



RIETI Policy Discussion Paper Series 12-P-006

# **East Asian Supply Chains and Relative Prices: A survey of the evidence**

**THORBECKE, Willem**  
RIETI



Research Institute of Economy, Trade & Industry, IAA

The Research Institute of Economy, Trade and Industry  
<http://www.rieti.go.jp/en/>

## **East Asian Supply Chains and Relative Prices: A survey of the evidence**

Willem THORBECKE\*

Research Institute of Economy, Trade and Industry

### **Abstract**

This paper provides an analytical description of East Asian supply chains. The data indicate that they have become more and more centered on China. In a value-added sense, though, East Asia as a whole is running surpluses against the West. The paper then surveys evidence from a variety of sources indicating that an appreciation throughout East Asian supply chain countries would help to rebalance trade within regional production networks.

RIETI Policy Discussion Papers Series is created as part of RIETI research and aims to contribute to policy discussions in a timely fashion. The views expressed in these papers are solely those of the author(s), and do not represent those of the Research Institute of Economy, Trade and Industry.

---

\* Address: Research Institute of Economy, Trade and Industry, 1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo, 100-8901 Japan; Tel.: + 81-3-3501-8248; Fax: +81-3-3501-8414; E-mail: willem-thorbecke@rieti.go.jp

## **1. Introduction**

Final production within East Asian supply chains has become more and more centered around China. In 2000 the value of China's final electronics goods (FEG) exports to the world equaled \$50 billion, less than the value of FEG exports from either Japan and ASEAN and about the same as the value of FEG exports from the newly industrialized economies (NIEs) of South Korea and Taiwan. By 2010 China's exports of final electronics goods equaled \$415 billion, almost twice the value of FEG exports from Japan, ASEAN, and the NIEs combined.

While China has specialized in exporting final goods, the rest of East Asia has specialized in producing or adding value to the parts and components that are used to make these final goods. In 2010 East Asian countries other than China exported more than \$330 billion of intermediate goods to other East Asian countries. Half of these goods eventually flowed to China. Thus much of the value-added of China's final goods comes from the East Asian supply chain countries.

China's surplus in processing trade has exploded, reaching \$370 billion in 2011. This paper will show that, in a value-added sense, this surplus is primarily between East Asia and the West. These burgeoning imbalances put pressure on relative prices to adjust. China has so far resisted exchange rate appreciations, however, first by accumulating \$3.2 trillion in reserves and more recently by stockpiling commodities. Ma and McCauley (2011) showed that in periods when China increased the flexibility of the renminbi, emerging Asian currencies tend to move together with the RMB. Henning and Katada (2011) demonstrated that currencies in emerging Asia now track the renminbi closely. Thus if the renminbi does not appreciate, currencies in supply chain countries will tend not to appreciate either.

Suppose that the renminbi were to appreciate against Western currencies in response to China's surplus in processing trade, and exchange rates in supply chain countries were to appreciate also. How would these exchange rate changes affect processing trade? This paper reviews evidence that concerted appreciations in East Asia would help to rebalance processing trade. This in turn would reduce unsustainable imbalances and help more of the fruits of economic growth to be channeled to East Asia consumers.

The next section provides an analytical description of East Asian supply chains and the central role that China plays within these production networks. Section 3 summarizes several recent studies that have examined how exchange rates changes and other variables affect processing trade. Section 4 concludes.

## **2. An Analytical Description of China's Trade**

Figures 1a and 1b show the composition of China's exports and imports in 1993. Figures 2a and 2b show the composition of exports and imports in 2010.

Figure 1 indicates that China in 1993 resembled a typical developing country. Its exports and imports were both below \$100 billion. It exported largely labor-intensive goods. 40 percent of its exports were textiles. Its imports were largely sophisticated, technology-intensive goods such as machinery and electronics products. Its trade surplus was also less than \$1 billion.

Figure 2 shows that China's trade has progressed remarkably over the last 18 years. It is now the world's largest exporter, with a value of almost \$1.6 trillion in 2010 and almost \$1.8 trillion in 2011. One-third of its exports are electronics goods. It is also a major importer, with imports exceeding \$1.1 trillion in 2010 and \$1.4 trillion in 2011. 20 percent of its imports are in the electronics sector. As explained below, much of China's imports are electronic parts and components and other intermediate goods that are used to produce final goods for re-export.

China's share of textile exports fell from 40 percent in 1993 to less than 17 percent in 2010. However, since total exports increased sixteen times over this period, the value of textile exports soared.

Figure 3 presents data on China's final electronics goods (FEG) exports and its labor-intensive goods (LIG) exports over this period. FEG includes consumer electronics goods, computer equipment, and telecommunications equipment.<sup>1</sup> LIG includes carpets, clothing, fabrics, furniture, knitwear, leather, and yarns.<sup>2</sup> In 2010, 26 percent of China's exports were FEG goods and 19 percent were LIG goods.

China's FEG exports in Figure 3 have increased more than forty times between 1993 and 2010. To get a sense of how amazing this growth is, one can note that in 1993 2.5 percent of the world's FEG exports came from China whereas in 2010 38% of the world's FEG exports came from China. The next leading FEG exporting country in 2010 only exported 5% of the world's total.

While the data in Figure 3 extend to 2010, the Chinese Ministry of Industry and Information Technology reported that electronics exports increased by 12 percent in 2011 and were growing steadily in 2012 (Min, 2012). Thus, the Chinese FEG export juggernaut continues unabated.

Figure 3 also indicates that LIG exports have increased more than six times between 1993 and 2010. Whereas China exported 12 percent of the world's total LIG goods in 1993, in 2010 it exported 35 percent of the world's total. The next leading LIG exporter in 2010 exported 7

---

<sup>1</sup> These goods come from the SITC classification numbers 75 (excluding 751.3 and 759.1) and 761-4.

<sup>2</sup> These goods come from 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.

percent of the world's LIG exports. Thus China is the dominant exporter of both final electronics goods and labor-intensive goods.

China's final electronics goods and other sophisticated products are produced mainly within global supply chains. China imports large quantities of parts and components, adds value to these, and exports the final goods. In 2010 almost 90 percent of China's electronics imports came from East Asian countries. China's sophisticated manufacturing exports are thus largely produced within East Asian supply chains.

Gaulier *et al.* (2005) have referred to "triangular trading patterns", whereby Taiwan, Japan, South Korea, and multinational corporations (MNCs) in ASEAN export sophisticated, technologically-intensive parts and components to China for assembly and re-export to the rest of the world.

Figures 4a, 4b, and 4c show, respectively, Japan's, the Newly Industrialized Economies' (NIEs), and ASEAN's exports of intermediate goods to East Asia. In the case of Japan, MNCs began transferring factories to the rest of Asia following the 60 percent appreciation of the yen after the Plaza Accord in 1985. Japanese companies lost their price competitiveness, and shifted production to lower cost areas. Figure 4a shows that initially parts and components flowed to the NIEs. However, in the late 1980s exchange rates in these economies appreciated and wages began to rise as the flow of workers from the rural to the urban sector slowed. At that point the NIEs lost some of their cost advantages and Japanese firms shifted production to ASEAN countries. This is seen in Figure 4a by the increase in intermediate goods going to ASEAN. Then starting in 2001 there was a surge in intermediate goods flowing to China. Many have argued that, after it became clear in 2001 that China would join the WTO, investors gained

confidence that China would follow the rule of law. This contributed to a surge of foreign direct investment (FDI) and of parts and components flowing to China.

Figure 4b shows the flow of intermediate goods from South Korea and Taiwan to the region. There is a marked surge of intermediate goods going to China beginning in 2001. This was driven, not only by China's WTO accession but also by the fact that the government of Taiwan deregulated outgoing FDI by laptop PC makers into China in 2001. Taiwanese original design manufacturers (ODMs) established a value chain centered in the Yangtze River Valley. Soon the lion's share of the world's laptop computers was made in this location.

Figure 4c shows the flow of intermediate goods from ASEAN countries (Malaysia, the Philippines, Singapore, and Thailand) to East Asia. There is again a large increase in goods flowing to China beginning in 2001. Many parts and components also flow between ASEAN countries. These involve, for instance, electronic components that are manufactured partly in one ASEAN country and then shipped to another ASEAN country for further processing (see Hiratsuka, 2011).

Figure 5 aggregates the evidence in Figures 4 a-c by looking at total exports from all of East Asia to ASEAN, China, the NIEs, and Japan. There is a surge in intermediate goods going to China beginning in 2001. The value in 2010 was about \$160 billion. ASEAN and the NIEs each received about \$80 billion in intermediate goods exports in 2010. Japan received about \$40 billion in 2010. The smaller volume going to Japan reflects the fact that Japan is upstream in the value chain, producing sophisticated parts and components and shipping them to other parts of Asia for processing and assembly.

While Figures 4 and 5 looked at the flow of intermediate goods, Figure 6 looks at the export of final assembled products. Specifically the figure presents data for the export of final

electronic goods.<sup>3</sup> The lion's share of the parts and components flowing between East Asian countries are electronics goods, and the largest export category from East Asia to the world is final electronics goods. Corresponding to the surge of intermediate goods flowing into China beginning in 2001, there is an even larger surge of final goods flowing from China to the world beginning in 2001. By 2010, the value of final electronics exports from China exceeded \$400 billion.

It is also noteworthy in Figure 6 that final goods exports from ASEAN and the NIEs remain attenuated, even though Figure 5 indicated that a large volume of intermediate goods imports flowed into these regions. Evidently these locations have become more and more specialized in importing parts and components, adding value to them, and then re-exporting these inputs to China for final assembly. Figure 6 shows that Japan was the largest East Asian exporter of final electronics goods until 2001, and now is the smallest exporter. This also implies that final assembly has become more and more concentrated in China.

Figures 4-6 thus indicate that parts and components flow throughout East Asia, while the final goods are assembled more and more in China. Another question is where the final assembled goods flow to. Figure 7 indicates that three-fourths of the final goods go outside of the region. Thus parts and components within East Asian production networks flow between countries, are assembled in China, and are then exported outside of the region.

One can also understand China's role within global supply chains by looking at a customs regime called processing trade. Imports for processing are goods that enter China duty-free for the purpose of being used to assemble goods for re-export. The final assembled goods are referred to as processed exports. Neither the imports for processing nor the processed exports are allowed to enter China's domestic economy.

---

<sup>3</sup> These goods come from the SITC classification numbers 75 (excluding 751.3 and 759.1) and 761-4.



Figure 8 shows China's processed exports and imports for processing. They have continued to soar, interrupted only by a brief decline in 2009 associated with the Global Financial Crisis. Processed exports equaled \$741 billion in 2010 and \$836 billion in 2011, about half of China's total exports. The figure also indicates that the gap between processed exports and imports for processing began increasing after 2004, leading to a surplus in processing trade of almost \$370 billion in 2011.

Table 1 disaggregates processing trade by country. It shows that the percentage of imports for processing coming from South Korea, Taiwan, Japan, and ASEAN is large. In 2010, 60 percent of imports for processing come from East Asia and only 5 percent each comes from the EU and the US. These data actually understate the importance of East Asia. As Xing (2011) discussed, the China Customs Statistics includes China itself as a source of imports for processing into China. China is also one of the largest sources of imports for processing into China. In 2008, for instance, Xing reported that \$61.3 billion or 16 percent of China's imports for processing came from China. Thus more than 75 percent of China's imports for processing come from East Asia.

Table 1 also shows that roughly 20 percent of processed exports go to East Asia and 80 percent go outside the region. 22 percent each go to Hong Kong and to the US, 17 percent goes to Europe, and 17 percent goes to the rest of the world. Since parts and components come primarily from East Asia and not from the West and finished products go primarily outside of East Asia and especially to the West, China runs deficits of about \$100 billion with East Asia and surpluses of \$150 billion with the US and Hong Kong and \$100 billion with Europe. Many of the goods exported to Hong Kong and Singapore are re-shipped to the US and Europe. Taking account of this, China's surplus with the US and Europe would be even larger. Using US

data, which treat Chinese entrepôt trade through Hong Kong and Singapore as coming from China, China's trade surplus with the US in 2011 equaled \$300 billion. Thus China's processing trade remains dependent on demand from the West and especially from the US.

Figure 8 suggests that China's value-added in processing trade increased after 2004. Following Tong and Zheng (2008), one way to measure China's value-added in processing trade ( $VA_t$ ) is by the difference between the value of processed exports ( $VPE_t$ ) and the value of imports for processing from all supply chain countries ( $VIP_t$ ):

$$VA_t = (VPE_t - VIP_t) / VPE_t, \quad (1)$$

Figure 9 presents China's value-added in processing trade. It also presents the value-added for the two subcomponents of processing trade, processing and assembly (PAA) trade and processing with imported materials (PWIM) trade. PAA trade refers to foreign suppliers importing intermediate goods that belong to them and using these inputs to produce goods for re-export and PWIM trade refers to foreign suppliers importing inputs from other firms and using these to produce goods for re-export (see Gaulier *et al.*, 2005). For processing trade, China's value-added started out at 18 percent in 1993 but reached 44 percent in 2011. As industrial clusters have developed in China, more and more of the value-added of electronics goods and other sophisticated exports are produced in China. For PAA exports, China's value-added was 19 percent in 1993 but fell to 13 percent in 2011. For PWIM exports, on the other hand, China's value-added increased from 18 percent in 1993 to almost 50 percent in 2011. The next section discusses how the difference in value-added between PAA exports and PWIM exports can be used to identify the effects of exchange rate changes on China's exports.

### **3. How Exchange Rates Affect Trade within East Asian Supply Chains**

The previous section showed that East Asian supply chain countries run surpluses with China in parts and components trade and that China runs surpluses with the US and Europe in final goods trade. In value-added terms, East Asia as a whole runs surpluses with the West in processing trade.

Absent government intervention in the currency markets and other factors, these surpluses would tend to cause East Asian currencies to appreciate. How would such an appreciation affect processing trade?

To address this question Thorbecke and Smith (2010) constructed an integrated exchange rate ( $irer$ ). To calculate  $irer$  they began with the bilateral exchange rates between China and the importing countries and the bilateral exchange rates between other supply chain countries and the importing countries. They then weighted the bilateral exchange rates between China and the importing countries by China's value-added in processing trade and the bilateral exchange rates between each supply chain country and each importing country by each supply chain country's value-added in processing trade. The integrated exchange rate measures how exchange rates affect the relative foreign currency costs not just of China's value-added but of China's entire output of processed exports.

They used a panel data set including China's exports to 33 countries. Their sample period extends from 1994-2004. Employing dynamic ordinary least squares (DOLS) estimation, they reported that a 10 percent appreciation of  $irer$  would reduce China's processed exports by 10 percent.

Ahmed (2009), in an invaluable paper, divided China's exchange rate into one component due to exchange rate fluctuations relative to East Asian supply chain countries ( $Q_A$ )

and another component due to exchange rate fluctuations relative to advanced economies and other trading partners ( $Q_B$ ). He demonstrated theoretically that an appreciation of  $Q_A$  would have opposing effects in China's exports. An appreciation of the renminbi relative to supply chain countries would reduce the demand for China's exports in supply chain countries. On the other hand, the appreciation would also reduce the cost of imported inputs to China and thus increase the supply of exports. For processed exports, the effect of an increase in  $Q_A$  would be ambiguous. For exports produced primarily using domestic factors (ordinary exports), an increase in  $Q_A$  should reduce China's exports.

Employing an autoregressive distributed lag model and quarterly data on China's exports to the world over the 1996Q1 – 2009Q2 period, Ahmed reported that an appreciation of the renminbi relative to East Asian countries would significantly reduce China's ordinary exports. He also reported that a 10 percent appreciation of the renminbi relative to non-East Asian countries would reduce China's processed exports by 17 percent and that a 10 percent appreciation relative to East Asian supply chain countries would increase China's processed exports by 15 percent. Discussing these results, he said (p. 24):

These results imply that if there was a unilateral appreciation of the RMB ( $DQ_A = DQ_B > 0$ ), the fall in processing exports would be much less than if all of the emerging Asian region's exchange rates appreciated together against other currencies ( $DQ_A = 0, DQ_B > 0$ ). Although we have followed a totally different approach, these results are quite consistent with those of Thorbecke and Smith (2008).

Yamashita (2011), in a careful study, constructed a panel including China's bilateral China's export to OECD countries for the period of 1992-2009 at the 2-digit industry level. To explain exports he constructed two exchange rate measures. One was the bilateral real exchange rate between China and the OECD importing country. The other was a weighted exchange rate between China and the currencies of 9 East Asian countries (Japan, Hong Kong, China, Taiwan,

South Korea, Singapore, Malaysia, Indonesia, Thailand, Philippines), with weights determined by the share of components in each industry flowing to China from each of these economies.

Yamashita (2011) reported that for Chinese electronics and transport equipment (SITC 7), a 10 percent appreciation of the renminbi relative to the importing country would decrease exports by 12.4 percent. A 10 percent appreciation of the renminbi relative to East Asian supply chain countries would reduce Chinese electronics and transport equipment exports by 11.5 percent. He also found that: 1) the coefficient remains negative when only the bilateral exchange rate is included but it is no longer statistically significant; 2) the coefficient on exchange rates in supply chain countries remains positive and significant when it is the only exchange rate variable included; 3) the income elasticity equals 1.05 and is statistically significant when both exchange rate variables are included but is not statistically significant when only the bilateral exchange rate variable is included. He noted that an appreciation of the renminbi may increase China's exports because of the effect on East Asian supply chain countries.

Yamashita (2011) considered the case where the renminbi appreciates against both advanced economy importing countries and against East Asian supply chain countries. The previous section demonstrated that East Asian supply chain countries run large surpluses with China in processing trade and that China runs large surpluses with the West in processing trade. In a value-added sense, both China and East Asia run large surpluses against the West in processing trade. This suggests that an economically interesting case to analyze would be one in which both China and East Asian supply chain countries appreciate against developed economies. This is the case that Ahmed referred to as  $DQ_A = 0$ ,  $DQ_B > 0$ . In this case, Prof. Yamashita's results imply that an appreciation would significantly reduce processed exports.

Because of triangular exchange rate arbitrage, analyzing China's exchange rates with importing countries and China's exchange rates with supply chain countries is equivalent to analyzing China's exchange rates with importing countries and supply chain countries' exchange rates with importing countries. Thorbecke (2011) used the second approach. He sought to explain China's processed exports to the world using China's real effective exchange rate and the weighted exchange rate in supply chain countries, with weights determined by the proportion of the value-added coming from China and from supply chain countries.

Using DOLS estimation and quarterly data over the 1993-2008 period, he reported that a 10 percent appreciation of either the renminbi or of the currencies of East Asian supply chain countries would reduce processed exports by about 17 percent. He also found that a model including both exchange rates in supply chain countries and the renminbi exchange rate encompassed a model only including the renminbi. In addition, when both exchange rates were included the coefficient on rest of the world income was always significant but when only the renminbi exchange rate was included the coefficient on income was not statistically significant in half of the cases. These weaker results suggest that the model was misspecified when only the RMB exchange rate was included and exchange rates in the countries supplying most of the value-added were excluded. This may also explain why Yamashita (2011) obtained weaker results when only the renminbi exchange rate against importing countries was included and the exchange rates in supply chain countries was excluded.

Thorbecke (2012) also disaggregated processed exports into their two main categories, processing with imported materials (PWIM) exports and processing and assembly (PAA) exports. As discussed above, for PWIM exports much of the value added comes from China while for

PAA exports most of the value-added comes from supply chain countries. While both types of exports should be affected by exchange rates in supply chain countries and thus by integrated exchange rates, PWIM exports should be affected much more than PAA exports by changes in the renminbi.

Using DOLS estimation and quarterly data over the 1993-2008 period, Thorbecke (2012) reported that appreciations of the integrated exchange rate cause large drops in both PAA and PWIM exports. In the case of PAA exports, he found that the response was driven entirely by exchange rates changes in supply chain countries. In the case of PWIM exports, on the other hand, he reported that the response was caused both by changes in the renminbi and by changes in suppliers' exchange rates. Changes in the RMB also have a larger effect than changes in suppliers' exchange rates on PWIM exports. Because PWIM exports are now six times the value of PAA exports, these results indicate that the renminbi matters for aggregate processed exports.

For Chinese imports Cheung, Chinn, and Fujii (2010), Marquez and Schindler (2007), and Garcia-Herrero and Koivu (2009) have reported that an appreciation of the RMB is often associated with a decrease in imports from the rest of the world (i.e., the coefficient is wrong-signed). Several authors discuss why estimated exchange rate elasticities for Chinese imports often take on the wrong sign (see Kamada and Takagawa, 2005, and Garcia-Herrero and Koivu, 2007). Many of China's imports are parts and components that are used to assemble goods for re-export to the rest of the world. An exchange rate appreciation that reduces exports will also reduce the demand for imported goods that are used to produce exports. This can cause the estimated exchange rate coefficient to take on the wrong sign.

The IMF (2005) noted that for processor economies, imports for processing should vary one-for-one with processed exports. This suggests that processed exports should be included as an independent variable when estimating import demand functions. Also, since imports for processing are only imported to produce goods for re-export, processed exports is a better variable to control for economic activity than Chinese GDP.

Cheung, Chinn, and Qian (2012) and Thorbecke and Smith (2012) included processed exports as a right-hand-side variable when estimating trade elasticities for imports for processing. Cheung et al. used DOLS estimation and quarterly data during the period after China joined the WTO in 2002. When China's processed exports were included as an independent variable, it had a coefficient of 1.26. The exchange rate elasticity was also correctly signed and equal to 0.79. Thorbecke and Smith used DOLS estimation and annual data on China's imports from 25 countries over the 1994-2008 sample period. In the preferred specification with processed exports included to control for economic activity, the coefficient on processed exports ranged from 0.88 to 0.98 and the exchange rate elasticity was correctly signed and ranged from 0.33 to 0.36. These two studies thus indicate that imports for processing respond approximately one-for-one to processed exports. They also indicate that, when controlling for processed exports, the exchange rate elasticity is correctly signed and less than unity.

#### **4. Conclusion**

Figure 8 shows that China's surplus in processing trade continues to expand and reached \$370 billion in 2011. Table 1 indicates that, in a value-added sense, this is an East Asian surplus and not just a Chinese surplus.



These burgeoning surpluses against the West would tend to produce appreciations of East Asian currencies. China resisted appreciation pressure by accumulating \$3.2 trillion in foreign exchange reserves.

Henning and Katada (2011) reported that, since 2005, East and Southeast Asian currencies other than the Japanese yen and the Korean won have tracked the renminbi closely. Ma and McCauley (2011) demonstrated that there was considerable exchange rate stability between China and emerging Asian countries when the renminbi was managed against a basket of currencies. Park and Song (2011) and Aglietta, Labonne, and Lemoine (2011) have all shown that emerging Asian currencies have tended to follow the renminbi in recent years. Thus when China resists appreciation, other currencies in Asia also tend to resist appreciation also.

In 2011 China ran a deficit of almost \$90 billion in ordinary trade. This would tend to offset some of the pressure for appreciation. As Table 2 shows, China's deficit in ordinary trade is largely due to its deficit with Australia. The deficit with Australia in turn reflects trade in metals. A concern is that China's surplus in ordinary trade reflects a hoarding of commodities such as iron, copper, and coal. It is possible that Chinese officials, having become sated with accumulating low-yielding US Treasury securities, have opted to acquire commodities instead. Stockpiling commodities could prove as unsustainable as continued accumulation of external reserves, however.

China may also provide Europe with loans to help it deal with its crisis. This also may not be helpful. Europe is not facing a balance of payments problem. Rather, some countries within the common currency run surpluses and others run deficits. Southern European countries would be helped by an improvement in their trade balances. One key way to achieve this would be through a depreciation of the currency. If China invests in Europe it would tend to strengthen

the euro. It would also provide vendor financing to enable Europe to continue purchasing goods from China. If Asia's imbalances with the West are unsustainable, investing in Europe would only postpone the inevitable adjustments.

A better solution would be for East Asian currencies to appreciate together against the currencies of the West. If they appreciated together, this would help maintain intra-regional exchange rate stability and reduce the increase in real effective exchange rates. Appreciations in the region would also enable more goods from the region to flow to consumers and businesses in Asia. If the resulting slowdown in exports to the West threatened economic growth, this could be offset by increased spending on rural education, healthcare, and other salutary projects. Since today's rural students will be tomorrow's urban workers, investing in their human capital will pay higher dividends and contribute more to sustained growth than further purchases of external reserves or stockpiling of commodities.

## References

- Aglietta, M. Labonne, and F. Lemoine, F. 2011. Exchange Rate Policy and Regional Integration in Asia. La Lettre du CEPII No. 307. Centre d'études prospective et d'informations internationales, Paris.
- Ahmed, S. 2009. Are Chinese Exports Sensitive to Changes in the Exchange Rate? International Finance Discussion Papers No. 987. Federal Reserve Board, Washington DC.
- Cheung, Y., M. Chinn, and X. Qian. 2012. Are Chinese Trade Flows Different? NBER Working Paper No. 17875. National Bureau of Economic Research, Cambridge, MA.
- Cheung, Y.-W., M. Chinn, and E. Fujii. 2010. China's Current Account and Exchange Rate. In: Feenstra, R., Wei, S.-J. (Eds.) *China's Growing Role in World Trade*. University of Chicago Press, Chicago, pp. 231-71.
- Feenstra, R. and S.-J. Wei. 2010. Introduction. In: Feenstra, R., Wei, S.-J. (Eds.) *China's Growing Role in World Trade*. University of Chicago Press, Chicago, pp. 1-31.
- García-Herrero, A. and T. Koivu. 2009. China's Exchange Rate Policy and Asian Trade. BBVA Working Papers No. 0916. BBVA Research, Madrid.
- Gaulier, G., F. Lemoine, and D. Unal. 2011. China's Foreign Trade in the Perspective of a More Balanced Economic Growth. CEPII Working Paper No. 2011-03. Centre d'études prospective et d'informations internationales, Paris.
- 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. Centre d'études prospective et d'informations internationales, Paris.
- Goldstein, M. and M. Khan. 1985. Income and Price Effects in Foreign Trade." In: Jones, R., Kenen, P. (Eds.) *Handbook of International Economics*, Vol. 2. North-Holland, Amsterdam, pp. 1041-1105.
- Henning, C. R. and S.N. Katada. 2011. Cooperation without Institutions: The case of East Asia Currency Arrangements. Mimeo, American University.
- Hiratsuka, D. 2011. Production Networks in Asia: A Case Study from the Hard Disk Drive Industry. ADBI Working Paper No. 301. Asian Development Bank Institute, Paris.
- IMF, 2005. IMF Regional Economic Outlook: Asia and Pacific, April. International Monetary Fund, Washington DC.
- Kamada, K. and I. Takagawa. 2005. Policy Coordination in East Asia and Across the Pacific. Bank of Japan Working Paper Series 05-E-4. Bank of Japan, Tokyo.

- Ma, G. and R. McCauley. 2011. The Evolving Renminbi Regime and Implications for Asian Currency Stability. *Journal of the Japanese and International Economies*, 25 (1), 23-38.
- Marquez, J. and J. Schindler. 2007. Exchange Rate Effects on China's Trade. *Review of International Economics*, 15 (5), 837-53.
- Min, Q. 2012. MIIT: Electronics, Software Business up 20% in 2011. *Caixin*, February 28.
- Park, Y.C. and C.-Y. Song. 2011. Prospects for East Asian Cooperation. ADBI Working Paper No. 314. Asian Development Bank Institute, Tokyo.
- Thorbecke, W. 2012. Investigating China's Disaggregated Processed Exports: Evidence that the Renminbi Matters. RIETI Discussion Paper 12-E-03.
- Thorbecke, W. 2011. Investigating the effect of exchange rate changes on China's processed exports. *Journal of the Japanese and International Economies*, 25 (2), 33-46.
- Thorbecke, W., Smith, G., 2010. How Would an Appreciation of the RMB and other East Asian currencies Affect China's Exports? *Review of International Economics*, 18 (1), 95-108.
- Tong, S. and Y. Zheng. 2008. China's Trade Acceleration and the Deepening of an East Asian Regional Production Network. *China and World Economy*, 16, 1, 66-81.
- Unterobderster, O., A. Mohommad, and J. Vichyanond. 2011. Implication of Asia's Regional Supply Chain for Rebalancing Growth. IMF Regional Economic Outlook: Asia and Pacific, April. International Monetary Fund, Washington DC.
- Xing, Y. 2011. Processing Trade, Exchange Rates, and the People's Republic of China Trade Balances. ADBI Working Paper No. 270. Asian Development Bank Institute, Tokyo.
- Yamashita, N. 2011. The Currency of the People's Republic of China and Production Fragmentation. ADBI Working Paper No. 327. Asian Development Bank Institute, Tokyo.

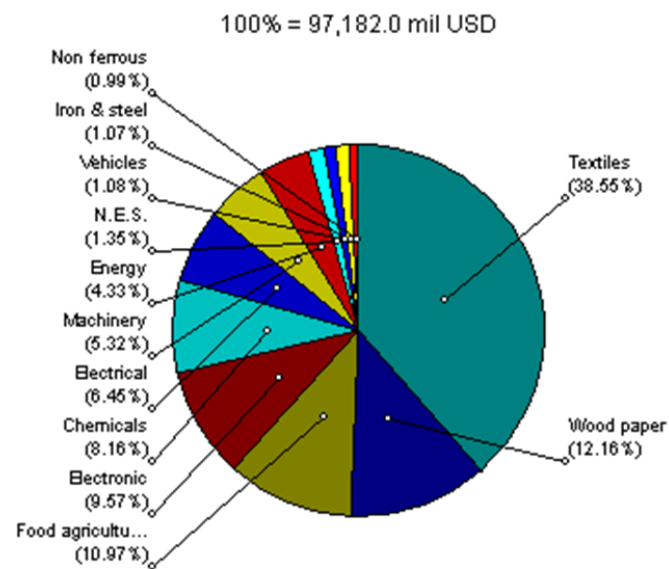


Figure 1a. Composition of China's Exports to the World, 1993.

Source: CEPII-CHELEM Database.

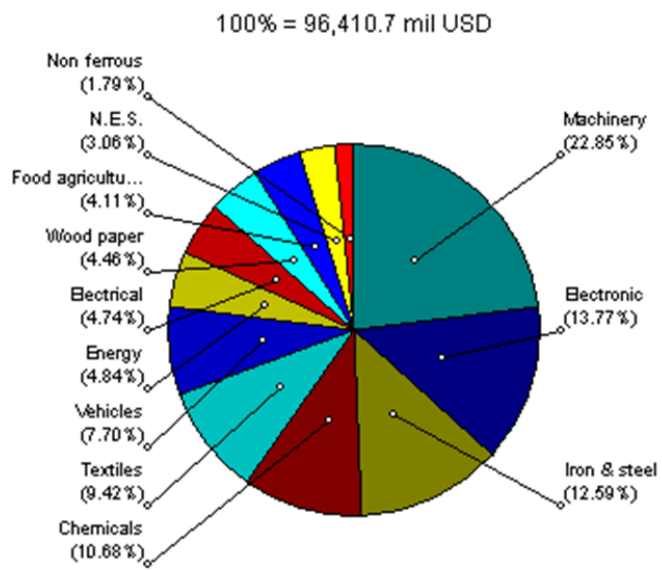


Figure 1b. Composition of China's Imports from the World, 1993.

Source: CEPII-CHELEM Database.

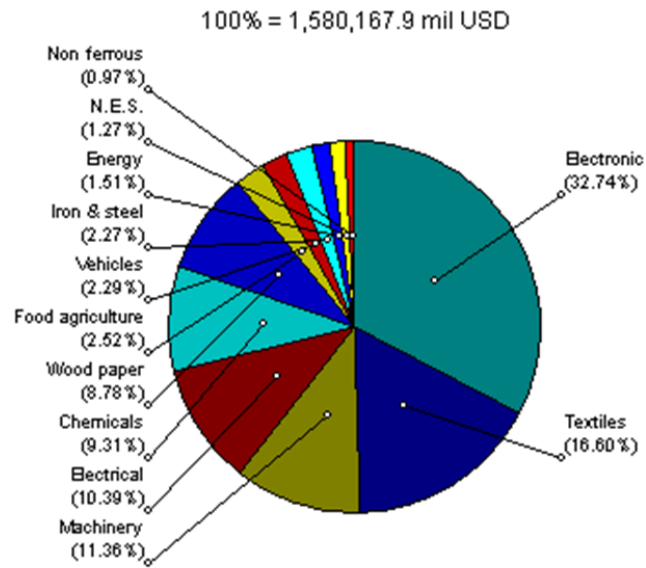


Figure 2a. Composition of China's Exports to the World, 2010.

Source: CEPII-CHELEM Database.

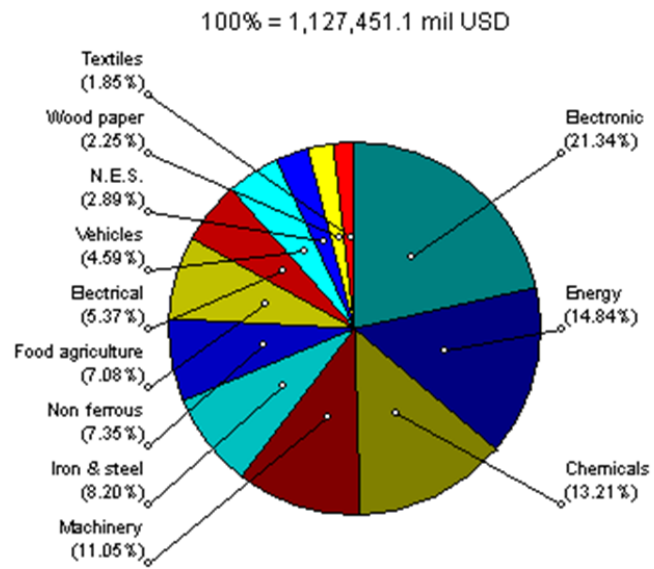


Figure 2b. Composition of China's Imports from the World, 2010.

Source: CEPII-CHELEM Database.



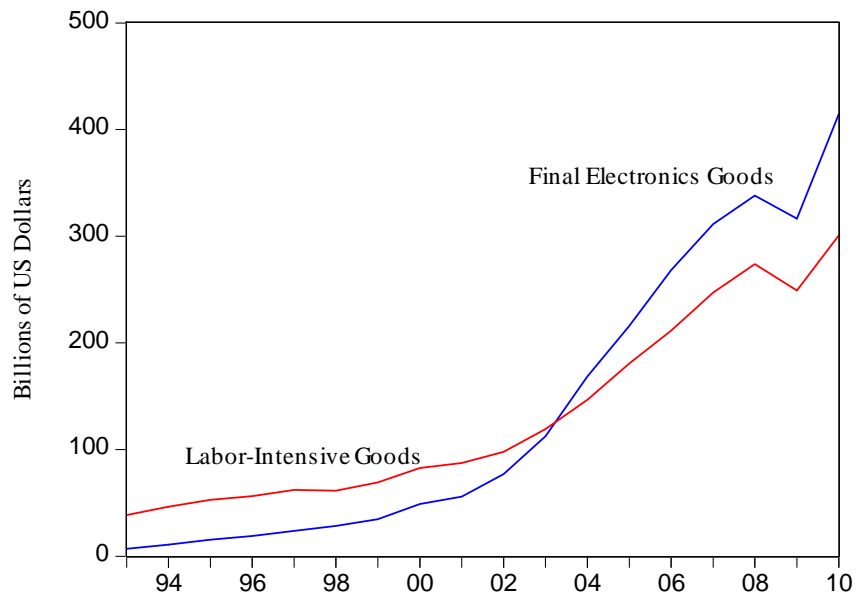


Figure 3. The Value of China's Exports of Labor-Intensive Goods and Final Electronics Goods to the World.

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

Source: CEPII-CHELEM Database.

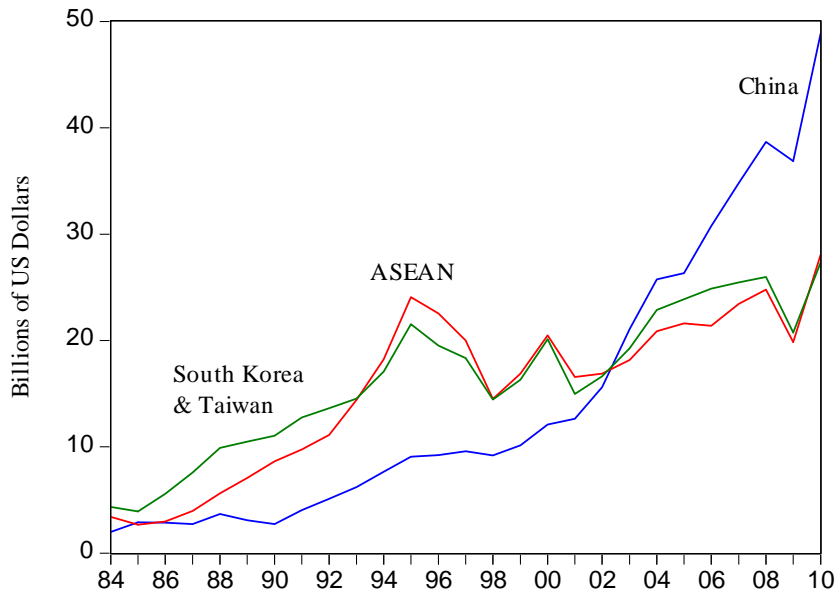


Figure 4a. Value of Japanese Intermediate Goods Exports to East Asia

Note: ASEAN includes Malaysia, the Philippines, Singapore, and Thailand.  
 Source: CEPII-CHELEM Database.

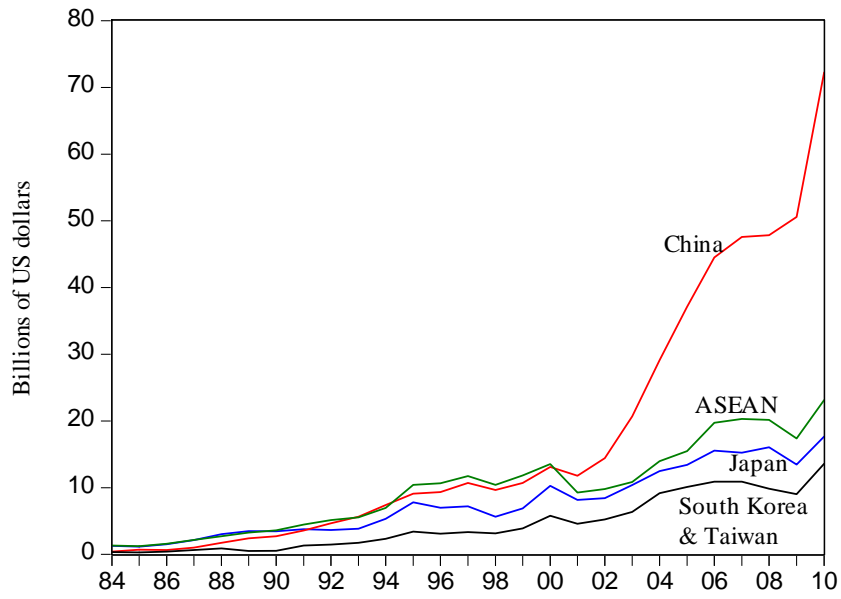


Figure 4b. Value of Intermediate Goods Exports from South Korea and Taiwan to East Asia.

Note: ASEAN includes Malaysia, the Philippines, Singapore, and Thailand.  
 Source: CEPII-CHELEM Database.

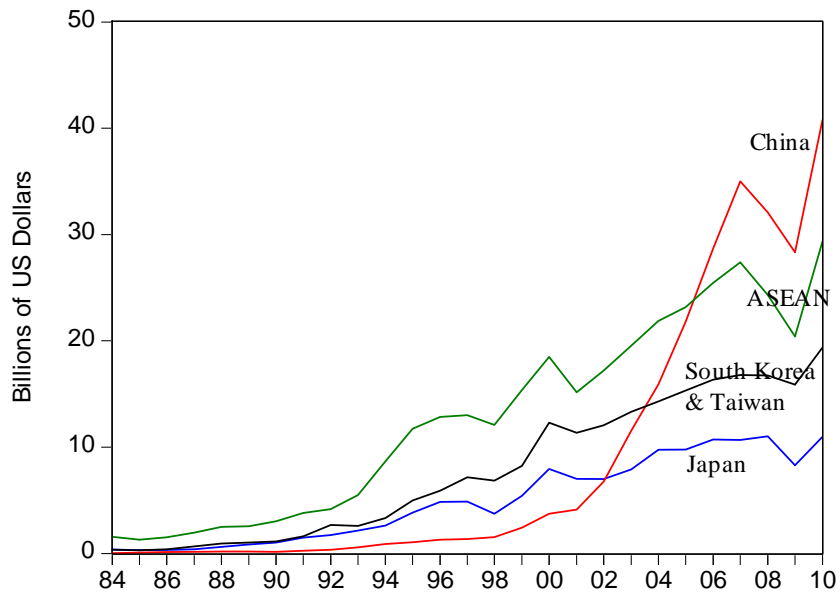


Figure 4c. Value of Intermediate Goods Exports from ASEAN to East Asia.

Note: ASEAN includes Malaysia, the Philippines, Singapore, and Thailand.  
 Source: CEPII-CHELEM Database.

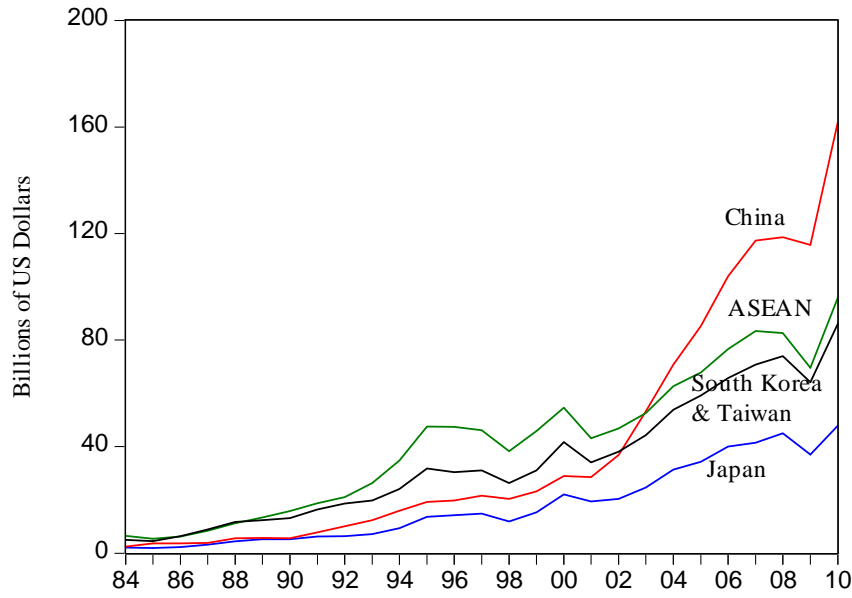


Figure 5. Intermediate Goods Exports from East Asia as a Whole to Individual Countries or Regions.

Note: ASEAN includes Malaysia, the Philippines, Singapore, and Thailand.  
 Source: CEPII-CHELEM Database.

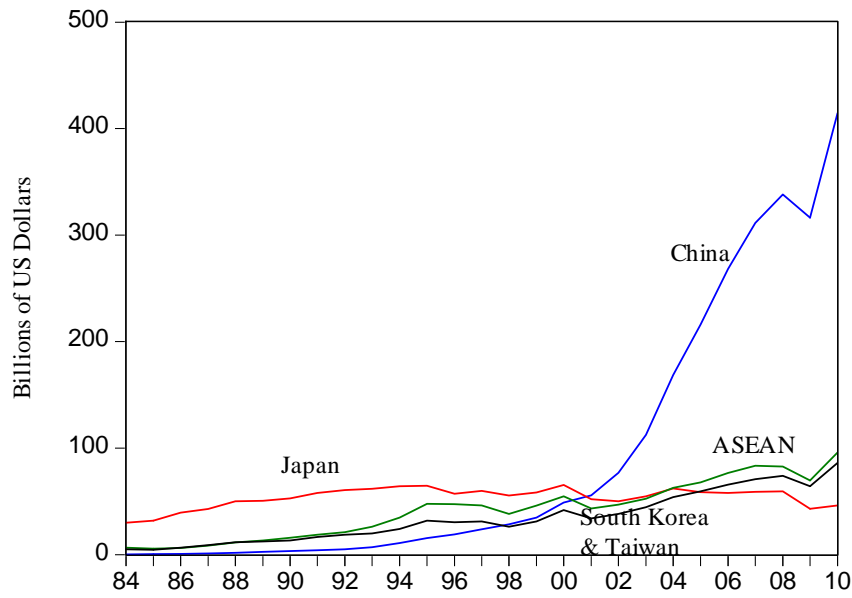


Figure 6. Final Electronics Goods Exports from ASEAN, China, Japan, and the NIEs.

Note: ASEAN includes Malaysia, the Philippines, Singapore, and Thailand.  
Source: CEPII-CHELEM Database.

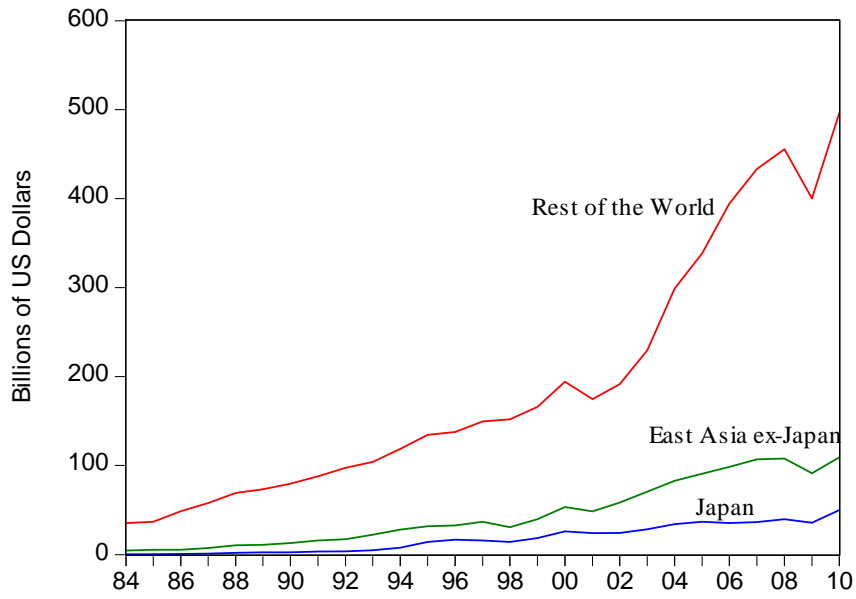


Figure 7. Final Electronics Exports from East Asia to Japan, the Rest of East Asia, and the Rest of the World.

Note: East Asia ex-Japan includes China, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand. Rest of the World includes all importers other than Japan and East Asia ex-Japan.

Source: CEPII-CHELEM Database.

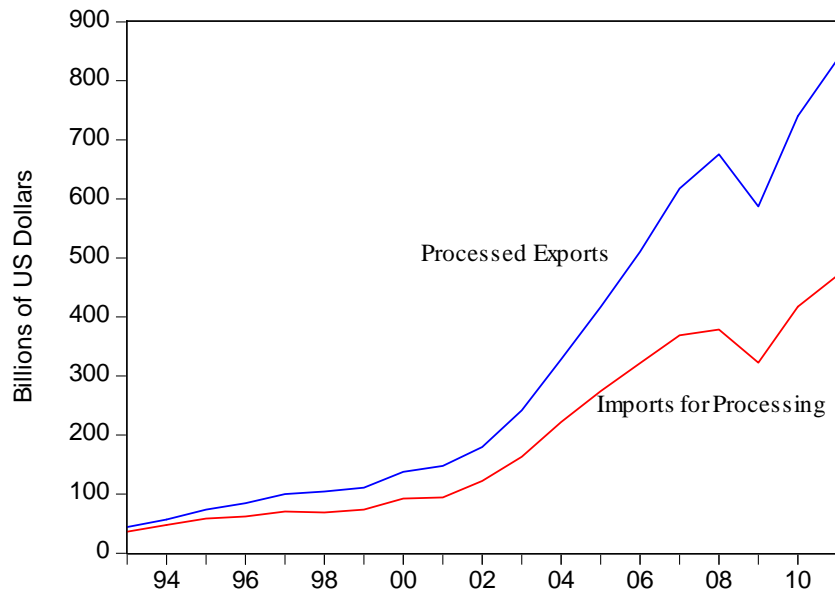


Figure 8. China's Imports for Processing and Processed Exports.

Source: CEIC Database.



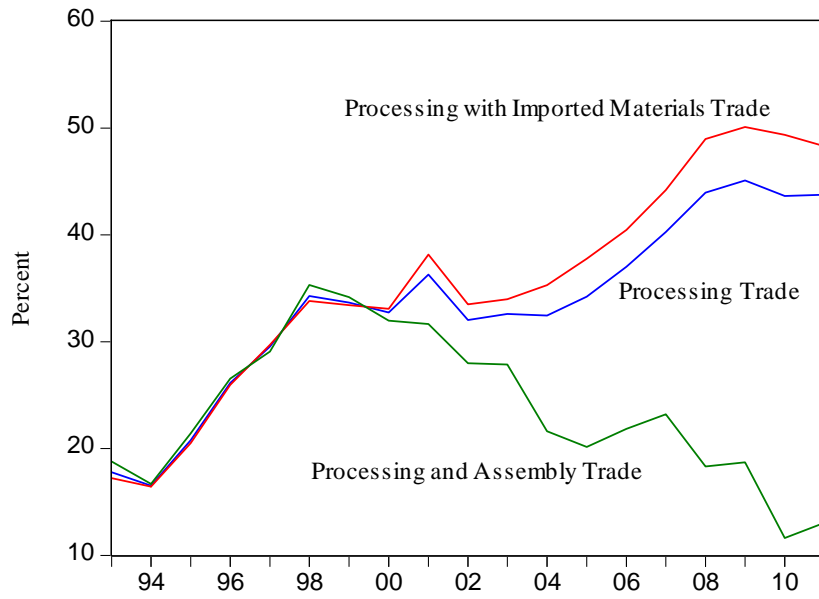


Figure 9. China's Value-added in Processing Trade, Processing and Assembly Trade, and Processing with Imported Materials Trade.

Source: CEIC Database and calculations by the author.

**Table 1. China's Processing Trade, 2007-2010**

	S. Korea	Taiwan	ASEAN4	Japan	Singapore	Hong Kong	US	Europe	R.O.W	Total
<b>Imports for Processing (%)</b>										
2007	15.24	18.75	10.65	16.11	2.40	1.98	4.93	5.03	24.91	100.00
2008	15.63	18.07	10.26	16.20	2.28	1.62	5.20	5.72	25.01	100.00
2009	16.95	16.96	9.73	15.53	2.18	1.32	4.80	5.51	27.03	100.00
2010	17.05	16.78	8.05	14.78	2.38	1.30	5.10	5.04	29.52	100.00
<b>Processed Exports (%)</b>										
2007	3.98	1.92	3.25	9.35	2.84	22.42	23.54	18.59	14.10	100.00
2008	4.75	1.88	3.27	9.22	2.79	21.01	22.20	18.71	16.16	100.00
2009	4.96	1.86	3.40	9.13	3.36	20.57	22.68	17.50	16.54	100.00
2010	4.71	2.03	3.40	8.85	2.84	21.70	21.96	17.19	17.32	100.00
<b>Balance in Processing Trade (billions of U.S. dollars)</b>										
2007	-31.57	-57.18	-19.18	-1.63	8.73	131.18	127.25	96.29	-4.65	249.24
2008	-27.07	-55.71	-16.72	0.99	10.19	135.76	130.20	104.67	14.46	296.77
2009	-25.50	-43.72	-11.41	3.56	12.72	116.46	117.61	84.93	9.92	264.57
2010	-36.26	-55.03	-16.95	3.89	11.05	155.23	141.31	106.26	13.40	322.90

Notes: ASEAN4 includes Indonesia, Malaysia, Philippines, and Thailand. Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Italy, Portugal, Spain, Sweden and United Kingdom.

Source: China Customs Statistics.

**Table 2. China's Ordinary Trade, 2007-2010**

	S. Korea	Taiwan	ASEAN5	Japan	Hong Kong, China	Australia	US	Europe	R.O.W	Total
<b>Ordinary Imports (%)</b>										
2007	7.05	4.26	7.67	11.77	1.06	5.27	8.41	15.78	35.95	100.00
2008	6.15	3.51	6.79	10.88	1.00	5.97	8.21	13.95	36.91	100.00
2009	6.47	3.73	7.43	11.75	0.69	6.82	9.39	15.95	36.86	100.00
2010	5.90	3.81	7.62	11.63	0.73	7.33	8.30	14.92	37.67	100.00
<b>Ordinary Exports (%)</b>										
2007	5.48	1.90	7.16	7.76	6.40	1.75	14.90	18.70	38.73	100.00
2008	5.95	1.77	7.47	7.57	5.17	1.88	14.13	19.15	43.54	100.00
2009	4.24	1.55	7.83	7.80	6.04	2.07	14.84	18.77	37.77	100.00
2010	4.17	1.73	7.7	7.09	5.60	2.05	14.91	19.08	39.76	100.00
<b>Balance in Ordinary Trade (billions of U.S. dollars)</b>										
2007	-0.69	-8.04	5.65	-8.65	29.89	-13.16	44.19	33.05	27.63	109.87
2008	4.18	-8.37	10.61	-12.11	28.55	-21.73	46.60	47.00	-4.82	89.91
2009	-12.11	-11.74	1.73	-21.44	28.30	-25.50	28.46	14.24	-6.53	-4.59
2010	-15.22	-16.79	-3.09	-38.29	34.72	-41.60	44.24	22.73	-34.32	-47.62

Notes: ASEAN5 includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Italy, Portugal, Spain, Sweden and United Kingdom.

Source: China Customs Statistics.