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Keywords: Exchange rate elasticities; China

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Abstract

Chinese policymakers have resisted calls for faster renminbi appreciation partly because they fear it will reduce low technology exports. We investigate this issue using a panel data set including China's exports of labor-intensive goods to 30 countries. We find that an appreciation of the RMB would substantially reduce China's exports of clothing, furniture, and footwear. We also find that an increase in foreign income, an increase in the Chinese capital stock, and an appreciation among China's competitors would raise China's exports. Since Europe is the second leading exporter of labor-intensive manufactures behind China, these results indicate that the large appreciation of the euro relative to the RMB since 2001 has crowded out European exports.

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1. INTRODUCTION

China's exports have grown faster than 22 percent per year between 2005 and the first half of 2008. Its current account surplus exceeded 9 percent of Chinese GDP in 2006 and 11 percent of GDP in 2007. Its economy grew by more than 10 percent per year between 2004 and 2007 and its capital account surplus in 2007 approached 3 percent of GDP. Many believe that China faces a fundamental disequilibrium in its balance of payments and that it should let the renminbi appreciate.[1]

The Chinese government has resisted calls for faster appreciation, saying it would damage labor-intensive exports (Ito, 2008). Chinese policymakers have argued that profit margins for labor-intensive goods are razor-thin and thus that an RMB appreciation would decimate these industries. Ito also discussed how fear of losing competitiveness relative to other exporting nations has prevented China from allowing its currency to appreciate.

Previous work has investigated how exchange rate changes affect China's processed and ordinary exports. Processed exports, as classified by the Chinese customs authorities, are goods that are produced using intermediate goods that have been imported duty free. Neither the imported inputs nor the assembled final goods normally enter China's domestic market.[2] Ordinary exports, in contrast, are produced primarily using domestic inputs. Marquez and Schindler (2007), Cheung, Chinn, and Fujii (2007), and Thorbecke and Smith (2007) all found that an RMB appreciation causes a larger decline in ordinary exports than in processed exports. This finding makes sense in light of the

[1] To the extent that China's capital account surplus reflects speculative inflows, the degree of disequilibrium would be less.
[2] Gaulier *et al.* (2005) provided a good discussion of ordinary and processed trade.

fact that more of the value-added of ordinary exports than of processed exports comes from China.

Previous authors have also attempted to control for competition between China and other countries in third markets. Bénassy-Quéré and Lahrèche-Révil (2003) found using a gravity model that a 10 percent depreciation of one East Asian exchange rate relative to other East Asian exchange rates would increase exports from the depreciating country by 8 percent Thorbecke (2006) reported results from dynamic ordinary least squares (DOLS) estimation indicating that a 10 percent depreciation of ASEAN currencies against the dollar would decrease China's exports to the U.S. by 7.5 percent. Cheung, Chinn, and Fujii (2007) also found using DOLS techniques that a depreciation of the RMB relative to exchange rates in third countries tends to increase China's exports to the U.S. Bénassy-Quéré and Lahrèche-Révil and Thorbecke reported statistically significant coefficients, but Cheung *et al.* did not.

In this paper, we focus not on all of China's ordinary exports but only on labor-intensive manufacturing exports. These goods include clothing, furniture, and footwear. We construct a panel data set of China's exports of labor-intensive manufactures to 30 countries. We explain exports using the bilateral RMB exchange rate and income in the importing countries. We control for competition between China and other countries by including a weighted exchange rate from the 17 other leading exporters of labor-intensive goods. We control for supply side factors by including China's capital stock in manufacturing.

The results indicate that an appreciation of the RMB would substantially reduce China's labor-intensive exports. They also indicate that an increase in foreign income, an

appreciation among China's competitors, and an increase in the Chinese capital stock would raise China's exports.

These results support the claim of the Chinese government that an RMB appreciation would damage labor-intensive exports. They also indicate that fear of losing competitiveness relative to other countries may have prevented the Chinese authorities from allowing the RMB to appreciate.

The next section presents the data and methodology we employ. Section 3 contains the results. Section 4 concludes.

2. DATA AND METHODOLOGY

2.1 China's Labor-Intensive Manufacturing Exports

Figure 1 shows China's exports in 2006 broken down by product category. The data come from the CEPII-CHELEM database. The largest category is final electronics goods, defined to include consumer electronics goods, computer equipment, telecommunications equipment, and electrical apparatuses. In 2006 33 percent of China's exports were in this category. The second largest category is labor-intensive manufactures, defined to include carpets, clothing, fabrics, furniture, knitwear, leather, and yarns. In 2006 21 percent of China's exports were in this second category.

Final electronics goods are produced largely within East Asian production and distribution networks. Japan, South Korea, Taiwan and multinational companies located in ASEAN produce sophisticated technology-intensive intermediate goods and ship them to China for assembly and re-export. According to Koopman, Wang, and Wei (2008), Chinese value-added in these sectors is small relative to the costs of

the intermediate goods imported from abroad. For instance, they reported that Chinese value-added in electronic computers was less than 5 percent in 2002 and that Chinese value-added in telecommunications equipment was less than 15 percent.

Labor-intensive manufactures, on the other hand, are produced largely using domestic inputs. Koopman, Wang, and Wei (2008) reported that Chinese value-added in these industries is approximately 70 percent.

Figure 2 shows China's share of the world's exports of labor-intensive manufacturing goods. In 2006 China surpassed Europe to become the world's leading exporter of these goods. Its share reached 29 percent, compared with 27 percent for Europe. The third leading region, East Asia ex-China, provided about 12 percent of total world exports of these products in 2006.[3]

Figure 3 shows the countries and regions that purchased China's labor-intensive exports. In 2006 30 percent went to the U.S., 17 percent went to the Euroland, 14 percent went to Japan, and the remainder went to the rest of the world.

China thus produces labor-intensive manufactures largely using domestic inputs and sells these products throughout the world.

2.2 The Imperfect Substitutes Model

We investigate how exchange rate changes affect China's exports of labor-intensive manufacturing goods. To do this we use data on China's real exports of these

[3] There are different ways to consider the countries that compete with China in exporting labor-intensive manufactures. China exports 29 percent of the world's total and the Euroland exports 27 percent. From this perspective China and Europe are the key competitors. However, these lower value-added goods make up less than 6 percent of Europe's total exports. For Bangladesh, these goods make up more than 90 percent of its total exports, Thus from Bangladesh's perspective China is a key competitor even though Bangladesh exports only 1 percent of the total quantity of labor-intensive manufacturing exports to the world each year.

goods to 30 countries. There has been substantial variation both cross-sectionally and over time in the RMB exchange rate relative to these countries. This approach should thus help to shed light on how exchange rate changes affect the exports of labor-intensive manufactures.

According to the imperfect substitutes model of Goldstein and Khan (1985), exports can be represented as:

$$ex_t = \alpha_{10} + \alpha_{11}\, rer_t + \alpha_{12}\, rgdp_t + \varepsilon_t \qquad (1)$$

where ex_t represents real exports, rer_t represents the real exchange rate, $rgdp$ represents foreign real income, and the variables are measured in natural logs.

It is possible to identify the parameters in equation (1) if the elasticity of supply is infinite. In the present case there is reason to believe that the perfect supply elasticity assumption is reasonable. China has almost two hundred million redundant rural laborers and tens of millions more who are either joining the labor force each year or underemployed in the urban sector. By migrating to low-skilled assembly activities these workers may enable exporters to increase supply at constant prices.

There is some evidence that demand pressures have recently started pushing up costs and export prices in China. The Congressional Budget Office (2008) for instance documented that Chinese tradable prices began increasing in 2007. Since this increase in the "China price" occurred after the sample period used here, it should not affect our ability to identify the parameters in equation (1).

2.3 Dependent and Independent Variables

The dependent variable is the log of labor-intensive manufacturing exports. These goods come from six product categories: clothing, furniture, leather, carpets, yarns and fabrics, and knitwear.[4] Data for exports of these goods measured in U.S. dollars are obtained from the CEPII-CHELEM database and are deflated using BLS price deflators for these six categories. In our regressions we use both labor-intensive manufacturing exports aggregated together and labor-intensive manufactures disaggregated by industry. Since Orcutt (1950), economists have recognized the benefit of using disaggregated data to estimate trade elasticities. If elasticities differ by industry, aggregated estimates may be biased (see Bahmani-Oskooee and Ardalani, 2006).

The panel data set includes exports from China to 30 countries over the 1987-2006 period. These countries are Argentina, Australia, Austria, Belgium, Bangladesh, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Italy, Japan, Malaysia, the Netherlands, New Zealand, Norway, Poland, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, the United Kingdom, and the United States.

The independent variables include the bilateral real exchange rate (*rer*) between China and the importing country and real income in the importing country (*rgdp*). Following Cheung, Chinn, and Fujii (2007), we use the Chinese capital stock in

[4] As defined by CEPII, these categories correspond to the SITC classification numbers 61, 65, 82, 83, 841, 842, 843, 844, 845, 846.1, .2, .91, .92, .93, .94, .99, 848.1, .2, .3, .4, 85, and 894.77.

manufacturing as a control for China's supply capacity.[5] We also include a WTO dummy variable that takes on a value of 1 after China joined the WTO and a weighted exchange rate (*wrer*) of the 17 other leading exports of labor-intensive manufactures relative to the importing country.[6]

To calculate the weighted exchange rate for the countries that compete with China we use the shares of exports from the other 17 leading exporters of labor-intensive manufactures (LIM) each year. For every year between 1987 and 2006 we calculate weights based on the percentage of LIM coming from the 17 other leading exporters to the world. For instance, if in 2006 Italy provided 10 percent of the LIM exports from the 17 leading exporters other than China then Italy would have a weight of 0.10. When trying to explain exports to Argentina in 2006, the bilateral real exchange rate between Italy and Argentina in 2006 would be multiplied by 0.10 (i.e., $0.10*\text{rer}_{\text{Italy, Argentina,2006}}$). We then proceed in the same way for the other 16 leading exporters, giving us a weighted exchange rate for Argentina in 2006 that can be written:

$$wrer_{Argentina,2006} = \sum_{i=1}^{17} w_{i,2006} * rer_{i,Argentina,2006} \qquad (2)$$

In the same way, we calculate weighted exchange rates for the other 29 importers in 2006. We then repeat the procedure for each year going back to 1987, recalculating the weights and using whatever countries were the 17 leading exporters each year.

[5] Data on China's capital stock come from Bai, Hsieh, and Qian (2006). Following Cheung, Chinn, and Fujii (2007), we assume that the capital stock grows by 12 percent in 2005 and 2006.

[6] Garcia-Herrero and Koivu (2007) posited that China's WTO accession began affecting China's trade after it became certain that China would join the WTO in the beginning of 2000. We thus set the WTO dummy variable equal to one beginning in 2000.

To calculate *wrer* in this way it is necessary to measure exchange rates using a common numeraire. We can do this by employing the real exchange rate variables constructed by the Centre D'Etudes Prospectives et D'Information Internationales (CEPII). These variables compare observed exchange rates to PPP ones, and exceed 100 when the currency is overvalued. They are thus comparable both cross sectionally and over time. These variables are obtained from the CEPII-CHELEM database.

Data on *rer* and *rgdp* are also obtained from CEPII-CHELEM. An increase in either *wrer* or *rer* represents an appreciation of the exchange rate.

2.4 Econometric Methodology

We estimate the model using dynamic ordinary least squares. DOLS involves regressing the left-hand side variable on a constant, the right-hand side variables, and lags and leads of the first difference of the right-hand side variables. The individual export equations have the form:

$$\begin{aligned} ex_{j,t} &= \beta_0 + \beta_1 rer_{j,t} + \beta_2 wrer_{j,t} + \beta_3 rgdp_{j,t} + \beta_4 K_t + \beta_5 Time + \beta_6 WTO \\ &+ \sum_{k=-p}^{p} \alpha_{1,k} \Delta rer_{j,t-k} + \sum_{k=-p}^{p} \alpha_{2,k} \Delta wrer_{j,t-k} + \sum_{k=-p}^{p} \alpha_{3,k} \Delta rgdp_{j,t-k} + \sum_{k=-p}^{p} \alpha_{4,k} \Delta K_{t-k} \\ &+ \mu_j + u_{j,t}, \\ & t = 1, \cdots, T; \qquad j = 1, \cdots, N. \end{aligned} \tag{3}$$

Here $ex_{j,t}$ represents real exports from China to country j, $rer_{j,t}$ represents the bilateral real exchange rate between China and country j, $wrer_{j,t}$ represents the weighted exchange rate between the 17 other leading exporters of labor-intensive

manufactures and country j, $rgdp_{j,t}$ equals real income in importing country j, *Time* is a time trend, *WTO* is the WTO dummy variable, and μ_j is a country j fixed effect.

The data set extends from 1987 to 2006. We use one lead and lag in the DOLS estimation.

3. RESULTS

Table 1 presents the results from estimating equation (3). Our preferred specification is in the first column. It includes the capital stock and excludes the time trend. The results in the other columns are similar. The results are also similar if we use more lags and leads in the DOLS estimation.[7]

The first row reports the coefficient on the RMB exchange rate with the importing country. The elasticity in our preferred specification is -1.84, and ranges from -1.60 to -1.83 in the other specifications. The coefficients are all highly statistically significant. The values imply that a 10 percent appreciation of the RMB would reduce labor-intensive exports by about 18 percent.

The second row reports the coefficient on the weighted exchange rate among countries competing with China in third markets. The elasticity in our preferred specification is 0.91, and ranges from 0.85 to 0.92 in the other specifications. The coefficients are again highly statistically significant in every specification. The values imply that a 10 percent appreciation among countries competing with China in exporting labor-intensive goods would increase China's exports by about 9 percent.

The third row reports the coefficient on income in the importing country. The

[7] These results are available on request.

coefficient in our preferred specification is 1.82, and ranges from 1.73 to 1.83 in the other specifications. These values imply that a 10 percent increase in income in the importing country would raise China's exports by about 18 percent.

The fourth row reports the coefficient on the Chinese capital stock. The coefficient equals 1.12 in the first specification and 1.15 in the second. It is highly statistically significant in both specifications.

Finally the fifth row reports the coefficient on the WTO dummy variable. It is negative in both specifications and only marginally significant in one of the specifications.

Table 2 presents the results for our preferred specification disaggregated by industry. The coefficients on the RMB exchange rate in Table 2 are consistent with the results in Table 1. The elasticities are larger for knitwear and furniture, smaller for yarns & fabrics and carpets and about the same for leather and clothing. They are statistically significant in every specification.

The coefficients on the weighted exchange rate among countries competing with China in Table 2 also appear broadly consistent with the results in Table 1. They are larger (and highly significant) for leather, furniture, yarns & fabrics, and carpets and smaller (and not significant) for clothing and knitwear.

The coefficients on income in the importing country in Table 2 are quantitatively different from the results in Table 1. In every case the coefficients are larger for the individual industries than for labor-intensive industries aggregated together. For leather and furniture the elasticities exceed 2.5 and for clothing and knitwear they exceed 4. These results imply that a 1 percent drop in income in importing countries would reduce China's exports of leather and furniture by 2.5 percent and China's exports of clothing

and knitwear by more than 4 percent.

The important implication of the results reported in this section is that exchange rates exert a major impact on China's exports of labor-intensive manufactures. These results support the claim that margins for these goods are thin, and thus that a decrease in profits arising from exchange rate changes can cause a large drop in output. They indicate that the concerns of the Chinese government that an RMB appreciation would harm exporters of goods such as clothing and footwear are well founded. The results also support the claim that fear of losing competitiveness relative to other exporting nations may have prevented China from allowing its currency to appreciate more.

A second implication of these results is that changes in income in the importing country also have a large effect on the demand for these goods. China's low-technology exporters are thus exposed, not only to an appreciation of the RMB but also to a slowdown in the rest of the world.

4. CONCLUSION

China's massive surpluses on both its current account and its capital and financial account suggest that an appreciation of the yuan is appropriate. The Chinese government has resisted calls for faster appreciation, saying it would damage labor-intensive exports. Ito (2008) has also discussed how fear of losing competitiveness relative to other exporting nations has prevented China from allowing its currency to appreciate.

In this paper, we examine how an appreciation of the RMB and of exchange rates in countries that compete with China would affect China's labor-intensive

manufacturing exports. To do this we construct a panel data set of China's exports of labor-intensive manufactures to 30 countries. Evidence from dynamic ordinary least squares estimation indicates that an appreciation of the RMB would cause a substantial decline in labor-intensive exports from China. We also find that depreciations in countries that compete with China would cause a substantial drop in China's exports.

These results confirm the claims of the Chinese government that an exchange rate appreciation would damage labor-intensive exports. They do not necessarily imply, though, that China should not let the RMB appreciate. Many have applauded the fact that, as of September 2008, the RMB has appreciated by 20 percent against the dollar. At the same time, though, the RMB has depreciated by 35 percent against the euro. The findings reported here indicate that this depreciation has caused China's exports of clothing, furniture, and footwear to crowd out Europe's exports of these goods in world markets.

Munchau (2008) discussed how European officials are upset about this, and may link the absence of exchange rate liberalization in China with a crackdown on free trade. While economically such a response might not make sense, politically it is understandable given the dislocation that exchange rate changes have caused in Europe.

Rather than triggering protectionism, it may be better for China to abandon its *de facto* dollar peg and adopt a regime characterized by: 1) a multiple currency, basket-based reference rate, and 2) a wider band around the reference rate. If China adopted greater exchange rate flexibility in this way, its large surpluses relative to Europe would tend to produce appreciations of the RMB against the euro and ease some of the pressure on European exporters.

The results in this paper indicate that such an appreciation would be painful for Chinese producers of clothing and shoes and might cause these industries to migrate abroad. A stronger RMB would also, however, provide Chinese companies an incentive to continue climbing the ladder of comparative advantage.

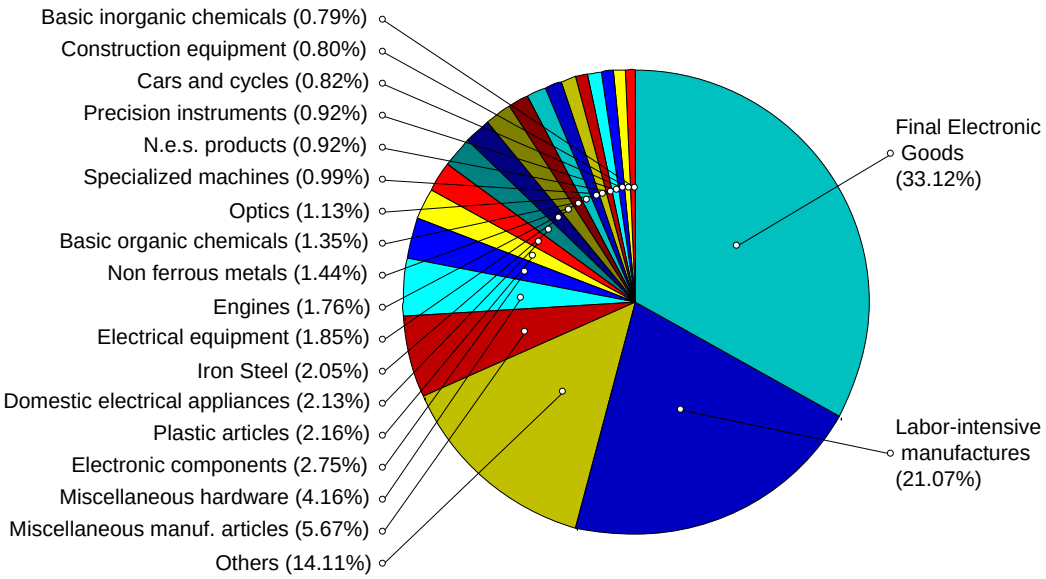

Figure 1. China's Exports by Product Category, 2006.

Note: Final Electronics goods include consumer electronics goods, computer equipment, telecommunications equipment, and electrical apparatuses. Labor-intensive Manufactures includes carpets, clothing, fabrics, furniture, knitwear, leather goods, and yarns.

Source: CEPII-CHELEM Database

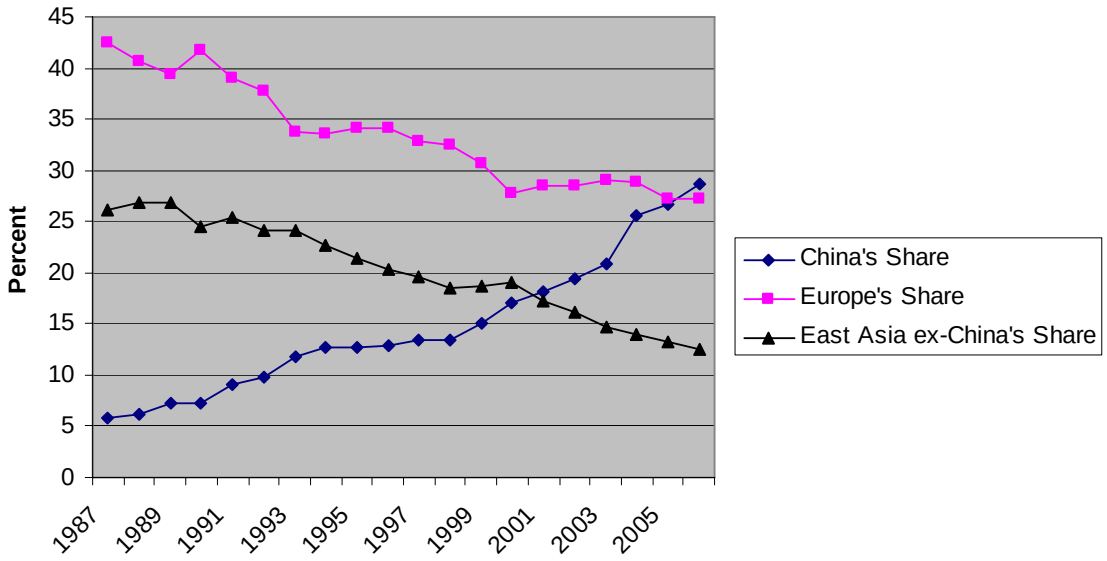

Figure 2. China, Europe, and East Asia's Shares of the World's Labor-Intensive Manufactures Exports

Source: CEPII-CHELEM Database

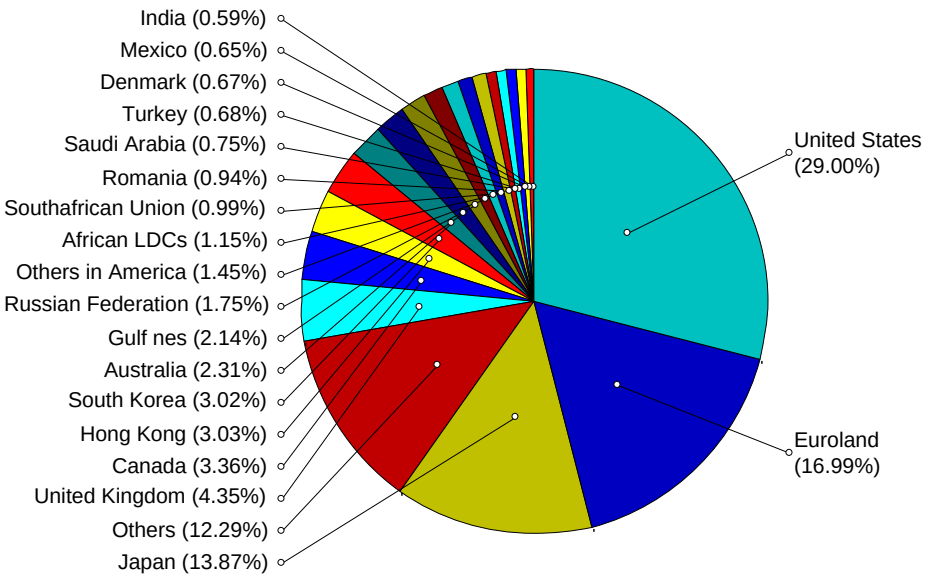

Figure 3. Share of China's Exports of Labor-Intensive Manufactures Going to Individual Countries and Regions in 2006.

Source: CEPII-CHELEM Database

Table 1. Panel DOLS Estimates of China's Exports of Labor-Intensive Manufactures to 30 Countries over the 1987-2006 Period

Bilateral RER	-1.84***	-1.65***	-1.83***	-1.60***
	(0.15)	(0.12)	(0.15)	(0.12)
Competitor's RER	0.91***	0.85***	0.92***	0.86***
	(0.24)	(0.24)	(0.24)	(0.24)
Real GDP	1.82***	1.75***	1.82***	1.73***
	(0.31)	(0.32)	(0.31)	(0.30)
Capital Stock	1.12***		1.15***	
	(0.11)		(0.11)	
WTO Dummy			-0.03	-0.08*
			(0.05)	(0.05)
Time		0.13***		0.13***
		(0.01)		(0.01)
Adjusted R-squared	0.94	0.94	0.94	0.94
No. of observations	508	508	508	508

Notes: DOLS(1,1) estimates. Heteroskedasticity-consistent standard errors are in parentheses. The data extend from 1987 to 2006. Since the DOLS estimation uses one lead and lag of the first difference of the right-hand side variables the actual sample period is from 1989-2005.
*** (**) denotes significance at the 1% (5%) level.

Table 2. Panel DOLS Estimates of China's Exports of Labor-Intensive Manufactures to 30 Countries over the 1987-2006 Period

	Industry					
	Leather Goods	Clothing	Knitwear	Furniture	Yarns & Fabrics	Carpets
Bilateral RER	-1.67***	-1.66***	-2.35***	-2.30***	-1.32***	-1.37***
	(0.29)	(0.32)	(0.46)	(0.17)	(0.23)	(0.22)
Competitor's RER	0.94***	0.23	0.58	1.03***	1.53***	1.40***
	(0.26)	(0.40)	(0.48)	(0.22)	(0.22)	(0.33)
Real GDP	2.52***	4.29***	4.02***	2.52***	1.87***	1.83***
	(0.50)	(0.35)	(0.35)	(0.32)	(0.23)	(0.36)
Capital Stock	0.96***	0.56***	0.99***	2.08***	0.67***	0.92***
	(0.19)	(0.16)	(0.20)	(0.06)	(0.11)	(0.10)
Adjusted R-squared	0.94	0.90	0.92	0.97	0.89	0.89
No. of observations	504	502	498	490	507	503

Notes: DOLS(1,1) estimates. Heteroskedasticity-consistent standard errors are in parentheses. The data extend from 1987 to 2006. Since the DOLS estimation uses one lead and lag of the first difference of the right-hand side variables the actual sample period is from 1989-2005.
*** (**) denotes significance at the 1% (5%) level.

REFERENCES

Bahmani-Oskooee, M. and A. Zohre (2006) "Exchange Rate Sensitivity of U.S. Trade Flows: Evidence from Industry Data", *Southern Economic Journal* 72, 542-559.

Bai, C. Chang-Tai Hsieh, and Y. Qian (2006) "Returns to Capital in China", *Brookings Papers on Economic Activity* 61-88.

Bénassy-Quéré, A. and A. Lahrèche-Révil (2003) "Trade Linkages and Exchange Rates in Asia: the Role of China", CEPII Working Paper No. 2003-21.

Cheung, Yin-Wong, M. Chinn, and E. Fujii (2007) "China's Current Account and Exchange Rate", in R. Feenstra and Shang-Jin Wei (eds), *China's Growing Role in World Trade.* Chicago: University of Chicago Press, forthcoming.

Congressional Budget Office (2008) *How Changes in the Value of the Chinese Currency Affect U.S. Imports.* Washington: CBO.

Garcia-Herrero, A. and T. Koivu (2007) "Can the Chinese Trade Surplus be Reduced through Exchange Rate Policy", BOFIT Discussion Papers 6, Helsinki: Bank of Finland's Institute for Economies in Transition.

Gaulier, G., F. Lemoine, and D. Unal-Kesenci (2005) "China's Integration in East Asia: Production Sharing, FDI, and High-Tech Trade", CEPII Working Paper No. 2005-09.

Goldstein, M. and M. Khan (1985) "Income and Price Effects in Foreign Trade", in R. Jones and P. Kenen (eds), *Handbook of International Economics*, *Vol. 2.* Amsterdam: North-Holland, 1041-1105.

Ito, T. (2008) "Influence of the Renminbi on Exchange Rate Policies of Other Asian Currencies", in M. Goldstein and N.R. Lardy (eds), *Debating China's Exchange Rate Policy.* Washington: Institute for International Economics, 239-258.

Koopman, R., Z. Wang, Z, and Shang-Jin Wei (2008) "How Much of Chinese Exports is Really Made in China? Assessing Domestic Value-Added When Processing Trade is Pervasive" NBER Working Paper 14109.

Munchau. W. (2008) "The Wrong Tools to Tackle Rising Inflation", Financial Times, 14 July.

Marquez, J. and J. Schindler (2007) "Exchange Rate Effects on China's Trade", *Review of International Economics* 15, 837-53.

Orcutt, G. (1950) "Measurement of Price Elasticities in International Trade", *Review of Economics and Statistics* 32, 117-132.

Thorbecke, W. (2006) "How Would an Appreciation of the Renminbi Affect the U.S. Trade Deficit with China?", *The B.E. Journal in Macroeconomics – Topics in Macroeconomics* 6, 1-15.

Thorbecke, W. and G. Smith (2008) "How would an appreciation of the RMB and other East Asian currencies affect China's exports?" *Review of International Economics*, forthcoming.