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

Abstract

Exchange rate pass-through is viewed as an important consideration in the choice of monetary policy regimes for countries. Some argue that exchange rate pass-through – along with price over cost markups in general – also are influenced by monetary policy outcomes, for example with lower price pass-through rates due to the lower inflation rates achieved in many countries. This paper contributes substantially to this debate. First, we provide extensive cross-country and time-series evidence on levels and changes in import price sensitivity to exchange rates. Second, we examine the role of macro-fundamentals versus industry structure in explaining the trajectories of pass-through coefficients across countries. Changes in macroeconomic variables are associated with changes in pass-through rates: higher inflation and exchange rate volatility are associated with higher pass-through of exchange rates into import prices. However, for OECD countries the more important determinants of pass-through are microeconomic and related to the composition of imports. The sizable shift away from Energy and into Manufactured Products in import share have led to substantial changes in the pass-through rates on aggregated import bundles.

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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 in which it entered discussions of the law of one price and convergence across countries, in the late 1980s through the 1990s exchange rate pass through studies emphasized industrial organization concepts, highlighting phenomenon such as segmentation of and price discrimination across geographically distinct markets for goods. More recently, pass-through has played a role in heated debates over appropriate monetary policies across countries. High import price pass-through means that nominal exchange rate fluctuations may lead to weak expenditure switching effects of domestic monetary policy, thereby leaving monetary policy less effective for dealing with real shocks. Relevant for this monetary policy debate is the actual degree of import price responsiveness to exchange rates in specific economies and the sources of changes in these pass-through elasticities.

Our paper focuses on these latter themes. For a sample of 25 OECD countries and using quarterly data from 1975 through 1999, we document the *statistical* evolution of short-run and long-run import price pass-through. We then turn to economic rationales for this evolution – a critical issue for much of the recent debate – and then re-estimate pass-through elasticities so that they are more meaningfully presented as unit elasticities for a given marginal cost. Once we control for marginal cost shifters, we explore the determinants of the remaining variability over time in the elasticities of import prices with respect to exchange rates.

Among the interesting questions in this area are the empirical merits of the recent Taylor hypothesis (John Taylor, 2001), wherein it is argued that pass-through of costs into markups may be endogenous to a country's inflation performance. The 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.[1] This issue is very important. 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), as

[1] The implications of pass-through performance for optimal monetary policy also is explored in Gian-Carlo Corsetti and Paolo Pesenti (2001), Maury Obstfeld (2000), Mick Devereux (2000), and Devereux and Charles

Taylor has argued, then recent gains in price stability can be fragile ones --- potentially eliminated after a short period of adverse price shocks. Alternatively, if the presumed declines in pass-through rates are due to other sources of declining pricing power of firms – sources more structural and removed from the macro policy environment – then the recent regime of price stability may be more robust.

The role of such macro variables as drivers of changes in exchange rate pass-through rates are compared with the roles of more micro-economic determinants, such as the composition of industries contained within country-specific baskets of imports. Since industries – even broadly defined -- generally have distinct pass-through performance (and we find relative stability in this pass through), shifting product mixes in the basket will shift aggregate pass-through rates.

Ultimately we provide partial support for the Taylor arguments. First, as a statement of empirical facts, we document that pass-through rates – at least into import prices -- have not generally declined across industrialized countries. Moreover, *levels* of pass-through by country are not significantly related to levels of the macroeconomic variables of those countries. However, we find support for Taylor's more important contention and the one really relevant for the current debate. Using time series panel regressions we show that increases in macroeconomic variables such as inflation and exchange rate volatility are associated with significant increases in exchange rate pass-through rates into aggregated import prices. Yet, we also caution against overplaying the empirical importance of this channel. Much 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 significantly greater implications for pass-through into import prices among OECD countries.

There are important policy implications of our results. The industry composition of trade is more structural than is inflation performance. Consequently, those 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 could be more robust to the inflation regime. Some of the increased reliance on manufacturing imports arose in the

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Engel (2000), among others. The role of the invoicing decisions of producers in influencing pass-through rates

context of increased globalization of production input markets[2] without actually necessitating industry-specific changes in price-over-cost markups. Monetary policy transmission is expected to be relatively robust to the extent that industry pass-through rates continue remain stable and to continue to evolve in association with the product mix of each country's trade. However, large increases in inflation or exchange rate volatility can still have economically meaningful effects on pass-through in the short run.

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

Analyses of the exchange rate and price linkages have followed numerous paths, moving from macroeconomic debates on exchange rate 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 analyzing the ability and desire of producers to price discriminate. Empirical tests of the associated hypotheses have revolved around the familiar equation:

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

where P is the domestic price index, E is the nominal exchange rate, and P^* represents foreign prices. (Relative) purchasing power parity tests use price indices across countries to test whether this relationship holds between price levels. Law of One Price hypotheses test the same equation for individual goods 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 indices, leading to equation (1) to hold in first differences rather than in levels. Studies of exchange rate pass-through have considered the extent to which exchange rate movements are passed-through into traded goods prices, versus absorbed in producer profit margins or markups. The specification of this relationship and the components for testing are critical for the debate of pass-through and monetary policy, versus debates on the role of market segmentation and price discrimination broadly studied in the existing exchange rate pass-through literature.

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is explored in recent work by Devereux and Engel (2001).

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

The textbook definition of ERPT is the percentage 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 estimates of γ generally estimated using 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. 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, to date there are no systematic analyses of whether this phenomenon is supported. Yet, such evidence is key to understanding the implications of currency movements for import prices and aggregate domestic prices in general.

Problems with direct study and estimation of equation (2) arise because this equation (in log levels or growth rates) represents a statistical relationship but has little economic interpretation. If the dependent variable *P* is the price of traded goods – for example the home currency price of imports, the pricing equation of a foreign exporter and its elasticity of response to an exchange rate movement depends on the structure of demand and costs it faces. More specifically, we can rewrite equation (1) with import prices of one country as the dependent variable and the pricing rule of the foreign exporter as the driving variable:

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

where $MKUP = \dfrac{P*}{C*}, C_w^* > 0, C_E^* < 0*, C_y^* > 0$.

*Mkup** represents the markup rate of prices over costs for the exporter and C( ) is the marginal cost function of the exporter in his own currency. The foreign marginal cost function depends on foreign wages, local demand conditions[3], and potentially on imported input costs which move with the exchange rate.

[3] 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

Differentiation yields an expression of the following form

$$\dot{P} = \dot{E}\left(1 + \frac{EC_E^*}{C^*}\right) + M\dot{K}UP + \left(\frac{W^*C_w^*}{C^*}\right)\cdot \dot{W}^* + \left(\frac{YC_y^*}{C^*}\right)\cdot \dot{Y} \qquad (4)$$

where "." over a variable represents a percentage change (for example $\dot{P} = \partial P / P$). So, the coefficient on the exchange rate term, which we usually call the pass-through elasticity, is equal to 1 when there are no imported inputs in the production function of the exporter. More reliance on imported inputs by the exporter reduces the pass through of exchange rate changes into local currency prices. The exchange rate pass-through coefficient might also be different from one to the extent that changes in markup are correlated with changes in the exchange rate. Pass-through rates will be lower when increases in markups are correlated with home currency apreciations. Finally, the coefficient on exchange rate growth can be biased if foreign wages or GDP are excluded from the regression and changes in these variables are correlated with home currency depreciation.

Log-linearizing this type of expression gives rise to the type of generic regression model found in the exchange rate pass-through literature:

$$p_t = \alpha + \delta x_t + \gamma e_t + \varphi Z_t + \varepsilon_t \qquad (5)$$

where *x* is a primary "control" variable generally representing cost or price drivers, depending on the purpose of the regression, and *Z* denotes other control variables.[4]

Most of the detailed empirical analyses of exchange rate pass-through focus exclusively on the prices of individual products (or baskets) exported by a single country to a number of destination markets. 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. The main emphasis of these studies is the phenomenon of pricing-to-market and the conditions under which producers can price discriminate across

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composition of demand facing exporters in different countries, our proxy here is the GDP of the importing country.

[4] 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).

export destinations.[5] In these studies, the primary control variable *x* is a measure of exporter costs. The other secondary controls might include product demand conditions, like the real GDP in the destination market. The coefficient on the exchange rate term in equation 4 more appropriately reflects the markup behavior of the exporter. This term has economic meaning associated with the microstructure of the traded goods markets, as exposited simply and eloquently in Dornbusch (1987). Studies of export pricing by Knetter (1993) and of import pricing by Yang (1997) show that pass-through into local currency prices is lower when local products are less differentiated.

For the debate on the inflationary consequences of exchange rate fluctuations, the relevant dependent variables are import prices of specific countries. It is appropriate to measure this elasticity in an equation like 5, which controls for other (potentially correlated) changes in cost and demand conditions. Our dependent variables are import unit value indices for 25 OECD countries. For each of these country indices we estimate short-run and long-run elasticities using the statistical specification in equation 2 (plus dynamics) and the alternative specification in equation 5 (plus dynamics), with the latter measure having a more direct *economic* interpretation. We then characterize the levels and paths of these elasticities across countries. Specifically, we provide explanations for cross-country and time series differences in pass-through performance, and analyze the role of alternative explanations for changes over time. These explanatory variables include monetary aggregates and the composition of a country's import bundle, with the latter composition theme entering the discussion in a way reminiscent of the debate between Knetter (1989) and Knetter (1993).

3. Exchange Rates and Import Prices: The Evidence

The Data. The OECD compiles quarterly data on *import unit values* for OECD countries, with series generally commencing around 1975 and ending in around 1999.[6] In addition to the country aggregates, the OECD also reports disaggregated data at the country level for five product categories: food, energy, raw materials, manufacturing, and non-

[5] 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).

[6] 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.

manufacturing products. Nominal exchange rates are series *neu* from the International Financial Statistics, 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.

Our simplest regressions estimate *statistical* pass-through elasticities:

$$\Delta \ln P_t^i = a_1^i \Delta \ln ER_t^i + a_2^i \Delta \ln P_{t-1}^i + v_t^i \qquad (6)$$

This equation is just like equation (2) with the addition of the lagged import price index to allow for the possibility of a partial adjustment of import prices to exchange rates. The short-run relationship between exchange rates and import prices of a country indexed by *i* is given by the estimated coefficient a_1^i. The long run elasticity is given by $a_1^i/(1-a_2^i)$.[7]

Our next set of regressions consider the extent to which the previous estimates are biased due to exclusion of appropriate controls for cost and demand conditions. We estimate the following specification

$$\Delta \ln P_t^i = a_1^i \Delta \ln ER_t^j + a_2^i \Delta \ln P_{t-1}^i + a_3^i \Delta \ln PPI_t^{*,i} + a_4^i \Delta \ln GDP_t^i + v_t^i \qquad (7)$$

in which we have introduced controls for the cost shocks to countries exporting to the domestic market and to world demand conditions. Our proxy for the primary control variable for shifting relative costs of a country's trading partners, we take advantage of the IFS reporting of both real *reu* and nominal *neu* exchange rate series and compute $PPI_t^{*,i} = neu_t^i \cdot P_t^i \,/\, reu_t^i$ by country in our sample. This gives us a measure of trading partner costs, weighted by the importance of the importing country's trading partners. The demand conditions facing the exporter are proxied by home GDP.

Table 1 presents the estimated coefficients from a least square regression of equation (1) using quarterly import unit value indexes from 1975 until the end of 1999. Short-run and long-run elasticities are provided in the first and second data columns of the table, along with the standard errors on these estimates. The results suggest a large degree of partial exchange

[7] 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.

rate pass-through for most countries in the sample. We can reject the hypothesis of zero short and long-run pass-through for 23 of the 25 countries, the exceptions being Iceland and Greece. We can reject the hypothesis of complete short-run pass-through for 22 of 25. Long run elasticities generally are closer to one (we reject pass-through equal to one in only 9 of 25 countries), and in 6 of the countries long run import prices adjust by more than the actual exchange rate change (although these terms are never statistically significant).

Across countries, the mean over the full period is 0.58 for the short run elasticity. This means that nearly 60 percent of the exchange rate change is passed through into import prices in one quarter after the exchange rate movement. The average long-run elasticity is 0.81, so that about 80 percent price adjustment is realized over the longer term. Of course, the table shows that there is considerable cross-country variation in these numbers. In the short run, some countries (such as the United States) exhibit 25 percent statistical pass-through, while for others the short-run statistical pass through is close to 100 percent.

Another interesting question is whether there appear to have been declines over time in these statistical measures of pass-through: such declines could occur in the context of increased reliance on imported inputs by exporters or declines in markups over time (without specifying the reasons for such declines) or changes in the composition of trade. [8] The last two columns of Table 1, which compare pass-through elasticities at 1999 with elasticities in 1989, support the tendency of statistical pass-through rates to have declined over time. However, there were *almost* as many large increases in the price elasticity as there were large decreases.

[8] Declines also may be due to changing omitted variables bias. See Table 2 discussion.

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

Country	Full Sample Pass-Through Elasticities		Change in Elasticities 1999 versus 1989	
	Short Run	Long-Run	Short-Run	Long-Run
Australia	0.565*+	0.836*	-0.027	-0.046
Austria	0.833*	0.690*	-0.203	-0.220
Belgium	0.744*	1.099*	-0.043	-0.075
Canada	0.636*+	0.922*	0.147	0.020
Switzerland	0.601*+	0.692*+	-0.067	-0.081
Czech Republic	0.255*+	0.482*+	0.255	0.482
Germany	0.459*+	0.954*	-0.124	-0.264
Denmark	0.692*+	1.090*	-0.166	-0.154
Spain	0.626*+	0.994*	0.027	-0.051
Finland	0.543*+	0.795*	-0.003	-0.187
France	0.637*+	1.376*	-0.066	-0.152
United Kingdom	0.353*+	0.641*+	0.021	0.036
Greece	0.313+	0.245+	0.084	0.075
Hungary	0.420*+	0.671*	0.405	0.652
Ireland	0.871*+	0.888*	-0.015	-0.004
Iceland	-0.009	-0.025+	-0.001	-0.000
Italy	0.644*+	1.037*	-0.061	-0.183
Japan	0.769*+	1.263*	-0.233	-0.361
Netherlands	0.634*+	1.457*	-0.110	-0.244
Norway	0.352*+	0.362*+	0.163	0.190
New Zealand	0.627*+	0.813*	-0.130	-0.255
Poland	1.338*+	0.797*+	-0.503	-0.170
Portugal	0.643*+	0.913*	0.114	0.174
Sweden	0.667*+	0.666*+	-0.200	-0.151
USA	0.223*+	0.525*+	0.063	0.011
Average	0.577	0.807	-0.027	-0.038

* Significantly different from zero at the 5 percent level. + Significantly different from one at 5 percent level.

Table 2 presents pass-through elasticity estimates from the economically meaningful regression that corrects for the influence on import prices of foreign country costs and local demand conditions. The resulting pass-through elasticities are often quite similar to those provided in Table 1. Once again, there are strong tendencies for partial pass-through in the short run (significantly different from zero in 23 out of 25 countries; significantly different from one for 21 out of 25), with longer run pass through close to one (complete pass-through rejected in 9 out of 25 countries). The cross-country average is 0.62 for the short-run

elasticities (compared with 0.58 from Table 1) and 0.77 for the long-run (compared with 0.81 in Table 1). The middle two columns of Table 2 again show that while pass-through elasticities have had a tendency to decline over the past decade, there also were many countries with rising pass-through elasticities. The final two columns of Table 2 compare the elasticities generated by the statistical versus marginal cost adjusted approaches. The balance of positive and negative entries show that the statistical approach generated about as many overestimates of pass-through elasticities as it did underestimates.

Table 2: Import Pass-through Elasticities (constant marginal costs), levels and comparisons

Country	Full Sample Pass-Through Elasticities		Change in Pass-through Elasticities 1999 versus 1989		Statistical versus Marginal Cost controlled	
	Short Run	Long-Run	Short-Run	Long-Run	Short-Run	Long-Run
Australia	0.575*+	0.713*+	-0.048	-0.045	-0.010	0.123
Austria	0.914*	0.764*	-0.214	-0.231	-0.080	-0.074
Belgium	0.216+	0.239+	0.255	0.283	0.528	0.860
Canada	0.581*+	0.845*	0.094	-0.004	0.055	0.077
Switzerland	0.598*+	0.681*+	-0.050	-0.066	0.003	0.010
Czech Republic	0.473*+	0.728*	0.302	0.529	-0.120	-0.245
Germany	0.449*+	0.988*	-0.152	-0.311	0.011	-0.033
Denmark	0.594*+	0.797*	0.026	0.181	0.098	0.293
Spain	0.637*+	0.917*	0.012	-0.046	-0.11	0.077
Finland	0.649*+	0.936*	-0.042	-0.265	-0.106	-0.141
France	0.636*+	0.962*	-0.165	-0.187	0.001	0.416
United Kingdom	0.354*+	0.600*+	0.025	0.017	-0.001	0.040
Greece	0.250+	0.194+	0.183	0.145	0.063	0.050
Hungary	0.523*+	0.804*	0.470	0.738	-0.103	-0.132
Ireland	0.827*	0.826*	-0.033	-0.021	0.068	0.083
Iceland	0.918*	1.101*	0.060	-0.087	-0.927	-1.126
Italy	0.607*+	0.835*	-0.208	-0.401	0.037	0.202
Japan	0.768*+	1.273*	-0.219	-0.352	0.001	-0.010
Netherlands	0.599*+	1.126*	-0.060	-0.131	0.035	0.331
Norway	0.531*+	0.601*+	0.140	0.186	-0.179	-0.238
New Zealand	0.515*+	0.527*+	-0.097	-0.123	0.112	0.288
Poland	1.558*+	0.881*	-0.446	-0.121	-0.220	-0.084
Portugal	0.733*	0.800*	0.095	0.114	-0.090	0.114
Sweden	0.679*+	0.680*+	-0.237	0.193	-0.012	-0.014
USA	0.253*+	0.522*+	0.061	-0.035	-0.030	0.002
Average	0.617	0.774	-0.010	-0.002	-0.039	0.035

* Significantly different from zero at 5 percent level. + Significantly different from one at 5 percent level.

As a final exercise for this section, we compute the (constant marginal cost) pass-through elasticities for the five sub-aggregates of import prices reported by the OECD: Food, Energy, Raw Materials, Manufacturing Products, and Non-manufacturing Products (see Appendix Table 1).[9]

In most industries there is significant evidence of partial pass-through, as summarized in Table 3. For all product categories --- with the key exception of Energy--- we can reject the hypothesis of zero exchange rate pass-through (LCP, local currency price stability) for at least half of the countries. For Manufacturing and Food, we also can reject complete pass through (PCP, producer currency price stability) for most countries. The partial pass-through evidence is strongest across Manufacturing imports, for which short-run pass through differs significantly from zero in 22 out of 24 countries, and significantly from one in 21 out of 24 countries. Food also exhibits fairly strong and consistent evidence of partial pass through in the short run. Energy imports have the most anomalous behavior among all the product categories. Country experiences vary considerably, with the evidence suggesting that the pass-through elasticities on Energy cluster either around zero (rejected in short run for only 9 of 24 countries) or around one (rejected for 6 of 24 countries).

The stability of pass-through coefficients for the disaggregated import price indices is important for understanding the sources of fluctuations in the aggregate import pass-through elasticity. We formally test for the stability of these coefficients by country and by product, with the sample period divided into four intervals (1975:1 to 1980:4, 1981:1 to 1986:4, 1987:1 to 1992:4, 1993:1 to 1999:4). Based on F-tests, while we reject stability for the pass-through coefficients over the aggregate import price series for 8 countries (including the United States), for the disaggregated indices we never reject stability of the pass-through coefficients for more than 4 countries. We take this result as an indication that exchange rate pass-through for the sub-indices is more stable than the exchange rate pass-through for aggregated import prices.

[9] 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

Table 3: Rejection of LCP or PCP for Industry Subaggregates
(# rejected out of 24 countries)

	Food	Energy	Raw Materials	Manufacturing	Non-Manufacturing
Short run					
Reject =0	18	9	18	22	16
Reject =1	17	6	10	21	9
Reject =0 & =1	13	0	6	19	3
Average elasticity	.48	.67	.66	.56	.65
Long run					
Reject =0	18	10	18	22	17
Reject =1	14	6	10	21	7
Reject =0 & =1	10	1	7	19	3
Average elasticity	.55	.89	.79	.61	.86

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

The previous section demonstrated that countries exhibit both large cross-sectional and time-series variation in pass-through elasticities. The derivation provided in equation 4 shows that pass through can evolve due to changes in producer markups over costs and to changes in imported input use. In this section we explore whether recent debates over the link between macroeconomic variables and pass-through --- which focus on the endogeneity of markups to the macroeconomic environment --- are borne out in the data. Alternatively, we consider whether changes in aggregate import price pass-through are mainly attributable to changes over time in the composition of import bundles.

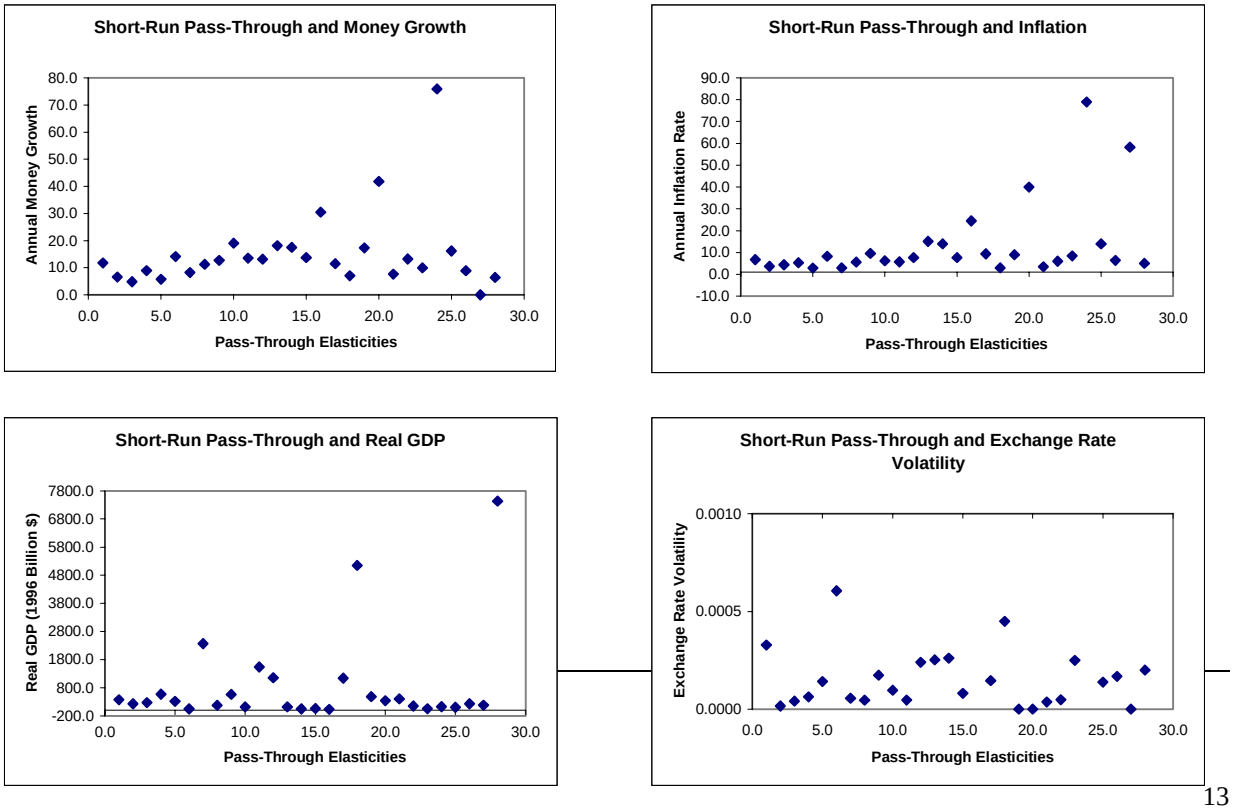
A. Macro determinant of pass-through. Taylor (2000) hypothesized that the decline in average inflation rates in the developed world has also resulted in a decline in the degree in which firms pass-through changes in costs into prices for their final goods. All else equal,

closer to classification as imported intermediate goods than Food, Manufacturing, and Non-manufacturing

lower inflation leads to lower import price pass-through. A similar result, reached through a different channel, is posited by Devereux and Engel (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, pass-through would be lower into these markets.

Exchange rate variability may also play a role in determining the extent of import price responsiveness. 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. Finally, exchange rate pass-through may be related to the importance of the importer relative to the total local market (this point could, however, be viewed as falling under a micro-determinant of pass-through). As a first pass at this issue, we correlate pass-through elasticities with country real GDP, recognizing that some measure of especially sector-specific openness may be an alternative way to proceed. These analyses are presented in Figures 1 and 2, with related regression specifications shown in Tables 4 and 5.

Figure 1 Short-Run Pass-Through Elasticities and Macro Variables
(Panel Results, 1975-1999)



Figures 1 and 2 present cross-sectional (panel) evidence on how the average short-run or long-run pass-through elasticities of specific countries correlate with average inflation rates over the estimation period, or money growth rates, or exchange rate volatility, or real GDP. We also present bivariate and multivariate panel regressions using simple weighted least squares regressions of short and long run elasticities. We use a weighted least squares method so that noisy estimates receive less weight in the second stage results. We use as weights the inverse of the standard error of the estimated pass-through elasticities.

The time series variables used in the estimation are all measured quarterly, for the sample period 1975:1 to 1999:4, and constructed as follows: *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 obtained from the nominal value in national currency using the CPI deflator and converting into U.S. dollar at the average 1996 nominal exchange rate.

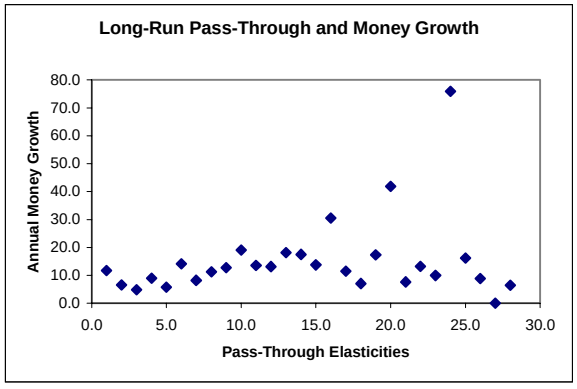
$$\gamma^{i}_{sr \text{ or } lr} = \alpha + \beta x^{i} + \varepsilon_{t} \qquad (8)$$

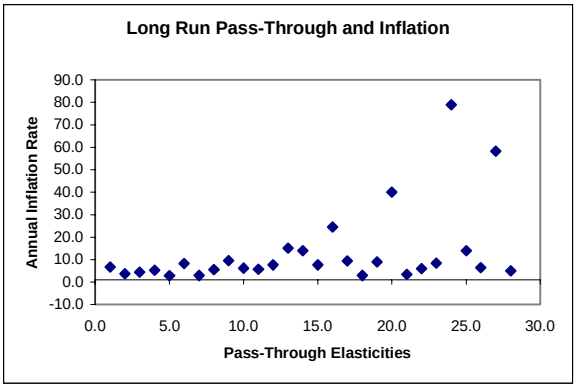
These panel tests (Tables 4 and 5), which do not have a time series component, suggest that country-specific pass-through elasticities are positively correlated with inflation or money growth, and with nominal exchange rate volatility of countries. However, these tests are clearly limited for hypothesis testing since they do not abstract from other country-specific determinants of pass-through rates. The more appropriate tests of whether altered pass-through is systematically associated with changes in macroeconomic performance introduce a time-series window and control for country fixed effects.

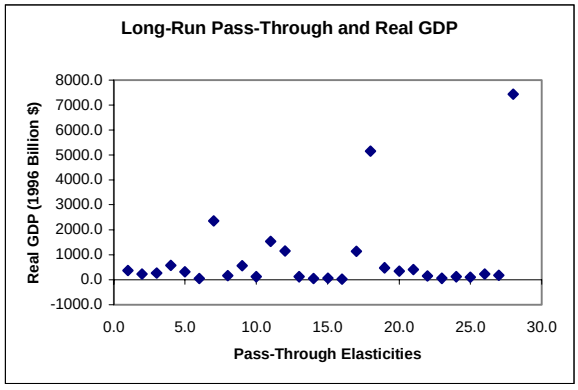
Table 4 Determinants of Short Run Pass-Through Elasticities: Cross Country Panel					
Constant	-0.000 (0.195)	0.298** (0.133)	0.558*** (0.042)	0.828*** (0.167)	0.044 (0.374)
Money	0.238*** (0.080)				0.321* (0.179)
Inflation		0.145** (0.068)			-0.108 (0.142)
ExVol			3.037 (1.862)		1.300 (1.953)
Real GDP				-0.043 (0.27)	-0.077 (0.031)
AdjR2	0.249	0.131	0.065	0.060	0.179
nobs	25	25	25	25	25

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares.

Figure 2 Long-Run Pass-Through Elasticities and Macro Variables
(Panel Results, 1975-1999)







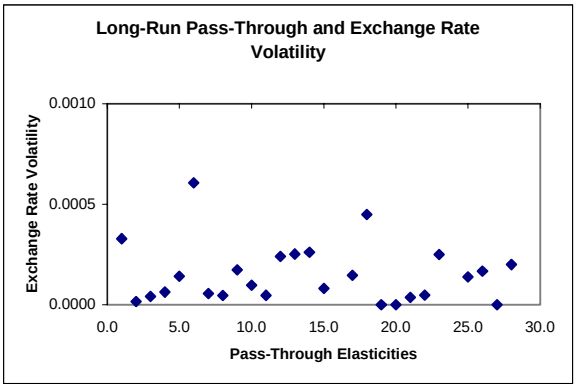


Table 5 Determinants of Long Run Pass-Through Elasticities: Cross Country Panel					
Constant	-0.535 (0.197)	0.735*** (0.135)	0.741*** (0.046)	0.649*** (0.192)	0.124 (0.306)
Money	0.090 (0.077)				0.562*** (0.173)
Inflation		0.013 (0.062)			-0.400*** (0.138)
ExVol			2.874* (1.658)		3.375*** (1.538)
Real GDP				-0.020 (0.033)	-0.048 (0.031)
AdjR2	0.016	0.042	0.079	0.028	0.363
nobs	25	25	25	25	25

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares.

For most countries the macroeconomic variables have moved substantially during the sample period. 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 used in the previous exercise is not very representative of behavior through the overall sample period, we split the sample period into four intervals (1975:1 to 1980:4, 1981:1 to 1986:4, 1987:1 to 1992:4, 1993:1 to 1999:4) and estimate for each interval the short and long-run pass through elasticities of aggregated import prices for each country using equation 7. We regress these estimated elasticities against the average behavior of the countries macroeconomic variables during those time periods, again using weighted least squares, using as weights for each observation the inverse of the estimated standard errors for each pass-through elasticity. We also included in the regression a set of country and time dummies to account for other country and period-specific effects not controlled for by the exogenous variables.

As expected, the time-series panel results (Table 6) are more informative than the prior panel regressions. Focussing first on short-run pass through elasticities, the regressions consistently show that periods with higher inflation rates and higher rates of exchange rate volatility are significantly correlated with higher rates of exchange rate pass through. These

inflation results are consistent with the macroeconomic argruments that higher inflation rates induce producers to pass on a higher percentage of cost shocks into final goods prices. A one percent increase in the inflation rate is associated with a 0.0015 increase in pass-through. Exchange rate volatility increases pass-through into import prices in the short run, an effect running counter to that predicted by the hysteresis arguments. While money growth does not appear to be important in these multivariate regressions, this is mainly due to its high correlation with inflation (which is picking up the statistical contribution of both terms). The macroeconomic variables are jointly statistically significant in these regressions, accounting for 11% of the variation in the movements over time in pass-through elasticities across countries.

Table 6 Macroeconomic Determinants of Pass-Through: Time Series Panel Regressions

	Short-Run Pass-Through (Levels)		Long-Run Pass-Through (Levels)	
time dummies	√	√	√	√
country dummies	√	√	√	√
money	-0.028 (0.053)		-0.175 (0.168)	
inflation	0.154*** (0.054)	0.148*** (0.053)	-0.075 (0.175)	-0.122 (0.169)
Exchange rate volatility	30.62** (14.32)	28.85** (13.85)	53.54* (32.24)	43.69 (30.84)
Real GDP	0.026 (0.027)	0.024 (0.026)	-0.031 (0.075)	-0.045 (0.074)
Adj. R2	0.568	0.573	0.09	0.09
Adj. R2 from specification with only Macro variables	0.11		-0.05	
# obs	87	87	87	87

***, **, * indicate statistical significance at the 1, 5 and 10 percent levels, accordingly. All regressions are weighted least squares.

The right-most columns of Table 6 provide results from specifications over long-run pass through elasticities. While exchange rate volatility is weakly significant with a positive

sign, the other macro variables enter insignificantly into these specifications. F-tests show that macro variables have no explanatory power within this cross-country time series panel for long-run pass through rates.

B. The Role of the Composition of Trade. While these macro variables had some explanatory power – especially in specifications over short run elasticities, the country and time fixed effects are highly significant in the regression specifications. Another possible explanation for changing exchange rate pass-through into import prices is that the pass-through elasticity reflects a changing composition of trade. We previously demonstrated that different categories of products are characterized by different import-price pass-through elasticities. The next issue, therefore, is the extent to which there were systematic changes in the composition of trade that may account for changes in the aggregate import pass through rates. If a country shifts the content of its trade from industries with high pass-through elasticities into industries with lower elasticities, the overall import price elasticity would decline. Conversely, a shift to higher pass-through products would raise the overall pass-through elasticity of aggregated import prices.

To illustrate the importance of the changing composition of trade we decompose the share of trade for the sample countries into the five different product categories at two points in our sample period, 1980 and 1992. As shown in Appendix Table 3, in 1980 for most countries manufacturing imports comprised more that 50 percent of the overall import bill. The clear exceptions were countries heavily reliant on imported energy, notably Japan, followed by Italy and France. Japan also stood out among OECD countries for the relatively large share of raw materials in its imports. By the 1990s there were striking changes across countries in the composition of imports, with a substantial shift into manufactured products. 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 and an almost identical increase in the share of Manufacturing Products during this period.

This shift in the components of trade is very revealing. Recall from the discussion above that Energy is the product category with the most polar pass-through rates (close to zero or close to one, but highly noisy) and that Manufacturing was the product category for which zero or perfect exchange rate pass-through was most often rejected. This shift in the relative importance of Energy and Manufacturing products in import volumes might be behind a sizable fraction of the cross-country changes in the average pass-through elasticity into import prices in developed countries.

We illustrate this point by estimating the changes in the aggregate pass-through elasticities of the countries in the sample that are due purely to changes in the structure of the industry composition of imports. We start with the estimated industry elasticities for each of the five industry groupings for each country. We also use OECD data on the industry composition of trade over these five groupings in four different sample periods, 1980, 1986, 1992, and 1998. The aggregate elasticity in each of these periods is a weighted average of the industry elasticities for the full sample, with weights defined by the share of each industry in the country's total imports of that year (see appendix Table 4 for the 1980 and 1992 results). [10]

The import pass-through elasticities estimated using this methodology would have declined for eleven of the sixteen countries for which we have available data in the sample. 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. For example, consider a comparison of 1980 and 1992 (mid points of the first and second halves of our overall sample period). For the case of the United States, the aggregate pass-through elasticity would have declined from 0.32 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 0.85 to 0.63.

Such imputed changes over time in the exchange rate pass-though elasticity of overall import prices (short run and long run) arising purely from the use of 1980 versus 1992 trade weights are presented in the last two columns of Table 7. The first two data columns of this

table show the actual changes in the aggregate pass-through elasticity computed using the data sub-periods I (1975:1 to 1980:4) and III (1987:1 to 1992:4).

Table 7 **Estimated Aggregate Short Run Elasticities From Trade Weights**

	Change in Pass-Through Elasticities Based on Aggregate import prices, Interval I-Interval III		Imputed Changes in Pass-Through Elasticities based on 1980 and 1992 Trade Weights	
	Short Run	Long Run	Short Run	Long Run
Australia	-0.016	-0.056	-0.009	-0.010
Austria	-1.853	-1.122	0.026	0.102
Belgium	-1.620	-1.556	-0.051	-0.052
Belgium	-1.274	-1.153	n.a.	n.a.
Canada	-0.186	0.124	0.150	0.264
Czeck	n.a.	n.a.	n.a.	n.a.
Denmark	0.024	0.034	0.135	0.156
Finland	-0.239	-0.302	0.226	0.165
France	0.549	0.861	0.132	0.064
Germany	0.169	0.556	0.150	0.264
Hungary	-0.151	-0.252	n.a.	n.a.
Iceland	-0.877	-0.711	n.a.	n.a.
Ireland	0.133	0.039	0.045	0.129
Italy	-0.094	0.182	0.225	0.393
Japan	0.152	0.934	0.090	0.169
Korea	n.a.	n.a.	n.a.	n.a.
Mexico	n.a.	n.a.	n.a.	n.a.
Netherland	0.000	0.575	0.245	0.379
New Zealand	0.469	0.584	n.a.	n.a.
Norway	-0.506	-0.585	-0.104	-0.101
Poland	-1.176	-1.159	n.a.	n.a.
Portugal	-1.778	-0.993	n.a.	n.a.
Spain	0.343	0.544	n.a.	n.a.
Sweden	0.436	0.428	0.028	0.049
Switzerland	0.068	0.221	n.a.	n.a.
Turkey	n.a.	n.a.	n.a.	n.a.
United Kingdom	-0.118	-0.152	-0.019	-0.010
United States	-0.284	-0.024	0.065	0.003
Rank Correlations	Short Run	0.312	Long Run	0.621

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

It is difficult to provide a formal statistical comparison between both sets of columns, given that all of these calculations come from estimated coefficients. However, as a first pass at this issue we use Rank Correlation analysis. This approach enables us to draw some inference between how likely it is that changes in the product composition of imports might have driven the changes in the aggregate import elasticities that we observed in Table 1. We find that the rank correlation between the changes in these short- and long-run pass-through elasticities (last row of the table) are both significantly positive. This suggests that countries for which the changes in the trade composition of imports were largest also experienced a larger change in the estimated aggregate import pass-through rates during the sample period.

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 about 17 countries, since some of the countries did not have adequate trade share decompositions for our purposes.

Our regression is of the form (delete boxes in front of money and inflation)

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

where country and time dummies are included, and weighted least squares estimation is again applied. Our regression results are reported in Table 8.

These specifications show that common time dummies, macro variables and imputed trade shares explain the most of the observed differences over time in the short-run pass-through elasticities of countries. Long-run elasticities, which are both closer to one and noisier across countries and over time, are much less well explained. Neither macro or micro variables contribute much at this horizon.

For the short run specifications, while higher inflation performance (or money growth) still is associated with increased pass-through, the macro variables taken together only account for at most 11 percent of the observed differences in pass-through elasticities. By contrast, the imputed trade elasticities --- pointing to the importance of trade composition

--- are highly statistically significant and account for 65 percent of the variation in short-run elasticities. In fact, the hypothesis of the joint insignificance of the macro variables cannot be reject at the one percent level (although it is rejected at the 5 percent level for the short-run passthrough specification). We conclude that trade composition effects dominate as explanations for movements over time in the short-run sensitivity of import prices to exchange rates.

Table 8 Macro versus Micro Determinants of Pass-Through: Time Series Panel Regressions

	Short-Run Pass-Through (log Levels)		Long-Run Pass-Through (log Levels)	
Time dummies	√	√	√	√
Country dummies	√	√	√	√
Money	-0.072** (0.035)		-0.207 (0.151)	
Inflation	0.087** (0.041)	0.084*** (0.043)	0.144 (0.194)	0.110 (0.194)
Exchange rate volatility	7.664 (9.223)	2.954 (9.265)	20.99 (26.37)	8.48 (25.00)
Trade Imputed Elasticity	0.839** (0.356)	0.822** (0.369)	0.110* (0.065)	0.101 (0.065)
Real GDP	0.015 (0.017)	0.012 (0.017)	1.416 (0.917)	1.242 (0.917)
Adj. R2	0.88	0.87	0.18	0.162
Adj. R2 from specification w/only Macro variables	0.11		0.31	
Adj.R2 from trade imputed elasticity only	0.65		0.11	
# obs	70	70	69	69

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 countries since 1975. We also have investigated competing arguments for changes in these pass-through elasticities over time and for differences across countries. Straight panel regressions suggest that macroeconomic variables play a significant but limited role in

cross-country differences in *levels* of pass-through elasticities. However, *changes* in short-run exchange rate pass-through elasticities do appear to be correlated with certain macro economic aggregates of the importing country. High volatility of the nominal exchange rate, high inflation or high growth of monetary aggregates are correlated with higher short-run elasticities of import prices to exchange rate changes. This provides some limited support for recent arguments for virtuous cycles between inflation and money policy effectiveness, where it is argued that low inflation (or inflation volatility) regimes are associated with low pass-through, and locally more effectiveness of monetary policy. Overtime, although there is some cross-country evidence that import price pass-through elasticities have declined, this does not appear to be a general phenomenon across the wide cross section of OECD countries in our sample.

The incidence of increases or decreases in pass-through rates into aggregate import price series mainly reflects interesting changes in import composition. Import price pass-through elasticities vary significantly across different types of products. 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 -- clustering closer either to zero or to one for countries. Given the systematic shift in the composition of country imports toward manufactures and away from energy imports, the implications for pass-through into the import prices of a country depend on whether the country started out with pass-through into energy prices near zero or near one. This shift in composition has been the most substantial driver of the shifts in short-run pass-through rates observed over the bundled aggregate import price indices of OECD countries.

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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*.

Appendix Table 1: 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	0.327*+	0.428+*	0.549	0.703	0.416*+	0.499*+	0.602*+	0.749*+	0.468*+	0.490*+
Austria	0.202	0.187	0.967	1.478	1.022	0.741	0.741*	0.525*+	1.228*	1.743*
Belgium	0.201+	0.300+	-0.376	-0.447	0.782*	0.962*	0.277+	0.250+	0.208+	0.241+
Canada	0.767*	0.806*	0.441	0.517	0.460*+	0.407*+	0.626*+	0.766*+	0.561*	0.570*
Switzerland	0.325*+	0.300*+	1.558*	2.379*+	0.488*+	0.577*+	0.576*+	0.519*+	1.072*	1.724*
Czech Republic	0.498*+	0.698*	0.045	0.055	0.916*	1.098*	0.431*+	0.520*+	0.310	0.489
Germany	0.257*+	0.527*+	1.269*	2.156*	0.691*	1.282*	0.353*+	0.588*+	0.804*	1.677*
Denmark	0.629*+	1.123*	1.335*	1.767*	1.105*	1.232*	0.515*+	0.741*+	1.177*	1.596*
Spain	0.666*+	0.584*+	0.762*	0.935*	0.699*	0.789*	0.662*+	0.747*+	0.769*	0.883*
Finland	0.319	0.225	1.619	1.168*	0.663	0.456+	0.146+	0.090+	1.222*	0.873*
France	0.823*	0.963*	0.747	0.892			0.416*+	0.778*	0.721*	0.868*
United Kingdom	0.255*+	0.304*+	0.194+	0.267+	0.487*+	0.688*+	0.419*+	0.473*+	0.332*+	0.541*+
Greece	0.296+	0.282+	-0.285+	-0.251+	0.082+	0.063+	0.397*+	0.415*+	-0.125+	-0.092+
Hungary	0.748*	0.709*	-0.058+	-0.099	0.681*	0.833*	0.468*+	0.644*+	0.195+	0.323
Ireland	0.707*	0.755*	1.199*	1.983*	0.852*	1.071*	0.730*	0.652*+	0.967*	1.865*
Italy	0.534*+	0.560*+	1.094*	1.514*	1.113*	0.898*	0.516*+	0.664*+	0.790*	1.048*
Japan	0.685*+	0.811*+	0.971*	1.431*	0.831*+	1.067*	0.664*+	0.840*+	0.838*	1.309*
Netherlands	0.249*+	0.701*	1.793*	2.397*	0.880*	2.429*	0.332*+	0.340*+	1.042*	1.584*
Norway	0.547*+	0.503*+	-0.316+	-0.295+	0.492	0.505	0.442*+	0.442*+	0.414+	0.427
New Zealand	0.597*+	0.548*+	0.244+	0.235+	0.430*+	0.417*+	0.475*+	0.497*+	0.492*+	0.420*+
Poland	0.041+	0.041+	0.059+	0.101+	0.040+	0.086+	1.558*+	0.881*	0.084+	0.106+
Portugal	0.642*	0.623*	0.599	0.743	1.222*	1.047*	0.801*	0.821*	0.426	0.469
Sweden	0.647*+	0.534*+	0.857*	0.960*	0.519*+	0.474*+	0.663*+	0.637*+	0.828*	0.868*
United States	0.139+	0.181+	0.520	0.613	0.145*+	0.316*+	0.225*+	0.550*+	0.376+	0.431+
average	0.481	0.552	0.668	0.892	0.664	0.793	0.558	0.609	0.645	0.862

*Significantly different from zero (5%), + Significantly different from one (5%).

Appendix Table 2: 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

Appendix Table 3: Share of total imports by major product category

Country	Food		Energy		Raw Materials		Manufacturing		Nonmanufacturing	
	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 4: **Imputed Aggregate Pass-Through Elasticities**
(constructed using import-share weights on product pass-through elasticities)

	Short-Run Elasticity		**Long-Run Elasticity**	
	1980	1992	1980	1992
Australia	0.569	0.578	0.709	0.719
Austria	0.764	0.738	0.669	0.567
Canada	0.574	0.619	0.684	0.739
Germany	0.588	0.438	1.019	0.756
Denmark	0.758	0.624	1.054	0.898
Finland	0.611	0.385	0.430	0.264
France	0.600	0.468	0.841	0.778
United Kingdom	0.372	0.390	0.443	0.453
Ireland	0.807	0.762	0.906	0.777
Italy	0.848	0.623	1.151	0.759
Japan	0.849	0.760	1.175	1.005
Netherlands	0.713	0.468	1.041	0.662
Norway	0.322	0.426	0.324	0.425
Sweden	0.703	0.674	0.702	0.653
United States	0.319	0.254	0.529	0.526
Belgium-Luxembourg	0.192	0.243	0.188	0.240