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Measuring the Competitiveness of China's Processed Exports[1]

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Abstract

China's surplus in processing trade remains large. Processed exports are final goods produced using parts and components that are imported duty free. Since much of the value added of these exports comes from East Asia, exchange rates throughout the region should affect their foreign currency prices. This paper presents data on value-added exchange rates for processed exports over the 1993-2013 period and reports that they significantly affect exports. While the renminbi (RMB) appreciated by 36% between the beginning of 2005 and the end of 2013, exchange rates in supply chain countries have depreciated. This has mitigated the effect of the RMB appreciation on the price competitiveness of processed exports.

Keywords: Chinese exports, Global supply chains, Competitiveness
JEL classification: F10, F40

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1. Introduction

China recorded a surplus in processing trade of over $360 billion in 2013. Between 2000 and 2013 its surpluses in processing trade cumulate to $3 trillion. Processing trade refers to a customs regime where exports such as tablet computers are assembled with parts and components such as microprocessors that are imported duty free. China's other major customs regime, ordinary trade, has been in deficit since 2009. China's total surplus was recorded at $261 billion in 2013 (see Figure 1).

Many respond to China's surpluses by recommending that the renminbi appreciate (see US Treasury, 2014). Evidence presented in Cheung, Chinn, and Qian (2012) and elsewhere indicates that an appreciation of the renminbi would reduce China's exports. However, an RMB appreciation would especially affect lower-end ordinary exports such as shoes and toys since most of the value added of these goods comes from domestic inputs. For processed exports much of the value added comes from sophisticated intermediate inputs produced in Taiwan, South Korea, and other parts of East Asia. While the renminbi appreciated by 36 percent in real effective terms between the first quarter of 2005 and the end of 2013, many currencies in supply chain countries have depreciated. Thus, the appreciation of the renminbi has had an attenuated effect on the price competitiveness of China's processed exports.

Bayoumi, Saito, and Turunen (2013), Ho (2012), Unteroberdoerster, Mohommad, and Vichyanond (2011), Thorbecke (2011), and Thorbecke and Smith (2010) have investigated the competitiveness of goods produced within global value chains. Bayoumi *et al.* modified the traditional International Monetary Fund (IMF) real effective exchange rate (REER) to take account of the fact that goods are produced not only using domestic factors but also using foreign inputs. They used weights to measure the contribution of foreign and domestic value-added to

the competitiveness of tradable goods. They called their variable an REER in goods. Ho did not use trade weights to construct effective exchange rates but instead employed GDP weights to construct a benchmark world currency basket of the major convertible currencies and to calculate real relative exchange rates. He found that his variables often out-performed standard exchange rates at explaining exports. Unteroberdoerster *et al.* calculated an integrated effective exchange rate (IEER) for China by including both the renminbi exchange rate and exchange rates in supply chain countries relative to the countries importing the final assembled goods. They reported that after 2008 the Chinese IEER has appreciated less than the Chinese REER because imported inputs have attenuated the link between Chinese factor prices and Chinese goods prices. Thorbecke calculated an IEER and Thorbecke and Smith calculated bilateral integrated exchange rates for China's processed exports. Both papers presented evidence that appreciations across the supply chain decreased processed exports.

Ho (2012) noted that although integrated exchange rates are supported by evidence they are difficult to use because they are hard to calculate. To remedy this problem, data are presented here on bilateral integrated exchange rates and IEERs for China's processed exports. This paper also extends the sample period for Thorbecke and Smith's estimation by nine years (from 2004 to 2013) and for Thorbecke's (2011) estimation by 24 quarters (from 2008Q1 to 2013Q4).[1] These later observations are important because, as Figure 1 shows, they include the time when imbalances in processing trade soared and because they include the Global Financial Crisis. As discussed in Section 3, the model used here explains the great trade collapse and recovery of 2008 and 2009 well. The results also provide strong evidence that exchange rates throughout the supply chain affect China's processed exports.

[1] Thorbecke and Smith employed data up to 2005. However, because the estimation employed one lead, the actual sample period for the estimation only extended to 2004.

The next section presents panel data results indicating that bilateral integrated exchange rates affect processed exports. Section 3 provides time series evidence that the IEER matters. Section 4 concludes. The Appendix presents data on integrated exchange rates.

2. Panel Data Evidence on Integrated Exchange Rates and Processed Exports

The workhorse imperfect substitutes model of Goldstein and Khan (1985) is used to specify export functions:

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

where ex_t represents the log of real exports, rer_t represents the log of the real exchange rate, and y_t^* represents the log of foreign real income.

Much of the value-added for Chinese processed exports comes from other East Asian countries. The U.S. dollar value of processed exports can be represented as:

$$XV^{\$} = P_x^{\$} \cdot x = \pi^{rmb} \cdot x \cdot E^{\frac{\$}{rmb}} + w^{rmb} \cdot L \cdot E^{\frac{\$}{rmb}} + \sum_i P\, m^i \cdot m_i \cdot E^{\frac{\$}{i}} \qquad (2)$$

where $XV^{\$}$ is the dollar value of processed exports, P_x is the export price, x is the volume of exports, π^{rmb} is the exporter's renminbi profit per unit of exports, E is the exchange rate (U.S. dollar per foreign currency), w is the nominal wage rate, L is the amount of labor, Pm_i is the import price for the ith country, m_i is the volume of imports from the ith country; superscripts denote currency denomination.[2] An appreciation of the renminbi against the dollar will affect the dollar cost of China's value-added in processing trade (the first and second terms on the right hand side of equation (2)). An appreciation of the renminbi and of the currencies in supply chain countries against the dollar will affect the dollar cost of China's entire output of processed

[2] Professor Takatoshi Ito and others encouraged me to consider the issue in these terms. They are not responsible for any problems with this specification.

exports (all three terms on the right hand side). [3] Using an integrated exchange rate would thus capture the effects of exchange rates across the supply chain on dollar costs.

Equation (2) indicates that a joint appreciation of exchange rates across the supply chain vis-à-vis the US dollar would affect the relative dollar price of China's processed exports more than an appreciation of the renminbi alone. Similarly a joint appreciation vis-à-vis the euro would affect the relative euro price of China's processed exports more than an appreciation of the renminbi alone. To measure these effects this section employs a weighted average of the RMB bilateral exchange rate and the bilateral exchange rates in supply chain countries against the countries importing the final goods. It also employs bilateral export data.

Panel data on processed exports from China to leading importing countries over the 1992-2013 period are used. Countries that imported small amounts over part of the sample period are excluded because they can have very large percentage changes from year to year due to idiosyncratic factors rather than the macroeconomic variables in equation (1). In all, China's exports to 24 countries are used.[4] The data are obtained from China Customs Statistics. Following Cheung, Chinn, and Qian (2012), exports are deflated using the Hong Kong to US re-export unit value indices obtained from CEIC database.

To compute an integrated bilateral real exchange rate, value-added in processed exports for China and the 9 primary supply chain countries is calculated. Following Tong and Zheng (2008), China's value-added in processing trade can be measured as the difference between the value of China's processed exports (VPE_t) and the value of imports for processing from all

[3] Yoshitomi (2007) makes this point.

[4] These countries are Australia, Austria, Belgium & Luxembourg, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Japan, South Korea, Malaysia, Netherlands, New Zealand, Philippines, Russian Federation, Singapore, Spain, Sweden, Taiwan, Thailand, United Kingdom, United States.

supply chain countries ($\sum_i VIP_{i,t}$):

$$VA_{Chin,t} = (VPE_t - \sum_i VIP_{i,t}) / VPE_t = 1 - \sum_i VIP_{i,t} / VPE_t, \quad (3)$$

where $VA_{Chin,t}$ equals China's value-added in processing trade. Each year data on the total value of processed exports and the total value of imports for processing are used to calculate China's value-added. These data are obtained from China Customs Statistics.

In calculating the share of total costs for other supply chain economies, the focus is on the nine major suppliers. As ordered by their contributions in 2013, these are South Korea, Taiwan, Japan, the United States, Malaysia, Thailand, Singapore, Germany, and the Philippines. More than 80 percent of imports for processing other than those produced in China and round-tripped out of China and back in for tax purposes come from these nine economies. For these suppliers weights ($w_{i,t}$) are calculated by dividing their contribution to China's imports for processing by the amount of imports for processing coming from the nine major suppliers together.

A weighted bilateral exchange rate ($wrer_{j,t}$) between the nine supply chain countries and a country *j* that purchases China's processed exports can be calculating as the inner product of the weights and the bilateral real exchange rates between the countries supplying imports for processing and country *j*:

$$wrer_{j,t} = \sum_i w_{i,t} * rer_{i,j,t} . \quad (4)$$

$wrer_{j,t}$ can then be combined with the bilateral exchange rate between China and country *j* weighted by China's value-added in processing trade. This makes it possible to calculate a single integrated bilateral real exchange rate ($irer_{j,t}$) measuring how exchange rate changes affect the entire cost of China's exports of processed goods to country *j*:

$$irer_{j,t} = VA_{Chin,t} * rer_{Chin,j,t} + (1 - VA_{Chin,t}) * wrer_{j,t} . \quad (5)$$

China's value-added ($VA_{Chin,t}$), the weights ($w_{i,t}$) , and the exchange rates ($wrer_{j,t}$, $irer_{j,t}$) in equations (3) through (5) are recalculated for each year.

To calculate *irer* in this way it is necessary to use exchange rates that are comparable cross-sectionally. The CEPII-CHELEM exchange rates are thus used. As Bénassy-Quéré, Fontagné, and Lahrèche-Révil (2001) discussed, this real exchange rate variable measures the units of consumer goods in the exporting country needed to buy a unit of consumer goods in country *j*. An increase in the exchange rate represents an appreciation of the exporter's currency.

Data on $irer_{j,t}$, $wrer_{j,t}$, and $rer_{Chin,j,t}$ for each importing country are presented in Table A1 of the Appendix. Averages of these variables across all 24 countries weighted by the share of processed exports going to each of these 24 countries are presented in Figure 2. According to this measure the renminbi has appreciated by 45 percent between 2005 and 2013 but the integrated exchange rate has only appreciated by 7 percent. The reason for this is that weighted exchange rates in supply chain countries have depreciated.

Data on real GDP in the importing countries are also obtained from the CEPII-CHELEM database. Finally, Feenstra and Wei (2010) reported that 84 percent of processed exports are produced by foreign-invested enterprises. The stock of foreign direct investment (FDI) is thus included as an independent variable. Data on the stock of FDI are obtained from the United Nations Conference on Trade and Development (UNCTAD) website.[5]

Results from a battery of panel unit root tests indicate that in most cases the series are integrated of order one. Results from Kao residual cointegration tests indicate that there exist

[5] The website is www.unctad.org. The data are measured in U.S. dollars. Following Eichengreen and Tong (2007), they were deflated using the U.S. consumer price index.

cointegrating relationships between Chinese exports, the exchange rate variable, income in the rest of the world, and the stock of Chinese FDI.

Panel DOLS, a technique for estimating cointegrating relationships, is thus employed. The estimated model takes the form:

$$ex_{j,t} = \beta_0 + \beta_1 irer_{j,t} + \beta_2 y_{j,t}^{*} + \beta_3 FDI_t + \sum_{k=-p}^{p} \alpha_{1,k} \Delta irer_{j,t-k} + \sum_{k=-p}^{p} \alpha_{2,k} \Delta y_{j,t-k}^{*} \quad (6)$$
$$+ \sum_{k=-p}^{p} \alpha_{3,k} \Delta FDI_{t-k} + u_{i,j,t},$$
$$t = 1, \cdots, T; \qquad j = 1, \cdots, N.$$

Here $ex_{j,t}$ represents real processed exports from China to country j, $irer_{j,t}$ represents the integrated bilateral real exchange rate between supply chain countries (including China) and importing country j, $y_{j,t}^{*}$ represents real income in country j, and FDI_t is the stock of FDI in China. Country j fixed effects are always included and linear trends are sometimes included. The Mark and Sul (1999) approach is used to allow for heterogeneity in the long run variances. The number of lags and leads are determined for each cross section by the Schwarz Information Criterion. The results are similar, though, when DOLS (0,1), DOLS(1,0), and DOLS(1,1) models are estimated.

Table 1 presents the results. The first row presents results with a trend term included and the second row without a trend. The coefficient on the integrated bilateral real exchange rate is of the expected sign and statistically significant in both cases. With a trend included the results indicate that a 1 percent appreciation of *irer* would reduce processed exports by 1.3 percent. Without a trend the results imply that a 1 percent appreciation would reduce processed exports by 2.0 percent.

The coefficient on rest of the world (ROW) GDP is also of the expected sign and statistically significant. With a trend included the results indicate that a 1 percent increase in ROW GDP would increase exports by 1.8 percent. Without a trend the results imply that a 1 percent increase in ROW GDP would increase exports by 2.8 percent. The coefficient on FDI is of the expected sign when no trend is included but of the wrong sign when a trend term is included.

The important implication of these results is that exchange rates throughout the supply chain matter for China's processed exports. As Figure 2 shows, the depreciations in supply chain countries have largely offset the appreciation of the renminbi since 2005 and helped to maintain the price competitiveness of processed exports. In addition, ROW GDP significantly affects processed exports.

3. Time Series Evidence on Integrated Exchange Rates and Processed Exports

The imperfect substitutes model is again employed. Data on China's aggregate processed exports are obtained from the CEIC database. They are again deflated using the Hong Kong to US re-export unit value indices.

China's value-added and the weights ($w_{i,t}$) for the nine other supply chain countries are calculated as in the previous section. These data are converted to quarterly frequencies using linear interpolation methods. They are employed to calculate an integrated real effective exchange rate index ($ireer_t$) for the entire value of China's processed exports by using the following formula:

$$ireer_t = ireer_{t-1}(chinareer_t / chinareer_{t-1})^{VA_{Chin,t}} \prod_{i=1}^{9} (reer_{i,t} / reer_{i,t-1})^{(1-VA_{Chin,t})w_{i,t}}, \qquad (7)$$

where $chinareer_t$ is China's real effective exchange rate at time t and $reer_{i,t}$ is the real effective exchange rate for supply chain country *i* at time t. Real effective exchange rates are employed to calculate $ireer_t$ because they are the most widely used measure of a country's multilateral price competitiveness. An increase in $chinareer_t$, $reer_{i,t}$, and $ireer_t$ represent real exchange rate appreciations. $ireer_t$ is set equal to 100 in 1993q1.

Data on real effective exchange rates are taken from *International Financial Statistics* except for South Korea and Taiwan and Thailand. In these three cases the data are obtained from the Bank for International Settlements.[6] The exchange rates are CPI-deflated.

Data on the integrated real effective exchange rate, the renminbi real effective exchange rate, and the weighted real effective exchange rate in supply chain economies are presented in Table A2 of the Appendix and in Figure 3. The figure shows that, although the renminbi has appreciated 36 percent between 2005Q1 and 2013Q4, the $ireer_t$ has only appreciated by 14 percent. The reason for this is that the exchange rates in key supply chain countries have depreciated.

Since the lion's share of processed exports go to higher income countries, quarterly data on real GDP in OECD countries are used to represent real income in the importing countries. These data are seasonally adjusted and obtained from the OECD.[7]

Finally, data on the stock of FDI are obtained from the United Nations Conference on Trade and Development (UNCTAD) website. The data are converted to quarterly frequencies using linear interpolation methods.

[6] The websites for these data are: www.imf.org and www.bis.org.
[7] The website for these data is http://stats.oecd.org

Augmented Dickey-Fuller tests indicate that the series are integrated of order one. The trace statistic and the maximum eigenvalue statistic then permit rejection at the 5% level the null of no cointegrating relations against the alternative of one cointegrating relation.

The model can be written in vector error correction form as:

$$\Delta ex_t = \beta_{10} + \varphi_1(ex_{t-1} - \alpha_1 - \alpha_2 ireer_{t-1} - \alpha_3 y_{t-1}^* - \alpha_4 FDI_{t-1}) + \beta_{11}(L)\Delta ex_{t-1} + \beta_{12}(L)\Delta\, ireer_{t-1} + \beta_{13}(L)\Delta y_{t-1}^* + \beta_{14}(L)\Delta FDI_{t-1} + \nu_{1t} \quad (8a)$$

$$\Delta ireer_t = \beta_{20} + \varphi_2(ex_{t-1} - \alpha_1 - \alpha_2 ireer_{t-1} - \alpha_3 y_{t-1}^* - \alpha_4 FDI_{t-1}) + \beta_{21}(L)\Delta ex_{t-1} + \beta_{22}(L)\Delta\, ireer_{t-1} + \beta_{23}(L)\Delta y_{t-1}^* + \beta_{24}(L)\Delta FDI_{t-1} + \nu_{2t} \quad (8b)$$

$$\Delta y_t^* = \beta_{30} + \varphi_3(ex_{t-1} - \alpha_1 - \alpha_2 ireer_{t-1} - \alpha_3 y_{t-1}^* - \alpha_4 FDI_{t-1}) + \beta_{31}(L)\Delta ex_{t-1} + \beta_{32}(L)\Delta\, ireer_{t-1} + B_{33}(L)\Delta y_{t-1}^* + \beta_{34}(L)\Delta FDI_{t-1} + \nu_{3t} \quad (8c)$$

$$\Delta FDI_t = \beta_{40} + \varphi_4(ex_{t-1} - \alpha_1 - \alpha_2 ireer_{t-1} - \alpha_3 y_{t-1}^* - \alpha_4 FDI_{t-1}) + B_{41}(L)\Delta ex_{t-1} + \beta_{42}(L)\Delta\, ireer_{t-1} + \beta_{43}(L)\Delta y_{t-1}^* + \beta_{44}(L)\Delta FDI_{t-1} + \nu_{4t}\,. \quad (8d)$$

φ_1 , φ_2 , φ_3 , and φ_4 are error correction coefficients that measure how quickly exports, the real exchange rate, income, and FDI, respectively, respond to disequilibria. If these variables move towards their equilibrium values, the corresponding correction coefficients will be negative and statistically significant. The L's represent polynomials in the lag operator. Equations (8a) – (8d) are estimated using Johansen maximum likelihood methods.

The Schwarz Information Criterion indicates 1 lag. The sample period extends from 1993:Q3 to 2013Q4.

Table 2 presents the results of estimating the system (8a)-(8d). The first row presents the results with a time trend included and the second row presents results without a trend. In both cases the coefficient on $ireer_t$ is of the expected sign and statistically significant. With a trend included the results indicate that a 1 percent appreciation of the integrated exchange rate would

reduce processed exports by 2.9 percent. Without a trend the results imply that a 1 percent appreciation would reduce processed exports by 2.2 percent.[8]

The coefficient on rest of the world (ROW) GDP is also of the expected sign and statistically significant. With a trend included the results indicate that a 1 percent increase in ROW GDP would increase exports by 4.1 percent. Without a trend the results imply that a 1 percent increase in ROW GDP would increase exports by 7.9 percent.

The error correction coefficient for exports is negative and statistically significant, implying that exports move towards their equilibrium value. In the first row the gap between the actual value and the long run value closes at a rate of 37 percent per quarter and in the second row at a rate of 23 percent per quarter. These large and statistically significant values for φ_1 indicate that there is a tight relationship between processed exports, the integrated exchange rate, and income in the importing countries. This is especially true for the results with a trend term included. In this case the findings imply that when a shock causes exports to deviate from their equilibrium values, 85 percent of the gap will close within 4 quarters.

The error correction coefficients for the integrated exchange rate and rest of the world GDP are small and not statistically significant. This indicates that these variables are weakly exogenous. The estimated elasticities can thus be interpreted as the response of exports to exogenous changes in $ireer_t$ and y^*_t.

Processed exports fell logarithmically by almost 50 percent between 2008Q3 and 2009Q1 and then increased by 44 percent between 2009Q1 and 2009Q4. In 2009Q1 the predicted value from the model in the first row is only 5 percent greater than the actual value and the predicted

[8] Figure 3 indicates that there was a large drop in the Chinese REER in 1994 but that it had recovered by 1996. To test whether this influenced the results the model was re-estimated over the 1996-2013 sample period. The coefficient on $ireer_t$ remains statistically significant at the 1 percent level and equals 2.7 both with and without a trend term included.

value from the model in the second row is only 4 percent greater than the actual value. In 2009Q4 the predicted value from the model in the first row is only 3 percent less than the actual value and the predicted value from the model in the second row is only 5 percent less than the actual value. Thus the models explain the great trade collapse and subsequent recovery well.

Parameter values in this section differ from the values reported in Section 2 because this section uses a different methodology and different data. For instance, this section employs GDP in OECD countries while the previous section assigned equal weight to GDP in each importing country. However the results in both sections indicate that exchange rates across the supply chain and income in importing countries exert important effects of processed exports.

4. Conclusion

China's surpluses in processing trade between 2000 and 2013 cumulate to $3 trillion. Much of the value added of processed exports comes from imported parts and components. Processed exports are thus modeled here as a function of exchange rates throughout the supply chain (integrated exchange rates). This paper reports that processed exports are sensitive to integrated exchange rates.

Figures 2 and 3 indicate that, while China's exchange rate appreciated by between 36 and 45 percent from 2005Q1 and 2013Q4, weighted exchange rates in supply chain countries depreciated. As a result, integrated exchange rates only increased by between 7 and 14 percent over this period.

The large surpluses that supply chain economies run in processing trade and in their global current account surpluses generate appreciation pressure. For instance, the two largest suppliers are Taiwan and South Korea. Their global current account surpluses between 2005 and

2013 averaged almost 9 percent of GDP and almost 3 percent of GDP, respectively. However, Taiwan's REER depreciated over this period and Korea's REER appreciated by less than 5 percent. Taiwan and Korea have used foreign exchange reserve accumulation to slow the rate of appreciation. China has also, and its foreign exchange reserves increased by $508 billion in 2013 and by $125 billion in the first quarter of 2014.[9]

Policymakers and international organizations such as the IMF and the ASEAN+3 Macroeconomic Research Office (AMRO) conduct surveillance at the country level. When China runs a current account surplus, they recommend greater flexibility of the renminbi. However, if this causes the renminbi to appreciate while exchange rates depreciate in surplus countries that supply parts and components, the source of China's surplus (processing trade) will not be affected but China's low margin labor-intensive trade (ordinary trade) will fall further into deficit. Exchange rate flexibility in this case needs to be advocated, not at the country level but at the level of the processing supply chain. If central banks in China and other surplus countries together reduced their rates of reserve accumulation and gave greater play to market forces, the surpluses that they run in processing trade and in their overall current account balances would generate a concerted appreciation of East Asian currencies against importers' currencies and help to rebalance processing trade.

Such an appreciation would have an attenuated effect on the export competition between East Asian economies in third countries because their currencies would be appreciating together. A joint appreciation would maintain intra-regional exchange rate stability and facilitate the flow of parts and components within production networks (see Tang, 2014). It would also reduce the misallocation of resources that occurs when central banks sterilize the impact of reserve

[9] The increase in 2013 was China's largest one year increase ever (see Troutman, 2014).

accumulation on domestic liquidity (see Yu, 2014). Finally it would increase citizens' purchasing power and redirect final goods to Asia.

Table 1 Panel DOLS estimates for Chinese processed exports to 24 countries over the 1993-2013 period.

	Cointegrating Relationship	Integrated Bilateral Real Exchange Rate Elasticity	Income elasticity	FDI elasticity	Summary Statistics		
					Adjusted R-squared	S.E. of regression	Sum of squared residuals
Processed Exports CPI-deflated integrated bilateral real exchange rate. 21 years; 24 cross sections; Cross sectional constants and deterministic trends; Long-run variance weights (Bartlett kernel, Newey-West fixed bandwidth)	Yes	-1.25*** (0.07)	1.77*** (0.31)	-0.80*** (0.05)	0.994	0.134	6.21
Processed Exports CPI-deflated integrated bilateral real exchange rate. 21 years; 24 cross sections; Cross sectional constants; Long-run variance weights (Bartlett kernel, Newey-West fixed bandwidth)	Yes	-1.96*** (0.09)	2.84*** (0.16)	0.31*** (0.04)	0.979	0.257	25.6

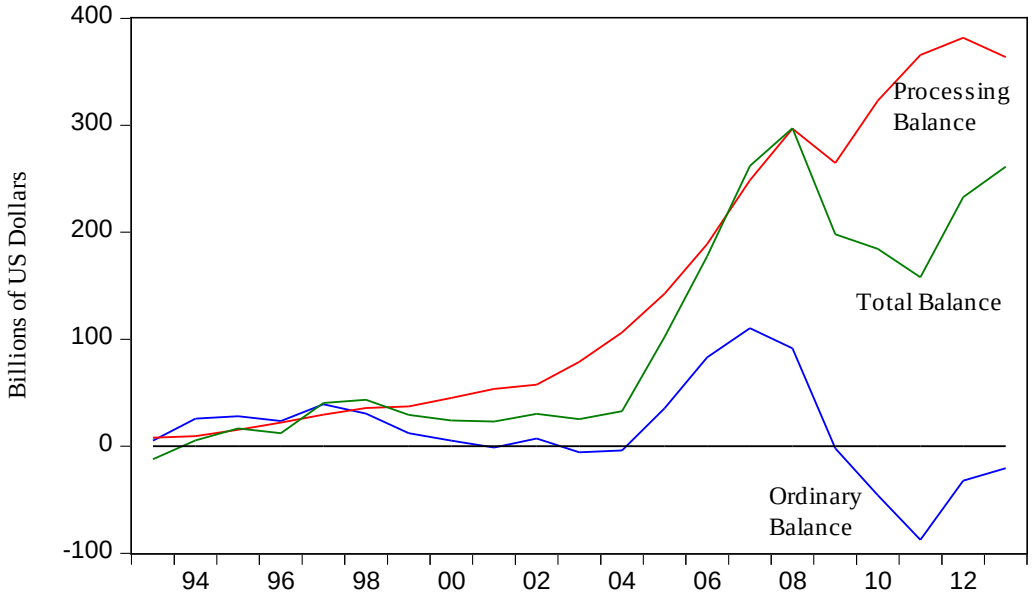
Notes: Lag length for each cross section is selected based on the Schwarz Criterion. Cointegrating relationships are determined by Kao residual cointegration tests. An increase of the integrated bilateral real exchange rate implies an appreciation across the supply chain relative to the importing country. The predicted sign of the coefficient is thus negative.
*** denotes significance at the 1% level.

Table 2. Johansen MLE Estimates for Chinese Processed Exports to the World over the 1993-2013 period.

	Number of Cointe-grating Vectors	Number of Obser-vations	Integrated Real Effective Exchange Rate Elasticity	Income Elastic-ity	FDI Elasticity	Error Correction Coefficients:			
						Exports	Integrated Real Effective Exchange Rate	Income	FDI Stock
Processed Exports (Lags: 1; Sample: 1993:III-2013:IV; Trend in cointegrating equation; Seasonal dummies for the first, second, and third quarters included)	1,1	82	-2.91*** (0.64)	4.06*** (1.02)	-0.51*** (0.14)	-0.37*** (0.07)	-0.01 (0.01)	-0.00 (0.00)	0.02 (0.01)
Processed Exports (Lags: 1; Sample: 1993:III-2013:IV; Seasonal dummies for the first, second, and third quarters included)	1,1	82	-2.24*** (0.77)	7.85*** (0.57)	-0.26** (0.12)	-0.23*** (0.07)	0.00 (0.01)	-0.00 (0.00)	0.03*** (0.01)

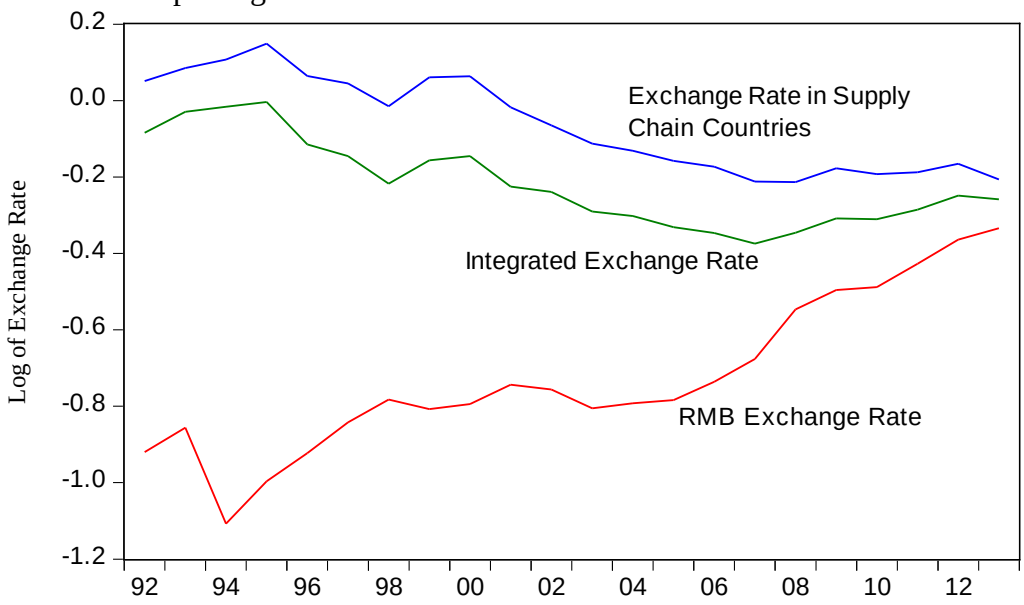
Notes: Number of Cointegrating Vectors indicates the number of cointegrating relations according to the trace and maximum eigenvalue tests using 5% asymptotic critical values. An increase in the integrated real effective exchange rate implies an appreciation across the supply chain. The predicted sign of the coefficient is thus negative.
*** (**) denotes significance at the 1% (5%) level.

Figure 1. China's Ordinary, Processing, and Total Trade Balances



Source: China Customs Statistics.

Figure 2. Weighted Averages of the Bilateral Integrated Exchange Rate, the Bilateral Exchange Rate in Supply Chain Countries, and the Bilateral RMB Exchange Rate with 24 Importing Countries



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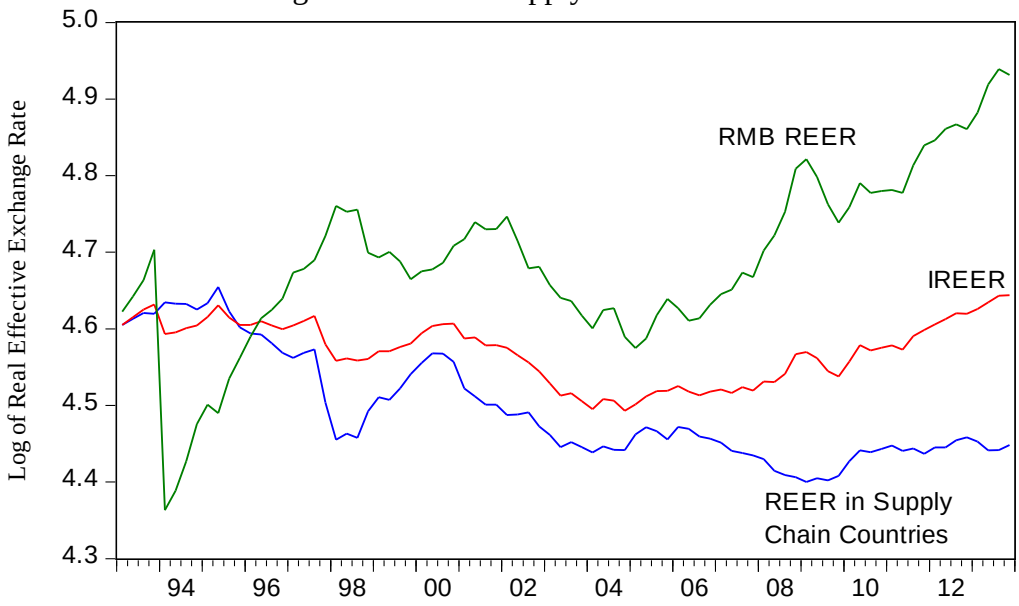
Source: The CEPII-CHELEM database, China Customs Statistics, and calculations by the author.

Note: Weights are determined by the share of processed exports going to each of the 24 countries.

Figure 3. The Integrated Real Effective Exchange Rate (IREER), the RMB REER and the Weighted REER in Supply Chain Countries



Source: The Bank for International Settlements, China Customs Statistics, the International Monetary Fund *International Financial Statistics*, and calculations by the author.

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Appendix

Table A1 Data on the integrated bilateral real exchange rate (*irer*), the weighted bilateral real exchange rate with supply chain countries (*wrer*), and the bilateral real exchange rate with China ($rer_{Chin,j}$).[1]

	Australia			Austria			Belgium & Luxembourg		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	0.985012	1.128234	0.427333	0.772132	0.884401	0.334978	0.808536	0.926099	0.350772
1993	1.149876	1.289634	0.50321	0.869026	0.97465	0.380305	0.913151	1.024137	0.399614
1994	1.100647	1.245197	0.369619	0.874667	0.989538	0.29373	0.908133	1.0274	0.304969
1995	1.125386	1.311002	0.416946	0.806565	0.939596	0.298825	0.840265	0.978854	0.311311
1996	0.935907	1.11933	0.417201	0.746479	0.892776	0.332759	0.779815	0.932646	0.347619
1997	0.888102	1.074733	0.442433	0.785716	0.950831	0.391426	0.815325	0.986662	0.406177
1998	0.908629	1.113006	0.516247	0.691291	0.846783	0.392765	0.707816	0.867025	0.402154
1999	0.927724	1.152773	0.483856	0.773588	0.961246	0.403466	0.788847	0.980206	0.411424
2000	1.003119	1.236202	0.524289	0.902482	1.112181	0.47169	0.910642	1.122238	0.475955
2001	0.979995	1.205617	0.583663	0.816989	1.005082	0.486581	0.824225	1.013984	0.49089
2002	0.911639	1.08517	0.543477	0.771172	0.917965	0.459737	0.77211	0.919081	0.460296
2003	0.758343	0.905903	0.453225	0.650563	0.777151	0.38881	0.643984	0.769291	0.384878
2004	0.672312	0.797425	0.411632	0.607007	0.719967	0.371648	0.598346	0.709695	0.366345
2005	0.624001	0.742113	0.396871	0.600178	0.71378	0.381719	0.588374	0.699742	0.374211
2006	0.604387	0.719	0.409301	0.585082	0.696034	0.396227	0.568663	0.676502	0.385108
2007	0.537785	0.632324	0.397442	0.543489	0.639031	0.401657	0.525477	0.617853	0.388346
2008	0.54436	0.62185	0.445549	0.53181	0.607512	0.435276	0.51304	0.586071	0.419914
2009	0.578763	0.659844	0.480018	0.550785	0.627947	0.456814	0.533873	0.608665	0.442787
2010	0.494384	0.556519	0.414088	0.606812	0.683076	0.508255	0.582051	0.655204	0.487516
2011	0.470418	0.51869	0.408379	0.615437	0.67859	0.534273	0.589191	0.649651	0.511489
2012	0.479045	0.520416	0.426873	0.66491	0.722333	0.592496	0.633008	0.687676	0.564068
2013	0.494015	0.520358	0.458008	0.612598	0.645264	0.567947	0.586478	0.617751	0.543731

	Brazil			Canada			Denmark		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	2.007601	2.299509	0.870969	0.922255	1.056352	0.400107	0.650196	0.744735	0.282078
1993	2.045807	2.294459	0.895289	1.060198	1.189057	0.463965	0.758064	0.850201	0.331745
1994	1.817166	2.055818	0.61024	1.166049	1.319188	0.391582	0.769696	0.870781	0.258479
1995	1.433701	1.670168	0.531173	1.218948	1.419996	0.45161	0.712172	0.829635	0.263854
1996	1.191622	1.425161	0.531192	1.058836	1.266351	0.471999	0.642052	0.767883	0.286208
1997	1.081653	1.308958	0.538856	0.967944	1.171353	0.482208	0.653226	0.790498	0.325423
1998	0.972095	1.190748	0.552307	0.906278	1.110126	0.514912	0.569945	0.698142	0.32382
1999	1.507241	1.87287	0.786104	0.959525	1.192288	0.500442	0.627669	0.779929	0.327362
2000	1.45705	1.795608	0.76154	0.937767	1.155666	0.490132	0.718892	0.885933	0.375735
2001	1.539939	1.894475	0.917154	0.866292	1.065737	0.515945	0.646882	0.795812	0.385268

2002	1.744358	2.076396	1.039904	0.872697	1.038815	0.520261	0.602822	0.71757	0.359374
2003	1.647785	1.968414	0.984802	0.771917	0.922118	0.461338	0.506402	0.604939	0.302652
2004	1.51336	1.794988	0.926575	0.725077	0.860009	0.443938	0.46978	0.557203	0.287629
2005	1.186896	1.411554	0.754877	0.660566	0.785599	0.420126	0.461871	0.549295	0.293755
2006	1.001508	1.19143	0.678238	0.60342	0.71785	0.408646	0.44934	0.534552	0.304301
2007	0.875095	1.028932	0.646726	0.572409	0.673036	0.423031	0.415747	0.488833	0.307252
2008	0.810443	0.925809	0.663333	0.581867	0.664696	0.476248	0.397941	0.454588	0.325707
2009	0.822523	0.937753	0.68219	0.634122	0.722958	0.525932	0.414735	0.472836	0.343975
2010	0.712481	0.802025	0.596761	0.591479	0.665817	0.495413	0.445147	0.501094	0.372848
2011	0.688002	0.758602	0.597269	0.597932	0.65929	0.519077	0.458779	0.505857	0.398275
2012	0.774944	0.84187	0.690547	0.605515	0.657809	0.53957	0.491923	0.534407	0.438349
2013	0.793967	0.836304	0.736097	0.596442	0.628246	0.552969	0.464342	0.489102	0.430498

	Finland			France			Germany		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	0.686777	0.786635	0.297948	0.763347	0.874339	0.331167	0.770957	0.883055	0.334468
1993	0.938832	1.05294	0.410853	0.876903	0.983483	0.383751	0.857624	0.961862	0.375315
1994	0.887675	1.004255	0.298099	0.893403	1.010736	0.300022	0.863123	0.976479	0.289854
1995	0.755167	0.87972	0.279783	0.84393	0.983124	0.312669	0.794821	0.925914	0.294474
1996	0.708407	0.847243	0.315788	0.757406	0.905845	0.33763	0.736803	0.881204	0.328446
1997	0.715139	0.865422	0.356267	0.780175	0.944125	0.388666	0.771503	0.933631	0.384346
1998	0.619452	0.758785	0.351948	0.679166	0.83193	0.385875	0.67726	0.829596	0.384793
1999	0.689355	0.85658	0.359534	0.761039	0.945653	0.396921	0.758511	0.942511	0.395603
2000	0.790966	0.974754	0.413405	0.882128	1.087099	0.461052	0.89907	1.107977	0.469907
2001	0.708118	0.871147	0.42174	0.797467	0.981066	0.474954	0.819924	1.008693	0.488328
2002	0.668198	0.795389	0.398348	0.745538	0.887452	0.444455	0.77248	0.919522	0.460516
2003	0.574115	0.685827	0.343121	0.623711	0.745073	0.372762	0.652005	0.778873	0.389672
2004	0.542075	0.642952	0.331893	0.582004	0.690312	0.35634	0.612038	0.725935	0.374729
2005	0.544395	0.647439	0.34624	0.576173	0.685232	0.366451	0.613698	0.72986	0.390318
2006	0.536161	0.637836	0.363097	0.560272	0.666519	0.379425	0.607641	0.722871	0.411504
2007	0.493281	0.579997	0.364552	0.517487	0.608459	0.382442	0.566524	0.666115	0.418681
2008	0.476949	0.544842	0.390374	0.502322	0.573827	0.411141	0.559571	0.639225	0.457998
2009	0.494475	0.563748	0.410111	0.524695	0.598202	0.435175	0.581814	0.663322	0.482549
2010	0.550734	0.619951	0.461286	0.580816	0.653813	0.486481	0.643577	0.724462	0.539049
2011	0.554625	0.611539	0.481482	0.593473	0.654373	0.515206	0.657965	0.725482	0.571192
2012	0.592288	0.64344	0.527784	0.642312	0.697784	0.57236	0.712558	0.774096	0.634955
2013	0.545197	0.574269	0.505459	0.596577	0.628389	0.553095	0.663826	0.699223	0.615442

	Italy			Japan			South Korea		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	0.783064	0.896922	0.339721	0.640289	0.733388	0.27778	1.824399	2.08967	0.791489
1993	1.051623	1.17944	0.460213	0.611548	0.685876	0.267626	1.937014	2.172444	0.847679

1994	1.093649	1.23728	0.367269	0.590045	0.667537	0.198149	1.996707	2.258939	0.670533
1995	1.120031	1.304764	0.414962	0.581806	0.677766	0.215554	1.955774	2.27835	0.724597
1996	0.899474	1.075756	0.40096	0.60118	0.719001	0.267989	1.683715	2.013696	0.750553
1997	0.881903	1.067231	0.439345	0.605579	0.732839	0.301686	1.657469	2.005778	0.825714
1998	0.762039	0.933444	0.432961	0.570447	0.698757	0.324106	1.854375	2.271479	1.053584
1999	0.842866	1.047329	0.439598	0.540782	0.671966	0.282046	1.93045	2.398741	1.00683
2000	0.973408	1.199587	0.50876	0.527482	0.650047	0.275693	1.805569	2.225109	0.943697
2001	0.872597	1.073493	0.519699	0.53929	0.663449	0.321189	1.643306	2.021641	0.978717
2002	0.807952	0.961746	0.481663	0.56803	0.676155	0.338633	1.601489	1.906332	0.954732
2003	0.668575	0.798668	0.399575	0.546809	0.653208	0.326802	1.586474	1.895173	0.948159
2004	0.619494	0.734779	0.379294	0.539949	0.640431	0.330591	1.562072	1.852765	0.956399
2005	0.613861	0.730053	0.390421	0.562859	0.669397	0.357983	1.445011	1.718524	0.91904
2006	0.599461	0.713141	0.405965	0.601798	0.715921	0.407548	1.34862	1.604367	0.913308
2007	0.554839	0.652376	0.410045	0.635828	0.747603	0.469899	1.245694	1.46468	0.920612
2008	0.538625	0.615298	0.440855	0.602163	0.687881	0.49286	1.165702	1.331639	0.954106
2009	0.55505	0.632809	0.460351	0.546615	0.623192	0.453355	1.308166	1.491431	1.084975
2010	0.617922	0.695582	0.51756	0.55846	0.628648	0.467757	1.223841	1.377654	1.025068
2011	0.631078	0.695837	0.547852	0.562106	0.619787	0.487976	1.197564	1.320453	1.039629
2012	0.682472	0.741412	0.608146	0.575756	0.62548	0.513052	1.218569	1.323807	1.085858
2013	0.63403	0.667839	0.587818	0.678684	0.714874	0.629217	1.208749	1.273203	1.120646

	Malaysia			Netherlands			New Zealand		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	0.879852	1.007783	0.381711	1.115603	1.277813	0.483988	2.14018	2.451365	0.928486
1993	0.999396	1.120865	0.437357	1.191657	1.336493	0.521494	2.326722	2.609518	1.018224
1994	1.008374	1.140805	0.338632	1.117106	1.263818	0.375146	2.165474	2.44987	0.727208
1995	0.927148	1.080068	0.3435	1.052314	1.225878	0.389873	2.084691	2.42853	0.772359
1996	0.853852	1.021193	0.380623	0.87891	1.051162	0.391793	1.753988	2.097741	0.781878
1997	0.877179	1.061514	0.436991	0.826243	0.999874	0.411616	1.691087	2.046461	0.842462
1998	0.761437	0.932707	0.432619	0.884893	1.083931	0.502761	1.668449	2.043733	0.947948
1999	0.839049	1.042586	0.437607	0.955159	1.186863	0.498165	1.609412	1.999826	0.839392
2000	0.948738	1.169185	0.495866	1.097858	1.352956	0.573805	1.752459	2.159658	0.915938
2001	0.832508	1.024174	0.495823	1.025251	1.261292	0.610617	1.716067	2.111153	1.022052
2002	0.766249	0.912104	0.456802	0.934771	1.112704	0.557266	1.675651	1.994611	0.998944
2003	0.639899	0.764412	0.382437	0.74165	0.885961	0.443248	1.745202	2.084786	1.043023
2004	0.602692	0.71485	0.369006	0.656903	0.779149	0.402198	1.784873	2.117028	1.092812
2005	0.593648	0.706015	0.377566	0.612143	0.728011	0.389329	1.675307	1.992411	1.065511
2006	0.579381	0.689253	0.392367	0.644125	0.766275	0.436213	1.489785	1.772303	1.008908
2007	0.53902	0.633776	0.398355	0.561552	0.66027	0.415007	1.343546	1.579733	0.992928
2008	0.525339	0.600121	0.42998	0.609328	0.696066	0.498724	1.282545	1.465114	1.049739
2009	0.55213	0.62948	0.457929	0.678767	0.773858	0.56296	1.3348	1.521797	1.107065
2010	0.612014	0.688932	0.512612	0.598391	0.673598	0.501202	1.291054	1.453314	1.081364

2011	0.626296	0.690564	0.5437	0.584218	0.644168	0.507171	1.294537	1.427377	1.123814
2012	0.679293	0.737958	0.605312	0.580396	0.63052	0.517186	1.257936	1.366574	1.120937
2013	0.627259	0.660706	0.58154	0.542053	0.570957	0.502544	1.199447	1.263406	1.112023

	Philippines			Russian Federation			Singapore		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	6.02222	6.89786	2.612654	1.291443	1.47922	0.560274	1.159943	1.3286	0.503224
1993	6.354642	7.126999	2.780927	1.286104	1.44242	0.562827	1.224334	1.373143	0.535795
1994	3.61682	4.091824	1.214599	1.294904	1.464966	0.434854	1.195895	1.352954	0.401605
1995	3.282638	3.82406	1.216188	1.266216	1.475059	0.469122	1.136384	1.323814	0.42102
1996	2.24668	2.686993	1.001507	1.033096	1.235566	0.460525	1.00317	1.199775	0.447185
1997	2.00922	2.431448	1.000949	0.924826	1.119174	0.460728	1.040656	1.259345	0.518432
1998	2.473282	3.029596	1.405222	0.859087	1.052322	0.4881	1.271101	1.557009	0.72219
1999	3.912947	4.862155	2.040805	1.093835	1.35918	0.570492	1.17198	1.45628	0.611248
2000	3.306992	4.075401	1.728429	1.088296	1.341172	0.568808	1.123999	1.38517	0.587468
2001	2.636827	3.243898	1.570436	1.014039	1.247499	0.60394	1.106552	1.361312	0.659038
2002	2.463553	2.93249	1.468655	1.068618	1.272029	0.63706	1.044042	1.242776	0.622409
2003	2.16923	2.591322	1.296444	1.109547	1.325444	0.663123	0.982579	1.173771	0.587241
2004	1.767217	2.096086	1.082002	1.079515	1.280406	0.660947	0.956738	1.134782	0.585776
2005	1.469266	1.74737	0.934467	1.036831	1.233084	0.659434	0.858833	1.021394	0.546226
2006	1.228766	1.461785	0.832141	1.002473	1.192578	0.678891	0.803378	0.955727	0.544061
2007	1.050091	1.234691	0.776054	0.931009	1.094675	0.688049	0.791832	0.931031	0.585192
2008	0.921358	1.052513	0.754115	0.951509	1.086956	0.778793	0.972101	1.110479	0.795646
2009	1.15104	1.312294	0.954658	0.868073	0.989684	0.719968	1.086517	1.238731	0.901143
2010	1.027603	1.156753	0.860703	0.948877	1.068132	0.794762	1.011533	1.138663	0.847243
2011	0.934798	1.030723	0.811517	0.960854	1.059453	0.834137	1.037475	1.143937	0.900653
2012	0.918845	0.998199	0.818776	0.881932	0.958097	0.785883	1.060839	1.152455	0.945305
2013	0.868059	0.914347	0.804789	0.853477	0.898987	0.791269	0.999566	1.052866	0.92671

	Spain			Sweden			Taiwan		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	0.938256	1.07468	0.407049	0.555988	0.636829	0.241207	1.059369	1.213403	0.459592
1993	1.218969	1.367125	0.533447	0.786364	0.88194	0.34413	1.173403	1.316021	0.513506
1994	1.29809	1.46857	0.435924	0.798277	0.903116	0.268077	1.215756	1.375424	0.408275
1995	1.224799	1.426811	0.453777	0.756849	0.881679	0.280406	1.265148	1.473816	0.468726
1996	1.068501	1.27791	0.476308	0.627007	0.749891	0.279502	1.132099	1.353972	0.504658
1997	1.099042	1.33	0.547518	0.640643	0.775272	0.319154	1.048493	1.268829	0.522336
1998	0.95221	1.16639	0.541009	0.577385	0.707256	0.328048	1.025065	1.255633	0.582402
1999	1.043256	1.296331	0.544112	0.6397	0.794879	0.333637	1.075006	1.335782	0.560671
2000	1.187946	1.463976	0.620891	0.712086	0.877546	0.372178	1.061553	1.308214	0.55483
2001	1.051482	1.293562	0.62624	0.702422	0.864139	0.418347	1.038593	1.277705	0.618563
2002	0.962902	1.146191	0.574037	0.655462	0.78023	0.390756	1.071725	1.275728	0.638912

2003	0.788811	0.942298	0.471434	0.547351	0.653855	0.327125	1.10157	1.315915	0.658355
2004	0.719308	0.853168	0.440406	0.517594	0.613916	0.316904	1.11594	1.32361	0.683249
2005	0.695506	0.827153	0.442348	0.527186	0.626972	0.335295	1.100297	1.308563	0.699799
2006	0.663325	0.789115	0.449214	0.511556	0.608565	0.346434	1.126871	1.340566	0.763136
2007	0.608634	0.715629	0.449802	0.471425	0.554299	0.3484	1.181968	1.389751	0.873516
2008	0.591761	0.675998	0.484346	0.474852	0.542447	0.388658	1.245827	1.423169	1.019686
2009	0.622073	0.709221	0.515939	0.539063	0.614582	0.447092	1.293635	1.474865	1.072924
2010	0.694671	0.781978	0.581845	0.536321	0.603726	0.449213	1.346089	1.515266	1.127461
2011	0.718818	0.79258	0.624021	0.519086	0.572352	0.450629	1.404264	1.548364	1.21907
2012	0.789988	0.858214	0.703953	0.544488	0.591511	0.485189	1.414233	1.53637	1.260213
2013	0.739633	0.779073	0.685724	0.506118	0.533106	0.469229	1.373278	1.446506	1.273184

	Thailand			U.K.			U.S.		
	irer	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$	*irer*	*wrer*	$rer_{Chin,j}$
1992	1.708104	1.956465	0.741036	0.838469	0.960383	0.363758	0.941159	1.078005	0.408308
1993	1.801156	2.020073	0.788225	1.05214	1.18002	0.460439	1.004409	1.126487	0.439551
1994	1.787109	2.021813	0.600146	1.07117	1.211849	0.35972	1.033543	1.169281	0.347084
1995	1.783479	2.077637	0.660763	1.078981	1.256942	0.399753	1.076901	1.25452	0.398982
1996	1.549671	1.853381	0.6908	0.943281	1.128148	0.420488	0.939668	1.123827	0.418877
1997	1.679042	2.031885	0.836462	0.804662	0.973758	0.400865	0.84167	1.018543	0.419301
1998	1.763717	2.160429	1.002075	0.679206	0.831979	0.385898	0.724537	0.887507	0.411654
1999	1.807388	2.245826	0.942646	0.731913	0.909461	0.381731	0.768331	0.954714	0.400724
2000	1.926086	2.373629	1.006686	0.790565	0.97426	0.413196	0.764885	0.942613	0.399774
2001	1.872324	2.303385	1.115115	0.727659	0.895186	0.433377	0.669787	0.823991	0.398911
2002	1.804699	2.148224	1.075877	0.685531	0.816021	0.408681	0.662982	0.789181	0.395239
2003	1.759944	2.102396	1.051834	0.630283	0.752925	0.37669	0.665135	0.794558	0.397519
2004	1.727123	2.048531	1.057454	0.573132	0.679788	0.350907	0.675735	0.801486	0.413728
2005	1.67017	1.986302	1.062244	0.571974	0.680239	0.363781	0.661593	0.78682	0.420779
2006	1.497571	1.781565	1.01418	0.550521	0.65492	0.372822	0.64309	0.765043	0.435511
2007	1.363605	1.603319	1.007752	0.511555	0.601484	0.378057	0.647625	0.761474	0.478618
2008	1.348914	1.540931	1.104061	0.574826	0.656652	0.470484	0.676697	0.773024	0.553864
2009	1.358654	1.548993	1.12685	0.662029	0.754775	0.549078	0.669984	0.763845	0.555676
2010	1.290571	1.452771	1.08096	0.689753	0.776441	0.577725	0.705324	0.793969	0.590767
2011	1.294382	1.427205	1.123679	0.706272	0.778747	0.613129	0.751426	0.828534	0.652328
2012	1.322312	1.43651	1.178302	0.715561	0.777359	0.637631	0.750062	0.814839	0.668375
2013	1.208843	1.273303	1.120734	0.701311	0.738707	0.650194	0.718688	0.757011	0.666305

Source: The CEPII-CHELEM database, China Customs Statistics, and calculations by the author.

Table A2 Data on the integrated real effective exchange rate (*ireer*), the weighted real effective exchange rate with supply chain countries (*wreer*), and the renminbi real effective exchange rate (*chinareer*).

	ireer	*wreer*	*chinareer*
1993Q1	100	100	101.737
1993Q2	100.9865	100.7794	103.787
1993Q3	102.0217	101.5795	106.03
1993Q4	102.6948	101.4478	110.313
1994Q1	98.81108	102.9879	78.52
1994Q2	99.02631	102.8054	80.5367
1994Q3	99.56995	102.7569	83.6933
1994Q4	99.91277	102.0172	87.85
1995Q1	101.0413	102.8683	90.1233
1995Q2	102.6043	105.0902	89.1267
1995Q3	100.9648	101.7879	93.2367
1995Q4	99.99681	99.67599	95.7733
1996Q1	100.0069	98.89542	98.4633
1996Q2	100.4606	98.74595	100.857
1996Q3	99.92205	97.62299	101.973
1996Q4	99.4485	96.41248	103.467
1997Q1	99.91263	95.78245	107.05
1997Q2	100.5191	96.40485	107.583
1997Q3	101.1943	96.8534	108.82
1997Q4	97.49331	90.35008	112.32
1998Q1	95.43014	86.07362	116.8
1998Q2	95.7057	86.75078	115.92
1998Q3	95.46093	86.2832	116.24
1998Q4	95.63717	89.32398	109.9
1999Q1	96.60259	90.99636	109.217
1999Q2	96.61031	90.68804	109.983
1999Q3	97.15378	92.03063	108.627
1999Q4	97.60107	93.77064	106.13
2000Q1	98.90687	95.1468	107.257
2000Q2	99.84298	96.36375	107.517
2000Q3	100.0903	96.30204	108.46
2000Q4	100.1689	95.2813	110.88
2001Q1	98.22667	92.02104	111.83
2001Q2	98.38433	91.09205	114.357
2001Q3	97.36277	90.09781	113.277
2001Q4	97.39245	90.11397	113.337
2002Q1	97.05423	88.90787	115.21

2002Q2	96.10791	88.95178	111.56
2002Q3	95.21762	89.20709	107.65
2002Q4	94.10608	87.59508	107.883
2003Q1	92.66002	86.59989	105.33
2003Q2	91.18459	85.24992	103.577
2003Q3	91.45698	85.79578	103.167
2003Q4	90.50692	85.24927	101.217
2004Q1	89.59358	84.64552	99.5333
2004Q2	90.77075	85.34333	101.963
2004Q3	90.56706	84.95472	102.217
2004Q4	89.38511	84.90497	98.4567
2005Q1	90.13448	86.66213	97.0267
2005Q2	91.09422	87.49942	98.25
2005Q3	91.72327	87.03373	101.273
2005Q4	91.76147	86.11969	103.45
2006Q1	92.32003	87.50747	102.203
2006Q2	91.66336	87.32334	100.55
2006Q3	91.19616	86.44936	100.86
2006Q4	91.6633	86.18125	102.67
2007Q1	91.90455	85.75889	104.097
2007Q2	91.50988	84.81733	104.72
2007Q3	92.19244	84.60896	107.08
2007Q4	91.77365	84.31959	106.42
2008Q1	92.85605	83.91261	110.19
2008Q2	92.81755	82.65786	112.39
2008Q3	93.80207	82.18524	115.903
2008Q4	96.23674	81.9714	122.61
2009Q1	96.51239	81.46277	124.163
2009Q2	95.7464	81.86655	121.293
2009Q3	94.11876	81.63555	117.033
2009Q4	93.46906	82.10617	114.263
2010Q1	95.31319	83.68373	116.597
2010Q2	97.38858	84.8804	120.333
2010Q3	96.70451	84.67548	118.787
2010Q4	97.05608	85.04497	119.11
2011Q1	97.35318	85.43102	119.247
2011Q2	96.80914	84.82994	118.81
2011Q3	98.52951	85.09246	123.153
2011Q4	99.32693	84.5124	126.43
2012Q1	100.0704	85.22216	127.237
2012Q2	100.7428	85.22727	129.17
2012Q3	101.5162	86.01293	129.91
2012Q4	101.4684	86.34236	129.103

2013Q1	102.0797	85.85703	131.917
2013Q2	102.9707	84.87876	136.873
2013Q3	103.8851	84.92745	139.643
2013Q4	103.9413	85.47894	138.597

Source: The Bank for International Settlements, China Customs Statistics, the International Monetary Fund *International Financial Statistics*, and calculations by the author.