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José Manuel Campa and Linda S Goldberg

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José Manuel Campa, IESE, Madrid and CEPR
Linda S Goldberg, Federal Reserve Bank of New York

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

Exchange Rate Pass-Through into Import Prices*

We provide cross-country and time series evidence on the extent of exchange rate pass-through into the import prices of 25 OECD countries. Across the OECD and especially within manufacturing industries, we find compelling evidence of partial pass-through in the short run, rejecting both producer-currency pricing and local currency pricing. Over the long run, producer-currency pricing is more prevalent for many types of imported goods. We show that many countries have experienced changes in exchange rate pass-through over the past decades. While we find that countries with higher rates of exchange rate volatility are also those with higher pass-through elasticities, we also conclude that macroeconomic variables have played only a minor role in accounting for the evolution of OECD pass-through over time. Far more important for pass-through changes have been the dramatic shifts in the composition of country import bundles.

JEL Classification: F30 and F40
Keywords: exchange rates, pass-through and trade composition

José Manuel Campa
IESE
Camino del Cerro del Aguila 3
28023 Madrid
SPAIN
Tel: (34 91) 211 3011
Fax: (34 91) 357 2913
Email: jcampa@iese.edu

Linda S Goldberg
Research Department, 3rd floor
Federal Reserve Bank of New York
33 Liberty Street
New York
NY 10045
USA
Tel: (1 212) 720 2836
Fax: (1 212) 720 6831
Email: linda.goldberg@ny.frb.org

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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 monetary performance. Low import price pass-through means that nominal exchange rate fluctuations may lead to lower 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 relevant pass through relationship for this important monetary debate is the pass-through of exchange rate movements into a country's import prices. To date, the literature has provided only limited relevant evidence on this relationship.[3]

The first goal of our paper is to provide extensive cross-country and time-series evidence on exchange rate pass-through into the import prices of 25 OECD countries. Using quarterly data from 1975 through 1999, we estimate pass-through elasticities after appropriately controlling for shifts in exporter marginal costs and demand conditions. Our cross-country evidence is strongly supportive of partial exchange rate pass-through in the short run (defined as one quarter) at the level of the aggregate import bundle.

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

[2] See Taylor (2000). 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).

[3] As surveyed by Goldberg and Knetter (1997), most of the available evidence is from very narrowly defined export industries, with an emphasis often placed on the pricing to market behavior of exporters. Knetter (1993), Marston (1990), P.Goldberg and Knetter (1997), and Kasa (1992) use export prices or export unit values from specific countries to multiple destinations with the intent of identifying price discrimination or pricing to market activity. While import prices are by definition just the local currency value of another producer's export prices, the import price series aggregate across producers from all source countries and across a broader array of prices. For the purpose of the relevant macroeconomic debate, import price series with aggregation are the appropriate units for analysis.

The unweighted average of pass-through elasticities across the OECD countries is 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.

What explains differences across countries in exchange rate pass through into import prices? A promising recent direction of research supplements the earlier microeconomic arguments by focussing on macroeconomic variables. Most notably, theoretical works by Engel and Devereux (2001) and Bacchetta and van Wincoop (2002) argue that monetary and exchange rate variability of economies should influence the choice of invoice currencies in trade. In equilibrium, countries with low relative exchange rate variability or stable monetary policies would have their currencies chosen for transaction invoicing. The low exchange rate variability countries would also be those with lower exchange rate pass-through.

We find weak evidence for these propositions through cross-country regressions linking exchange rate pass through rates to a set of macroeconomic variables. We identify a weak systematic positive relationship between a country's exchange rate volatility over recent decades and its pass-through rates into import prices. There are not similar systematic relationships between country size and pass-through into aggregate import bundles. This empirical evidence might be limited by the sample of countries that we examine, the full set of OECD countries. For the most part, these countries have shown relatively stable monetary evolution over the last three decades.

Another issue receiving attention in the recent macroeconomic debate is the stability of exchange rate pass-through rates over time. Taylor (2001) and Goldfajn and Werlang (2001), among others, have argued that pass-through rates may have been declining over time. The Brazilian experience of the late 1990s is often cited: despite a large currency depreciation, *consumer prices* responded very little, in sharp contrast with past depreciation episodes. The issue posed in these and related studies is whether this decline in pass through, and a proported more general decline in pass through rates, are related to improved macroeconomic conditions in the importing countries.[4] We further ask whether these issues are ones that extend to the OECD countries. There are two distinct issues that often are not adequately distinguished. Our work emphasizes the importance of separating the process into two parts. The first is a border phenomenon: to what extent are there changes in pass-through

rates at the level of import prices, i.e. at the border? Second, to what extent are these border price changes transmitted to consumers or even offset by anticipated current or future monetary policy changes? Our analysis specifically deals with the former question. [5]

Out of the 24 OECD countries for which appropriate statistical tests could be performed, we confirm that there has been a tendency toward declines in exchange rate pass through rates. However, the strength of this result should not be overstated. Passthrough declines were statistically significant in only 4 countries, but significant increases in pass through into import prices also were evident in 2 countries. The United States is not one of the countries that have experienced statistically significant declines in the pass-through of exchange rates into its import prices.

We continue by undertaking a direct examination of the causes of changing pass-though rates into import prices. For any country, such shifts could arise either because of changes in the underlying composition of products in a country's import bundle, or because of changes in the pass-through elasticities associated with these product groups. At the level of specific disaggregated products, pass-though elasticities could evolve because of changes in industry competitive conditions or in macroeconomic conditions.

We are able to study the role of import composition at a broad level, since the OECD makes available import price series, by country, at the level of five import categories: food, manufacturing, energy, raw materials, and nonmanufacturing. We use these import series to further document the prevalence of LCP, PCP, or partial pass-through, and to undertake tests for stability in pass-through in these disaggregated categories. Once again, there is strong cross-country evidence on the prevalence of partial pass-through into import prices. Both PCP and LCP are strongly rejected as short-run descriptions of pass-through into Manufacturing and Food import prices. Since manufacturing trade now dominates the imports of OECD countries, the partial pass-through of overall import prices is explained. But, the issue of stability of pass-through remains relevant for the broader debate.

Interestingly, these pass-through rates for disaggregated import prices are highly stable over the two decades of data examined. We use these stable pass-through elasticities along with time-varying data on import composition to construct a series that captures the

[4] An alternative explanation rests on monetary reaction functions, as in Gagnon and Ihrig (2002).

[5] Our focus should not be confused with that of related recent papers that attempt to explain the pass-through of exchange rates into a country´s 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).

effect of import composition on aggregate pass through. We then run a horse race, contrasting the contribution to aggregate pass-through changes of time-varying macroeconomic series (country size, inflation, and exchange rate variability) against that of trade composition. Despite the fact that macroeconomic variables – especially exchange rate variability – matter for the ranking of country pass-through levels (consistent with Bacchetta and van Wincoop (2002) and Devereux and Engel (2001) conjectures), these variables have not been quantitatively important for explaining declining exchange rate pass-through into import prices across the OECD countries. Far more important for overall pass-through rates are changes in the composition of industries in each country's import basket. In particular, the move away from energy as a high proportion of the import bundles and the related substantial rise in the share of manufactured products has been the primary driver behind recent pass-through changes into import prices among numerous OECD countries.

2. Exchange Rates and Prices

The micro-foundations of pricing behavior by exporters are a useful starting point for understanding the dynamics of exchange rate pass through into import prices. The import prices for any country j, $P_t^{m,j}$, are a transformation of the export prices of that country's trading partners, $P_t^{x,j}$, using the exchange rate (domestic currency per unit of foreign) E_t :

$$P_t^{m,j} = E_t P_t^{x,j} \qquad (1)$$

The export prices, in turn, are a markup ($mkup_t^x$) over exporter marginal costs (mc_t^x). Using lower case letter to reflect logarithms, we rewrite equation (1) as

$$p_t^m = e_t + mkup_t^x + mc_t^x \qquad (2)$$

where for simplicity we have dropped the country superscript j

We further allow markups to have both an industry-specific fixed effect and a component that is sensitive to macroeconomic conditions, expressed for simplicity at this point as a function only of the exchange rates,

$$mkup_t^x = f + \Phi e_t \qquad (3)$$

and specify exporter marginal costs as rising with export market wages, w_t^x, and destination market demand conditions y_t.[7,8]

$$mc_t^x = c_0 y_t + c_1 w_t^x \qquad (4)$$

so that import prices are written in general form as

$$p_t^m = f + (1+\Phi) e_t + c_0 y_t + c_1 w_t^x \qquad (5)$$

This structure permits exchange rate pass-through $b = 1+\Phi$ to depend on the structure of competition in the industry. This is consistent with the large literature on explaining cross-sectional differences on exchange rate pass-through, as has been exposited simply and eloquently in Dornbusch (1987) and Marston (1990), among others, and supported empirically by Knetter (1993) and Yang (1997). This structure also has a direct analogue in the discussion of producer versus local currency pricing. If $\Phi = 0$, producer currency pricing takes place; if $\Phi = -1$ there is local currency pricing and exporters fully absorb the fluctuations in exchange rates in their own markups.

3. Exchange Rates Pass-Through into Aggregate Import Prices: The Evidence

A. Data and Estimation Methods. We capture the arguments of equation (5) through a log-linear regression specification similar to that tested throughout the exchange rate pass-through literature:[9]

$$p_t = a + d\, w_t + b\, e_t + j\, y_t + e_t \qquad (6)$$

where p_t are local currency import prices, e_t is the exchange rate, w_t is a primary "control" variable representing exporter costs, and y_t is a vector of other controls, including real GDP

[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.

[8] The exchange rate can also be an argument in the exporter's cost function to the extent that the exporter relies on imported inputs or has other costs that move with the relative value of the destination market currency. 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.

[9] P.Goldberg and Knetter (1997) overview the relationships between these studies. Beyond the industrial organization themes, there also are 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).

of the destination market. Biased estimates of the pass-through coefficient could arise if foreign wages or GDP are correlated with exchange rates but omitted from the regression.

We have used quarterly data on import price indices, from the OECD, compiled quarterly for 25 OECD countries, with the series commencing around 1975 and ending in 1999.[10] Nominal exchange rates are from the International Financial Statistics (series *neu*), defined in our specifications 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 aggregated 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 rate series and computing $W_t^{x,j} = neu_t^j \cdot P_t^j \big/ reu_t^j$ 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.

For each of the 25 aggregate import price indices, the first stage of our analysis entails estimating short-run (one quarter) and long-run pass-through elasticities, $\hat{b}$, from equation (5). Expressed in first-differences, 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,[11] the estimation equation is:

$$\Delta p_t^j = a + \sum_{i=0}^{-4} a_i^j \Delta e_{t-i}^j + \sum_{i=0}^{-4} b_i^j \Delta w_{t-i}^j + c^j \Delta gdp_t^j + J_t^j \qquad (7)$$

The short-run relationship between exchange rates and the import prices of country j is given by the estimated coefficient a_0^j. The long run elasticity is given by the sum of the coefficients

[10] We limit our sample to the OECD countries because we also need corresponding information on the import prices of more disaggregated categories of import. These disaggregated series are not consistently available outside of this OECD database. A detail description of the data is provided in the Data Appendix.

[11] We include up to four 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).

on the contemporaneous exchange rate and four lags of exchange rate terms $\sum_{i=0}^{-4} a_i^j$. 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.[13] [14]

B. Estimates of Exchange Rate Pass-Through into Aggregate 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, 26 percent within one quarter and about 41 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.

[13] We were unable to reject the hypothesis that the (log) series of import prices, foreign costs, and effective exchange rates were nonstationary. 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 2 of 75 instances (3 series for each of the 25 countries). This is clearly below the statistical error for 75 specifications, which would be 3.75 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.

[14] 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. Abstracting from the issue of low power of these tests, and despite predictions of theory, we rejected the cointegration hypothesis and consequently did not apply an error correction model. We reached this conclusion by first rejecting 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. We also tested for the possibility that a cointegrating vector existed but it was different from what this theory predicts. We run a model where $p(t) = a + b*e(t) + c*w(t) + u(t)$, and compute $\hat{u}(t) = \rho * \hat{u}(t-1) + e(t)$. We test whether the estimated coefficient, ρ, is different from unity, and rejected for only 3 cases the hypothesis that ρ is different from unity at the 5% level. This is slightly higher than the 1.25 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 (1975-87) minus (1988-99)	
	Short Run	Long-Run	Short-Run	Long-Run
Australia	0.55*+	0.69*+	-0.07	0.03
Austria	1.22*	1.25	0.62	0.34
Belgium	0.16+	0.71	1.29*	0.23
Canada	0.65*+	0.68*+	0.13	-0.13
Switzerland	0.67*+	0.94*	-0.10	0.09
Czech Republic	0.38*+	0.61*	---	---
Germany	0.59*+	0.79*	-0.36	-0.04
Denmark	0.56*+	0.68*	-0.05	-0.10*
Spain	0.66*+	0.56*+	-0.33	-0.86*
Finland	0.69*+	0.82*	-0.13	-0.03
France	0.53*+	1.21*	-0.64*	-1.06
United Kingdom	0.39*+	0.47*+	0.09	0.05
Greece	0.40+	-0.02+	-0.75	-1.20
Hungary	0.58*+	0.85*	0.75*	0.92*
Ireland	0.79*	1.37*	-0.00	-1.05
Iceland	1.18*	0.76*	0.54	0.30
Italy	0.67*+	0.62*	-0.80	-0.64
Japan	0.88*	1.26*	-0.33*	-0.63*
Netherlands	0.75*+	0.77*	-0.31	-0.38
Norway	0.51*+	0.79*	-0.22	-0.16
New Zealand	0.47*+	0.62*+	-0.41*	-0.48*
Poland	0.50	0.99*	0.82	0.49
Portugal	0.60*+	0.88*	-0.03	-0.19
Sweden	0.67*+	0.59*+	-0.65*	-0.35
USA	0.26*+	0.41*+	0.59	0.16
Average	0.61	0.77	-0.04	-0.27
# countries with pass through increase (# significant)			8 (2)	8 (1)
# countries with pass through decrease (# significant)			16 (4)	16 (4)

Notes: *, + imply that an elasticity is significantly different from zero or one at a 5 percent level.

A recurrent issue in the recent macroeconomics literature is the prevalence of local currency price stability (LCP) versus producer currency pricing (PCP). In our specifications, LCP represents a null hypothesis of zero pass-through while PCP implies a pass-through of unity. Notation included in Table 1 highlights our tests for the existence of local currency pricing, producer currency pricing, or partial pass-through into import prices. LCP can be rejected for 22 of the 25 countries in both the short run and the long run. PCP can also be overwhelmingly rejected in the short run (for 20 out of the 25 countries) while in the long run is much harder to reject (only for 7 of the 25 countries in the sample). For countries in the OECD, we overwhelmingly reject complete pass-through (or PCP) and zero pass-through (or LCP) as a description of aggregate import prices in the short run. In the longer run, pass-through elasticities are larger and closer to one, thus PCP is better supported as a longer run characterization.

C. Are there differences across countries in aggregate pass through?

We have tested for the statistical differences across countries in pass-through elasticities shown in Table 1 by restimating equation seven with the data pooled for all countries and imposing the restriction that estimated coefficients be the same across countries. We rejected this hypothesis at the one per cent level. We also re-estimated equation (7) for the pooled sample allowing coefficients in the non-exchange rate terms to vary by country and we also rejected the hypothesis of equality of exchange rate pass through across countries.

Theoretical arguments for cross-country differences in exchange rate pass through rates can depend on the stability of local monetary policy (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. Exchange rate variability and local monetary volatility could also enter through 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. As initially exposited by Dornbusch (1987), exchange rate pass-through may be

higher if the exporters are large in number relative to the presence of local competitors. One approximation to this point is that pass-through elasticities might be inversely related to country real GDP. An alternative approach would be to also consider measures of sector-specific openness for countries.

We test for the importance of these alternative hypotheses by running second stage regressions over the short-run and long-run pass-through elasticities of OECD countries. The second stage regression is given by

$$\hat{b}^{j}_{sr \text{ or } lr} = a + b x^{j} + e^{j} \qquad (8)$$

where x^j is a vector representing all the exogenous regressors that may explain cross-country differences in exchange rate pass through. We have used as exogenous variables: country-specific average inflation rates, money growth rates, exchange rate volatility, and real GDP during the sample period. The bivariate and multivariate cross-country 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 the right-hand-side macro variables are all measured quarterly over the sample period 1975:1 to 1999:4. These variables include: *Money* measured as 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 nominal value in national currency deflated using the CPI deflator and converted into U.S. dollar at the average 1996 nominal exchange rate.

The results of the second stage panel regressions are presented in Table 2. These cross-country results, 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: countries with more nominal volatility have higher pass-through rates. The result that lower nominal volatility is associated with lower pass-through is consistent with the main theoretical results of Devereux and Engel (2001) and Bacchetta and vanWincoop (2001). The role of country size, however, is insignificant in the rankings of pass-through rates across countries. Despite the observation that U.S. pass-through rates are

quite low, across the OECD there is no systematic relationship between pass-through and a country real GDP. Some large countries have high pass-through (Japan) while some small countries have low pass-through (Czech Republic).

Table 2 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.

D. Stability of Aggregate Pass through Elasticities

As noted in our introduction, an outstanding issue is whether pass-through rates have been declining over time, and if so, figuring out if such declines are related to changes in macroeconomic policy variables. We confront the first part of this issue directly by performing two types of structural change tests on the pass-through elasticities. We first assume an exogenously imposed break point in the middle of the sample and perform Chow

tests for parameter stability. In a second set of tests we allow for endogenously determined structural break points.[15] In the process of doing these tests, we further identify the dominant directions of pass-through changes.

In our implementation of the Chow-tests we compare elasticities estimated over the first half of the sample, 1975 through 1987, with those over 1988 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 – 4 cases with statistically significant declines– and increased in 8 countries—with 2 being statistically significant. A similar pattern appears in the long run elasticities. Thus, while Chow tests suggest that there has been a tendency 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 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 stability analyses, we test for the presence of a structural break in pass-through using the methods proposed by Andrews (1993) and Andrews and Ploberger (1994). These methods test for the existence of a structural break point in the stated relationship at some unknown date within the sample period. These tests have the advantage that the researcher does not need to specify a priori the date in which the structural break takes place. However, these tests are asymptotic and their power in our context 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 rejected 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 essentially overlaps with, but is not identical to, the Chow test instability countries.

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

4. Understanding the Evolution of Aggregate Pass Through

A. Theoretical underpinnings. Various explanations could be offered for changes over time in the country rates of exchange rate pass through. Most of the arguments that we described in the previous section to justify differences in pass through *across* countries also could be directly applied to the evolution of exchange rate pass through *within* countries over time. In this section we distinguish between these general macro-based explanations and an alternative explanation based on changes over time in the composition of imports. Recall from equation (5) that any import price series is given by $p_t^m = f + (1+\Phi)\, e_t + c_0 y_t + c_1 w_t^x$. This equation is derived directly from a first order condition of a firm and it holds at the individual micro level. In the previous section we used this equation as a justification for the estimation of a pass-through rate for the country using an aggregate import price series. Obviously, this aggregate import price is composed of a weighted average of industry specific import price indices. If there are N products within a country's import bundle, we can rewrite the expression in equation (5) for an aggregate index as

$$p_t^m = \sum_{i=1}^{N} a_i \cdot f_i + \sum_{i=1}^{N} a_i \cdot (1+\Phi_i) \cdot e_t + \sum_{i=1}^{N} a_i \cdot mc_t^{i,x} \qquad (9)$$

where a_i represents the weight of any product category i in a country's import bundle. This implies that short-run aggregate pass-through β, and changes in aggregate pass through can be expressed as

$$b = \sum_{i=1}^{N} a_i \cdot (1+\Phi_i) \qquad (10)$$

$$\Delta b = \sum_{i=1}^{N} \Delta a_i \cdot (1+\Phi_i) + \sum_{i=1}^{N} a_i \cdot \Delta\Phi_i \qquad (11)$$

Observe that equation 11 states that changes in aggregate pass through can arise due to changes in the weights of different types of products in the overall import bundle, or due to changes over time in the markup sensitivities to exchange rates for particular industries.

We can easily nest in this model the macroeconomic hypothesis formulated in the pass-through macro literature (Engel, Devereux, Taylor) by specifying this markup response as having an industry fixed effect related to the industry's competitive conditions and a time-varying component related to macroeconomic variables.

$$\Phi_i = m_i + m\mathrm{X}_t \quad \text{so that} \quad \Delta\Phi_i = m\Delta\mathrm{X}_t \qquad (12)$$

Combining equations (11) and (12),

$$\Delta b = 1 + \sum_{i=1}^{N} \Delta a_i \cdot \Phi^i + \sum_{i=1}^{n} a_i m \Delta X_t \qquad (13)$$

Equation 13 states that aggregate import-price pass through can change because of the import composition effect and because of the effects of macroeconomic conditions on markups.

To determine the role of each piece in pass through evolution within the OECD countries, we turn first to data on disaggregated import prices within each country – examining the related pass-through features and their stability -- and then directly test equation (13).

B. Exchange Rate Pass through into Disaggregated Import Prices.

In addition to the country aggregates on import prices, the OECD compiles data on disaggregated import prices at the country level for the same 25 countries in the sample (except Iceland) for five product categories: Food, Energy, Raw Materials, Manufacturing, and Non-Manufacturing products. We reestimated equation (7) for this sample of disaggregated price data.[16]

As detailed in Appendix Table 1[17] and summarized in Table 3, most industries exhibit a striking degree of partial pass-through. For each product category except Energy, we reject the hypothesis of zero exchange rate pass-through (LCP) 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.[18]

[16] We also performed tests for nonstationarity of each of these price series and, by country, for the existence of a cointegrating relationship between these series, the exchange rate, and the foreign price. The results of these tests were similar to those for the aggregate import price series. Mainly, we could not reject nonstationarity of import prices and we could reject the existence of a cointegrating relationship among the three variables.

[17] Appendix Table 1 provides these estimates, by country. 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] We also performed pass-through estimation for more disaggregated product categories within the energy sector. Details of these estimates are provided in an appendix.

Table 3: Rejection of LCP or PCP for Disaggregated Import Prices

Entries in table show number of countries for which each hypothesis is rejected.
Total number of countries is 25 for all imports, 24 for disaggregated products.

	Food	Energy	Raw Materials	Manufacturing	Non-Manufacturing
Short run					
Reject =0	17	8	16	21	14
Reject =1	14	7	10	21	10
Reject =0 & =1	10	2	6	19	4
Average Pass Through elasticity	.43	.70	.64	.49	.64
Long run					
Reject =0	16	4	16	21	8
Reject =1	9	7	8	10	7
Reject =0 & =1	5	2	7	9	2
Average Pass Through elasticity	.61	.73	.89	.71	.81

As we examine the evolution of aggregate pass-through, the decomposition of equation (13) raises the issue of the degree of stability of pass through into the disaggregated import prices. Using the same types of stability tests that we apply in the case of aggregate import prices, we conclude that exchange rate pass-through rates into disaggregated import prices are more stable than pass through into the aggregate import price series. As summarized in Table 4, we never reject stability of the disaggregated pass-through coefficients for more than 5 countries out of 24 countries, and the number is closer to 2 or 3 in any product category.[19] By contrast, short-run stability is rejected in 9 of the 25 cases for the aggregate import price series. These results 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] 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.

Table 4: Pass-Through Parameter Stability — Disaggregated Price Series

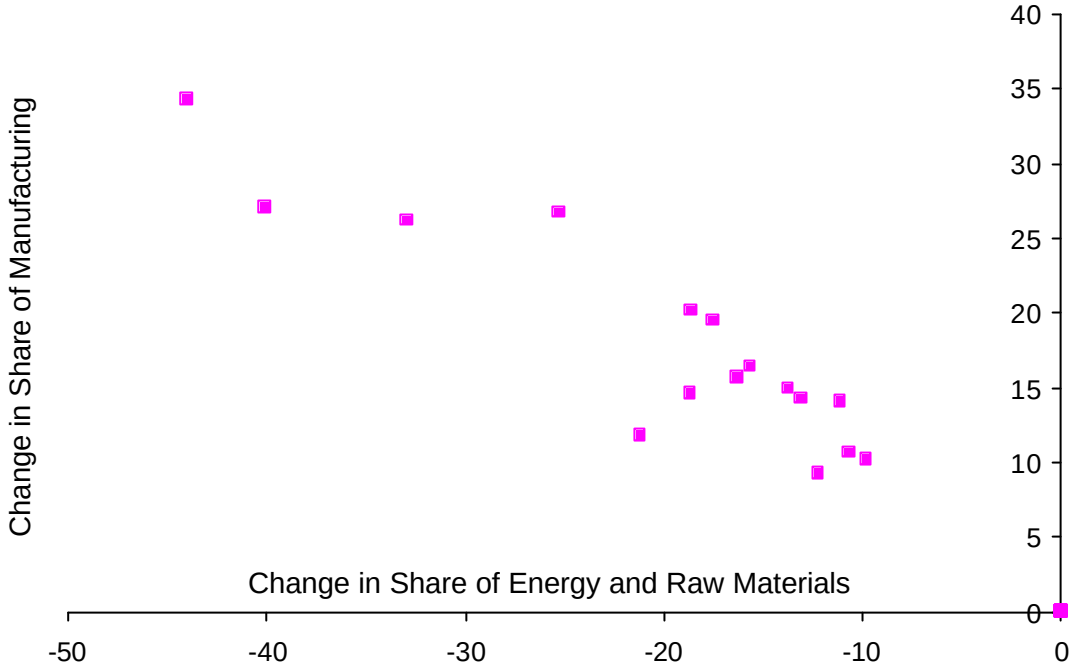
Entries in table show the number of countries for which stability is rejected for each type of import price series. Total number of countries is 25 for all imports, 24 for disaggregated products

	Aggregate Imports	Food	Energy	Raw Materials	Manufact.	Non-Manufact.
Chow Test						
Short run instability	4	2	2	3	5	3
Long run instability	2	4	1	3	4	2
Hansen Test						
Short run instability	9	2	4	3	5	4
Long run instability	0	0	0	0	0	0

The next issue raised by equation 13 concerns the stability of the pattern of imports into OECD countries. We conclude from the decomposition of imports into the five product categories that, perhaps not surprisingly, composition changes have been substantial.[20] The main force at work has been a tremendous rise in the relative importance of manufacturing imports, along with a reduction in the relative importance of raw materials, and especially energy (Figure 1). In 1980 manufacturing imports comprised more that 50 percent of the overall (merchandise) import bill for most countries (Appendix Table 3). 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. However, due to lower energy prices, changes in energy policies, and the 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 and raw material products in total imports and an almost identical increase in the share of manufacturing Products, as illustrated in Figure 1.

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

Figure 1: Changes in Import Composition for 24 OECD Countries, 1980 versus1992



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.

C. Composition versus macro variability as determinants of evolving pass-through.

Aggregate pass through elasticities, import composition, and macroeconomic ("exogenous") variables over the full period are not representative of behavior over shorter intervals. Consequently, to test the type of relationship given by equation (13) we split the full sample period into four sub-periods: 1975:1 to 1980:4, 1981:1 to 1986:4, 1987:1 to 1992:4, and 1993:1 to 1999:4. For each sub-period, we run a first-stage regression of the type shown by equation (7) and generate four estimates of the short- and long-run pass-through elasticities of aggregated import prices for each country. We also introduce a time-series panel version of equation (8) as the second stage specification, with macroeconomic variables measured over the respective sub-periods,[21] and add an imputed trade composition

[21] The GDP variable reflects the 1996 U.S. dollar value of each country´s GDP in 1978, 1984, 1990 and 1996.

variable. The second-stage specification over the estimated elasticities (4 per country, 24 countries) takes the form:

$$\Delta\hat{b}_{srorlr} = g_1 \Delta \ln money_t^j + g_2 \Delta \ln inflation_t^j + g_3 \Delta \ln exchvol_t^j + g_4 \Delta \ln GDP_t^j + g_5 \Delta \ln imputed_t^j + g_t t \quad (14)$$

We apply a weighted least squares procedure in order to reduce the importance of the noisier parameter estimates in driving overall conclusions (the weights are the inverse of the estimated standard error each pass-through). Within this time-series panel approach, the second stage regressions include time dummies in order to account for other period-specific fixed effects that are not captured by the exogenous right-hand-side variables.

For each country and time period the "imputed aggregate pass-through elasticity" captures the changes in a country's aggregate pass-through elasticity that are attributable exclusively to changes in its composition of imports. The construct uses the time-invariant (full sample period) estimates of pass-through elasticities for each of the five industry groupings for each country. The imputed elasticity is constructed by varying each period the weights of each type of import in each country's total import bundle. We use as weights the import share values at 1980, 1986, 1992, and 1998.[22]

The results from these specifications are reported in Table 5. Consistent with Taylor's (2000) arguments, short run pass-through is lower when a country achieves lower inflation, or less money growth. Lower and more stable monetary conditions induce producers to pass on a smaller percentage of cost shocks into final goods prices. Exchange rate volatility does not have any clear effect on pass-through rates. 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. Finally, the measure of pass-through elasticity imputed from the evolution of the pass-through elasticities estimated from disaggregated data is always positive and statistically significant at the one per cent level.

[22] Availability of the appropriate disaggregated import data reduced the number of countries included.

Table 5 The Determinants of Pass-Through Rates, over time and across countries				
	Short-Run Pass-Through (log Levels)		Long-Run Pass-Through (log Levels)	
Money	-0.121 (0.082)		-0.181 (0.151)	
Inflation	0.143** (0.062)	0.101* (0.056)	0.209* (0.110)	0.144 (0.096)
Exchange rate volatility (x100)	3.713 (27.2)	-4.211 (26.98)	3.303 (43.99)	-7.345 (43.25)
Trade Imputed Elasticity	1.149*** (0.189)	1.090*** (0.187)	1.053*** (0.234)	0.993*** (0.229)
Real GDP	0.019 (0.017)	0.019 (0.017)	0.001 (0.030)	0.002 (0.031)
Adj. R2	0.34	0.33	0.26	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, time series panel specifications. Reported regressions exclude country dummies but include time dummies.

Despite the statistical significance of inflation in these specifications, the included macroeconomic variables account for a negligible amount of the variation over time in pass-through elasticities across countries. The joint explanatory power that these macro variables have in explaining the evolution of pass-through is basically zero (the adjusted R2 statistic is negative). F-tests cannot reject the hypothesis that these macro variables have no explanatory power for long-run pass through rates across our OECD country sample.

Common time dummies, macro variables and imputed trade shares explain about 30 percent of the observed differences over time in the short-run pass-through elasticities of countries. Almost all of the explanatory power of the regressions comes from the imputed trade elasticity variables, even though our composition arguments have been made with only the coarsely disaggregated series that are available in the import price data. Trade composition effects are the clearly dominant explanations for movements over time in the short-run and long-run sensitivity of import prices to exchange rates.

Further evidence for the role of the imputed measure tracks comes from direct tests against the changes observed in the actual pass-through estimates for the sample of 21 countries for which comparisons are possible. The imputed measure generates declines for 10

of the 14 cases where declines were 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. These are the two products for which the import price elasticities were often highest. According to this calculation, the aggregate pass-through elasticity for the United States would have declined from 0.37 to 0.25 between 1980 and 1998 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.

5. Conclusions

In this paper we have provided cross-country, time-series, and industry-specific evidence on the pass-through of exchange rates into import prices across a large sample of OECD countries. As a cross-country average, import prices in local currencies reflect 60 percent of exchange rate fluctuations in the short run, and nearly 80 percent over the long-run. By contrast, exchange rate pass-through into U.S. import prices is about 25 percent in the short run and 40 percent over the long run. For the OECD as a whole, partial pass-through is overwhelmingly the best description of import price responsiveness shortly after an exchange rate movement. In the longer run, pass-through elasticities are closer to one, although complete pass-through or producer currency pricing is still rejected for many countries. 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 average inflation and low exchange rate variability.

While there is evidence that pass-through rates have been declining over time in some countries, this pattern of pass-through decline has not been a common feature of all OECD countries. Short-run exchange rate pass-through elasticities rise with price inflation (or higher money growth rates). Despite statistical correlations, the quantitative importance of these macroeconomic effects have been small in the OECD. 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 changes in pass-through rates into aggregate import prices more closely reflect 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 and raw material imports appear to have pass-through elasticities closer to one. 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 of 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.

Our findings inform recent discussions of the "exchange rate disconnect" puzzles, wherein exchange rate movements have been shown to have a much smaller effect on consumer prices than would generally be expected. By focussing on the import prices, we have shown that the border prices of goods are in fact very sensitive to exchange rate fluctuations, even for the United States. With border prices highly sensitive to exchange rates and retail prices considerably less so, we conclude that the focus of the disconnect within the chain of producer and policy actions should shift away from the debate over the existence of producer-currency pricing versus local-currency pricing on international trade. Instead, future research on the transmission and absorption of international fluctuations should focus on the role of the distribution sector,[23] which links import prices to prices at the retail level, or other mechanisms that facilitate such apparent domestic insulation.

[23] See recent contributions by Burstein, Neves and Rebelo (2001, 2002) and Corsetti and Dedola (2002).

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Data Appendix:

OECD import price series

Source: OECD Statistical Compendium. 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, Manufactures, Non-Manufacturing products. 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 (only aggregate import prices available), Italy, Japan, Republic of Korea, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, Turkey, United States. 10 of the 27 OECD 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.

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 Code in IFS database: 66*

Inflation Rate

Annual inflation rate based on the consumer price indices from the *International Financial Statistics. Code in IFS databse:64.*

Disaggregated Energy Prices

Oil prices are the average cost (in dollars/bbl) of total crude imports converted in national currency using the average quarterly nominal exchange rate. Data is quarterly from 1980:1 to 1999:4. Source: International Energy Agency.

Steam and Coking Coal prices are the import cost (in U.S. dollar/tonne) converted to national currency using the average quarterly nominal exchange rate. Data is quarterly from 1980:1 to 199:4. Source: International Energy Agency.

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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	0.33*+	0.36*+	0.45	-0.30+	0.38*+	0.52*+	0.58*+	0.80*+	0.47*+	0.11+
Austria	0.02	0.39	1.58	3.06	1.39	2.62	1.02*	0.63	1.51*	2.75*
Belgium	0.11+	0.64*	-0.35	-1.38	0.84*	1.85*	0.21+	0.58*	0.11+	0.44
Canada	0.84*	0.70*	0.80	-0.39	0.43+	0.64*	0.70*+	0.73*+	0.68*	0.37
Switzerland	0.44*+	0.80*	1.89*+	2.68*+	0.53*+	0.74*+	0.63*+	0.85*.	1.20*	2.18*+
Czech Republic	0.45*	0.97*	-0.55	1.03	0.60*	0.99	0.46*+	0.51*+	-0.04+	0.91
Germany	0.32*+	0.48*+	1.51*	2.00*	0.82*	1.11*	0.40*+	0.50*+	0.97*	1.33*
Denmark	0.65*+	0.23*	1.20*+	0.93	1.08*+	1.06*	0.50*+	0.67*+	1.10*+	0.88
Spain	0.73*+	0.64*	0.86*	-0.58+	0.68*	1.12*	0.60*+	0.89*	0.87*	0.14+
Finland	-0.17	0.65	1.60	2.38	0.39	0.04	-0.20+	0.66	1.07	1.62
France	0.78*	1.30*	0.50	1.69			0.42*+	1.06*	0.58	1.29*
United Kingdom	0.22*+	0.52*+	0.09+	-0.05+	0.42*+	0.58*+	0.41*+	0.53*+	0.25*+	0.32+
Greece	0.39+	0.52	0.05+	-1.29	0.21+	0.06	0.52*+	0.24+	0.20	-0.43
Hungary	0.73*	1.06*	-0.04+	0.92	0.72*	0.86*	0.52*+	0.68*	0.24+	0.94*
Ireland	0.74*	1.31*	0.94*	1.92*	0.88*	2.20*+	0.68*	1.23*	0.76*	1.70*
Italy	0.50*+	0.54*+	1.11	-0.23	1.13*	0.92	0.54*+	0.74*	0.86*	0.33
Japan	0.71*+	0.73*+	1.08*	2.17*+	0.88*	0.80*	0.69*+	0.85*	0.94*	1.49*+
Netherlands	0.29*	0.22+	2.12*	2.18	1.20*	1.68*	0.29*+	0.29*+	1.25*	1.41*
Norway	0.64*	-0.07+	-0.08	0.09	0.19	0.39	0.48*+	0.84*	0.31+	0.08
New Zealand	0.52*+	0.65*	0.02+	0.53	0.40*+	0.45*+	0.43*+	0.62*+	0.43*+	0.63
Poland	0.02+	0.12+	0.07+	0.19+	0.02+	-0.15+	0.50	0.99*	0.06+	0.12+
Portugal	0.33	0.90*	0.38	0.02	1.07*	1.23*	0.68*+	0.96*	0.21	0.45
Sweden	0.63*+	0.62	0.96*	0.03	0.45*+	0.45*+	0.63*+	0.70*	0.87*	0.31
United States	0.08+	0.24+	0.69	-0.16+	0.06+	0.39*+	0.22*+	0.49*+	0.46+	0.12+
average	0.43	0.61	0.70	0.73	0.64	0.89	0.50	0.71	0.64	0.81

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

Appendix 2

We compiled further disaggregated import price series for the energy industry. The performed tests on pass through for the aggregate energy price index showed that these series have the most anomalous behavior among all the product categories, with country estimated pass-through coefficients varying considerably. For Energy imports, pass-through elasticities calculated using effective exchange rates are noisy, and cluster either around zero (rejected in the short run for only 8 of 24 countries) or around one (rejected for 7 of 24 countries). Given the noise in the energy estimates of exchange rate, and the anecdotal evidence that energy markets are highly globally integrated with prices determined in U.S. dollars, we proceeded to a further examination of the Energy series. Specifically, we consider three available disaggregates of energy import prices: Oil, Coking Coal, and Steam Coal.[24] Instead of using effective exchange rate series, we examined pass-through of bilateral local currency exchange rates against the U.S. dollar. The resulting pass-through elasticities were much more precisely estimated for these disaggregated product categories. As reported in Appendix Tables 2A and 2B, bilateral dollar movements fully pass-through into local currency Oil prices. Coking Coal and Steal Coal, known to be more heterogeneous products because of their sulfur content and local standards, exhibit more varied rates of pass-through across countries. Overall, we again find that partial pass-through is a common phenomenon particularly among heterogeneous products. More homogeneous products have more extreme pass-through values.

[24]Data source: International Energy Agency. See Appendix Table 3 for detailed results. The countries for which Oil import price data is used include: 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.

Appendix Table 2A. 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)						
	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				
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*	0.98*	1.09*	1.15*	0.82*	0.80*
Finland			0.75	1.57	1.06*	0.19
France	1.05*	1.07*	0.36*+	0.99*+	0.93*	0.70*
U.K.	0.88*	0.78*	0.18+	0.98*	0.84*	0.96*
Greece	0.84*	0.76*				
Ireland			3.70	1.65	0.59*	0.70*
Italy	0.88*	0.94*	0.85*	1.04*	1.07*	1.24*
Japan	0.98*	1.42*	0.96*	1.09*	0.94*	1.06*
Netherlands	0.84*	0.96*	0.89*	0.95*	0.99*	1.39*
Norway	1.38	2.93				
New Zealand	1.54*	1.03*				
Portugal	1.62*	0.41				
Sweden	0.91*	1.09*				
Average	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%). # excludes Denmark and Ireland.

Appendix Table 2B: Rejection of LCP or PCP for Energy Import Prices on dollar movements (Entries in table show number of countries for which hypothesis is rejected)			
	Oil (of 17 countries)	Coking Coal (of 11 countries)	Steam Coal (of 11 countries)
Short run			
Reject =0	15	6	11
Reject =1	0	3	2
Reject =0&=1	0	1	2
Average	1.04	1.15	0.89
Long run			
Reject =0	12	7	10
Reject =1	0	2	0
Reject =0& =1	0	1	0
Average	1.06	0.63	0.94

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
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
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: 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