Exchange-Rate Volatility and Commodity Trade: The Case of the US and Italy

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ABSTRACT

In recent years, numerous empirical studies have estimated the role of exchange-rate uncertainty on different countries' industry-level trade flows. These have tended to find mixed results, with the majority of industries registering no impact, and the rest split between positive and negative effects. This study extends the literature to the case of US-Italian trade, for 145 export industries and 125 import industries. Of those industries, most exhibit significant short-run responses to exchange-rate volatility, but fewer register significant long-run effects. US exports of food and imports of raw materials appear to be particularly affected by risk in the long run, while many manufactures are not.

1. INTRODUCTION

THE EXPANSION OF WORLD TRADE IN RECENT DECADES, coupled with the collapse of the Bretton Woods system and the prevalence of floating exchange rates, has led to a growth in research on the impact of volatile exchange rates on trade flows. In addition, advances in econometric techniques and the increased availability of disaggregated export and import data have allowed for an increasing number of analyses of the role of risk on specific industries' trade flows. These studies have greatly expanded and deepened economic understanding of specific commodities and bilateral trade partnerships.

As noted by McKenzie (1999) and Bahmani-Oskooee and Hegerty (2007), it is not an automatic conclusion that increased risk will reduce trading activity. Exchange-rate variability does not necessarily lead to a decline in

exports or imports as traders choose to avoid spending more of their own currency to buy a previously purchased product. Both theory and econometric analyses have shown there to be little significant impact in many cases. Studies have even pointed to increases in trade, given the presence of 'risk loving' exporters or importers. As a result, studies of these effects must be conducted on a case-by-case basis.

Because of the seemingly limitless combinations of international pairings, bilateral analyses of these trade effects are constrained only by the availability of data. In recent years, a number of industry-level studies have been conducted, primarily for the United States vis-à-vis its major trading partners, examining dozens of individual industries. Examples include Bahmani-Oskooee and Hegerty (2009a, 2009b) for US bilateral trade with Mexico and Japan, respectively. These studies all make use of single-equation cointegration techniques that are robust to short annual samples and that incorporate stationary as well as non-stationary variables. These studies tend to arrive at certain similar findings: first, a large share of industries are insensitive to exchange-rate volatility. Second, while the remaining commodities are split between positive and negative effects, the latter tend to outnumber the former, suggesting that there is some degree of risk aversion among traders. Finally, industry size and specific outcomes by sector are able to explain some of the results.

This study continues in that tradition with an examination of bilateral trade between the United States and Italy for 143 US export and 125 US import industries. While US-Italian trade has been included in such multilateral studies as De Grauwe (1987), Bleaney (1992), and Vergil (2002) — finding mixed effects — such a specific investigation has not yet to our knowledge been conducted. Using annual data from 1979 to 2010, we find that most of our industries are not affected by exchange rate volatility. US exports of food and imports of raw materials seem to have the largest proportion of industries that register significant effects.

This paper proceeds as follows. Section II describes the models and the methodology. Section III discusses the results. Section IV concludes. Data are described in the Appendix.

2. The Models and the Methodology

Drawing on previous studies such as Bahmani-Oskooee and Hegerty (2009a, 2009b), we model each export or import flow as a function of the purchasing country's income, the Italian-US real exchange rate (to capture price effects), and a measure of real exchange rate volatility. These variables are explained in detail in the appendix. We expect income effects to be positive for both exports and imports, while the real exchange rate will have opposite effects on exports and imports. Here, because an increase represents a euro appreciation or a dollar depreciation, there should be a positive coefficient for the exchange rate in the US export specification, and a negative one in the import

specification. The impact of uncertainty will differ on an industry-by-industry basis, regardless of specification, based on the theory and literature outlined above.

Previous studies also dictate that we apply an appropriate error-correction model to capture the long-run and short-run effects of exchange-rate volatility on industry trade flows. We employ the popular Autoregressive Distributed Lag (ARDL) cointegration approach of Pesaran *et al* (2001), which includes both first-differenced and level variables as in (1) and (2):

$$\ln VX_t = \alpha_0 + \beta_0 EURO + \sum_{j=1}^{n1} \beta_j \Delta \ln VX_{t-j} + \sum_{j=0}^{n2} \gamma_j \Delta \ln Y_{t-j}^{Italy} + \sum_{j=0}^{n3} \delta_j \Delta \ln REX_{t-j} + \sum_{j=0}^{n4} \kappa_j \Delta \ln VOL_{t-j}$$
$$+ \theta_1 \ln VX_{t-1} + \theta_2 \ln Y_{t-1}^{Italy} + \theta_3 \ln REX_{t-1} + \theta_4 \ln VOL_{t-1} + \varepsilon_t \qquad (1)$$

and:

$$\Delta \ln VM_t = \alpha_2 + \phi_0 EURO + \sum_{j=1}^{n5} \phi_j \Delta \ln VM_{t-j} + \sum_{j=0}^{n6} \varphi_j \Delta \ln Y_{t-j}^{U.S.} + \sum_{j=0}^{n7} \pi_j \Delta \ln REX_{t-j} + \sum_{j=0}^{n8} \vartheta_j \Delta \ln VOL_{t-j}$$
$$+ \theta_5 \ln VX_{t-1} + \theta_6 \ln Y_{t-1}^{U.S.} + \theta_7 \ln REX_{t-1} + \theta_8 \ln VOL_{t-1} + \varepsilon_t \qquad (2)$$

where VX (VM) is the volume of exports of industry i by the US (volume of imports), Y^{Italy} (Y^{US}) is Italian income (the US income), REX is the real euro-dollar rate, and VOL is a measure of the volatility of REX.

These models estimate both short-run and long-run coefficients in a single equation. In addition, by assuming that no changes take place in a long-run steady state, the remaining (lagged) level variables form a type of cointegrating vector that can be normalised to provide long-run estimates. These variables, if jointly significant, also provide evidence of cointegration. The critical values for this F-test are provided for small samples by Narayan (2005). Since results below this 'upper bound' are often ambiguous, we provide a secondary test as well.[2] Note that the upper bound critical value of the F test is based on the assumption that all variables are integrated of order one, or I(1). The lower bound assumes are variables are stationary or I(0). Pesaran *et al* (2001) show that upper bound critical value could be used even if some variables are I(1) and some I(0). This is the main advantage of this approach over other cointegration approaches.

We proceed in our estimation as follows. First, we choose the lag lengths n (from a maximum of four) by minimising the Akaike Information Criterion, and test for the joint significance of the lagged level variables for each industry in equation (1) or (2). If the F-statistic is above the upper bound critical value, we consider there to be a long-run relationship among the variables. If it is below, we group the fitted values into a single variable (called *ECM*, since it represents the error-correction process) and re-estimate the equation with *ECM* in place of the separate lagged level variables. If this term is significantly negative, we can say that the variables are reverting to equilib-

rium as a group.[3] Note that Banerjee *et al* (1998) show that the distribution of the t-ratio to judge the significance of estimated coefficient is non-standard, hence they tabulate new critical values that are used here.

Next, for those industries for which we find the variables to be cointegrated, we provide estimates for Equations (1) and (2). We can then evaluate the role of uncertainty in these trade flows. Consistent with earlier studies, we find a mixture of positive and negative effects.

3. RESULTS

Table 1 provides the results of our two cointegration tests, for both exports and imports. We find that of the 143 export industries, 43 have F-statistics above the upper-bound critical value of 4.150. Applying the ECM test (which requires a t-statistic below -2.95) to the remainder, we find that 53 of these can be said to be cointegrated. For the 125 US import industries, 36 have F-statistics above the upper bound, so we apply the ECM test to the rest. In total, 96 export industries and 92 import industries have significant long-run relationships among the variables. We focus our long-run analysis on these industries, although we examine the short-run coefficients on all industries regardless of whether cointegration is present.[4]

Table 1. Cointegration Test Results

		US exports			*US imports*		
Code	*Industry*	*F-test*	*ECM_{t-1}*	*Cointeg?*	*F-test*	*ECM_{t-1}*	*Cointeg?*
001	Live animals	1.79	-0.63 (1.05)	No			
013	Meat in airtight containers, n.e.s				7.49	2.87 (3.36)	Yes
022	Milk and cream	3.94	-2.37 (5.28)	Yes			
024	Cheese and curd				1.46	-1.18 (3.78)	Yes
025	Eggs	3.11	-0.69 (4.99)	Yes			
031	Fish, fresh & simply preserved	5.01	-0.37 (3.72)	Yes	4.05	-1.33 (5.51)	Yes
032	Fish, in airtight containers, n.e.s	2.43	0.11 (0.33)	No	1.16	-0.90 (2.83)	Yes
041	Wheat including spelt	2.54	-0.63 (3.62)	Yes			
042	Rice				1.72	-0.63 (5.66)	Yes
044	Maize corn unmilled	2.44	-0.53 (3.34)	Yes			
045	Cereals, unmilled excl. wheat, rice	3.75	-1.81 (7.85)	Yes			
048	Cereal preps & preps of flour	0.98	-2.01 (8.71)	Yes			
051	Fruit, fresh, and nuts excl. Oil nuts	7.41	-1.30 (5.72)	Yes	10.15	-0.13 (0.37)	Yes
052	Dried fruit including artificially	3.37	-1.13 (3.80)	Yes	0.54	-1.20 (4.05)	Yes
053	Fruit, preserved and fruit preparations	3.87	-0.93 (4.16)	Yes	3.46	-0.78 (5.12)	Yes
054	Vegetables, roots & tubers, fresh	13.38	-0.09 (0.33)	Yes	16.44	-0.69 (4.95)	Yes
055	Vegetables, roots & tubers preserved	1.05	-4.37 (4.19)	Yes	1.64	-0.45 (2.80)	Yes
061	Sugar and honey	2.58	1.09 (3.68)	No	0.96	-0.29 (0.81)	No
062	Sugar confectionery, sugar preps.	7.76	-0.99 (3.72)	Yes	0.73	-0.42 (1.49)	No
071	Coffee	3.48	-1.35 (6.79)	Yes	0.78	-0.16 (0.52)	No
073	Chocolate & other food preparations	3.09	-0.52 (2.00)	No	2.47	-1.07 (8.58)	Yes
075	Spices				0.85	-1.74 (3.82)	Yes
081	Feedstuff for animals excl. unmilled	2.21	-0.89 (4.24)	Yes	1.94	-0.75 (6.37)	Yes
099	Food preparations, n.e.s.	1.70	-0.98 (4.66)	Yes	2.63	-1.48 (4.44)	Yes

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111	Non alcoholic beverages, n.e.s.				1.55	-0.96 (4.31)	Yes
112	Alcoholic beverages	15.94	-0.63 (3.09)	Yes	1.14	-0.50 (3.28)	Yes
121	Tobacco, unmanufactured	0.24	0.18 (0.16)	No	1.95	-0.50 (1.13)	No
211	Hides & skins, exc.fur skins	2.17	0.25 (1.39)	No	0.37	-1.34 (5.93)	Yes
212	Fur skins	10.77	-0.72 (4.92)	Yes			
221	Oil seeds, oil nuts and oil kernels	6.21	-1.35 (3.74)	Yes			
231	Crude rubber incl. synthetic & recycled	0.97	-0.34 (0.98)	No	4.77	-0.35 (3.16)	Yes
242	Wood in the rough or roughly square	4.85	-1.37 (5.83)	Yes			
243	Wood, shaped or simply worked	1.18	-0.32 (1.77)	No			
251	Pulp & waste paper	4.19	-1.00 (4.23)	Yes			
262	Wool and other animal hair	3.61	-0.61 (4.59)	Yes	2.77	-1.78 (5.99)	Yes
263	Cotton	8.29	-0.70 (3.55)	Yes			
266	Synthetic and regenerated	2.18	-1.02 (3.39)	Yes	2.96	-0.55 (4.50)	Yes
267	Waste materials from textile fabric	1.86	-0.68 (2.28)	No	4.43	-1.07 (4.44)	Yes
273	Stone, sand and gravel	1.71	-0.07 (0.60)	No	0.57	-0.37 (1.11)	No
275	Natural abrasives incl. industrial	1.78	-0.21 (1.22)	No	2.32	-0.52 (2.19)	Yes
276	Other crude minerals	3.98	-1.08 (4.27)	Yes	2.76	-0.80 (5.00)	Yes
282	Iron and steel scrap	0.94	-0.23 (0.79)	No			
283	Ores & concentrates of non ferrous metals	5.20	-2.08 (4.47)	Yes			
284	Non ferrous metal scrap	2.13	-1.00 (5.19)	Yes			
291	Crude animal materials, n.e.s.	3.84	-0.93 (4.25)	Yes	1.39	-0.62 (1.94)	No
292	Crude vegetable materials, n.e.s.	3.74	-0.99 (4.06)	Yes	1.50	-1.48 (4.58)	Yes
321	Coal, coke & briquettes	0.96	-1.14 (2.51)	No			
332	Petroleum products	1.23	-0.33 (1.23)	No	2.28	-0.43 (3.11)	Yes
341	Gas, natural and manufactured	6.79	-1.44 (5.54)	Yes			
411	Animal oils and fats	2.60	-0.52 (1.96)	No	2.96	-0.95 (3.77)	Yes
421	Fixed vegetable oils, soft				3.82	-0.32 (2.34)	Yes
422	Other fixed vegetable oils	1.87	-0.87 (5.10)	Yes			
431	Anim./veg. Oils & fats, processed,	1.23	1.45 (1.37)	No			
512	Organic chemicals	2.34	0.06 (0.21)	No	1.32	0.19 (0.90)	No
513	Inorganic chemicals elements, oxides	2.85	-0.65 (3.34)	Yes	2.95	-0.90 (3.50)	Yes
514	Other inorganic chemicals	1.74	-0.56 (2.60)	No	7.05	-1.48 (4.91)	Yes
515	Radioactive and associated materials	6.37	-0.46 (4.29)	Yes			
531	Synthetic. organic dyestuffs, natural	8.33	-1.73 (5.50)	Yes	8.34	-1.85 (4.61)	Yes
532	Dyeing & tanning extracts	3.80	-1.00 (7.17)	Yes	2.49	-1.21 (4.83)	Yes
533	Pigments, paints, varnishes	2.84	-0.53 (2.43)	No	2.89	-0.64 (4.18)	Yes
541	Medicinal & pharmaceutical products	2.42	-3.74 (3.84)	Yes	7.73	-0.76 (2.68)	Yes
551	Essential oils, perfume and flavor	3.73	-0.96 (4.17)	Yes	3.01	-1.56 (5.01)	Yes
553	Perfumery, cosmetics, dentifrices,	1.56	-0.49 (2.87)	No	10.31	-0.41 (2.09)	Yes
554	Soaps, cleansing & polishing preparations	12.12	-0.59 (1.79)	Yes	3.22	-1.39 (5.46)	Yes
571	Explosives and pyrotechnic products	1.73	-0.05 (0.27)	No	6.04	-0.49 (2.46)	Yes
581	Plastic materials, regenerated	2.62	-0.71 (2.95)	Yes	1.91	-0.002 (0.12)	No
599	Chemical materials and products, n.e.s.	3.58	-1.66 (5.72)	Yes	18.92	-1.55 (4.59)	Yes
611	Leather	36.53	-0.82 (2.02)	Yes	3.86	-0.03 (0.60)	No
612	Manufacturers of leather	4.86	-0.53 (2.28)	Yes	3.06	-0.12 (1.04)	No
613	Fur skins, tanned or dressed	1.65	-0.26 (1.72)	No	0.74	-1.31 (4.96)	Yes
621	Materials of rubber	2.94	-0.71 (3.31)	Yes			
629	Articles of rubber, n.e.s.	2.62	-0.35 (2.61)	No	3.85	-0.47 (2.79)	Yes
631	Veneers, plywood boards & other woods	1.69	-1.30 (3.92)	Yes	4.54	-0.73 (4.39)	Yes

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632	Wood manufactures, n.e.s.	4.29	-0.28 (0.84)	Yes	1.86	-0.31 (1.58)	No
633	Cork manufactures				1.16	-0.56 (3.32)	Yes
641	Paper and paperboard	1.54	-0.02 (0.08)	No	16.19	-0.88 (6.91)	Yes
642	Articles of paper, pulp, paperboard	6.22	-1.34 (4.62)	Yes	2.94	-0.54 (3.06)	Yes
651	Textile yarn and thread	2.03	-1.74 (5.90)	Yes	3.51	-0.50 (3.39)	Yes
652	Cotton fabrics, woven ex. narrow	2.19	-0.64 (3.59)	Yes	20.29	0.11 (0.22)	Yes
653	Text fabrics woven ex narrow	2.13	-0.60 (4.75)	Yes	6.11	0.04 (0.35)	Yes
654	Tulle, lace, embroidery, ribbons	0.76	-0.94 (3.01)	Yes	3.62	-0.25 (0.98)	No
655	Special textile fabrics and related materials	3.85	-1.63 (4.88)	Yes	2.82	-0.19 (1.06)	No
656	Made up articles, wholly or chiefly	1.83	-0.89 (4.62)	Yes	6.23	-0.35 (2.12)	Yes
657	Floor coverings, tapestries, etc.	2.65	0.34 (0.97)	No	13.57	-0.92 (7.83)	Yes
661	Lime, cement & fabr. bldg.mat.	4.28	-1.22 (4.80)	Yes	1.41	-0.01 (0.09)	No
662	Clay and refractory construction materials	11.05	-1.46 (3.18)	Yes	4.16	-0.17 (1.45)	Yes
663	Mineral manufactures, n.e.s.	1.36	0.20 (0.66)	No	0.80	0.10 (0.53)	No
664	Glass	1.14	-1.42 (5.59)	Yes	2.13	-0.23 (1.55)	No
665	Glassware	0.85	-1.02 (2.65)	No	6.57	-0.33 (1.64)	Yes
666	Pottery	2.03	-0.55 (2.63)	No	9.85	-0.05 (0.55)	Yes
667	Pearls and precious & semi precious stone	3.34	-2.52 (5.06)	Yes	2.20	0.37 (0.45)	No
671	Pig iron, spiegeleisen, sponge iron	10.83	-0.34 (1.97)	Yes	1.54	-0.44 (3.42)	Yes
672	Ingots & other primary forms of iron	2.72	-2.14 (4.58)	Yes	5.51	-1.39 (4.48)	Yes
673	Iron and steel bars, rods, angles,	1.33	-0.03 (0.09)	No	2.91	-0.81 (2.31)	Yes
674	Universals, plates and sheets of iron	1.00	-0.32 (1.69)	No	2.18	-1.54 (3.64)	Yes
676	Rails & railway track construction materials	3.66	-0.72 (3.74)	Yes			
677	Iron and steel wire	1.73	-0.36 (1.09)	No	1.21	-0.72 (3.05)	Yes
678	Tubes, pipes and fittings of iron	1.64	-0.85 (4.97)	Yes	9.40	-0.17 (0.84)	Yes
679	Iron steel castings forgings	5.24	-2.52 (5.16)	Yes			
681	Silver and platinum group metals	1.85	0.58 (0.84)	No			
682	Copper	8.09	-1.66 (5.49)	Yes	3.60	-0.81 (6.21)	Yes
683	Nickel	2.78	-1.48 (4.66)	Yes			
684	Aluminium	4.77	-0.28 (1.32)	Yes	2.20	-0.79 (4.89)	Yes
685	Lead	5.02	-1.45 (5.10)	Yes			
689	Miscellaneous non ferrous base metals	7.75	-1.82 (5.43)	Yes	3.09	-1.08 (3.69)	Yes
691	Finished structural parts	1.24	-1.25 (4.74)	Yes	2.41	-0.42 (3.99)	Yes
692	Metal containers for storage and transport	4.12	1.19 (0.88)	No	4.63	-0.89 (4.19)	Yes
693	Wire products	1.79	-0.61 (1.55)	No	2.66	-0.39 (2.35)	Yes
694	Nails, screws, nuts, bolts, rivets	0.67	-0.87 (2.00)	No	2.29	-1.89 (6.64)	Yes
695	Tools for use in the hand or in machine	5.99	-1.15 (4.55)	Yes	3.97	-0.17 (1.49)	No
696	Cutlery	12.09	-1.99 (4.23)	Yes	1.06	-0.32 (1.74)	No
697	Household equipment of base metals	4.41	-1.18 (3.95)	Yes	1.29	-0.61 (3.78)	Yes
698	Manufactures of metal, n.e.s.	3.14	-1.30 (4.79)	Yes	2.22	-0.24 (2.36)	Yes
711	Power generating machinery	4.11	-1.13 (3.37)	Yes	6.57	-3.17 (5.72)	Yes
712	Agricultural machinery and implements	2.66	-1.19 (4.49)	Yes	2.16	-0.85 (2.64)	Yes
714	Office machines	3.29	-0.17 (2.70)	No	2.12	-0.43 (2.33)	Yes
715	Metalworking machinery	1.81	1.93 (3.41)	No	0.70	-0.39 (1.52)	No
717	Textile and leather machinery	2.06	-0.39 (2.88)	No	5.84	-0.16 (2.70)	Yes
718	Machines for special industries	2.26	0.12 (0.47)	No	3.29	-0.97 (3.50)	Yes
719	Machinery and appliances non electrical	1.02	-1.12 (5.30)	Yes	1.32	-0.21 (1.45)	No
722	Electric power machinery and switch	1.81	-1.75 (6.98)	Yes	6.38	-0.61 (3.81)	Yes
723	Equipment for distributing electricity	3.25	0.03 (0.38)	No	6.48	-0.51 (1.07)	Yes

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724	Telecommunications apparatus	4.35	-1.33 (3.51)	Yes	6.82	-0.49 (3.49)	Yes
725	Domestic electrical equipment	0.47	-0.48 (4.15)	Yes	0.72	-0.04 (0.07)	No
726	Elec. apparatus for medical purposes	4.40	-1.24 (7.13)	Yes	1.34	-0.23 (0.54)	No
729	Other electrical machinery and apparatus	15.82	-1.15 (2.16)	Yes	1.59	-0.89 (3.02)	Yes
731	Railway vehicles	4.13	-1.10 (4.28)	Yes	13.41	-1.95 (4.77	Yes
732	Road motor vehicles	1.74	-0.47 (1.59)	No	1.95	-0.05 (0.31)	No
733	Road vehicles other than motor vehicles	7.68	-0.62 (4.05)	Yes	1.29	-2.25 (5.55)	Yes
734	Aircraft	3.29	0.94 (1.54)	No	4.38	-1.21 (4.49)	Yes
735	Ships and boats	1.31	-0.24 (1.35)	No	7.83	-1.24 (5.92)	Yes
812	Sanitary, plumbing, heating & light	16.05	-1.12 (6.03)	Yes	4.78	-0.35 (2.90)	Yes
821	Furniture	4.79	-1.99 (4.17)	Yes	3.39	-0.12 (2.75)	Yes
831	Travel goods, handbags and similar	5.99	-1.51 (4.69)	Yes	2.20	-1.57 (5.39)	Yes
841	Clothing except fur clothing	3.94	-1.02 (7.00)	Yes	2.76	-0.22 (4.14)	Yes
842	Fur clothing	3.32	-0.58 (3.04)	Yes	1.89	-0.33 (2.28)	Yes
851	Footwear	4.52	-0.35 (1.94)	Yes	1.59	-0.22 (1.85)	No
861	Scientific, medical, optical, means.	2.42	-0.68 (4.01)	Yes	1.96	-0.16 (1.30)	No
862	Photographic and cinematographic supply	2.67	-0.49 (3.92)	Yes	3.66	0.001 (0.02)	No
863	Developed cinematographic film	4.84	-1.16 (4.45)	Yes	2.19	-0.25 (1.65)	No
864	Watches and clocks	0.10	-1.69 (3.26)	Yes	2.92	-0.18 (0.75)	No
891	Musical instruments, sound recorder	0.99	0.06 (0.37)	No	5.62	-0.002 (0.02)	Yes
892	Printed matter	27.37	-2.85 (4.93)	Yes	9.04	-0.16 (2.06)	Yes
893	Articles of artificial plastic materials	4.59	-1.03 (4.55)	Yes	5.01	-0.74 (4.28)	Yes
894	Perambulators,toys, games & sporting goods	7.53	0.22 (0.55)	Yes	3.79	-0.19 (1.46)	No
895	Office and stationery supplies, n.e.s.	5.00	-0.22 (6.36)	Yes	1.84	-0.20 (2.02)	Yes
896	Works of art, collectors pieces	0.87	1.29 (2.31)	No	3.45	-0.21 (2.02)	Yes
897	Jewellery and gold/silver smiths watches	0.69	-1.88 (7.43)	Yes	6.19	-0.03 (0.76)	Yes
899	Manufactured articles, n.e.s.	1.24	-0.76 (1.86)	No	2.50	-0.26 (1.25)	No
931	Special trans. not classified according to kind	2.01	-0.45 (2.38)	No	2.22	-0.46 (4.15)	Yes
951	Firearms of was and ammunition				1.09	-0.13 (0.21)	No

Note: Absolute values of the t-statistic are in parentheses. Critical values for the F-test are 4.150 for the upper bound, as per Narayan (2005), Case III, with an unrestricted intercept, no trend, k = 3, and 30 observations. The critical t-statistic for the ECM test is -2.95, as per Banerjee *et al* (1998). n.e.s. = not elsewhere specified.

We begin by looking at the short-run impact of exchange-rate volatility on US export flows, which are provided in Table 1. Although the signs are mixed, 100 individual industries have at least one significant coefficient. This implies that for these industries, short-run effects are present — as previous studies predict.

Do these short-run effects also last into the long run? Table 2 also gives the long-run coefficient estimates for the cointegrated export industries for all variables. Briefly examining the control variables in our model, we note that income has its expected significantly positive sign in 27 cases, while *REX* has a positive effect on the exports of 30 commodities.

Exchange-rate variability exhibits ambiguous results, with an absence of significant effects dominating: slightly less than half of the cointegrated industries have significant volatility coefficients of either sign. Of the 96 in our analysis, 51

have an insignificant coefficient. Of the remainder, 22 volatility coefficients are positive and 23 are negative. This corroborates previous findings that the effects are

Table 2: Coefficient Estimates

Code	Industries	Share	ΔlnVOL(t)	ΔlnVOL(t-1)	ΔlnVOL(t-2)
	Positively Affected By Volatility				
025	Eggs	0.01%	0.40 (2.02)		
044	Maize corn unmilled	0.00%	0.97 (3.10)	-0.55 (1.36)	-0.35 (1.14)
048	Cereal preps & preps of flour	0.04%	1.37 (5.39)	-1.32 (2.63)	-0.36 (0.96)
052	Dried fruit including artificially	0.01%	0.20 (2.16)	-0.29 (2.62)	
053	Fruit, preserved and fruit preparations	0.08%	0.13 (0.93)	0.68 (3.44)	0.18 (1.18)
242	Wood in the rough or roughly square	0.00%	0.14 (1.71)	-0.50 (2.97)	-0.39 (2.77)
284	Non ferrous metal scrap	0.37%	-0.77 (1.19)	-0.86 (1.17)	-1.72 (2.94)
541	Medicinal & pharmaceutical products	0.38%	0.05 (0.64)	-0.45 (1.99)	-0.15 (1.02)
599	Chemical materials and products, n.e.s.	0.09%	0.02 (0.36)	-0.05 (0.42)	-0.20 (1.66)
652	Cotton fabrics, woven	0.19%	0.40 (2.31)		
654	Tulle, lace, embroidery, ribbons	3.21%	-0.03 (0.13)	-0.95 (2.09)	-0.38 (1.38)
678	Tubes, pipes and fittings of iron	5.59%	0.43 (2.73)	-0.88 (3.59)	0.83 (4.04)
689	Miscell.non ferrous base metals	5.04%	-0.05 (0.41)	-0.35 (1.35)	-0.83 (4.15)
698	Manufactures of metal, n.e.s.	3.84%	0.16 (1.54)	-0.50 (2.52)	-0.41 (2.45)
722	Electric power machinery and switch	0.13%	-0.21 (3.65)	0.29 (4.57)	0.15 (2.61)
724	Telecommunications apparatus	0.86%	0.25 (2.41)		
725	Domestic electrical equipment	1.38%	-0.07 (1.02)	-0.13 (1.67)	-0.10 (1.82)
726	Elec. apparatus for medical purposes	1.59%	0.15 (2.73)		
841	Clothing except fur clothing	0.07%	0.18 (2.41)	-0.35 (3.82)	
851	Footwear	0.21%	0.39 (4.18)	-0.68 (4.39)	-0.27 (2.51)
864	Watches and clocks	0.35%	-0.08 (0.49)	-0.93 (1.94)	-0.65 (2.31)
892	Printed matter	0.08%	0.08 (0.71)	-0.33 (1.68)	-0.13 (1.12)
	Negatively affected by volatility				
041	Wheat including spelt	0.21%	-0.12 (1.21)		
045	Cereals, unmilled excl. wheat, rice	0.16%	-0.002 (0.004)	1.91 (2.45)	0.78 (1.25)
055	Vegetables, roots & tubers	0.21%	-1.03 (1.31)	6.08 (2.93)	5.13 (2.79)
071	Coffee	1.72%	-0.64 (2.55)	0.28 (0.65)	0.10 (0.28)
081	Feed. Stuff for animals	11.93%	-0.11 (0.67)	0.62 (1.97)	0.47 (1.79)
099	Food preparations, n.e.s.	0.11%	-0.69 (3.45)	0.99 (2.61)	1.04 (3.43)
112	Alcoholic beverages	0.00%	-0.25 (2.49)	0.46 (2.59)	0.47 (2.52)
262	Wool and other animal hair	0.17%	-0.42 (2.01)		
531	Synthetic organic dyestuffs	0.33%	-0.19 (1.84)	0.49 (2.52)	0.53 (3.18)
551	Essential oils, perfume and flavor	0.48%	0.20 (1.55)	0.47 (3.17)	
653	Text fabrics woven ex narrow	0.27%	-0.08 (0.77)	0.25 (1.97)	0.23 (2.07)
655	Special textile fabrics	0.26%	-0.03 (0.41)	0.14 (1.83)	

mixed, although the majority of significant effects tend to be negative in other studies. Here, however, positive and negative coefficients are roughly proportional.[5]

United States Exports to Italy

ΔlnVOL(t-3)	*Constant*	*EURO*	*lnY(IT)*	*lnREX*	*lnVOL*
	42.72 (1.92)	2.18 (3.52)	-5.22 (1.79)	1.02 (0.84)	0.59 (1.92)
	157.46 (2.06)	-1.36 (0.92)	-17.45 (1.86)	8.62 (1.89)	5.07 (2.34)
-0.52 (1.68)	-41.27 (3.81)	-0.58 (1.95)	6.25 (4.39)	0.66 (1.09)	1.56 (5.48)
	-0.25 (0.04)	-0.53 (3.17)	0.96 (1.19)	0.53 (1.42)	0.74 (3.81)
	12.34 (0.70)	-0.10 (0.22)	1.81 (0.84)	0.34 (0.37)	0.68 (2.41)
-0.24 (2.59)	-1.33 (0.22)	0.23 (1.41)	1.05 (1.31)	0.87 (2.48)	0.45 (3.11)
	10.06 (0.22)	-1.69 (1.19)	0.05 (0.01)	-2.08 (0.74)	2.28 (2.11)
	-23.87 (9.58)	0.11 (1.67)	4.25 (13.15)	-0.67 (4.72)	0.21 (3.97)
-0.07 (0.92)	-0.77 (0.21)	0.22 (1.95)	1.00 (2.19)	0.89 (4.34)	0.06 (6.68)
	73.52 (2.98)	-0.39 (0.59)	-8.36 (2.61)	1.89 (1.33)	1.36 (2.61)
	-29.13 (1.03)	-1.45 (1.83)	4.77 (1.27)	-0.82 (0.48)	1.62 (2.15)
-0.62 (4.13)	68.85 (3.02)	2.24 (3.36)	-7.84 (2.73)	3.48 (2.76)	1.38 (3.02)
-0.43 (3.36)	35.43 (5.00)	1.35 (6.88)	-3.75 (4.15)	1.27 (2.38)	0.46 (2.34)
-0.18 (1.57)	10.24 (2.09)	0.18 (0.72)	-1.32 (1.16)	0.63 (1.24)	0.59 (2.98)
	-13.38 (5.30)	-0.04 (0.59)	2.55 (7.80)	0.21 (1.34)	0.26 (4.15)
	-1.02 (0.12)	-0.38 (1.78)	1.39 (1.30)	0.91 (1.76)	0.68 (3.30)
	16.59 (1.14)	-0.06 (0.17)	-1.37 (0.72)	3.01 (3.21)	0.53 (2.00)
	-12.41 (4.58)	0.13 (1.64)	2.48 (7.12)	0.08 (0.57)	0.11 (2.53)
	0.94 (0.13)	-0.14 (0.72)	0.92 (0.94)	0.03 (1.41)	0.89 (5.57)
	124.86 (1.92)	1.53 (0.91)	-14.45 (1.79)	0.72 (0.47)	2.87 (2.50)
	1.54 (0.13)	0.37 (1.16)	0.55 (0.37)	1.79 (2.62)	0.87 (2.99)
-0.06 (0.86)	-4.43 (1.45)	-0.02 (0.19)	1.41 (3.51)	0.70 (3.86)	0.19 (1.89)
	-5.09 (0.74)	0.36 (1.73)	1.40 (1.52)	-0.88 (2.14)	-0.28 (2.03)
	-18.63 (0.61)	-0.68 (0.81)	2.31 (0.58)	0.74 (0.41)	-1.43 (2.51)
2.75 (2.85)	-9.17 (0.59)	-0.79 (1.85)	0.99 (0.48)	3.89 (4.38)	-1.64 (4.08)
-0.36 (1.48)	-51.18 (2.64)	-0.40 (0.74)	6.33 (2.49)	-0.18 (0.17)	-0.87 (2.06)
0.38 (2.07)	51.27 (2.42)	-0.02 (0.04)	-6.22 (2.22)	2.35 (1.93)	-0.99 (2.18)
0.59 (3.15)	-51.35 (5.11)	-0.92 (2.43)	6.46 (4.71)	-0.30 (0.49)	-1.79 (5.02)
0.37 (2.64)	-43.72 (2.66)	0.21 (0.39)	5.77 (2.76)	-0.99 (1.07)	-1.28 (2.43)
	-49.79 (2.11)	-1.29 (1.82)	6.61 (2.14)	-4.13 (3.19)	-0.69 (1.91)
0.30 (2.87)	-18.54 (1.66)	-0.37 (1.22)	2.51 (1.73)	0.79 (1.25)	-0.86 (3.11)
	-8.58 (0.60)	0.13 (0.31)	1.42 (0.75)	0.21 (0.24)	-0.52 (2.05)
	-41.29 (3.24)	-1.55 (3.61)	5.99 (3.48)	-1.36 (1.85)	-0.25 (6.81)
	1.63 (0.48)	0.17 (1.60)	0.38 (0.82)	0.28 (1.21)	-0.17 (2.08)

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661	Lime, cement & fabricated bldg. materials	0.29%	0.19 (0.66)	1.34 (2.54)	0.90 (2.08)
662	Clay and refractory construction materials	0.20%	-0.33 (1.06)	0.15 (0.46)	0.33 (1.45)
664	Glass	0.64%	-0.22 (1.67)	0.10 (0.57)	0.23 (1.77)
685	Lead	0.42%	-2.25 (2.59)	2.48 (2.91)	
697	Household equipment of base metals	4.85%	-0.77 (3.44)	0.55 (2.36)	
711	Power generating machinery	9.20%	-0.22 (4.77)	0.39 (7.82)	
712	Agricultural machinery and implements	0.18%	-0.39 (3.40)	0.29 (1.56)	-0.003 (0.02)
812	Sanitary, plumbing, heating & light	0.11%	-0.31 (3.51)	0.44 (2.98)	0.25 (2.16)
862	Photographic and cinematographic supply	0.16%	-0.33 (2.46)		
893	Articles of artificial plastic materials	0.39%	-0.22 (1.83)		
895	Office and stationery supplies, n.e.s.	0.02%	-0.22 (1.85)		
	Not significantly affected by volatility				
022	Milk and cream	2.24%	-0.28 (0.69)		
031	Fish, fresh & simply preserved	0.07%	0.11 (1.53)	-0.11 (1.13)	-0.10 (1.31)
051	Fruit, fresh, and nuts excl. Oil nuts	0.35%	0.02 (0.24)	0.19 (1.70)	
054	Vegetables, roots & tubers, fresh	0.39%	0.35 (3.04)	0.40 (1.79)	0.45 (2.25)
062	Sugar confectionery, sugar preps.	0.04%	-0.09 (0.24)	0.53 (0.78)	1.23 (2.24)
212	Fur skins, undressed	0.02%	-0.06 (0.36)		
221	Oil seeds, oil nuts and oil kernels	0.00%	0.12 (0.31)		
251	Pulp & waste paper	0.01%	0.01 (0.20)		
263	Cotton	11.51%	0.12 (0.55)		
266	Synthetic and regenerated artificial	0.00%	0.14 (1.17)	0.18 (0.90)	-0.03 (0.18)
276	Other crude minerals	0.18%	-0.05 (0.61)		
283	Ores & concentrates of non ferrous	0.07%	-0.22 (0.28)		
291	Crude animal materials, n.e.s.	15.93%	-0.08 (1.04)		
292	Crude vegetable materials, n.e.s.	0.17%	0.09 (1.19)		
341	Gas, natural and manufactured	0.06%	-0.42 (0.50)	-2.33 (1.72)	-1.79 (1.60)
422	Other fixed vegetable oils	1.84%	-0.27 (0.70)		
513	Inorganic chemicals elements	0.03%	0.03 (0.26)		
515	Radioactive and associated material	0.17%	0.18 (1.99)	0.35 (2.15)	0.68 (4.58)
532	Dyeing & tanning extracts	0.07%	-0.13 (0.58)		
554	Soaps, cleansing & polishing preparations	1.41%	-0.07 (0.48)	-0.48 (2.16)	-0.27 (1.99)
581	Plastic materials, regenerated	0.55%	0.16 (2.54)	-0.12 (0.90)	-0.16 (1.65)
611	Leather	2.40%	-0.18 (1.11)	-0.19 (0.85)	-0.25 (1.85)
612	Manuf. of leather	3.52%	-0.09 (0.65)		
621	Materials of rubber	0.26%	-0.09 (0.76)	0.05 (0.29)	0.24 (1.78)
631	Veneers, plywood boards & other wood	0.24%	-0.26 (1.71)	-0.48 (1.71)	-0.47 (1.81)
632	Wood manufactures, n.e.s.	0.17%	-0.12 (0.76)	0.26 (1.42)	0.15 (1.17)
642	Articles of paper, pulp, paperboard	0.75%	0.004 (0.05)	0.26 (1.46)	0.16 (1.05)
651	Textile yarn and thread	1.98%	-0.04 (0.30)	0.26 (1.41)	0.21 (1.50)
656	Made up articles, wholly or chiefly	0.28%	0.26 (1.71)		

0.43 (1.41)	-9.23 (0.33)	0.98 (1.28)	0.68 (0.18)	1.49 (0.92)	-1.77 (2.57)
	-6.16 (0.54)	-0.32 (0.96)	0.89 (0.58)	2.02 (2.12)	-0.79 (2.55)
	-7.52 (0.83)	-0.004 (0.01)	1.37 (1.15)	2.26 (4.18	-0.38 (2.20)
	-100.09 (1.27)	2.51 (1.14)	9.66 (0.93)	-1.75 (0.36)	-6.26 (3.83)
	-32.66 (1.74)	-0.69 (1.08)	4.19 (1.67)	1.17 (1.21)	-1.33 (4.69)
	-14.85 (3.30)	0.69 (5.63)	2.54 (4.26)	0.01 (0.05)	-0.93 (10.29)
0.19 (1.85)	-2.52 (0.32)	0.59 (2.23)	0.69 (0.65)	1.04 (2.18)	-0.85 (3.31)
0.26 (3.05)	5.18 (0.52)	1.01 (3.29)	-0.54 (0.39)	1.54 (2.02)	-0.82 (2.78)
	15.92 (0.87)	-0.42 (0.78)	-1.83 (0.75)	2.05 (1.66)	-1.14 (3.09)
	-26.85 (3.99)	-0.07 (0.34)	4.05 (4.60)	0.17 (0.37)	-0.22 (1.83)
	-36.41 (2.58)	-0.95 (2.50)	5.19 (2.81)	-0.58 (0.73)	-0.26 (1.79)
	8.39 (0.51)	1.02 (2.37)	-1.29 (0.57)	3.43 (3.74)	0.12 (0.71)
-0.10 (1.70)	-4.48 (0.25)	0.92 (1.51)	1.38 (0.59)	3.14 (2.22)	0.75 (1.28)
	-38.47 (3.36)	-0.04 (0.14)	5.63 (3.69)	-0.49 (0.71)	-0.28 (1.38)
0.25 (1.87)	349.69 (0.31)	0.06 (0.01)	-43.57 (0.31)	24.28 (0.32)	2.14 (0.28)
0.38 (0.95)	-87.39 (2.39)	-1.17 (1.01)	10.76 (2.25)	-0.72 (0.35)	-1.35 (1.37)
	-58.61 (2.62)	-2.06 (2.58)	8.03 (2.10)	-4.31 (2.74)	-0.37 (1.18)
	16.58 (0.79)	-1.09 (1.59)	-0.99 (0.35)	-0.56 (0.44)	0.44 (0.69)
	-6.56 (1.57)	-0.02 (0.15)	1.85 (3.39)	0.56 (2.41)	0.01 (0.20)
	15.64 (0.92)	-0.36 (0.68)	-1.27 (0.57)	-0.05 (0.05)	0.17 (0.55)
0.13 (1.17)	26.73 (3.25)	0.30 (1.10)	-2.99 (2.70)	1.55 (3.09)	-0.38 (1.40)
	5.56 (0.79)	0.02 (0.11)	0.01 (0.02)	0.82 (1.96)	0.11 (0.12)
	-78.30 (3.55)	-0.65 (0.99)	10.65 (3.68)	-2.39 (1.93)	-0.11 (0.28)
	13.69 (0.98)	-0.05 (0.34)	-1.28 (2.11)	0.59 (2.29)	-0.08 (1.05)
	-5.90 (0.80)	-0.04 (0.21)	1.50 (1.56)	-0.25 (0.62)	0.09 (1.19)
-2.02 (2.62)	-8.01 (0.14)	0.90 (0.47)	1.69 (0.22)	-3.61 (1.04)	1.20 (0.65)
	53.11 (1.13)	-0.36 (0.35)	-6.48 (1.06)	4.19 (1.59)	-0.31 (0.73)
	7.03 (0.61)	0.59 (1.59)	-0.24 (0.15)	0.76 (1.25)	0.04 (0.26)
0.32 (2.79)	-15.97 (0.89)	-1.79 (3.48)	2.45 (1.07)	-0.44 (0.44)	-0.37 (0.77)
	-95.99 (7.28)	-0.97 (2.47)	12.58 (7.23)	-0.03 (0.04)	-0.13 (0.59)
	24.03 (0.81)	-0.12 (0.19)	-2.81 (0.59)	4.04 (1.73)	0.85 (0.88)
-0.12 (1.89)	-0.57 (0.06)	0.41 (1.48)	1.03 (0.83)	0.71 (1.24)	0.19 (0.85)
	-11.05 (0.62)	0.49 (0.78)	2.28 (0.98)	-0.18 (0.20)	0.27 (0.62)
	-21.77 (0.89)	0.23 (0.39)	3.09 (0.99)	-1.46 (0.88)	-0.17 (0.55)
	-41.61 (2.08)	-1.32 (2.38)	5.81 (2.19)	0.06 (0.05)	-0.23 (0.66)
-0.29 (1.52)	-11.35 (1.12)	0.32 (1.19)	2.07 (1.62)	0.33 (0.58)	-0.01 (0.05)
	64.05 (0.61)	0.34 (0.29)	-8.76 (0.60)	9.39 (0.84)	-2.33 (1.10)
0.18 (1.74)	1.83 (0.28)	0.20 (0.74)	0.27 (0.21)	0.39 (0.69)	-0.08 (0.34)
	-8.54 (1.29)	-0.09 (0.50)	1.63 (1.87)	0.88 (2.09)	-0.21 (1.37)
	-19.89 (1.82)	-0.33 (0.98)	3.20 (2.21)	-0.48 (0.81)	0.29 (1.59)

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667	Pearls and precious and semi precious stone	0.62%	-0.33 (1.13)	0.10 (0.32)	-0.23 (0.90)
671	Pig iron, spiegeleisen, sponge iron	1.73%	0.26 (0.87)	-0.27 (0.78)	-0.68 (2.39)
672	Ingots & other primary forms of iron	6.85%	0.75 (0.88)		
676	Rails & railway track construction materials	1.98%	-0.16 (0.25)		
679	Iron steel castings forgings	24.27%	-0.29 (0.93)		
682	Copper	0.17%	0.32 (1.45)		
683	Nickel	2.57%	0.16 (1.14)		
684	Aluminium	1.18%	-0.09 (0.57)	-0.23 (0.81)	-0.48 (2.02)
691	Finished structural parts	0.07%	0.01 (0.06)		
695	Tools for use in the hand or in machine	1.28%	-0.04 (0.65)		
696	Cutlery	0.75%	-0.63 (2.61)	-0.24 (0.84)	-0.43 (1.89)
719	Machinery and appliances non electrical	0.01%	0.01 (0.19)	0.06 (0.92)	-0.02 (0.42)
729	Other electrical machinery and apparatus	0.11%	-0.12 (1.43)	0.20 (1.44)	0.07 (0.62)
731	Railway vehicles	4.64%	0.44 (1.50)	0.17 (0.33)	0.19 (0.47)
733	Road vehicles other than motor vehicle	0.67%	-0.17 (1.29)	-0.22 (1.00)	-0.13 (0.65)
821	Furniture	2.24%	0.08 (0.52)		
831	Travel goods, handbags and similar	0.01%	-0.17 (1.31)	0.02 (0.11)	0.28 (2.12)
842	Fur clothing	0.08%	-0.12 (0.41)		
861	Scientific, medical, optical, means.	0.00%	-0.01 (0.16)		
863	Developed cinematographic film	0.04%	-0.07 (0.26)		
894	Perambulators ,toys, games and sportin goods	0.21%	-0.10 (0.84)	-0.39 (1.66)	-0.20 (0.88)
897	Jewellery and gold/silver smiths watches	1.72%	0.18 (0.97)		
	Not Cointegrated				
001	Live animals	0.11%	1.04 (6.23)	-0.90 (2.30)	-0.44 (1.64)
032	Fish, in airtight containers, n.e.s	0.08%	-0.77 (1.23)	-0.07 (0.07)	0.06 (0.09)
061	Sugar and honey	0.02%	-0.44 (1.36)	1.34 (2.38)	1.59 (3.28)
073	Chocolate & other food preparations	1.25%	1.35 (1.83)		
121	Tobacco, unmanufactured	0.16%	-2.05 (2.51)	1.69 (1.93)	1.98 (2.55)
211	Hides & skins, exc.fur skins	0.04%	-0.15 (2.08)	-0.43 (3.91)	-0.38 (4.77)
231	Crude rubber incl. synthetic & recycled	0.03%	0.06 (0.58)	-0.29 (1.58)	-0.42 (2.72)
243	Wood, shaped or simply worked	0.14%	0.07 (0.79)	0.18 (1.69)	0.21 (2.22)
267	Waste materials from textile fabric	4.04%	-0.21 (1.33)		
273	Stone, sand and gravel	5.89%	0.04 (0.49)	-0.90 (4.68)	-0.80 (4.95)
275	Natural abrasives	0.38%	0.51 (4.16)	0.43 (1.40)	0.66 (2.73)
282	Iron and steel scrap	0.02%	0.21 (0.61)	0.32 (0.97)	
321	Coal, coke & briquettes	3.10%	0.31 (2.24)	-0.63 (2.88)	-0.44 (2.55)
332	Petroleum products	0.36%	0.28 (1.26)	-0.41 (1.03)	-0.72 (2.13)
411	Animal oils and fats	2.47%	0.27 (0.39)	-2.05 (2.91)	
431	Anim./veg. Oils & fats, processed,	0.99%	-1.23 (1.91)	2.52 (2.31)	1.09 (1.74)
512	Organic chemicals	0.11%	0.14 (0.99)	0.22 (0.95)	0.44 (2.25)
514	Other inorganic chemicals	0.96%	0.13 (0.59)	0.05 (0.18)	0.41 (1.98)

	-45.26 (4.82)	0.52 (1.89)	6.14 (5.05)	-2.83 (5.29)	-0.12 (0.69)
	-37.52 (0.34)	0.53 (0.19)	5.80 (0.40)	-6.82 (0.91)	0.99 (0.62)
	30.18 (0.95)	1.18 (1.28)	-3.25 (0.77)	3.54 (1.96)	0.35 (0.84)
	-52.08 (0.58)	-3.24 (1.25)	7.73 (0.65)	-1.67 (0.31)	1.57 (1.04)
	-10.66 (1.44)	0.49 (2.22)	1.68 (1.72)	0.02 (0.06)	-0.11 (0.89)
	5.43 (0.46)	0.69 (2.15)	-0.22 (0.14)	2.32 (3.39)	-0.19 (1.58)
	-20.64 (2.49)	0.18 (0.84)	3.32 (3.09)	0.51 (0.90)	0.11 (1.04)
-0.25 (1.53)	106.40 (1.31)	4.57 (1.20)	-13.56 (1.22)	5.29 (1.12)	-0.27 (0.18)
	5.68 (0.51)	0.38 (1.21)	-0.38 (0.26)	1.59 (2.42)	-0.18 (1.20)
	-6.74 (1.08)	0.13 (0.82)	1.54 (1.89)	0.59 (1.59)	-0.04 (0.65)
	7.96 (0.73)	0.48 (1.63)	-0.84 (0.59)	0.84 (1.32)	-0.34 (1.48)
0.04 (1.38)	6.42 (1.73)	0.35 (3.38)	0.21 (0.42)	1.01 (4.09)	-0.03 (0.36)
0.09 (1.18)	6.46 (6.62)	0.22 (0.81)	0.09 (0.06)	0.56 (0.76)	-0.27 (1.30)
0.75 (2.78)	54.11 (1.57)	0.49 (0.66)	-6.11 (1.41)	4.39 (2.12)	0.91 (1.19)
-0.25 (1.93)	5.27 (1.69)	0.09 (0.13)	0.67 (0.47)	-0.06 (0.12)	37.33 (1.57)
	-29.44 (3.86)	0.12 (0.06)	4.46 (4.48)	-0.55 (1.21)	0.04 (0.54)
	-36.04 (5.71)	0.63 (3.02)	5.09 (5.95)	-0.81 (2.13)	0.03 (0.19)
	29.12 (0.88)	-0.10 (0.09)	-3.57 (0.82)	2.91 (1.48)	-0.21 (0.40)
	-6.48 (0.47)	0.25 (0.70)	1.89 (1.06)	1.38 (1.69)	0.16 (1.02)
	79.84 (2.77)	0.53 (0.68)	-10.36 (2.72)	2.85 (1.63)	-0.46 (1.17)
-0.20 (1.39)	7.07 (0.09)	-0.36 (0.20)	-0.25 (0.02)	-1.87 (0.38)	-1.43 (0.68)
	-49.33 (4.91)	0.27 (1.04)	7.02 (5.32)	-1.83 (3.08)	-0.01 (0.09)

-0.35 (2.16)
-0.71 (1.62)
0.78 (2.56)

-0.27 (2.87)
0.09 (1.42)

-0.31 (2.74)
0.18 (1.36)

-0.27 (2.27)
0.34 (1.47)

0.22 (1.60)

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533	Pigments, paints, varnishes	0.80%	0.06 (0.83)	0.01 (0.07)	0.16 (1.64)
553	Perfumery, cosmetics, dentifrices,	0.70%	0.05 (0.45)	-0.59 (2.56)	-0.51 (2.65)
571	Explosives and pyrotechnic products	0.70%	-0.08 (0.26)		
613	Fur skins, tanned or dressed	0.62%	0.14 (0.52)	1.13 (2.62)	0.41 (1.33)
629	Articles of rubber, n.e.s.	0.88%	0.09 (1.02)		
641	Paper and paperboard	0.00%	0.01 (0.19)	-0.06 (0.62)	-0.16 (1.84)
657	Floor coverings, tapestries, etc.	0.06%	0.62 (1.92)	-0.32 (0.56)	-0.64 (1.44)
663	Mineral manufactures, n.e.s.	0.30%	0.003 (0.02)	0.32 (2.05)	
665	Glassware	0.83%	-0.29 (1.48)	0.22 (0.66)	0.57 (1.96)
666	Pottery	0.09%	-0.18 (0.86)		
673	Iron and steel bars, rods, angles,	1.94%	1.31 (5.58)	-1.53 (4.84)	-0.89 (3.89)
674	Universals, plates and sheets of iron	1.20%	0.04 (0.25)	-0.06 (0.30)	-0.29 (1.89)
677	Iron and steel wire	0.81%	-0.19 (0.96)	0.37 (1.23)	0.49 (2.14)
681	Silver and platinum group materials	3.64%	0.43 (1.20)	1.27 (2.04)	1.11 (2.15)
692	Metal containers for storage and transport	10.22%	-0.57 (1.75)	-0.58 (0.97)	-0.88 (1.39)
693	Wire products	0.73%	0.02 (0.10)	0.04 (0.12)	-0.56 (1.91)
694	Nails, screws, nuts, bolts, rivets	6.35%	0.44 (2.56)	-0.58 (1.72)	-0.99 (4.35)
714	Office machines	7.11%	-0.10 (2.19)		
715	Metalworking machinery	7.72%	0.79 (2.97)		
717	Textile and leather machinery	0.03%	0.01 (0.13)		
718	Machines for special industries	0.00%	0.12 (2.08)	0.13 (1.91)	
723	Equipment for distributing electricity	0.16%	0.03 (0.38)		
732	Road motor vehicles	4.57%	0.22 (1.73)	-0.71 (2.92)	-0.44 (2.26)
734	Aircraft	6.00%	0.56 (2.18)	-0.75 (1.60)	-0.52 (1.07)
735	Ships and boats	0.63%	0.25 (1.27)	0.56 (2.02)	0.39 (1.87)
891	Musical instruments, sound recorder	0.01%	0.06 (0.97)		
896	Works of art, collectors pieces	0.04%	0.23 (1.04)	0.94 (2.42)	0.84 (2.69)
899	Manufactured articles, n.e.s.	1.25%	-0.05 (0.39)	0.21 (1.13)	0.25 (1.58)
931	Special transactions not classd.acc	11.93	0.20 (1.63)		

Note: Absolute value of the t-statistic in parentheses.

Turning to US imports, given in Table 3, we find that our control variables seem to explain these trade flows somewhat.[6] In the long run, 49 industries register an increase with higher income, while 21 industries see a decline in imports with dollar depreciation. Volatility is again ambiguous, corresponding to the theory, and temporary impacts seem to dominate over permanent ones. As was the case with US export flows, the majority of industries (82 of 125) have at least one significant short-run coefficient. In the long run, most cointegrated industries see no effect from increased exchange-rate volatility. Of these 92 industries, 56 have an insignificant coefficient. Significant effects are overwhelmingly negative: thirteen industries have positive coefficients, while 23 have negative ones. For imports alone do we find negative effects

-0.33 (2.53)

-0.68 (1.93)

0.20 (1.11)

0.43 (1.36)
-0.39 (1.05)
-0.36 (1.79)
-0.53 (4.27)

-0.27 (2.13)
-0.59 (1.82)

0.18 (0.96)
0.17 (1.72)

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to outnumber positive ones, which is more in line with earlier studies. Likewise, the majority of import industries are unaffected by exchange-rate risk.[7]

What might be responsible for these differing industry-level results? We examine two underlying factors: industry trade share and SITC 1-digit sectors. With the first factor, we might find whether large (or small) industries are more affected by exchange-rate volatility, and whether these effects are positive or negative. With the second, we can see whether these effects are concentrated among specific types of goods. Tables 2 and 3 have separated the results into four groups: industries positively affected by volatility, those with negative effects, those that register no effects, and non-cointegrated industries. They

Table 3: Coefficient Estimates

Code	Industries	Share	ΔlnVOL(t)	ΔlnVOL(t-1)	ΔlnVOL(t-2)
	Positively Affected By Volatility				
053	Fruit, preserved and fruit preparations	0.07%	0.34 (1.80)		
111	Non alcoholic beverages, n.e.s.	0.55%	0.12 (1.86)	-0.12 (1.46)	
231	Crude rubber incl. synthetic	0.07%	0.29 (1.94)	-0.29 (1.71)	
262	Wool and other animal hair	0.02%	0.12 (0.38)	-1.52 (2.66)	-1.79 (3.53)
276	Other crude minerals	0.06%	-0.26 (2.02)		
332	Petroleum products	5.04%	-0.46 (1.92)		
513	Inorganic. chemicals elements	0.17%	0.40 (2.87)	-0.39 (2.49)	
514	Other inorganic chemicals	0.08%	0.23 (1.92)	-0.49 (2.00)	-0.37 (2.09)
599	Chemical materials and products, n.e.s.	0.81%	0.28 (3.09)	-0.25 (1.41)	-0.14 (0.84)
629	Articles of rubber, n.e.s.	0.42%	0.22 (3.04)		
693	Wire products	0.13%	0.37 (3.42)	-0.23 (1.64)	
734	Aircraft	2.78%	0.34 (2.95)	0.23 (1.25)	0.22 (1.61)
821	Furniture	2.12%	0.04 (1.19)	-0.22 (2.42)	-0.08 (2.00)
	Negatively Affected By Volatility				
013	Meat in airtight containers n.e.s	0.05%	0.03 (0.13)	0.39 (0.77)	0.56 (1.33)
052	Dried fruit including artificially	0.00%	-0.17 (0.49)		
075	Spices	0.01%	-0.65 (4.47)	1.18 (3.55)	0.61 (2.11)
112	Alcoholic beverages	5.22%	-0.05 (1.32)	0.22 (3.28)	0.13 (2.93)
267	Waste materials from textile fabric	0.00%	-0.51 (1.79)		
292	Crude vegetable materials, n.e.s.	0.07%	-0.46 (3.25)	0.79 (2.28)	0.24 (0.94)
533	Pigments, paints, varnishes	0.16%	-0.22 (2.09)		
541	Medicinal & pharmaceutical products	6.97%	-0.07 (1.48)	0.79 (6.98)	0.53 (6.43)
613	Fur skins, tanned or dressed	0.01%	-0.20 (1.13)	1.01 (2.72)	0.95 (3.18)
633	Cork manufactures	0.03%	0.54 (2.07)	0.72 (1.21)	0.86 (1.90)
642	Articles of paper, pulp, paperboard	0.17%	-0.14 (2.36)		
657	Floor coverings, tapestries, etc.	0.04%	-0.01 (0.13)	0.43 (3.81)	0.26 (2.79)
684	Aluminium	0.12%	-0.32 (3.10)	0.25 (2.07)	
689	Miscellaneous non ferrous base metals	0.02%	-0.73 (3.93)		
691	Finished structural parts	0.13%	-0.63 (4.98)	0.59 (2.38)	0.46 (2.13)
692	Metal containers for storage and transport	0.09%	-0.13 (0.67)	0.66 (2.64)	0.44 (2.22)
712	Agricultural machinery and implements	0.85%	-0.14 (2.47)	0.12 (1.46)	-0.10 (1.72)
718	Machines for special industries	2.45%	-0.12 (1.83)	0.38 (2.98)	0.13 (1.19)
722	Electric power machinery and switch	1.59%	-0.03 (0.49)	0.39 (2.33)	0.39 (2.67)
731	Railway vehicles	0.03%	-0.98 (1.57)		
733	Road vehicles other than motor vehicle	0.32%	-0.04 (6.81)	0.18 (2.16)	0.05 (1.02)
812	Sanitary, plumbing, heating & light	0.33%	0.05 (0.14)	0.11 (1.85)	0.09 (2.04)
896	Works of art, collectors pieces	2.03%	-0.15 (1.86)	0.31 (2.31)	

United States Imports from Italy

ΔlnVOL(t-3)	*Constant*	*EURO*	*lnY(US)*	*lnREX*	*lnVOL*
	-74.46 (3.19)	-2.47 (2.79)	8.84 (3.40)	-1.87 (1.91)	0.44 (1.76)
	-51.09 (7.67)	-0.25 (1.04)	6.26 (8.22)	0.49 (1.51)	0.30 (2.19)
	19.25 (0.50)	-1.38 (0.96)	-0.77 (0.18)	0.39 (0.18)	2.21 (1.91)
-0.86 (2.34)	-0.41 (0.02)	1.51 (2.76)	0.49 (0.28)	1.28 (1.68)	0.85 (2.29)
	-76.21 (5.20)	-0.69 (1.45)	8.51 (5.26)	-3.63 (5.26)	0.78 (2.71)
	-65.49 (1.64)	-1.36 (1.03)	9.04 (1.99)	-6.06 (2.82)	2.64 (3.22)
	-9.41 (0.80)	-0.75 (1.81)	2.06 (1.54)	0.06 (0.10)	1.15 (4.26)
-0.24 (1.94)	-15.49 (1.42)	-0.59 (1.54)	2.53 (2.06)	-1.04 (2.02)	0.87 (2.55)
-0.18 (1.85)	-27.82 (3.87)	-0.31 (1.19)	3.91 (4.79)	-0.41 (1.32)	0.47 (2.53)
	-3.74 (0.27)	-0.03 (0.06)	1.29 (0.82)	-0.29 (0.49)	0.47 (1.96)
	12.44 (0.51)	0.16 (0.19)	0.01 (0.003)	-3.00 (1.45)	2.15 (2.56)
	7.51 (0.69)	0.05 (0.14)	0.10 (0.08)	0.74 (1.48)	0.14 (2.48)
	19.36 (0.72)	0.27 (0.27)	-0.55 (0.18)	0.07 (0.05)	1.95 (1.72)
0.26 (1.08)	-57.16 (6.76)	-0.38 (1.37)	6.56 (7.07)	-1.81 (5.19)	-1.81 (5.19)
	52.49 (1.63)	1.56 (1.36)	-6.05 (1.65)	-0.83 (0.54)	-1.35 (1.86)
0.57 (2.77)	-45.99 (5.99)	0.53 (1.79)	4.73 (5.17)	-0.40 (0.96)	-1.32 (3.38)
	-33.94 (4.68)	-0.26 (1.12)	4.43 (5.63)	-1.27 (4.22)	-0.76 (2.73)
	11.45 (0.46)	0.68 (0.88)	-1.42 (0.52)	1.99 (1.73)	-0.51 (1.79)
0.21 (1.44)	-12.19 (1.38)	0.40 (1.23)	1.52 (1.54)	0.97 (2.46)	-1.09 (3.89)
	-37.32 (2.84)	-0.08 (0.20)	4.43 (3.08)	-1.66 (1.76)	-0.68 (2.17)
0.33 (6.42)	-34.11 (6.17)	0.004 (0.02)	4.39 (6.73)	0.49 (1.02)	-1.11 (2.88)
0.26 (1.48)	-73.77 (6.81)	-0.98 (2.63)	8.08 (6.69)	-3.55 (6.83)	-0.89 (2.05)
0.33 (1.33)	-73.10 (1.79)	-0.13 (0.09)	7.09 (1.55)	4.59 (2.26)	-3.50 (2.46)
	-27.26 (3.21)	0.28 (0.92)	3.34 (3.47)	-0.36 (0.89)	-0.59 (1.93)
0.21 (3.04)	-16.09 (2.19)	-0.005 (0.02)	2.07 (2.620	-0.31 (0.96)	-0.42 (2.11)
	-20.15 (1.60)	-0.31 (0.73)	2.52 (1.77)	-0.96 (1.59)	-0.90 (3.28)
	-17.10 (1.25)	0.22 (0.48)	1.92 (1.28)	0.59 (0.90)	-0.73 (3.93)
0.26 (1.72)	-101.46 (3.54)	-0.65 (0.69)	10.59 (3.39)	-3.13 (2.40)	-3.22 (2.99)
	-44.87 (2.70)	-0.46 (0.79)	5.14 (2.74)	-0.54 (0.67)	-0.89 (2.29)
	-11.41 (2.04)	-0.48 (2.51)	1.85 (2.94)	0.06 (0.23)	-0.49 (4.12)
0.13 (1.71)	-21.77 (3.88)	-0.09 (0.49)	3.04 (4.84)	0.68 (2.48)	-0.58 (3.54)
0.14 (1.85)	-45,58 (3.16)	-1.13 (1.88)	5.56 (3.55)	-0.38 (0.58)	-0.72 (1.87)
	-39.57 (1.69)	-0.67 (0.86)	4.71 (1.83)	-2.13 (1.99)	-0.50 (1.68)
	-24.25 (10.62)	0.61 (0.01)	3.26 (12.68)	-0.29 (2.64)	-0.14 (2.45)
	-16.23 (1.30)	-0.28 (0.68)	2.26 (1.67)	-0.50 (0.78)	-0.57 (1.79)
	-36.79 (4.78)	0.12 (0.45)	4.63 (5.34)	0.39 (1.11)	-0.54 (2.55)

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	Not significantly affected by volatility				
024	Cheese and curd	0.98%	-0.06 (1.55)	-0.16 (1.81)	-0.06 (1.00)
031	Fish, fresh & simply preserved	0.00%	0.08 (0.33)		
032	Fish, in airtight containers, n.e.s	0.03%	0.16 (1.24)	0.29 (1.54)	0.35 (2.34)
042	Rice	0.04%	-0.15 (2.63)	-0.08 (1.09)	-0.13 (2.48)
051	Fruit, fresh, and nuts excl. Oil nuts	0.09%	-0.16 (1.56)	0.23 (2.39)	
054	Vegetables, roots & tubers, fresh	0.02%	0.17 (1.36)	-0.26 (1.21)	-0.24 (1.41)
055	Vegetables, roots & tubers preserved	0.15%	0.08 (0.49)		
073	Chocolate & other food preparations	0.09%	-0.04 (0.65)	0.22 (2.48)	-0.13 (1.70)
081	Feed Stuff for animals excl. unmilled	0.02%	0.39 (2.35)	0.35 (1.85)	
099	Food preparations, n.e.s.	0.75%	-0.05 (0.48)	-0.02 (0.12)	-0.02 (0.15)
211	Hides & skins, excluding fur skins	0.00%	0.27 (1.23)		
266	Synthetic and regenerated artificials	0.01%	-0.25 (1.07)	-0.46 (1.84)	
275	Natural abrasives incl. industrial waste	0.00%	-0.07 (0.24)		
411	Animal oils and fats	0.00%	0.10 (0.21)	1.44 (2.06)	1.03 (2.03)
421	Fixed vegetable oils	1.77%	0.05 (0.78)		
531	Synthetic organic dyestuffs	0.01%	0.30 (0.53)	0.58 (1.28)	0.54 (1.99)
532	Dyeing & tanning extracts	0.03%	-0.01 (0.06)	0.47 (1.08)	0.68 (2.02)
551	Essential oils, perfume and flavor	0.07%	0.11 (1.75)		
553	Perfumery, cosmetics, dentifrices,	1.36%	-0.12 (2.39)	0.39 (3.54)	0.23 (2.35)
554	Soaps, cleansing & polishing preparations	0.16%	0.13 (0.96)	0.29 (1.28)	0.38 (1.97)
571	Explosives and pyrotechnic products	0.03%	0.35 (1.27)	-0.43 (1.160	
631	Veneers, plywood boards & other woods	0.08%	0.28 (2.18)	-0.03 (0.13)	0.02 (0.08)
641	Paper and paperboard	0.35%	0.05 (0.46)		
651	Textile yarn and thread	0.21%	-0.03 (0.29)		
652	Cotton fabrics, woven	0.30%	0.45 (1.66)	-1.51 (2.96)	-0.51 (1.14)
653	Text fabrics wooven	0.62%	0.08 (1.86)		
656	Made up articles, wholly or chiefly	0.24%	0.06 (1.18)	-0.11 (1.47)	-0.11 (2.23)
662	Clay and refractory construction materials	1.54%	0.04 (0.91)	-0.05 (0.60)	-0.02 (0.32)
665	Glassware	0.38%	-0.01 (0.22)	0.16 (1.76)	0.10 (1.37)
666	Pottery	0.10%	0.07 (1.01)	-0.49 (3.44)	-0.30 (2.43)
671	Pig iron, spiegeleisen, sponge iron	0.00%	-0.06 (0.24)		
672	Ingots & other primary forms of iron	0.33%	0.25 (0.63)	-1.01 (2.37)	
673	Iron and steel bars, rods, angles,	0.87%	-0.18 (1.37)		
674	Universals, plates and sheets of iron	0.08%	-0.35 (1.64)	-0.38 (1.23)	-0.43 (2.18)
677	Iron and steel wire	0.12%	0.04 (0.69)	-0.08 (0.77)	-0.11 (1.45)
678	Tubes, pipes and fittings of iron ore	1.41%	0.16 (0.94)	-0.93 (2.36)	-0.82 (2.69)
682	Copper	0.12%	-0.08 (0.77)	-0.32 (2.40)	-0.27 (2.45)
694	Nails, screws, nuts, bolts, rivets	0.28%	-0.001 (0.02)		
697	Household equipment of base metals	0.27%	-0.19 (2.90)	-0.08 (0.81)	-0.17 (2.65)
698	Manufactures of metal, n.e.s.	0.76%	-0.03 (0.76)		
711	Power generating machinery	3.00%	0.06 (0.98)		

-0.08 (1.89)	14.54 (5.17)	-0.14 (1.45)	2.40 (7.58)	0.39 (3.19)	0.08 (0.81)
	-19.37 (1.65)	0.34 (0.85)	2.37 (1.82)	-0.06 (0.09)	0.06 (0.33)
0.25 (2.64)	-56.65 (4.51)	-0.97 (2.40)	6.51 (4.73)	-2.14 (4.37)	-0.03 (0.10)
	-17.25 (2.49)	-0.19 (0.92)	2.20 (2.89)	3.06 (8.94)	-0.19 (0.97)
	5.57 (0.27)	4.42 (0.34)	-7.32 (0.28)	2.29 (0.27)	-4.82 (0.33)
-0.35 (3.09)	30.67 (2.38)	-0.05 (0.12)	-2.72 (1.90)	1.29 (1.73)	0.62 (1.37)
	-90.85 (2.36)	-3.17 (2.28)	10.70 (2.50)	-3.52 (2.57)	0.17 (0.47)
	-21.68 (4.64)	-0.83 (4.95)	3.01 (5.72)	-0.72 (2.99)	0.15 (1.26)
	24.16 (1.14)	-0.15 (0.22)	-2.09 (0.98)	3.89 (3.51)	0.79 (1.56)
-0.15 (1.39)	-47.01 (5.96)	0.09 (0.35)	5.76 (6.52)	-0.15 (0.39)	-0.01 (0.07)
	08.76 (0.54)	-0.34 (0.63)	1.15 (0.64)	-0.98 (1.25)	0.27 (1.23)
	-97.44 (2.45)	-3.37 (2.53)	11.39 (2.52)	-5.20 (2.64)	0.69 (0.78)
	32.61 (0.66)	1.43 (0.05)	-3.93 (0.69)	3.23 (1.32)	-1.49 (1.24)
	6.94 (0.14)	0.07 (0.04)	-0.96 (0.18)	2.72 (1.24)	-0.68 (0.66)
	5.40 (0.26)	0.51 (0.85)	0.19 (0.08)	1.81 (2.45)	-0.15 (0.79)
	49.69 (3.62)	-0.30 (0.62)	-4.87 (3.19)	3.06 (5.09)	0.67 (1.64)
	-30.01 (1.36)	-1.44 (1.83)	3.62 (1.45)	0.51 (0.49)	-0.26 (0.45)
	1.78 (0.56)	0.19 (1.87)	0.32 (0.93)	0.63 (4.30)	0.07 (1.54)
0.15 (2.51)	-56.40 (3.54)	-0.32 (0.61)	6.47 (4.07)	-0.77 (0.99)	-1.26 (1.45)
0.23 (1.82)	-71.85 (11.24)	-0.58 (2.61)	8.28 (11.72)	-1.70 (5.85)	-0.12 (0.47)
	-49.33 (0.84)	-2.80 (1.09)	6.89 (0.98)	-2.51 (0.70)	3.14 (1.49)
0.18 (1.46)	-29.00 (1.96)	-0.44 (0.78)	3.74 (2.22)	-0.03 (0.04)	0.19 (0.35)
	2.64 (0.23)	0.39 (1.06)	0.40 (0.32)	0.46 (0.79)	0.06 (0.46)
	-11.76 (0.66)	-0.20 (0.30)	1.89 (0.97)	0.50 (0.60)	-0.07 (0.29)
-0.69 (2.22)	400.76 (0.24)	23.02 (0.25)	-50.97 (0.23)	21.84 (0.26)	-22.72 (0.23)
	108.41 (0.46)	6.27 (0.37)	-11.29 (0.43)	14.95 (0.39)	-1.95 (0.35)
	-47.02 (3.69)	-0.81 (1.27)	5.93 (3.91)	-0.67 (1.28)	0.58 (0.96)
0.05 (1.13)	-56.38 (1.52)	-1.81 (1.11)	7.47 (1.76)	-1.54 (1.05)	1.01 (1.29)
	-18.51 (0.94)	-0.66 (0.69)	2.47 (1.17)	0.49 (0.75)	-0.91 (1.40)
-0.13 (1.56)	-14.22 (0.11)	-7.05 (0.45)	5.73 (0.29)	-5.06 (0.37)	10.49 (0.55)
	230.18 (4.15)	1.46 (0.93)	-24.98 (4.10)	9.59 (4.01)	-0.14 (0.24)
	-51.84 (2.17)	-1.80 (2.19)	6.63 (24.4)	1.31 (1.10)	0.75 (1.30)
	-64.48 (5.74)	-0.97 (2.75)	7.70 (6.23)	-1.51 (2.89)	-0.18 (1.37)
	21.19 (2.12)	-0.07 (0.19)	-1.66 (1.44)	1.39 (3.07)	-0.07 (0.18)
	-46.56 (5.44)	-0.49 (1.51)	5.73 (5.86)	-1.90 (4.72)	0.36 (1.29)
-0.33 (1.47)	63.48 (0.39)	4.23 (0.53)	-4.67 (0.28)	2.52 (0.31)	5.56 (0.84)
	-25.81 (2.50)	0.13 (0.36)	3.44 (2.96)	-1.53 (2.96)	0.35 (1.43)
	-19.36 (7.87)	-0.32 (4.24)	2.77 (10.22)	-0.06 (0.55)	-0.65 (0.55)
	-5.13 (0.53)	0.75 (2.16)	1.05 (0.95)	-0.04 (0.09)	-0.42 (1.40)
	-37.64 (2.31)	-0.88 (1.49)	4.85 (2.72)	-0.98 (1.31)	-0.14 (0.73)
	-22.27 (14.23)	0.02 (0.42)	3.31 (19.28)	0.52 (0.01)	0.02 (1.03)

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714	Office machines	0.53%	0.12 (0.78)		
717	Textile and leather machinery	0.36%	0.11 (2.08)	0.11 (1.11)	0.15 (1.88)
723	Equipment for distributing electricity	0.07%	-0.49 (1.49)	1.94 (2.90)	1.11 (2.24)
724	Telecommunications apparatus	1.13%	0.55 (2.21)	0.60 (3.01)	0.34 (2.45)
729	Other electrical machinery and apparatus	2.21%	0.01 (0.09)	-0.26 (1.41)	-0.25 (2.17)
735	Ships and boats	0.56%	-0.51 (1.29)		
831	Travel goods, handbags and similar	1.68%	0.04 (0.90)	0.02 (0.15)	-0.08 (1.65)
841	Clothing except fur clothing	4.03%	-0.04 (1.51)	-0.11 (1.35)	-0.07 (1.06)
842	Fur clothing and articles of artificial	0.08%	0.05 (0.53)	-0.24 (2.08)	
891	Musical instruments, sound recorder	0.07%	0.09 (1.75)	-0.23 (1.82)	-0.01 (0.12)
892	Printed matter	0.38%	0.06 (0.95)	-0.12 (1.03)	-0.18 (1.02)
893	Articles of artificial plastic materials	0.60%	-0.02 (0.56)	-0.09 (0.94)	-0.09 (1.20)
895	Office and stationery supplies, n.e.s.	0.05%	-0.13 (1.35)		
897	Jewellery and gold/silver smiths watches	2.00%	0.05 (1.87)	-0.12 (3.66)	
931	Special transactions not classified according to kind	2.63%	0.06 (1.12)	-0.03 (0.27)	0.08 (0.83)
	Not cointegrated				
061	Sugar and honey	0.01%	0.61 (1.38)	-0.94 (1.30)	-0.90 (1.63)
062	Sugar confectionery, sugar preparations	0.03%	0.24 (1.30)	0.88 (2.42)	0.68 (2.18)
071	Coffee	0.17%	-0.02 (0.17)		
121	Tobacco, unmanufactured	0.05%	-0.25 (2.85)	0.60 (5.38)	-0.23 (0.12)
273	Stone, sand and gravel	0.01%	-0.31 (0.87)		
291	Crude animal materials, n.e.s.	0.00%	-0.12 (0.86)	-0.55 (1.75)	-0.32 (1.27)
512	Organic chemicals	2.58%	0.09 (1.07)	-0.31 (1.69)	0.14 (0.89)
581	Plastic materials, regenerated	1.08%	0.01 (0.16)	-0.07 (0.98)	-0.12 (2.28)
611	Leather	0.43%	0.04 (0.82)	-0.34 (3.87)	-0.16 (2.49)
612	Manufacturers. of leather	0.05%	-0.17 (2.58)	-0.14 (1.78)	
632	Wood manufactures, n.e.s.	0.15%	0.07 (0.84)	0.15 (1.18)	0.15 (1.49)
654	Tulle, lace, embroidery, ribbons	0.05%	-0.29 (1.46)	-0.90 (2.91)	
655	Special textile fabrics and related	0.31%	0.006 (0.09)	-0.001 (0.01)	0.13 (1.02)
661	Lime, cement & fabricated building materials	1.05%	-0.02 (0.37)		
663	Mineral manufactures, n.e.s.	0.27%	-0.09 (1.19)	0.20 (1.64)	0.11 (1.17)
664	Glass	0.11%	0.04 (0.48)	-0.24 (2.150	
667	Pearls & precious & semi precious stones	0.07%	0.34 (0.96)	-1.61 (1.88)	-1.47 (1.89)
695	Tools for use in the hand or in machine	0.36%	-0.04 (1.09)		
696	Cutlery	0.04%	-0.04 (0.88)	-0.03 (0.29)	-0.07 (0.87)
715	Metalworking machinery	0.86%	-0.06 (0.62)	-0.12 (0.68)	-0.16 (1.29)
719	Machinery and appliances non electrical	10.63%	-0.07 (3.73)	0.10 (2.05)	0.03 (0.89)
725	Domestic electrical equipment	0.52%	-0.07 (0.79)	-0.43 (2.48)	-0.34 (3.35)
726	Electrical apparatus for medical purpose	0.19%	-0.04 (0.54)		
732	Road motor vehicles	4.48%	0.06 (0.96)	-0.10 (1.39)	

	106.12 (2.32)	2.90 (1.99)	-10.66 (2.16)	4.49 (2.55)	0.27 (0.69)
0.09 (1.76)	71.36 (2.16)	-0.89 (0.76)	-6.99 (1.93)	4.24 (2.73)	0.32 (0.34)
0.77 (2.46)	111.52 (0.78)	5.87 (0.92)	-13.89 (0.77)	5.94 (0.80)	-6.34 (0.86)
	-39.12 (1.64)	-0.59 (0.71)	4.77 (1.79)	-0.49 (0.43)	-0.76 (0.96)
	0.87 (0.07)	0.39 (1.04)	0.89 (0.69)	1.09 (2.16)	0.44 (0.97)
	-40.57 (1.41)	0.28 (0.29)	4.86 (1.53)	-0.42 (0.31)	-0.51 (1.29)
	-15.72 (5.65)	-0.24 (2.64)	2.55 (8.49)	0.09 (0.79)	-0.08 (0.73)
-0.09 (2.09)	-35.90 (1.81)	-1.80 (2.15)	5.07 (2.30)	-2.47 (1.99)	0.34 (0.71)
	-45.97 (1.37)	-45.97 (1.37)	5.85 (1.51)	-1.87 (1.09)	1.04 (1.32)
-0.23 (3.55)	-5068.8 (0.02)	-268.49 (0.02)	610.62 (0.02)	-283.12 (0.02)	151.14 (0.02)
-0.11 (1.76)	11.27 (0.35)	-0.91 (0.70)	0.02 (0.01)	-0.65 (0.34)	1.36 (1.01)
-0.09 (1.82)	-13.74 (2.49)	-0.09 (0.56)	2.29 (3.85)	-0.61 (2.43)	0.15 (0.77)
	-79.03 (1.31)	-2.97 (1.49)	9.08 (1.39)	-4.28 (1.45)	-0.65 (1.15)
	-214.33 (0.63)	-16.09 (0.71)	27.65 (0.67)	-19.58 (0.68)	8.49 (0.71)
-0.07 (1.17)	-22.58 (1.91)	-0.74 (1.49)	3.51 (2.64)	-0.55 (0.86)	0.43 (1.22)

0.44 (2.17)

-0.38 (2.29)
-0.09 (1.09)

-0.05 (1.15)

0.11 (1.45)

-0.09 (1.90)

0.04 (1.86)

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851	Footwear	3.11%	-0.10 (2.49)		
861	Scientific, medical, optical, means.	3.38%	-0.08 (1.72)		
862	Photographic and cinematographic supply	0.01%	0.23 (1.84)	0.08 (0.47)	0.26 (1.85)
863	Developed cinematographic film	0.00%	-0.12 (0.39)	-0.94 (1.63)	-0.11 (0.23)
864	Watches and clocks	0.06%	0.30 (1.54)	-0.27 (1.33)	
894	Perambulators ,toys, games & sporting goods	0.70%	0.03 (0.55)	-0.47 (3.92)	-0.39 (4.32)
899	Manufactured articles, ne.s.	0.29%	-0.03 (0.61)	-0.14 (1.35)	-0.02 (0.18)
951	Firearms of war and ammunition	0.28%	-0.09 (0.691)	-0.14 (0.42)	0.17 (0.64)

Note: Absolute value of the t-statistic in parentheses.

also provide each export or import industry's trade share (as a percentage of the total). We first perform a statistical test to see whether there is a relationship between the two. Following Bahmani-Oskooee et al (2012), we conduct a Kruskall-Wallis test on the four groups, looking for differences in mean trade share. This nonparametric alternative to ANOVA is based on rank sums and makes few assumptions about the underlying data.

Table 4 provides the results. We see that there is no significant difference in mean trade share among groups. As a result, large or small industries are not concentrated among those that are significantly positively or negatively impacted by risk, or among those that are unaffected. Instead, an assortment of industry sizes might be found within each of the four groups.

Table 4: Kruskall-Wallis test statistics

Group	*Exports Observations*	*Rank sum*	*Imports Observations*	*Rank Sum*
Positive	22	1397.0	13	909.0
Negative	23	1605.5	23	1297.5
No Relationship	51	3616.0	56	3516.5
Not Cointegrated	47	3677.5	32	2027.0
X(3)	2.096		1.237	
p-value	0.553		0.744	

Null hypothesis: No difference in means among the four groups.

The characteristics of specific industry sectors provide more of an explanation. Table 5 breaks down the results by sector, in terms of how many industries fall into each of the four groups. We omit those sectors for which we only have a few industries.

While we expect that a majority of industries in each sector to have results that are either not cointegrated or have an insignificant volatility coefficient, we do find certain sectors to have a disproportionate share of industries that are significantly affected by exchange-rate volatility. The breakdowns are given in Table 5. Overall, only 31 per cent of export industries and

-0.31 (0.94)

-0.15 (2.71)
-0.13 (2.12)
0.29 (1.42)

Table 5: Industry sectors by volatility result

Exports	*p/n/nr/nc*	*Imports*	*p/n/nr/nc*
ALL	22/23/51/47	ALL	13/23/56/33
000	5/6/5/6	000	1/3/10/3
200	2/1/9/7	**200**	3/2/3/2
500	2/2/4/5	500	3/2/6/2
600	5/7/19/14	600	2/8/19/11
700	4/2/4/8	700	1/5/7/5
800	4/4/7/4	800	1/2/8/7

Key: p = positive; n = negative; nr = no relationship (but cointegrated); nc = not cointegrated. Note: 'ALL' also includes industries in SITC category 1, 3, and 4.

29 per cent of import industries have a significant volatility coefficient. We find, however, that one half of the US export industries within SITC sector 0 (Food and live animals) are affected. The same is true for imports from Italy in category 2 (Crude materials, inedible, except fuels). The rest show a lower proportion, particularly sectors 6 (Manufactured goods), for both exports and imports. These results suggest that durable goods, and particularly manufactures, are less sensitive to risk.

In a few cases, the proportion of industries with significant coefficients is between one third and one half, providing weak evidence of a concentration of effects within these industries. Examples include US exports and imports in sector 7 (Machinery and transport equipment), imports in Sector 5 (Chemicals and related products), and exports in sector 8 (Miscellaneous manufactures). For the most part, we conclude that food and raw materials are more sensitive to exchange-rate volatility than are manufactured goods.

4. Conclusion

Over the past decade, a large body of literature has arisen that deals with the industry-level effects of exchange-rate volatility on bilateral trade flows.

Employing cointegration analysis, these studies have investigated a growing list of country pairs. They have generally found mixed effects, with the majority of industries unaffected by risk, and more negative effects than positive ones. This study extends this literature to the case of industry trade between the United States and Italy.

Examining 143 US export industries and 125 US import industries over the period from 1979 to 2010, we find a large share not to be cointegrated with income, the real exchange rate, or volatility. Of those that do show a long-run relationship, most still register an insignificant long-run volatility coefficient. In all, 22 export industries respond positively to increased risk, while 23 have a negative coefficient that suggests risk-aversion among purchasers of these products. The equal proportion in signs is a relatively rare outcome in this type of study. For imports, 13 have positive coefficients and 23 have negative ones. Risk aversion dominates 'risk loving' behaviour in this case.

Examining the factors that might potentially explain these mixed results, we find that industry size (trade share) bears little relationship to which industries respond positively, negatively, or not at all. Specific sectors exhibit more of a pattern, with a relatively large proportion of significant effects concentrated among US exports of food products (SITC sector 0) and imports of raw materials (sector 2). Manufactures' (sector 6) low proportions of these effects suggest that manufactured goods are less sensitive to increases in exchange-rate risk.

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APPENDIX

Data Definitions and Sources

All data are over the period from 1979-2010 and are collected from the following sources:

(a) The World Bank.
(b) *International Financial Statistics* of the IMF.
(c) The University of Pennsylvania (http://pwt.econ.upenn.edu/php_site/pwt70/pwt70_form.php)
(d) Economagic (www.economagic.com)

Sources a-c are annual, while source (d) is monthly.

Variables

VX = For each industry i, *VX* is defined as the volume of US exports to Italy. Export value data in US dollars for each commodity come from source (a). In the absence of annual price levels for each commodity, following others we deflate each industry's trade value by the US export unit value (source b).

VM = For each industry i, *VM* is defined as the volume of US imports from Italy. Import value data in US dollars for each commodity come from source (a). Again, in the absence of annual price levels for each commodity, we deflate each industry's trade

value by the US import unit value from source (b).

Y^{Italy} = Italian real GDP. The data come from source (b).

Y^{US} = US real GDP, from source (b).

REX = Real bilateral exchange rate between the euro and the dollar, defined as $\left(\frac{CPI_{Italy} \times NEX}{CPI_{U.S.}}\right)$, where CPI is the Consumer Price Index. *NEX* is the nominal bilateral exchange rate defined as number of dollars per euro. Thus, an increase in REX reflects a real depreciation of the dollar. The annual dollar/euro nominal rate comes from source (c).

VOL = Volatility of the real bilateral exchange rate (*REX*). Following Bahmani-Oskooee and Hegerty (2009a), it is the standard deviation of the 12 monthly real exchange rate (*REX*) values within that year. Monthly CPI and nominal exchange rate data come from source (d).

EURO = a dummy that equals zero until 1998 and 1 beginning in 1999.

ENDNOTES

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2. For some other applications of this method see see Bahmani-Oskooee *et al* (2005), Halicioglu (2007), Tang (2007), De Vita and Kyaw (2008), Mohammadi *et al* (2008), Payne (2008), and Wong and Tang (2008).

3. Precisely, the lagged error-correction term for equation (1) is formed using $ECM_{t-1} = \ln VX_{t-1} - \frac{\hat{\theta}_2}{\hat{\theta}_1}\ln Y_{t-1}^{Italy} - \frac{\hat{\theta}_3}{\hat{\theta}_1}\ln REX_{t-1} - \frac{\hat{\theta}_4}{\hat{\theta}_1}\ln VOL_{t-1}$ equation. A similar procedure is followed for model (2). For details see Bahmani-Oskooee and Tanku (2008).

4. As a preliminary exercise we had to make sure that there are no I(2) variables, using DF and ADF tests. This was indeed the case. These results are not reported, but are available upon request from the authors.

5. In an effort to increase number of cointegrated industries, we also relied upon SBC and HQC criteria to select the optimum lags in non-cointegrated industries in Table 1. Industries 001, 032, 061, 073, 231, 282, 512, 533, 553, 613, 641, 656, 666, 693, 718, 891, and 899 were found to be cointegrated. Furthermore, while exchange rate volatility had significantly positive effect on exports of 001 and 656, it had adverse effects on the exports of 061.

6. Diagnostic statistics for all export and import equations are available upon request. They mostly support autocorrelation-free residuals, correctly specified models, stable short-run and long-run coefficient estimates, and very good fit.

7. Once again for non-cointegrated industries, we tried SBC and HQC lag selection criteria. We were able to find cointegration in industries 061, 291, 581, 611, 612, 632, 655, 667, 732, 851, 862, 863, 894, 899, and 951. Furthermore while the effects of exchange rate volatility on imports of industries 061 and 951 were positive, the effects were negative on the imports of 291 and 851.

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