	0.640*	-0.347	-1.381	0.840*	1.845*	0.211+	0.583*	0.112+	0.437
Canada	0.836*	0.701*	0.803	-0.385	0.433+	0.638*	0.699*+	0.728*+	0.676*	0.366
Switzerland	0.435*+	0.795*	1.889*+	2.684*+	0.533*+	0.744*+	0.632*+	0.851*.	1.200*	2.175*+
Czech Republic	0.449*	0.970*	-0.554	1.034	0.604*	0.988	0.460*+	0.509*+	-0.040+	0.911
Germany	0.319*+	0.483*+	1.514*	2.000*	0.824*	1.114*	0.403*+	0.501*+	0.970*	1.328*
Denmark	0.650*+	0.228*	1.202*+	0.927	1.083*+	1.060*	0.496*+	0.666*+	1.103*+	0.882
Spain	0.731*+	0.636*	0.863*	-0.576+	0.681*	1.124*	0.597*+	0.889*	0.865*	0.142+
Finland	-0.168	0.652	1.599	2.375	0.388	0.004	-0.200+	0.659	1.071	1.620
France	0.782*	1.301*	0.501	1.691			0.419*+	1.056*	0.583	1.290*
United Kingdom	0.218*+	0.523*+	0.092+	-0.051+	0.417*+	0.584*+	0.406*+	0.532*+	0.252*+	0.315+
Greece	0.391+	0.520	0.052+	-1.289	0.207+	0.055	0.519*+	0.237+	0.196	-0.434
Hungary	0.732*	1.059*	-0.035+	0,919	0.718*	0.859*	0.518*+	0.677*	0.235+	0.943*
Ireland	0.741*	1.314*	0,943*	1.923*	0.881*	2.203*+	0.680*	1.228*	0.762*	1.702*
Italy	0.500*+	0.538*+	1.111	-0.225	1.134*	0.923	0.541*+	0.737*	0.862*	0.328
Japan	0.710*+	0.731*+	1.079*	2.165*+	0.882*	0.799*	0.693*+	0.848*	0.941*	1.489*+
Netherlands	0.293*	0.222+	2.120*	2.181	1.203*	1.678*	0.286*+	0.287*+	1.252*	1.412*
Norway	0.642*	-0.065+	-0.081	0.089	0.193	0.389	0.476*+	0.842*	0.311+	0.084
New Zealand	0.518*+	0.651*	0.017+	0.528	0.397*+	0.445*+	0.427*+	0.619*+	0.429*+	0.629
Poland	0.017+	0.124+	0.071+	0.192+	0.015+	-0.154+	0.495	0.990*	0.061+	0.120+
Portugal	0.330	0.902*	0.375	0.021	1.068*	1.227*	0.677*+	0.958*	0.213	0.447
Sweden	0.631*+	0.615	0.963*	0.025	0.450*+	0.454*+	0.628*+	0.699*	0.873*	0.313
United States	0.083+	0.238+	0.691	-0.160+	0.060+	0.386*+	0.219*+	0.488*+	0.457+	0.118+
average	0.429	0.605	0.704	0.727	0.642	0.891	0.495	0.709	0.640	0.812

*Significantly different from zero (5%), + Significantly different from one (5%). 12/7/01: includes lagged coefficient method.

Appendix Table 4: Change over time in Disaggregated Import Price Pass-Through Elasticities (1999-1989)

	FOOD		ENERGY		RAW MATERIALS		MANUFACTURING		NON-MANUFACTURING	
	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run
Australia	-0.053	0.009	-0.039	-0.158	0.042	0.168	-0.051	0.017	0.032	0.012
Austria	0.360	0.343	-0.813	-1.659	-0.187	-0.180	-0.023	-0.013	-0.533	-1.054
Belgium	-0.243	-0.608	1.080	1.497	0.514	0.651	0.201	0.185	0.273	0.320
Canada	-0.338	-0.312	0.392	0.434	0.105	0.016	0.003	0.006	0.125	0.017
Switzerland	-0.009	0.010	-0.109	-0.471	-0.067	-0.057	-0.017	0.006	-0.031	-0.337
Czech Republic	0.232	-1.673	1.658	0.917	-0.848	-0.697	0.083	0.120	-0.849	0.038
Germany	-0.001	-0.193	-0.435	-1.597	-0.265	-0.471	-0.097	-0.183	-0.295	-1.059
Denmark	0.128	0.209	-0.390	-0.761	-0.081	0.051	0.057	0.227	-0.100	0.023
Spain	0.077	0.063	0.100	-0.067	0.056	0.057	-0.031	-0.005	0.055	-0.029
Finland	0.222	0.158	1.052	0.746	0.507	0.349	-0.267	-0.152	0.594	0.419
France	-0.003	-0.020	-0.585	-1.056			-0.042	0.021	-0.266	-0.420
United Kingdom	0.077	0.099	-0.070	-0.253	-0.027	-0.354	0.003	0.048	-0.026	-0.296
Greece	0.138	0.123	0.248	0.289	0.168	0.129	0.100	0.127	0.220	0.160
Hungary	0.143	0.293	0.483	0.709	0.295	0.207	0.657	1.021	0.329	0.462
Ireland	0.014	-0.079	-0.595	-1.928	-0.045	-0.023	0.105	-0.119	-0.350	-1.233
Italy	-0.397	-0.315	-1.637	-2.754	-0.215	-0.049	-0.141	-0.090	-0.489	-0.807
Japan	-0.047	-0.075	-0.535	-1.068	-0.221	-0.228	-0.104	-0.136	-0.329	-0.619
Netherlands	0.040	0.040	-0.254	-1.176	-0.134	0.159	0.041	0.040	-0.128	-0.435
Norway	0.189	0.150	0.822	0.904	0.483	0.493	0.123	0.139	0.400	0.409
New Zealand	-0.190	-0.205	0.199	0.186	-0.054	-0.072	-0.110	-0.130	0.068	0.052
Poland	0.018	-0.078	0.015	-0.189	0.030	0.015	-0.444	-0.120	0.056	-0.069
Portugal	0.342	0.347	-0.287	-0.725	-0.109	0.030	0.100	0.108	0.168	0.171
Sweden	-0.172	-0.126	0.221	-0.002	-0.070	-0.001	-0.210	-0.153	-0.099	-0.225
United States	0.005	-0.007	0.932	1.303	0.064	0.115	-0.034	0.032	0.549	0.679
average	0.024	-0.077	0.061	-0.279	0.000	0.009	-0.002	0.036	-0.023	-0.156

Figure 1 Percentage Point Decline of Energy Share in Imports, by OECD Country