Pass through of exchange rates to consumption prices: What has changed and why?

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Abstract

The sensitivity of border prices to exchange rates is much higher than the sensitivity to exchange rates of retail prices of similar goods. The distribution sector and imported input use play important roles in driving a wedge between these two levels of exchange rate pass through. In this paper, we present cross-country evidence on sector-specific import price sensitivity to exchange rates, and on changes over time in this sensitivity. We also document how changes over time in expenditures on local distribution and on use of imported inputs in production should influence retail price sensitivity to exchange rates.

Keywords: Exchange rate, pass through, import prices, distribution margins, consumer prices, imported inputs
JEL Classification: F3, F4

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1. Introduction

Nominal exchange rate fluctuations lead to changes in quantities of goods imported mainly if they change the relative prices of imported goods. Researchers have shown that a number of forces contribute to less than complete pass through of exchange rates into the consumption prices of imported goods. First, pass through into prices at the border is less than complete, varying considerably across goods and across countries. Second, distribution services, like local storage, transportation, and retail costs, provide some insulation of consumption prices of traded goods, both by diluting the import content of the final consumption good and because distributors may actively adjust profit margins to absorb currency fluctuations. Third, even if the consumption prices of imports adjust with exchange rates, the prices of home competing goods may co-move, especially if the home goods rely on imported inputs into production. (Hellerstein 2004, Devereux, Engel, and Tille 1999, Devereux and Engel 2002, and Campa and Goldberg 2006). Imported goods play a role, directly introducing sensitivity to exchange rates in the domestic economy through costs, as in Campa and Goldberg (2006), or alternatively by keeping pass through into import prices low in a model of foreign exporting firms selling intermediate goods to domestic producers who compete with nontraded goods producers, as argued by Bacchetta and van Wincoop (2003).[1]

In this paper, we explore the role of distribution margins and imported inputs in exchange rate transmission into the consumption prices of five categories of goods: manufactured, non-manufactured, food, energy, and raw materials. Campa and Goldberg (2006) explored the role of the distribution sector and imported inputs in CPI sensitivity to exchange rates across twenty-one OECD countries. Distribution margins on household consumption are between 30 and 50 percent of purchasers' prices. These margins are dominated by wholesale and retail sector costs, with transportation and storage costs relatively low except in the case of various raw materials and mining industries. In tradable goods production, imported inputs account for between 10 and 48 percent of the final price. Imported inputs are also used less extensively in the production of nontradables, ranging from 3 percent in the United States to 22 percent in Hungary. Campa and Goldberg (2006) found that predicted and actual CPI sensitivity to exchange rate movements are low, often below 10 percent of any exchange rate change. Using data drawn from sixteen

[1] Corsetti and Dedola (2005) make related arguments in a different production chain and pricing set-up.

countries, we compare distribution margins, imported input use, and pass through into import prices across countries, sectors, and pre- and post-1995 time periods.

Section II begins our exposition by presenting evidence on industry-specific exchange rate pass through into import prices and the (more sparse) evidence available on pass-through into consumption prices at the level of particular industries. In Section III we delve into the industry-specific features of distribution margins and imported input use, and focus specifically on the country, industry, and time fixed effect descriptions of these. We present industry time trends. Section IV pulls together this information and evidence on exchange rate pass through into import prices to generate predicted values for the consumption price sensitivity to exchange rates of different types of goods across countries. Section V concludes, emphasizing the implications of these results for cross-country trade balance adjustments to exchange rate fluctuations.

The analysis yields the following observations. Pass through into import prices is defined more by industry than by country, with the notable exception of typically low pass through into U.S. import prices. Looking across countries and over time, pass through into import prices is noisiest and least precisely measured with respect to energy imports. The rate of exchange rate pass through into import prices of manufactured goods and, less so, food prices, are the only categories consistently measured with precision across countries. Distribution expenditures have a large industry-specific component, while imported input use has industry characteristics, country and time also matter substantially. Trend growth has not been a strong feature of sectoral expenditures on distribution. Imported input use has tended to grow over time, both across countries and across industries. These findings suggest that recent growth (or reduction) in distribution margins is not a key contributor to changing pass through into consumption prices of imported goods over the past decade. Growth in imported input use, in particular in distribution services, has increased the predicted sensitivity of retail prices of imported goods to exchange rates, contingent on exchange rate pass-through into border prices.

II. Import Price Elasticities with Respect to Exchange Rates

There is a large literature that has looked at the extent to which exchange rate changes affect import prices of goods. Most of these previous studies generally have found that pass-through is incomplete, implying that import prices are less volatile than exchange rates. Goldberg and Knetter (1997) present a review of the literature in this area and concluded that pass-through into U.S. import prices was in the order of 50 percent. Large variations around this estimate occur by industry. Antzoulatos and Yang (1996), Yang (1997) and Olivei (2002) all perform estimation of pass-through rates into import prices at the industry level and conclude that pass-through varies across industries. The existing evidence has been obtained by either focusing in a subset of narrowly defined industries, using data at even the firm or product level (micro studies) or by broadly looking at a cross-section of relatively aggregated industry statistics (industry studies).[2]

Micro-oriented studies generally focus on pass-through from one country's firms into another country and concentrate on a particular product or industry. For example, Feenstra (1989) and Gron and Swenson (1996) examined the pass-through in Japanese shipments of cars, trucks and motorcycles into U.S. prices of these goods. Gil-Pareja (2003) and Goldberg and Verboven (2001) focus on the degree of pass-through also in the automobile industry by looking at detailed product imports from different countries. In other industries, Bernhofen and Xu (2000) examined the exchange rate pass-through into U.S. petrochemical imports from Germany and Japan and Blonigen and Haynes (2002) looks at Canadian exports of iron and steel into the U.S.

The industry studies focus on import prices for a broad set of industries. Feinberg (1989), Yang (1997), Pollard and Coughlin (2005) provide estimates of pass-through at broader industry classifications for imports in the manufacturing sector in the U.S. Campa and Goldberg (2006) provide similar evidence for a large number of OECD countries for only five industry categories and Campa, Goldberg and González Mínguez (2006) provide estimates for the European Union countries.

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[2] A related literature focuses exclusively on contributions to changes in real exchange rates. Engel (1999) finds that real exchange rate movements are dominated more by fluctuations in the relative prices of traded goods and deviations from the law-of-one-price than by the relative prices of nontraded goods. Crucini, Telmer, and Zachariadis (2005) find extensive deviations from the law of one price for individual goods across European countries.

Table 1 reports estimated pass-through rates into import prices for all imports and for five broad industry categories across 16 countries. The reported coefficients are the estimated pass-through rates from a regression of changes in import prices on changes in nominal exchange rates and foreign prices using quarterly data for the period 1976:1 to 2003:1[3]. The reported estimates of pass through of exchange rate changes are the contemporaneous effect and the cumulative one-year impact from an exchange rate shock. These estimates come from a partial-adjustment model of the form

$$\Delta p_t^j = \alpha + \sum_{i=0}^{-4} a_i^j \Delta e_{t-i}^j + \sum_{i=0}^{-4} b_i^j \Delta w_{t-i}^j + c^j \Delta gdp_t^j + \vartheta_t^j$$

where p_t are local currency import prices or the local consumer price index, e_t is the exchange rate, w_t is the foreign production costs, gdp_t is real GDP, and the final term is the regression residual. The short-run relationship between exchange rates and the respective price series of country *j* is given by the estimated coefficient a_0^j. The long run elasticity is given by the sum of the coefficients on the contemporaneous exchange rate and four lags of exchange rate terms $\sum_{i=0}^{-4} a_i^j$. While the theoretical antecedents of this equation suggest a log-levels relationship among variables, for estimation the variables in these equations are first differences in logarithms to control for the possibility of unit roots (Campa and Goldberg 2006 and Osbat 2006).

3 The sample period begins later for Netherlands (1977:2), Norway (1978:2), Portugal and Sweden (1980:2), Australia and Belgium (1981:2), Italy (1982:2), Denmark and New Zealand (1987:3), and Hungary (1995:2) and ends earlier for Netherlands (1997:4), Portugal (1998:4), Austria (1999:4), Denmark and New Zealand (2002:4). France is missing data from 1987:1 to 1996:1.

Table 1: Pass-through- rates into Industry Import Price Indices

	ALL IMPORTS	FOOD	ENERGY	RAW MATERIAL	MANUFACTUR.	NON-MANUFACTUR.
Australia	0.67*+	0.35*+	-0.69+	0.43*+	0.93*	0.06+
Austria	0.10	0.06	2.24	1.74	-0.32+	1.50
Belgium	0.68	0.55	-0.70	1.72*	0.43	0.51
Denmark	0.82*	0.99*	3.50	1.14*	0.57*+	1.61*
Finland	0.77	0.83	1.46	0.28	0.74	1.08
France	0.90*	1.41*	1.89	--	0.99*	1.27
Germany	0.80*	0.48*+	2.72*	1.12*	0.42*+	1.54*
Hungary	0.78*	0.63*	0.89	-0.00	0.79*+	0.67
Ireland	-0.06	1.23*	1.78*	2.06*	1.19*	1.70*
Italy	0.35+	0.81*	-.80	0.76	0.56*+	0.07
Netherlands	0.84*	0.54*+	2.19	1.72*	0.32*+	1.44*
New Zealand	0.22+	0.23+	0.27	-0.04+	0.24+	0.18
Norway	0.63*	0.15+	-0.69	0.69	0.61*	0.07
Portugal	1.08*	1.07*	0.79	1.41*	1.02*	0.85
Spain	0.70*	1.01	-0.01	1.23*	1.06+	0.61
Sweden	0.38*+	0.85*	-1.64+	0.11+	0.66*+	-0.66+
U. Kingdom	0.46*+	0.52*+	0.39	0.47*+	0.46*+	0.39+
United States	0.42*+	0.21+	0.20	0.44*+	0.44*+	0.33
Average	**0.59**	**0.66**	**0.77**	**0.90**	**0.62**	**0.77**
St. Deviation	**0.30**	**0.39**	**1.42**	**0.67**	**0.36**	**0.68**

*Significantly different from zero (5%), + Significantly different from one (5%). Most data are quarterly, spanning 1975 through the end of 2004. Data sources: nominal exchange rate and consumer prices come from the IFS; import price comes from the OECD. Specific start and end dates by country are detailed in the data appendix. Long-run elasticities (four quarters) shown.

Using data for 1975 through 2004, across the sixteen countries examined in this paper, the (unweighted) average pass-through elasticity of import prices is 0.59 in the long run. Most industries exhibit a striking degree of partial pass through. The hypothesis of zero exchange rate pass-through is rejected for more than half of the countries in the all imports category. Looking across industries, pass-through rates equal to 1, i.e. complete pass-through, is strongly rejected for Manufacturing and Food.

Pass through is smaller in manufacturing industries than in commodity industries such as energy and raw-materials. The precision of the estimates is tightest for manufacturing and food, with dispersion of pass-through across countries lowest for these categories. Campa and Goldberg (2005) reached similar conclusions for both short-run and long-run pass-through rates in the OECD countries. These differences across industries also occur at more disaggregated levels within manufacturing. Yang (1997) and Pollard and Coughlin (2005) provide estimates of differences in the pass-through rates to import prices for manufacturing industries in the U.S. Campa, Goldberg, and González-Minguez (2006) provide similar evidence for the euro-area countries. Pass-through into the import prices of non-manufactured goods, energy, and raw materials appears to be poorly measured by the estimating equation applied.

Recent studies have argued that pass through elasticities into import prices may have declined since 1997, particularly for the United States [Marazzi et al (2005), Ihrig et al (2006)]. Campa, Goldberg, and Minguez-Gonzalez (2005) argued that the evidence was more broad-based across European countries. Tests for pass-through changes across the goods categories and countries presented in Table 1 show that results are much more mixed and difficult to establish. Comparing a pre-1995 period with the period from 1995 to the present, we find a noisy and unstable relationship between exchange rates and the local currency import prices of energy, raw materials, and non-manufactured goods. It is only in the case of manufactured goods that estimates appear more informative, with instances of pass through into import prices sometimes rising and sometimes declining across countries. Of course, these tests do not control for the different sources of exchange rate movements across time, or for changes in monetary policy that may interfere with the measured transmission of exchange rates into import prices. As in Gagnon and Ihrig (2004), if monetary policy successfully stabilizes CPI inflation, then observed inflation will be lower than the incipient inflation associated with the exchange rate change.

III. Mapping imported inputs and distribution margins into consumption prices of goods

One goal of the analysis of pass through and consumption prices of categories of goods is to understand the signal sent to consumers to induce expenditure switching between imported and home produced goods. This signal is a critical link in trade balance sensitivity to exchange rate fluctuations. Another goal is to understand the feedback between exchange rate changes and stimuli to consumption prices across countries. In order to move from exchange rate sensitivity in the border prices of goods to sensitivity in retail prices, analyses need to account for the role of the distribution sector and imported inputs used in production. For this purpose, we use a basic approach of a two country model with wage stickiness and monopolistically competitive producers. Our specific formulation is from Campa and Goldberg (2006), but this just follows from the earlier foundations laid by Obstfeld and Rogoff (2000), Corsetti and Dedola (2003), Burstein, Neves and Rebelo (2003), Devereux, Engel, and Tille (1999), Devereux and Engel (2002), and Bacchetta and van Wincoop's (2003).

A. The mapping

This approach has a utility-based framework that explicitly tracks the degree of substitutability of imported and domestic products, and presents the explicit cost functions faced by producers. We assume C.E.S. utility functions over nontraded and traded goods consumption. Both sectors produce a continuum of varieties with similar elasticities of substitution, θ. Home (h) and foreign (f) tradable goods consumption are imperfect substitutes, with an elasticity of substitution of $\phi_T > 1$. Consumption of tradable (T) and nontradable (N) products are also governed by a constant elasticity of substitution ϕ. Bringing one unit of traded goods to consumers requires units of a basket of differentiated nontraded goods indexed by *n*, where such distribution costs per unit of output are denoted by $m_t\left(h\right)$ and include expenditures on wholesale and retail sector services, as well as expenditures on transportation and storage. Analogous notation is used for the imported goods sector, indexed by brand *f*. Furthermore, per unit production requires imported input share $\mu_t(h)$ on home tradable goods and $\mu_t(n)$ on home nontradable goods. The pricing equations for home nontradable goods *n*, home tradable goods *h*, and imported consumption goods *f* are given by

$$P_t(n) = \frac{\theta}{\theta-1} c_t(n) = \frac{\theta}{\theta-1}\left[\frac{W_t}{Z_N} + \mu_t\left(n:e\right)\frac{eW_t*}{Z_F}\right] \quad (1)$$

$$P_t(h) = \frac{\theta}{\theta-1} c_t(h) = \frac{\theta}{\theta-1}\left[\frac{W_t}{Z_H} + m_t\left(h:e\right)\cdot P_t(n) + \mu_t(h:e)\frac{eW*}{Z_F}\right] \quad (2)$$

$$P_t(f) = \frac{\theta}{\theta-1} e_t c_t*(f) = \frac{\theta}{\theta-1}\left[\frac{eW_t^*}{Z_F} + m_t\left(f:e\right)\cdot P_t(n)\right] \quad (3)$$

where W_t refers to the wage per unit of labor at home, and $W_t *$ refers to foreign wages. This derivation assumes that all distribution costs are incurred in the home market, and productivity parameters as well as domestic and foreign wages are sticky over the relevant pricing horizon. *e*, the exchange rate, is the domestic currency price of foreign exchange. The exchange rate is also introduced as an argument of the distributor margin $m_t(i:e)$ where $i \in (h, f)$, to allow distribution margins to vary with exchange rate changes.

Differentiating equations (1) through (3), we derive expressions for exchange-rate pass – through elasticities into home tradable, home nontradable, and imported goods prices.

$$\eta^{P(n),e} = \frac{\partial P(n)/\partial e}{P(n)/e} = \left(1+\eta^{u_t(n:e),e}\right)\left[\frac{\mu_t(n:e)\frac{ew*}{Z_F}}{c_t(n)}\right] = \frac{\theta}{\theta-1}\left(1+\eta^{u_t(n:e),e}\right)\left[\frac{\mu_t(n:e)\frac{ew*}{Z_F}}{P_t(n)}\right] \tag{4}$$

$$\eta^{P(h),e} = \frac{\partial P(h)/\partial e}{P(h)/e} = \frac{\theta}{\theta-1}\left[\left(\eta^{P(n),e}+\eta^{m(h),e}\right)\frac{m(H:e)P(n)}{P_t(h)} + \left(1+\eta^{u_t(h:e),e_t}\right)\frac{\mu(h:e)\frac{eW*}{Z_F}}{P_t(h)}\right] \tag{5}$$

$$\eta^{P(f),e} = \frac{\partial P(f)/\partial e}{P(f)/e} = 1-\frac{\theta}{\theta-1}\frac{\left(m(f:e)P_t(n)\right)}{P(f)}\left[1-\left(\eta^{m(f),e}+\eta^{P(n),e}\right)\right] \tag{6}$$

Beginning with equation (4) observe that pass through into the consumption price of nontradables occurs only because this sector, assumed to price as in monopolistic competition, has cost sensitivity to exchange rates because of its use of imported inputs. This pass through is mitigated only to the extent that producers can substitute away from these imported inputs when they become more expensive, $\eta^{\mu_t(n:e),e} < 0$.

Exchange-rate pass through into the prices of home tradables, shown in Equation (5), occurs for a similar reason (the use of imported inputs) and also because sectoral expenditures on distribution can be sensitive to exchange rates. The latter occurs passively, because nontradables prices can respond to exchange rates, and actively, because distributors may strategically adjust the markups they take on home tradables that compete with imported brands.

Pass through into the consumption prices of imports, Equation (6), differs from border price sensitivity of imports. [The latter is assumed to be 1 in equations 4-6. If pass through at the border is different than 1, that border pass through rate multiplies equations 4-6.] The distribution sector damps the import content of this consumption good (the first term), even more so if distributor markups decline during home currency depreciations. One force magnifying the pass through of exchange rates, and therefore working in the opposite direction, is that from equation (4) distribution costs rise if these services rely on imported inputs into production and have costs that are sensitive to exchange rates.

Equations (4) to (6) also show the impact that increases in the distribution margins have on the expected pass-through rates of a given change in imported prices of final goods or intermediate inputs in final consumer prices. In general, increases in the share of the distribution sector in the final price of a good decrease the impact on final consumer prices. For non-traded goods this effect occurs mainly through imported inputs in the production of nontradables. For domestically produced traded goods the impact in equation (5) occurs through a decrease in the foreign value added part of the product. There is a second impact on these goods which is through the isolation from foreign competition that an increase in the local content value added from distribution costs has for imported products.

These effects on locally produced goods are dampened by the role of imported inputs in the production of these products. As the share of imported inputs in the production of the good increases, changes in border prices of imported products have a higher percentage impact in the production cost of domestically produced goods. This results in higher pass-through into consumer prices.

The existing evidence on pass-through into import prices at the aggregate level suggests that the pass-through has declined in the last decade, at least in developed countries (see Pollard and Coughlin (2005), Marazzi et al (2005) and Olivei (2002)). Most of this literature has focused on the impact in the U.S. manufacturing sector. Despite this possible change in pass-through there is an issue on what is the role that imported inputs and distribution costs had in this behavior and in its final impact on consumer prices. On the first point, increases in imported inputs and in vertical trade that have occurred in the last decade suggest a decline in import price pass-through. Increases in vertical trade raise the likelihood that imported products contain a larger share of their value added that has been produced in the currency of the importing country via re-exports or consumption of intermediate inputs originating from the importing country. In this context, we should expect the sensitivity of import prices to decline to exchange rate changes. At the same time, increases in the imported input component of domestically produced goods imply a higher exposure of domestically produced products to exchange rate changes and a higher pass-through from import prices into final consumer prices. To quantify the relative size of each of these effects it is first necessary to examine the evolution of imported input shares and distribution margins over the last decade.

B. Patterns in Imported Input Use and Distribution Expenditures

We measure the size of imported inputs for all industries using country-specific input-output tables.[4] Our full sample of imported input data spans 17 countries, 59 homogeneous manufacturing, primary-industry, and service industry groupings, and 1 to 2 years per country-industry observation. The data on distribution margins span all but one of the same countries, but has narrower availability in terms of industries because no service industry data are available. Details are provided in Appendix Table 2.

Campa and Goldberg (2006), looking at the disaggregated data across countries, found that the industry with the highest imported input share is Coke, Refined Petroleum Products, and Nuclear Fuel Manufacturing. More generally, industries involved in services and agriculture and commodity production have much lower shares of imported inputs than industries in the manufacturing sector. For instance, Real Estate services have average imported input shares of around 6 percent of total costs, while Forestry, Logging and Related Services have average imported input shares of around 14 percent. By contrast, almost all manufacturing industries have imported input shares above 20 percent. Within the manufacturing sector, after coke, refined petroleum, and nuclear fuel, computers and communication equipment have the highest imported input shares, at around 50 percent. The industry within manufacturing with the lowest imported input share is food and beverage manufacturing.

The dispersion of imported inputs into production also differs significantly by country. In general, larger countries have a lower share of imported inputs into production while smaller countries have a higher share. The United States has by far the lowest ratio of imported inputs

[4] Details on construction methods are in Campa and Goldberg (2006).

into production of all countries in our sample. Ireland, with 51 percent, has by far the largest ratio of imported inputs into production. Other smaller countries like Belgium, Hungary and the Netherlands also have large ratios of imported inputs into production.

In order to provide a window into these data, we perform variance decompositions to identify the portions of the observational variance within this data base that are attributable to industry fixed effects, country fixed effects, or time dummies. As detailed in Appendix Table 2, the regression is run with 1,394 observations, covering 59 industries and 16 countries.

Table 2 Imported Input Variance Decomposition

Adjusted R-squared for the full regression specification with all dummy variables			0.70
	Adj. R-squared for regression excluding each set of dummies	Adj. R-squared for regression with only each set of dummies	Percent of full regression specification adjusted R2 explained by each set of dummies
Industry dummies	0.19	0.48	68.3
Country dummies	0.60	0.19	26.7
Year dummies	0.69	0.10	14.2

Note: We define the percent of the full regression adj. R-squared explained by the industry dummies as (adjusted r-squared from the regression including only the industry dummies)/(adj. r-squared of the full specification). The alternative, (adj. r-squared from the regression including everything but the industry dummies)/(adj. r-squared of the full specification), would yield slightly higher percents.

With the exception of France, Ireland, Norway, Portugal, Spain, and the United Kingdom, each country included in the sample has two years (typically five years apart) of imported input data. Of the 57 industries with enough observations to run a regression, 16 industries had statistically significant, time trends, at a 10 percent level, all of which were positive. The industries with significant time trends[5] included food, energy extraction and refining, manufacture and servicing of computers and other machinery, and some service industries. On average, the industries with significant trends had imported input use increase by 0.9 percentage points per year. Manufacture of coke, refined petroleum products and nuclear fuel had the largest statistically significant increase in imported input share, rising 3.4 percentage point per

[5] Industries 5, 11, 14, 15, 19, 23, 29, 30, 51, 61, 70, 71, 72, 85, 92, 93. Full names of each industry are provided in Appendix Table 3.

year, on average. Real estate activities had the smallest significant increase, averaging 0.2 percentage points per year.

Since our discussion of pass-through uses data on more aggregated industries, we use the disaggregated information just discussed to create broader sectoral information for each country. These broader results are presented in Table 3. Energy and manufactured goods have by far the highest imported input share at, on average across countries, 43 percent and 38 percent of total inputs respectively. Non-manufactured goods, food, raw materials, and the distribution sector all have average imported input shares at or just under 20 percent.

Table 3: Imported Input Share

	Year	All Industries	Manuf Goods	Non-manuf	Energy	Food	Raw Materials	Dist. Sector
Austria	2000	0.29	0.48	0.18	0.46	0.18	0.15	0.17
Belgium	2000	0.35	0.53	0.23	0.61	0.34	0.32	0.28
Denmark	2000	0.23	0.39	0.16	0.30	0.20	0.19	0.17
Finland	2000	0.25	0.35	0.16	0.58	0.15	0.11	0.17
France	2000	0.14	0.22	0.09	0.47	0.11	0.17	0.07
Germany	2001	0.19	0.31	0.12	0.44	0.16	0.19	0.17
Hungary	2000	0.44	0.63	0.21	0.71	0.20	0.16	0.21
Ireland	1998	0.52	0.68	0.42	0.48	0.30	0.48	0.46
Italy	2000	0.20	0.30	0.13	0.54	0.16	0.18	0.17
Netherlands	2000	0.30	0.46	0.22	0.45	0.35	0.44	0.28
Norway	2001	0.21	0.30	0.17	0.13	0.14	0.17	0.22
Portugal	1999	0.24	0.40	0.13	0.36	0.25	0.06	0.15
Spain	1995	0.18	0.27	0.11	0.40	0.12	0.08	0.08
Sweden	2000	0.25	0.37	0.18	0.57	0.20	0.20	0.20
UK	1995	0.18	0.29	0.12	0.12	0.16	0.15	0.13
US	2002	0.06	0.09	0.03	0.28	0.04	0.07	0.03
Average		**0.25**	**0.38**	**0.17**	**0.43**	**0.19**	**0.20**	**0.19**
St.Deviation		**0.11**	**0.15**	**0.08**	**0.16**	**0.08**	**0.12**	**0.10**

As a counterpart to this discussion of imported inputs, we also analyze the patterns in distribution margins. Starting with disaggregated industry level data, in general each country in the sample had two years of distribution margins data included. Of 30 industries with enough observations to examine trend, only 7 had statistically significant time trends. Among these industries, 4 had positive time trends: Agriculture, Mining, Manufacturing of Food products, and Pulp, Paper and Paper products. In contrast, 3 had negative time trends: Manufacturing of Radio Television, Motor Vehicles, and Medical and Precision equipment. These last three industries are all in manufacturing and characterized by increasing shares of imported products. Thus, the number of industries with strong margin trends was low, and the pattern of changes in distribution margins was not persistent for all industries in either a positive or negative direction. This observation contrasts sharply with what was observed for imported input use, where increasing globalization of production was readily apparent across many industries. The variance decomposition for distribution margins is provided in Table 4.

Table 4 Distribution Expense Variance Decomposition

Adjusted R-squared for the full regression specification with all dummy variables			0.49
	Adj. R-squared for regression excluding each set of dummies	Adj. R-squared for regression with only each set of dummies	Percent of full regression specification adjusted R2 explained by each set of dummies
Industry dummies	0.13	0.34	69.1
Country dummies	0.44	0.13	26.9
Year dummies	0.49	0.09	18.3

There are common patterns across countries in the incidence of high and low distribution margin expenditures for industries. Distribution expenses are consistently high in apparel (18), leather (19), and furniture (36) manufacturing, as well as in fishing, fish farms, and related services (5). Distribution expenses appear to be lowest on some commodity-type products and industries, such as petroleum and natural gas extraction (11), uranium, thorium, and metal ore mining (12 and 13), and non-automobile transportation equipment manufactures (35).

Table 5 provides cross-country and cross-industry decompositions for distribution margins, presented at a higher level of sectoral aggregation. While the reported numbers suggest that for most industries distribution expenditures are on the order of 10-20 percent of the producer price, this decomposition neglects an important caveat about the distribution margin data. As explained in Campa and Goldberg (2006), the total distribution margins with industry-level detail encompass margins on total final consumption. This includes distribution margins for household consumption, investment, public sector, and export markets. In part, the country-fixed effects in the variance decomposition just discussed reflect the components of final demand in each country. Distribution margins in fixed capital formation and export are substantially lower than those on household consumption.

Table 5: Distribution Margin Share

	Year	All Industries	Manufact. Goods	Non-manuf Goods	Energy	Food	Raw Materials
Austria	2001	0.14	0.14	0.14	0.19	0.21	0.10
Belgium	2001	0.14	0.13	0.16	0.11	0.16	0.14
Denmark	2000	0.16	0.16	0.14	0.08	0.17	0.22
Finland	2002	0.12	0.12	0.15	0.12	0.28	0.13
France	2001	0.12	0.12	0.12	0.10	0.17	0.04
Germany	2001	0.14	0.13	0.21	0.12	0.25	0.22
Greece	1999	0.20	0.20	0.15	0.18	0.20	0.07
Hungary	2000	0.07	0.08	0.00	0.10	0.18	-0.11
Ireland	1998	0.09	0.10	0.02		0.09	0.04
Italy	2001	0.16	0.15	0.31	0.14	0.28	0.31
Netherlands	2001	0.13	0.14	0.09	0.06	0.17	0.03
Norway	2002	0.17	0.19	0.12	0.17	0.20	0.06
Portugal	1999	0.14	0.14	0.15	0.18	0.19	0.10
Spain	2000	0.13	0.13	0.18	0.07	0.20	0.10
Sweden	2001	0.11	0.11	0.13	0.11	0.20	0.07
UK	2001	0.21	0.22	0.10	0.05	0.28	0.07
US	1997	0.29	0.29	0.33	0.34	0.39	0.32
Average		**0.15**	**0.15**	**0.15**	**0.13**	**0.21**	**0.11**
St. Deviation		**0.05**	**0.05**	**0.08**	**0.07**	**0.07**	**0.11**

Differences across sectors and countries also are attributable to the breakdown of total distribution margins into the wholesale-retail and transportation components. While transportation accounts for a significant portion of total distribution margin in exports, its contributions to the total margins for consumption and gross-fixed capital formation are significantly lower. Wholesale and retail margins are also significantly lower for investment relative to other final demand components, but even after taking this into consideration, the relative contribution of transportation to total margins is lower for investment.

IV. Pass through into the consumption prices of imported goods

Looking across countries, we have already discussed the border (imports) price series for food, energy, raw materials, manufacturing, and non-manufacturing, and have discussed the sensitivity of these prices to exchange rates. Since the sensitivity of these prices to exchange rates differs from the sensitivity of related retail prices of these goods to exchange rates, we use the theoretical exposition of equations (4) through (6) to predict which sectors would have had increased or decreased pass through of import price movements into consumption prices due to changes in measured distribution sector expenditure and use of imported inputs into production. Equations (4) to (6) show the model-based prediction of the transmission of exchange rates into border prices into pass-through at the retail level.

The computation of the effects in equations (4) to (6) requires an assumption for the demand elasticity (θ), the elasticities of substitution among groups of products, and elasticities of response to exchange rates of distribution margins and imported inputs.[6] We use an estimate of the demand elasticity, θ, that is consistent with the steady state price over cost markups, defined by $markup = \theta / (\theta - 1)$, reported in the literature. Basu and Fernald (1997) find markups for United States industries in the range of 11 percent. Oliveira Martins, Scarpetta, and Pilat (1996), after examining 14 OECD countries and 36 manufacturing industries, find markups generally ranging between 10 and 35 percent. Since these markup values imply values of θ between 10 and 4, we chose for this exercise a value of 7 which is in the mid-point of that range. Lower demand elasticities imply higher values of pass through into home tradables prices. For simplicity, we assume unity between the initial relative prices of imported and home tradables, and of home tradables and nontradables. We assume that the imported input share elasticities to exchange rates are 0 and identical across the production of nontradables and home tradables. Finally, we also assume zero elasticities for distribution margins to exchange rate changes, $\eta^{m(f:e),e}$ and $\eta^{m(h:e),e} = 0$. Given these assumptions, the emphasis here is on how changes in distribution margins and imported input shares have affected the transmission of exchange rate changes into the final consumption prices of types of goods across countries.

We compute the estimated effects of an exchange rate change on pass through into the final goods prices for imported products and for domestically produced products using equation (4) to (6), the reported shares of imported inputs in production of traded and nontraded goods, and the measured distribution expenditures. The differences between the estimated values for equations (5) and (6) using data from the period after 1995 and data prior to 1995 are reported in

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[6] The calibrations basically shut down the role of initial conditions and substitution between tradables and nontradables goods by setting the relative price terms to equal one in the calculations. Accordingly, values of ϕ do not matter for these calibrations. Corsetti, Dedola, and Leduc (2004) use $1/(1-\phi) = 0.77$, implying $\phi = 1.3$, based on Mendoza (1991).

Table 6. Increases in the pass-through for imported products can be due, following equation (6), to decreases in the share of distribution costs in the final price of imported products. Increases in the prices of non-traded goods due to increases in the imported inputs used in the production of non traded goods can result in a decline in pass-through of exchange rates into final prices of imported products.

The results in the top-panel of Table 6 indicate that there has been an increase in the pass-through of movements in border prices into movements in final prices for most countries. This effect has happened in manufacturing for all countries with the exception of the United States and Italy. In fact in these two countries, given transmission of exchange rates into the border prices of imported goods, there appears to be a decline in the pass-through rates into final prices for the majority of goods. This effect has been mainly due to increases in the distribution costs in these industries. In the United States the substantial decrease in the distribution margins in energy and non-manufacturing have resulted in a substantial increase in pass-through for those industries.

The bottom panel of Table 6 shows the imputed changes in the predicted pass-through rates of domestically-produced traded products. Following equation (5), increases in the share of imported inputs in production, in the distribution costs, and in the sensitivity of nontraded prices to exchange rates all result in an increase in pass-through rates to final prices of those goods. The results in Table 6 show that the imputed pass-through into home-produced tradable goods has increased in almost all industries and countries. The effect is positive in all cases in manufacturing industries. However, changes have been larger in absolute value in energy and raw material products. This effect has been mainly due to changes in the ratio of imported inputs in the production in these industries. The United States has had the smallest overall share in its pass-through mainly due to its lower share in imported inputs among all the countries in the sample.

Table 6: Changes in implied pass-through into the consumption prices of imported and domestically-produced traded products

For imported products

	all industries	*manufacturing*	*nonmanuf*	*energy*	*food*	*raw materials*
Austria	0.017	0.008	0.116	-0.018	-0.051	0.133
Belgium	-0.001	0.000	-0.026	0.047	0.007	0.049
Denmark	0.030	0.027	0.029	0.051	0.019	0.028
Finland	0.002	0.010	-0.100	-0.027	-0.046	-0.072
Germany	0.020	0.017	0.011	0.015	-0.012	0.015
Hungary*	0.039	0.021	0.196	0.087	-0.003	0.097
Italy	-0.013	-0.007	-0.113	-0.006	-0.045	-0.268
Netherlands	0.007	0.002	0.038	0.025	0.001	0.107
Sweden	-0.003	0.009	-0.118	0.007	-0.069	-0.029
Us*	-0.016	-0.016	0.200	0.175	-0.096	-0.267

For Domestically Produced Products

	all industries	*manufacturing*	*nonmanuf*	*energy*	*food*	*raw materials*
Austria	0.025	0.039	-0.045	0.079	0.062	-0.137
Belgium	0.068	0.020	0.085	0.085	0.027	-0.046
Denmark	0.051	0.008	0.077	-0.014	0.074	0.091
Finland	0.069	0.022	0.088	0.073	0.058	-0.002
Germany	0.064	0.032	0.048	0.089	0.017	0.131
Hungary*	0.099	0.037	-0.035	0.071	0.012	-0.027
Italy	0.015	0.015	0.021	0.015	0.016	0.138
Netherlands	0.015	0.006	0.021	0.056	0.008	0.106
Sweden	-0.008	0.033	-0.052	0.121	0.266	-0.096
Us*	0.010	0.008	0.000	0.029	0.004	0.026

The numbers reported here are the difference between the estimated values of equations (5) and (6) for each country using data prior to 1995 and post-1995. The computation further assumes an elasticity of demand of 4, and zero elasticities of exchange rate changes to distribution margins in home products, and to the share of imported inputs used in production.

V. Conclusions

This paper explores the channels for transmission of exchange rates into various types of consumption goods prices and into the aggregate level of prices across sixteen economies. We find that pass through into import prices are measured with some precision in manufactured goods, but less precisely measured with respect to non-manufactured goods, raw materials, and energy. The period since 1995 may have marked differences in such pass through, but we are reluctant to take the estimates over this short-period as definitive, and also recognize how noisy such estimates have been outside of manufactured goods. For understanding the likely changes in pass through into the consumption prices of the same categories of goods, we have examined in detail changes over time in sectoral distribution margins and imported input use. We conclude that changes in pass-through into final products have been more due to changes in the evolution of imported input products in these developed economies than to changes in distribution margins. Distribution margins are an important component of the final price of goods in all of these economies. However, its evolution over time has been stable while imported inputs in some of these product categories have been more dynamic.

These findings are all relevant for expenditure switching and trade adjustment from changes over time in exchange rates. As Goldberg and Tille (2006) argue, an adjustment process to current account imbalances is likely to be asymmetric across the United States and its partners in trade, in particular because price sensitivity to exchange rates is expected to be substantially less in the United States. For the United States, retail prices are expected to have a lower sensitivity to exchange rates mainly due to its lower ratio of imports into final consumption for the vast majority of product categories. However, to the extent that the use of imported inputs in the production of both traded, and nontraded goods, including distribution services have risen over time, this finding results in increases over time of the sensitivity of final prices to exchange rate changes.

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DATA APPENDIX

OECD import price series: Source: OECD Statistical Compendium. Quarterly time series of aggregate import price indices in local currency for 1975:Q1 to approximately 2004:Q4. We work with the maximum amount of data available by country in our analysis.

Effective Exchange Rate Indices. The nominal exchange rate index, is the trade weighted exchange rate index provides by the IMF. *Code in IFS database: neu*. The real effective exchange rate used is code *reu*. Regression analysis uses the inverse of the reported series, so that an increase in the exchange rate is a currency depreciation.

Foreign Price Index. 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 $W_t^{x,j} = neu_t^j \cdot P_t^j / reu_t^j$ by each country in our sample. This gives us a measure of trading partner costs (over all partners *x* of importing country *j*), with each partner weighted by its importance in the importing country's trade. The real effective exchange rate is calculated from Unit Labour Costs for developed countries by the IMF. *Code in IFS database:* reu. The consumer price indices from the *International Financial Statistics. Code in IFS database: 64*.

Input-Output (I/O) databases.

The Input-Output data for the different countries come from different sources:

- Data for Belgium, Finland, France, Germany, Greece, Italy, Netherlands, Spain, Sweden, and the United Kingdom come from the Eurostat National Accounts database. This database computes the input-output tables for these countries and reports a supply and a use table disaggregated to a total of 59 industries. These 59 industries include 22 manufacturing industries, 5 mining and extraction industries, 3 agriculture industries, 5 construction and energy industries, 8 trade and transport industries, and 17 service industries. We report distribution margin data for 29 manufacturing, mining and agriculture industries (we merge two mining industries into one, given their small production values in most countries).

- Data for Australia on input-output tables comes from the Australian Bureau of Statistics. The data reports supply and final use tables for a total of 237 industries. We convert these industries into the CPA classification of 29 manufacturing, mining and agriculture industries.

- Data for the United States on input output tables come from the "Benchmark Input Output Accounts for the US economy" (years 1992, and 1997). The U.S. input output accounts use a specific IO industry classification, which can then be transformed into the NIPA classification (Nacional Income and Product Account Tables) and then aggregated into the CPA classification of 29 manufacturing, mining and agriculture industries used in the paper.

- Data for New Zealand on input output tables come from Statistics New Zealand. The data reports supply, use, and import tables for a total of 210 industries. We aggregate these industries into the CPA classification of 29 manufacturing, mining and agriculture industries.

Calculation of distribution margins:
We compute the distribution margins for total supply in the industry as the ratio of the value of trade and transport margins to the value of total supply in the industry at purchasers' prices. Purchaser prices include the cost of supply at basic prices plus the distribution (retail, wholesale and transportation) costs plus net taxes on products. To the extent that taxation differs significantly across countries for the same industry and across industries within a country, distribution margins may not be perfectly comparable in all cases. See Campa and Goldberg (2006).

Calculation of imported input ratios:
The Input Output tables report the value of the use matrix broken down the use of inputs by origin: domestic and imported. We calculate imported inputs into the production of each industry as the ratio between the total value of imported intermediate inputs by an industry to the value of total intermediate inputs.

Techniques to construct the imported intermediate flows matrix in the input-output tables vary by country. Most countries used to some extent the import proportionality assumption. This technique assumes that an industry uses an import of a particular product in proportion to its total use of that product. This assumption is limiting since some industries might be using inputs from domestic and import sources in different proportions than the average of the economy. Countries made use of this assumption at very different levels of aggregation. For instance, the OECD reports that Germany and Denmark made used of over 2000 different commodities, while the U.S. and Japan used slightly over 500 and the United Kingdom less than 200.

Appendix Table 1: Long-run Import Price Pass Through

	All Imports	Manufact. Goods	Non-manuf Goods	Energy	Food	Raw Materials
Pre-1995						
Australia	0.62*+	0.89*	0.16+	-0.51	0.38*+	0.32+
Austria	1.01	0.55	2.27*	2.85	0.49	2.86*
Belgium	1.03	0.6	0.56	-3.13	1.36*	3.18*+
Denmark	0.95*	0.77*	1.10	1.37	0.74	1.95*
Finland	0.72	0.6	1.43	2.01	1.06	0.27
France	0.87*	0.86*	1.12	1.57	1.43*	
Germany	1.00*	0.54*+	1.69*	2.64*	0.55*+	1.45*
Hungary						
Italy	0.32+	0.48+	-0.09	-1.53	0.80*	1.07
Netherlands	0.93*	0.25+	1.77*	2.36	0.73*	2.42*+
New Zealand	0.36+	0.29+	0.99	1.91	0.04+	-0.43+
Norway	0.97*	0.77*	0.31	-0.21	-0.41+	0.83
Portugal	1.18*	1.06*	1.03*	1.06	1.14*	1.48*+
Spain	0.66*	1.00*	0.58	0.06	0.95	1.16*
Sweden	0.32+	0.56*+	-0.30+	-0.88+	0.79*	0.28
UK	0.45*+	0.46*+	0.36+	0.18	0.50*+	0.55*+
US	0.44*+	0.47*+	0.15+	-0.22+	0.24+	0.36*+
Average	**0.74**	**0.63**	**0.82**	**0.60**	**0.67**	**1.18**
St Deviation	**0.29**	**0.24**	**0.73**	**1.66**	**0.48**	**1.05**
Post-1995						
Australia	0.82*	0.93*	0.44	0.45	0.10+	0.43
Austria	-1.40	-1.30	-2.55	-7.60	-1.11	3.02
Belgium	0.25+	0.14+	0.47	2.08	-0.30+	0.73
Denmark	0.83*	0.45*+	1.80*	3.67	1.30*	0.82
Finland	-0.16	-0.24	-1.58	-3.37	2.50	-1.70
France	0.28	0.28+	1.00	0.12	1.31	
Germany	0.68	0.67*	0.63	0.54	0.44	0.93
Hungary	0.78*+	0.79*+	0.67	0.89	0.63*	0.00
Italy	0.85*	0.81*	1.82	4.11*	0.57	0.23
Netherlands						
New Zealand	0.12+	0.19+	-0.26+	-0.62	0.27+	0.18+
Norway	0.09+	0.06+	-0.23	1.90	1.02	-1.27
Portugal	1.96	1.66	-0.64	-16.58	6.47	7.55
Spain	1.18*	1.70	0.84	-3.18	2.23	3.18*+
Sweden	0.21+	0.61*	-1.74*+	-3.22*+	0.67*	-0.19+
UK	0.32*+	0.26+	0.43	1.30	0.62*	0.08+
US	0.30*+	0.27*+	0.54	0.97	0.03+	0.34
Average	**0.44**	**0.46**	**0.10**	**-1.16**	**1.05**	**0.96**
Std Deviation	**0.71**	**0.71**	**1.22**	**5.07**	**1.70**	**2.23**

* indicates different from 0 with 10% significance
+ indicates different from 1 with 10% significance

Appendix Table 2 Overview of data on imported inputs and distribution margins, by country and industry

Imported Input Data Availability			Distribution Margin Data Availability	
Country	Years	Number of Industries	Years	Number of Industries
Austria	1995, 2000	1995: 54, 2000: 56	1995, 2001	1995: 27, 2001: 29, in both: 27
Belgium	1995, 2000	1995: 54, 2000: 55	1995, 2001	1995: 29, 2001: 29, in both: 29
Denmark	1995, 2000	1995: 55, 2000: 55	1995, 2000	1995: 27, 2000: 28, in both: 27
Finland	1995, 2000	1995: 56, 2000: 56	1995, 2002	1995: 29, 2002: 30, in both: 29
France	2000	2000: 57	1995, 2001	1995: 30, 2001: 29, in both: 29
Germany	1995, 2001	1995: 57, 2001: 56	1995, 2001	1995: 30, 2001: 30, in both: 30
Greece			1995, 1999	1995: 30, 1999: 30, in both: 30
Hungary	1998, 2000	1998: 57, 2000: 57	1998, 2000	1998: 30, 2000: 30, in both: 30
Ireland	1998	1998: 55	1998	1998: 26
Italy	1995, 2000	1995: 57, 2000: 57	1995, 2001	1995: 29, 2001: 29, in both: 29
Netherlands	1995, 2000	1995: 55, 2000: 55	1995, 2001	1995: 30, 2001: 30, in both: 30
Norway	2001	2001: 57	2002	2002: 29
Portugal	1999	1999: 56	1995, 1999	1995: 28, 1999: 28, in both: 28
Spain	1995	1995: 57	1995, 2000	1995: 29, 2000: 29, in both: 29
Sweden	1995, 2000	1995: 48, 2000: 55	1995, 2001	1995: 29, 2001: 29, in both: 29
UK	1995	1995: 57	1995, 2001	1995: 29, 2001: 29, in both: 29
US	1997, 2002	1997: 30, 2002: 30	1992, 1997	1992: 29, 1997: 29, in both: 27

Appendix Table 3: Industry Names

For disaggregated imported input and distribution margin data

Number	**Industry Name**	**Mapping**
a01	Agriculture, hunting and related service activities	non-manuf.
a02	Forestry, logging and related service activities	non-manuf., raw materials
b05	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	non-manuf.
ca10	Mining of coal and lignite; extraction of peat	non-manuf., raw materials
ca11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction excluding surveying	non-manuf., raw materials
ca12+	Mining of uranium and thorium ores	non-manuf., raw materials
cb13	Mining of metal ores	non-manuf., raw materials
cb14	Other mining and quarrying	non-manuf., raw materials
da15	Manufacture of food products and beverages	manuf., food
da16	Manufacture of tobacco products	manuf., food
db17	Manufacture of textiles	manuf.
db18	Manufacture of wearing apparel; dressing; dyeing of fur	manuf.
dc19	Tanning, dressing of leather; manufacture of luggage	manuf.
dd20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	manuf.
de21	Manufacture of pulp, paper and paper products	manuf.
de22	Publishing, printing, reproduction of recorded media	manuf.
df23	Manufacture of coke, refined petroleum products and nuclear fuel	manuf., energy
dg24	Manufacture of chemicals and chemical products	manuf.
dh25	Manufacture of rubber and plastic products	manuf.
di26	Manufacture of other non-metallic mineral products	manuf.
dj27	Manufacture of basic metals	manuf.
dj28	Manufacture of fabricated metal products, except machinery and equipment	manuf.
dk29	Manufacture of machinery and equipment n.e.c.	manuf.
dl30	Manufacture of office machinery and computers	manuf.
dl31	Manufacture of electrical machinery and apparatus n.e.c.	manuf.
dl32	Manufacture of radio, television and communication equipment and apparatus	manuf.
dl33	Manufacture of medical, precision and optical instruments, watches and clocks	manuf.
dm34	Manufacture of motor vehicles, trailers and semi-trailers	manuf.
dm35	Manufacture of other transport equipment	manuf.
dn36	Manufacture of furniture; manufacturing n.e.c.	manuf.
dn37	Recycling	non-manuf.
e40*	Electricity, gas, steam and hot water supply	non-manuf., energy
e41*	Collection, purification and distribution of water	non-manuf.
f45*	Construction	non-manuf.
g50*	Sale, maintenance and repair of motor vehicles	non-manuf.
g51*	Wholesale trade and commission trade, except of motor and motorcycles	non-manuf.
g52*	Retail trade, except of motor vehicles, motorcycles; repair of personal and household goods	non-manuf.
h55*	Hotels and restaurants	non-manuf.
i60*	Land transport; transport via pipelines	non-manuf.
i61*	Water transport	non-manuf.
i62*	Air transport	non-manuf.
i63*	Supporting and auxiliary transport activities; activities of travel agencies	non-manuf.
i64*	Post and telecommunications	non-manuf.

j65*	Financial intermediation, except insurance and pension funding	non-manuf.
j66*	Insurance and pension funding, except compulsory social security	non-manuf.
j67*	Activities auxiliary to financial intermediation	non-manuf.
k70*	Real estate activities	non-manuf.
k71*	Renting of machinery and equipment without operator and of personal and household goods	non-manuf.
k72*	Computer and related activities	non-manuf.
k73*	Research and development	non-manuf.
k74*	Other business activities	non-manuf.
l75*	Public administration and defence; compulsory social security	non-manuf.
m80*	Education	non-manuf.
n85*	Health and social work	non-manuf.
o90*	Sewage and refuse disposal, sanitation and similar activities	non-manuf.
o91*	Activities of membership organization n.e.c.	non-manuf.
o92*	Recreational, cultural and sporting activities	non-manuf.
o93*	Other service activities	non-manuf.
p95+*	Private households with employed persons	non-manuf.

+ Excluded from Imported input time trend regressions because of insufficient observations.