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Abstract: This paper examines US-China trade relations, focusing on the ongoing process of global production sharing global production sharing—the breakup of the production processes into geographically separated stag—and the resulting trade complementarities between the two countries in world manufacturing trade. The results suggest that the US-China trade imbalance is basically a structural phenomenon resulting from the pivotal role played by China as the final assembly centre in East-Asia centered global production networks. Given the current state of China's factor market conditions, US-China trade patterns are unlikely to change dramatically in the short to medium run.

Keywords: China, global production sharing, U.S.-China trade imbalance

JEL Codes: F14, F23, O53,

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1. INTRODUCTION

Over the past decade, the widening bilateral trade deficit has been the focal point of the U.S.-China economic relations. This is often portrayed as a cause of the overall U.S. current account imbalances. The real public concerns in the United States surrounding the debate about the 'China deficit' are, however, rooted in the perceived economic threat of import competition. In the late 1990s, when imports from China were dominated by traditional labour intensive manufactures such as clothing and footwear, employment losses and wage suppression faced by unskilled workers were the prime focus of the debate. More recently, the apparent rising sophistication of imports from China—in particular the sharp increase in imports of computers and electronic products—has fueled concerns that the rise of China poses a direct threat to United States' position as a technology superpower, a concern reminiscent of the economic fears about Japan that pervaded the US policy scene in the 1970s and 1980s.

The 'unfair' Chinese import competition is perceived to take a number of forms, including illegal export subsides, lax enforcement of intellectual property rights, restrictions on imports and foreign investment in China, and the national currency being kept undervalued through massive intervention in the foreign exchange market (Hufbauer et al. 2006, Mankiw and Swagel 2005, Weisman 2007). These concerns have fueled call for new legislation to prevent unfair practices. In February 2005, the US Senate passed the *Byrd Amendment*, a provision that encourages American companies to fill anti-dumping lawsuits by awarding revenue collected from the resultant tariffs to litigating companies. Other China-specific legislations proposed over the past two years, including a bill that stipulates declaring exchange rate protection as a form of illegal subsidization

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for which U.S. firms can seek compensation. The economic Sinophobia has also begun to spillover to other arenas of US-China relations, including international food-safety standards and U.S policy postures relating to the entry of Chinese firms in the corporate arena (Shirk 2007, p. 267).

The policy debate on U.S.-China trade relations has so far been based on the conventional notion of horizontal specialization, in which trade takes place in the form of final goods (goods that are produced from start to finish in a given country). It has largely ignored the ongoing process of global production sharing—the breakup of the production processes into geographically separated stages[1]—and the resulting trade complementarities between the two countries as dominant players of this new form of international exchange. Global production sharing opens up opportunities for countries to specialize in different slices (different tasks) of the production process depending on their relative cost advantage and other relevant economic fundamentals. Consequently, parts and components are now exchanged across borders at a faster rate than final goods. In this context, decisions about how much to produce and for which market have to be combined with decisions about whether to produce and with what degree of intra-product specialisation. The upshot is that trade flow analysis based on data coming from a reporting system designed at a time when countries were trading only in final goods naturally distorted values of exports and imports, leading to a falsification of the current account imbalances. The degree of falsification is likely to increase over time as more complex production networks are created with an ever increasing number of interacting countries (Jones and Kierzkowiski 2001a, 2001b). The spread of international production sharing can also diminish the efficacy of exchange rate policy and tariff policy in influencing trade flows by opening up opportunities for firms to acquire inputs from, and relocate final assembly to different countries within global production networks, with a view to cushioning their profit margins in the face of such policy changes (Ghosh and Rajan 2007, Feenstra 2008).

[1] In the recent literature on international trade, an array of alternative terms have bee used to describe this phenomenon, including 'international production fragmentation', 'vertical specialisation', 'slicing the value chai' and 'outsourcing'.

Given the current state of the data, it is not possible to quantify the effect of international production sharing on bilateral trade imbalances: this would require a major overhaul of international system of collecting trade data to record domestic value-added content at different stages of production. The COMTRADE database of the United National does, however, now provide disaggregated data which permit separation of parts and components from final goods with a satisfactory coverage of trade in machinery and transport equipment, a commodity class in which most of global production sharing is concentrated. Data extracted from this source, when combined with the available case-study-based evidence of global operations of multinational enterprises (MNEs), permit us to paint a broad-brush picture of the nature of the on-going process of global production sharing and its implications for the U.S.-China trade relations in order to better inform the current policy debate. That is what we aim to do in this paper. A number of recent studies have alluded to the importance of paying attention to global production sharing in understanding the drivers of US-China trade deficit (Bergsten *et al*. 2006, Lardy 2005, Fung *et al*. 2006, Krugman 2008). To our knowledge, however, this is the first attempt to examine this issue systematically to the extent permitted by the available data.

The key inference of the paper is that the U.S.-China trade imbalance is a structural phenomenon, quite distinct from the overall trade imbalance of the United State, and it is related largely to the pivotal role played by China as the final assembly centre in global production networks. It is akin to the substantial structural deficits in trade with the oil exporting countries (based on their specific resource endowment), which the US and the rest of the world have accustomed to live with. Given the current state of China's factor market conditions, one can speculate that US-China trade patterns are unlikely to change dramatically in the short to medium run provided, of course, the global trading environment remain accommodative and Chinese policies remain conducive reaping gains from specialisation on the basis of its comparative advantage.

The remainder of this paper is in four parts. The next section offers an overview of trends and patterns of China trade in order to set the stage for the ensuing analysis. The third section surveys US-China trade patterns with emphasis on emerging patterns of the two counties' involvement in global production networks and their implications for the bilateral trade flows using some fresh data tabulations separating trade in parts and components and final goods in machinery trade. This is followed by an econometric analysis of the determinants of trade flows, focusing on the role of the 'China factor' over and above the other standard variables. The final section presents concluding remarks.

2. US-CHINA TRADE GAP

Bilateral trade between the United State and China has grown persistently since the early 1980s, with the rate of growth acceleration from about the mid-1990s and again after China's accession to the World Trade Organization (WTO) in 2001 (Figure 1). The value of U.S. imports from China have risen from US$ 16 billion 1990 to US$ 307 billion in 2006. Since 2003, China has been the second largest source of U.S. imports, after Canada but ahead of Mexico and Japan. U.S. exports to China have also grown persistently during this period, but from a low base and at a slower rate. Total exports in 2006 amounted to a mere US$ 55 billion, up from US$ 5 billion in 1990. Bilateral economic ties between the two countries have therefore been characterised by a steadily growing trade imbalance: the trade deficit increased from US$11 billion in 1990 to US$205 billion in 2006, the largest deficit that the United State has ever had with any country. The bilateral trade deficit as a percentage of U.S. GDP increased from 0.2% in 1990 to 0.9% in 2000, and then to 1.9% in 2007. Deficit with China has been the U.S.'s single largest bilateral trade deficit since 1999. As part of WTO accession China substantially reduced barriers to import becoming the fastest growing export market for U.S. exports. However, WTO accession also gave foreign companies confidence to move their assembly plants within global production networks to China. As a result, China's exports to the US kept growing faster rate.

Figure 1 about here

Figure 2 about here

Figure 3 about here

Figure 2 illustrates the U.S.-China trade deficit in the context of the United States growing overall trade deficit. At the same time that the US deficit with China increased, the overall US deficit with all other countries has expanded. In 2006, the U.S.-China bilateral deficit amounted to 28% of the total US trade deficit—in other words, almost three-quarters of the total U.S. trade deficit was with the rest of the world. Moreover, from about 1999, the widening U.S.–China deficit has been significantly counterbalanced by a sharp decline in the relative importance of U.S. bilateral trade deficits with Japan and the other East Asian Countries. Between 1999 and 2006, the increase in China's share in the total US trade deficit from 20.4% to 28.4% was accompanied by a decline in the respective figure for Japan—from 21.1% to 10.5%. The combined share of the other East Asian countries too declined—from 16% to 10.3%—between these two years. As can be seen in Figure 3[2], the widening China-U.S. trade surplus over the past 10 years have been accompanied by widening bilateral deficits with Japan and the other East Asian countries. From 2004 to 2006, the combined deficit with Japan and the other East Asian countries amounted to 85% of the China-U.S. trade surplus. As we will see in the following section, China's widening trade deficits with the regional trading partners, which mirror China's widening surpluses with the U.S., are closely associated with China's increasingly important role as the main centre of final assembly within regional production networks.

[2] It is important to note that Chinese estimates of the US trade deficit have always been lower than the United States' own figures because of different ways US treat imports from and exports to China that pass through Hong Kong. According to estimates by Fung *et al.* (2006), the US official data tend to overstate the actual deficit by about 17%, while the degree of underestimation involved in the Chinese official estimate is as high as 33%. This discrepancy does not, however, seem to create a serious problem in examining overall trends in the trade gap.

3. GLOBAL PRODUCTION SHARING AND US-CHINA TRADE PATTERNS

In order to help understand US-China trade relations from a comparative perspective, data on the changing patterns of geographic profile and commodity composition of US import and export trade are summarised in Tables 1 and 2. China's share in total US merchandise imports increased from 6.5% in 1995/6 to 15.5% in 2005/6. The accompanying market share losses have come predominantly from the other East Asia exporting countries, in particular Japan, Korea and Taiwan. At the early stage of China's export takeoff, conventional labour-intensive manufactured goods (reported in the UN trade data system as 'miscellaneous manufactures' (SITC 8)) dominated U.S. imports from China, reflecting China's general pattern of export specialization at the time. Since then there has been a palpable shift in the commodity composition of imports away from these products and towards machinery and transport equipment, in particular information and communication technology (ICT) products (falling under SITC categories 75, 76 and 77). Between 1995/6 and 2005/6 the share of miscellaneous manufactures in total imports from China declined from 58.8% to 38.5%, accompanied by an increase in the share of machinery from 26.3% to 44.1%. The share of ICT products increased from 22.4% to 37.6%, and this commodity group contributed to over 40% of the total increment in imports from China between these two time points. China's share in total US ICT-product imports increased from 6.5% in 1995/6 to 33.0% in 2005/6. This was underpinned by a sharp decline in the combined share of the other East Asian countries from 63.5% to 36.6%. China's share in the U.S. ICT imports in 2005/6 was almost two times that of Mexico (15.7%).

Table 1 about here

Table 2 about here

To gain further insights into growing importance of overseas assembly as a source of imports for the United States and the pivotal role played by China in this international division of labour, we disaggregated data on machinery trade into parts and components, and final goods (reported trade – parts and components).[3] The results of this exercise are presented in Table 3 and Figure 4. Table 3 gives data on the share of parts and components in total U.S. imports and exports of machinery and the subcategory of ICT products therein. Data for ICT products disaggregated into final goods and parts and components are plotted in Figure 4.

Table 3 about here

Figure 4 about here

The share of parts and components in U.S machinery exports is generally much higher across all partner countries compared to that of imports (Table 3). Moreover, on the import side, the shares have recorded a notable decline across all import trading partners. This decline is much sharper for ICT products subcategory within the broader category of machinery and transport equipment. These patterns are generally consistent with the U.S.'s comparative advantage in skill/capital intensive activities in production processes within global production networks in vertically integrated industries (Feenstra 2008, Mann 2006). Within this broader context, one can observe two peculiarities relating to China's role in international production sharing in relation to her trade with the United States.

First, the share of parts and components in U.S exports to the other East Asian countries (in particular to the countries in ASEAN) is much higher compared with that of exports to China. This pattern is consistent with the case study-based findings that U.S firms located in the East Asian countries undertake further processing/assembly of parts and components originally designed/produced in the United States as part of their engagement in China-centered regional production networks. US-based multinational enterprises have a long history of engagement in parts and component assembly and testing Southeast Asia dating back to the setting up of processing plants by National Semiconductors and Hewlett Packard in Singapore in the early 1970s. Many more US firms entered this arena and their production locations expanded to Thailand, Malaysia,

[3] For details on this decomposition procedure, see Athukorala (2005).

and the Philippines in subsequent years and, more recently, to Vietnam. At the formative stage, the activities of U.S. multinational affiliates involved simple assembly/testing of simple components and re-importing the assembled components to the United States to be incorporated in the final products. Over time, more and more sophisticated stages of the production process were relocated in Southeast Asia, resulting in multiple border-crossings of parts and components before they are incorporated in final production not only in the United States but also in other countries covered by the US multinational's network (through their own affiliated firms and arm's-length trade relations (Lipsey 1998, Athukorala 2008). U.S. multinational affiliates in Southeast Asia have, in fact, expanded assembly activities in the region since the emergence of China as the global assembly centre for ICT products and other machinery, and these firms supply parts and components to their own affiliates and other firms involved in assembly operations in China (Athukorala 2007).

Second, the share of parts and components in U.S imports from China are remarkably low compared with the figures for the other East Asian countries, as well as the global average. In years for which data are reported, parts and components account for about 20% of total ICT imports to the United States—that is, final goods accounted for nearly four-fifths of total imports. Consequently, the increasing trend of China's penetration in the US ICT markets is much sharper (Figure 4) in terms of data for final goods compared to the figures based on the standard (gross) trade data. Third—and relating to the two previous points—two-way trade in parts and components seems to account for much larger share of trade between the U.S. and other East Asian countries (in particular, ASEAN countries) compared with trade with China. These contrasting patterns reflect China's role as the centre of final goods assembly within East-Asia centered global production networks in a wide range of ICT products.

China's world market share of ICT products recorded a five-fold increase from 5% in 1992/3 to 24.1% in 2005/6. Among them the share of office machines increased from less than 2% in 1992/93 to over 28% in 2005/6. Today, China is the world's largest producer as well as the single largest exporter of personal computers falling in this commodity group. China's world market share of telecommunication and sound recording equipment (dominated by mobile phones, DVD players, and optical disc (CD) players) was 26.2% in 2005/6, up from 7.9% in 1992/3. The phenomenal structural shift in China's export structure away from the traditional labour intensive products and towards ICT products have been widely interpreted—not only in the popular press and policy reports of agencies involved in promoting R&D activities but also in some scholarly writings—to argue that China is rapidly becoming an advanced-technology superpower and the sophistication of its export basket is rapidly approaching the levels of those of most advanced industrial nations (e.g. Rodrik 2006, Yusuf *et al*. 2007). A closer examination of data, however, suggests that such an inference is fundamentally flawed. In reality, what we observe is the rapid consolidation in China of final-assembly stages of East Asia-centered global production networks of these products. Ample supply of relatively cheap and trainable labour and the scale economies arising from China's vast domestic market (which enables firms to achieve low unit costs) [4] are contributory factors to China's attractiveness as a global assembly centre. ICT products. The bulk of ICT products exported from China (such as note book computers, display units, mobile phones, and DVD and CD players) are simply 'mass-market commodities' produced in huge quantities and at relatively low unit cost using imported high-tech parts and components; they are not 'leading edge-technology products' (Bergsten et al 2006, Lardy 2005, Sung 2007).

4. DETERMINANTS OF TRADE FLOWS

It is clear from the discussion so far that Chain's emergence as an important player in global production networks is an important structural factor behind the widening trade deficit between the United States and China. We now turn to a more formal examination of the determinants of U.S. trade, distinguishing between imports and exports, and focusing on the behavior of trade flows of final goods and parts and components within machinery trade. The purpose is to examine whether trade with China has a specific effect on the overall international trade patterns of the United States beyond what can be

[4] According to available estimates 70% or more of assembled products are sold domestically (Bergesten *et al*. 2006, p. 90)

expected in terms of the standard determinants of bilateral trade flows. The analytical tool used for this purpose is the gravity equation, which has become a standard tool for analysing bilateral trade flows. For the purpose of our analysis, we augmented the basis gravity model in a number of ways to yield the following specification:

$$
\begin{aligned}
Ln\ TRD_{i,j} = \alpha &+ \beta_1 lnGDP_i + \beta_2\, lnGDP_j + \beta_3\, lnPGDP_i + \beta_4\, lnPGDP_j \\
&+ \beta_5 lnDST_{i,j} + \beta_6 ADJ_{i,j} + \beta_7 lnRULC_{i,j} + \beta_8\, lnRER_{i,j} + \beta_9 DCH \\
&+ \beta_{10} DJP + \beta_{11} DTW + \beta_{12} DAS + \gamma T + \varepsilon_{ij}
\end{aligned}
$$

in which subscripts *i* and *j* refer to the reporting (the United State) and the partner country, and *ln* denotes natural logarithms. The variables are listed and defined below, with the postulated sign of the regression coefficient for the explanatory variables in brackets.

TRD	Trade (imports (*MP*) or exports (*EX*)) between *i* and *j*
GDP	Real gross domestic product (GDP) (+)
PGDP	Real GDP per capita (+)
DST	The distance between the economic centres of *i* and *j* (-)
ADJ	A binary variable assuming the value 1 if *i* and *j* share a common land border and 0 otherwise (+)
RULC	Relative unit labour cost of manufacturing between *j* and *i* (*EX* +; *MP* -)
RER	An index of bilateral real exchange rate which measure the international competitiveness between *j* and *i* (*EX* +, *MP* -)
DCH	Intercept dummy variable for China (+ or -)
DJP	Intercept dummy variable for Japan (+ or -)
DTW	Intercept dummy variable for Taiwan and Korea (+ or -)
DAS	Intercept dummy variable for the six major member countries of ASEAN (Indonesia, Malaysia, Philippine, Singapore and Thailand)
T	A set of time dummy variables to capture year-specific ‘fixed’ effects
α	A constant term
ε	An stochastic error term, representing the omitted other influences on bilateral trade

The first four explanatory variables (*GDP*, *GDPP*, *DST* and *ADJ*) are the standard gravity-model arguments that do not require further discussion. Among the remaining variables, the relative unit labour cost (*RULC*, relative manufacturing wage adjusted for labour productivity) is presumably a major factor impacting on the global spread of fragmentation-based specialisation (Jones and Kierzkowski 2001a; 2001b). In a context where both capital and components have become increasingly mobile, relative cost of production naturally becomes an important consideration in cross-border production. The inclusion of real exchange rate, *RER*, which captures international competitiveness of traded-goods production, is based on similar reasoning. Another important determinant of trade flows suggested by the theory of production fragmentation is the cost of 'service links' connecting 'production blocks' in different countries. There is no unique measure of the cost of service links. However, in our model, distance (*DST*), adjacency (*ADJ*), and per capital income (*PGDP*) capture certain aspects such costs. Technological advances during the post-World War II era have certainly contributed to a remarkable reduction in international communication cost. There is, however, evidence that the geographical 'distance' is still a key factor in determining international transport cost—in particular shipping cost—and delivery time (Evans and Harrigan 2003). Timely delivery can in fact be a more important influence on vertical trade compared to final trade because of multiple boarder-crossing involved in the value added chain. The common border dummy (*ADJ*) captures possible additional advantages of proximity that are not captured by the standard distance measure (the greater cycle distance between capital cities). The inclusion of *PGDP* as an explanatory variable allows for the fact that more developed countries have better ports and communication systems and other trade-related infrastructure as well as better institutional arrangements for contract enforcement that facilitate trade by reducing the cost of maintaining 'services links'.

China dummy (*DCH*) is expected to capture the 'China effect' over and above the other variables. Dummy variables are also included for Japan (*DJP*), Taiwan and Korea (*DTW*) ASEAN (*ASN*) and Mexico (*DMX*) guided by the empirical regularities in trade patterns observed in the previous section. We observed that China's rapid export expansion in standard labour intensive manufactures and ICT products has been in direct competition with these countries. Thus, it is important to control for any unobserved fixed effects underpinning the competitiveness of these countries in these product lines for precise estimation of the 'China effect'. Finally, the time-specific fixed effects (*T*) are included to control for general technological change and other time-varying factors.

The model was estimated using annual data for manufacturing trade over the period 1992-2005. Data are tabulated for all US trading partner countries each of which accounted for 0.1% or more of total world manufacturing exports in 2000/1. There are 41 partner countries which satisfied this criterion. Of these, Hong Kong was combined with China because of its peculiar trade links with the latter.[5] Thus, our data set relates to 40 countries. Data on bilateral exports are compiled from the importers' records (CIF) of the UN Comtrade database. The data for machinery trade are disaggregated into components and final products following the procedures detailed in Athukorala (2005). The data source for other variables and methods of variable construction are explained the Appendix.

We use the random effect estimator as our preferred estimation technique. The alternative fixed effect estimator is not appropriate because our model contains a number of time-invariant variables. Note that we estimate the model for bilateral trade (imports and exports) of the U.S. with the other 40 countries. This means that the reporting country' GDP and PGDP have only 'within variation' in the data panel. It is not possible therefore to retain one or both of these variables and time dummies in the same regression because of multicollinearity. After undertaking experimental estimations to see the sensitivity of the results to alternative specifications (with income variables only and time dummies only while keeping all other variables the same), we opted for the version with time dummies. It turned out to be superior to the alternative in terms of economic plausibility, the overall fit and statistical significance of the coefficient estimates of the other variables. This specification choice means that the estimated coefficients of time dummies capture both the reporting country's (the United State) income effect and other time-specific factors

[5] We also treated Hong Kong as a separate country in experimental runs and found that results were insensitive to this alternative specification.

impacting on trade flows. Relating to the latter, the most noteworthy developments are China's accession to the WTO in 2001 and the subsequent tariff reductions, and the abolition of Multifibre Arrangement (MFA) with effect from 2005. The common border dummy (*BRD*) could not be retained in the final estimation because of its high (negative) correlation with the distance variable. This is not surprising given the United State's high intensity of trade with its two neighbours, Mexico and Canada. In experimental runs, we also tested an additional dummy variable for the North American Free Trade Agreement membership (in place of the Mexico dummy). It turned out to be statistically insignificance over and above the other variables, and it's inclusion/exclusion had no significant effect on the size/statistical significance of the other coefficients in the regressions. The regression results are reported in Table 4.

Table 4 about here

The coefficient of the China dummy (*DCH*) is positive and statistically significant in all equations.[6] It is much larger in the import equations, indicating that, after controlling for the standard determinants of trade flows, exports from China have penetrated in the US at a rate much higher rate (on average, sixteen times) compared to those from other countries. The coefficient of *DCH* in the final machinery export equation is strikingly large (4.55) and is almost twice of that in the equation for parts and components (and total manufacturing). This result is consistent with the dominant 'assembly bias' in the emerging patterns of China's export specialisation, which we observed in the previous section. The differences in magnitude among the coefficients of *DCH*, *DAS*, *DKT* and *DMX*in each of the four import equations are also consistent with the observed differences between China and these other countries in their role in global production networks. The much larger coefficient of the ASEAN dummy in the component equation (3.5) is particularly noteworthy. As discussed, the explanation seems to lie in economic history: the early choice of the region by MNEs as a location for components assembly and testing in their global production networks.

[6] Note that, as the model was estimated in log, the percentage equivalent for any dummy coefficient is, [exp (dummy coefficient) – 1]*100.

On the export side, there is no evidence to suggest that US firms perform relatively poorly in exporting to China compared with exporting to other countries. The coefficient of *DCH* is greater than unity and is statistically significant in all cases, suggesting that, once controlled for the other determinants, on average, exports to China have grown almost three times faster than exports to other destinations. The results for the dummy variables also do not reveal any notable difference in the rates of expansion of exports to the U.S. from China and Mexico. A comparison of the results for China and ASEAN corroborate our earlier observation of the growing complementarity among these countries in their trade links with the United States within global production networks.

Among the other explanatory variables, the results for *GDP* and *PGDP* variables are quite consistent with those of previous gravity model applications to trade flow analysis[7]. The results for the distance variable (*DST*) provide strong support for the hypothesis that cost of transportation and other distance-related costs are an important determinant of imports to the U.S.. Interestingly, at the disaggregated level, the distance coefficient for components and final goods of machinery imports are much larger compared to the coefficients of other manufacturing and total manufacturing[8]. This difference is consistent with the hypothesis that vertical specialisation, given the multiple border crossing involved in the production process, is much more sensitive to transport cost. The distance coefficients in the exports equations are much smaller in magnitude (and barely attain statistical significance) compared to the respective coefficients on the import side. This asymmetry in the distance effect in U.S. foreign trade is an interesting issue for further investigation. One possible explanations is the increased concentration over time of U.S. machinery exports, in particular ICT products, in 'high value-to-weight' segments of the production process within global production networks (Brown and Linden 2005, Mann 2006)—a process that seems to have helped U.S. exporting firms to overcome trade barriers associated with the distance.

[7] See Soligo and Winters (2001) and the works cited therein.
[8] The differences are statistically significant at one-percent level or better.

The coefficient of the relative unit labour cost variable (*RULC*) is statistically significant with the expected (negative) only in the equation for final machinery imports. It suggests that, other things being equal, a 1 percentage point difference in unit labour cost among exporting countries is associated with 0.35% difference in growth of exports of this product category to the U.S. market. This unique result is consistent with the important role played by relatively low unit labour costs of China and other exporting countries in rapid penetration of ICT products and other assembled goods in the U.S. market.

Finally, turning to results for real exchange rate (*RER*), on the import side, its coefficient is barely significant with the unexpected (positive) sign in the equation for final machinery and is not different from zero in the other three equations. On the export side, the coefficient carries the expected (positive) sign in all four equations and it fails to achieve significance only in the machinery parts and components equation. The coefficients are, however, rather small—less than 0.1 in all cases. Overall, there is no evidence here to suggest that exchange rate plays a significant role in determining the United States' widening trade gap.[9] These results are generally consistent with the available evidence that global production sharing considerably weakens the link between the degree exchange and trade performance, particularly when it comes to the components trade (Feenstra 2008, Gron and Swenson 1996; Swenson 2000).

5. CONCLUDING REMARKS

The evidence harnessed in this paper supports the view that, in a context where international fragmentation of production is becoming the symbol of economic globalization, the real story behind the U.S.-China trade gap is much more complicated than what is revealed by the standard trade- flow analysis undertaken with data coming from a data-reporting system developed at a time when countries were trading predominantly (if not solely) in final goods. The widely-held view that China's rapid market penetration in the US economy is driven by unfair trade practices needs to be

[9] In experimental regression runs, we also interacted *RER* with *CHD* and failed to detect any China specific effect on the link between RER and trade flows.

reexamined in light of the fact that the two economies are deeply interconnected and interdependent within global production networks. Growing trade deficit between the two countries has been underpinned by China's emergence as the main point of final assembly in Asian production networks based on its amply supply of labour and moves by U.S. firms to supply high-end parts and components from their Asian bases. In sum, the deficit is to a large extent a *structural* deficit driven by the process of global production sharing. It is akin to the substantial deficits in trade with the oil exporting countries (based on their specific resource endowment), which the U.S. and the rest of the world has accustomed to live with.

Given the current state of China's factor-market conditions (as surveyed in a number of recent studies, including Cooper 2006; Meng and Bai 2007; Naughton 2007), one can speculate that China's trade patterns are unlikely to change dramatically in the short to medium run. China still has about half of its labour force in agriculture where its productivity is, on average, barely one-eighth of that in industry and about a quarter of that in the service sector. Agriculture still accounts for over 45% of total employment in the country even though agriculture's share in GDP is only 13%. GDP per worker in the economy as a whole is three times the value added per worker in agriculture. The country still remains very rural, with a rate of urbanization of about 40% of the total population— much lower than the 'normal' level of 60% consistent with Chin's income level. These features, coupled with the high skilled-unskilled wage differential (which, according to some estimates, has risen from 1.3 to 2.1 in the past decade) suggest that China still has much potential for moving unskilled workers out of agriculture and into manufacturing and other productive urban sector activities. Of course, for this to happen, the global trading environment would need to remain accommodative and Chinese policies receptive to gains from specialisation on the basis of comparative advantage.

Given the current state of data, in this paper, we have focused solely on U.S.–China trade in goods. The inferences therefore need to be qualified for the fact that the difference between merchandise trade and services trade had become increasingly blurred because of the ongoing process of global production sharing. U.S. firms that have shifted components production/assembly and final assembly activities overseas provides/and manage ‘services links’ involved in the global production networks from their home bases (Brown and Linden 2005, Mann 2006). In other word, as part of the ongoing process of global production sharing, the related services—particularly knowledge-based or information technology-enabled services that are beyond the traditional notion of internationally traded services, such as transportation, travel and tourism—have become increasingly tradable. There is evidence that exports of these new production-related services have significantly expanded in recent years (CEA 2007). The surplus in U.S. services trade (which has persisted since the late 1970s) has expanded rapidly in recent years, reaching $75 in 2006. The largest subcategory—growth of which has far outpaced growth in the rest of services—in the services account is ‘other private services’ trade which capture many of the information technology-related services, and management and consultancy services which are central to the process global production sharing.[10] An analysis that overlooks these exports could overstate the magnitude of the US-China trade imbalance, presumably by a wide margin.

[10] From 1995 to 2005, US exports of ‘other services’ grew 143%, compared with 44% growth in all other services, and accounted for 90% of the overall US services trade surplus in 2005, up from 38% in 1995 (CEA 2007).

APPENDIX

Table A-1: Dataset Used in Regression Analysis: Definition of Variables, Source and variable construction, and the Country Coverage

Variable	*Definition*	*Data Source/variable construction*
EXP	Value of U.S. bilateral trade in US$ measured at constant (2000) price.	Trade data (in current US$) compiled from importer records of UN-COMTRADE, online database (http://www.bls.gov/ppi/home.htm), deflated by the manufacturing sub-index of the US producer price index.
GDP, PGDP	Real GDP, and real per capita GDP (at 1995 price)	World Development Indicator, The World Bank
DIST	Weighted distance measure of the French Institute for Research on the International Economy (CEPII), which measures the bilateral great-circle distance between major cities of each country	CEPII database
ADJ	A binary dummy variables which take value 1 for countries which share a common land border and 0 otherwise	CEPII database
RULC	The ratio of unit labour cost (ULC) in country *j* and country *i*, where ULC is measured as the ratio of the average manufacturing wage to manufacturing value added per worker, both measured in US$. By construct, an increase (a decrease) in *RULC* indicates a deterioration (an improvement) in country J's cost competitiveness relative to i (the U.S., in this case).	Annual manufacturing wages data for USA: 'Interactive database of National Income and Product Accounts Tables' at http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Selected=N#S6 under Section 6 - Income and Employment by Industry All other countries: US Bureau of Economic Analysis (BEA) online database, 'Survey of U.S. Direct Investment Abroad' http://www.bea.doc.gov/bea/uguide.htm#_1_23
RER	Real exchange rate: $RER_{ij} = NER * \frac{P_J^W}{P_i^D}$ where, *NER* is the nominal bilateral exchange rate index.(US$ price of foreign currency), P^W in price level of country j measured by the producer price index and P^D is the domestic price index of country i measured by the GDP deflator. By construct, an increase (decrease) in RER_{ij} indicates a deterioration (an improvement) in country *j*'s competitiveness in traded-goods production vis a vis *i* (The U.S., in this case).	Constructed using data obtained from World bank, World development Indicators database. Following Soloaga and Winters (2001), mean-adjusted RER is used in the model. This variable specification assumes that countries are in exchange rate equilibrium at the mean.

APPENDIX (continued)

Countries Covered

Argentina	Finland	Malaysia	Slovakia
Australia	France	Mexico	Slovenia
Austria	Germany	Netherlands	South Africa
Belgium	Hungary	Norway	Spain
Brazil	India	Philippines	Sweden
Canada	Indonesia	Poland	Switzerland
China + Hong Kong	Ireland	Portugal	Taiwan
Costa Rica	Israel	Rep. of Korea	Thailand
Czech Rep.	Italy	Russian Federation	Turkey
Denmark	Japan	Singapore	United Kingdom

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Table 1: Geographic profile of U.S. trade (%)

Partner county/ country groups	Primary products		Manufactured goods								Total Trade	
			Total		Machinery (SITC 7)		ICT products		Misc. mfg (SITC 8)			
	1995/6	2005/6	1995/6	2005/6	1995/6	2005/6	1995/6	2005/6	1995/6	2005/6	1995/6	2005/6
(a) IMPORTS												
China + HK	1.4	1.7	9.5	21.6	4.5	18.2	8.1	33.4	27.4	39.7	7.8	16.0
China	1.3	1.7	7.9	21.0	3.7	18.0	6.5	33.0	22.6	37.8	6.5	15.5
East Asia	6.2	4.2	37.1	24.1	47.1	32.1	63.5	36.6	26.8	17.0	30.7	18.7
Japan	0.8	0.5	19.2	10.8	26.2	16.1	24.9	9.2	8.3	4.3	15.4	8.1
Korea	0.3	0.7	3.7	3.3	4.5	4.6	7.5	5.3	3.0	1.0	3.0	2.6
Taiwan	0.3	0.2	4.8	2.8	4.9	3.2	8.3	5.1	5.6	2.3	3.9	2.1
ASEAN	4.7	2.7	9.4	7.3	11.5	8.3	22.8	16.9	9.9	9.5	8.4	6.0
NAFTA	37.1	33.3	25.2	23.6	28.5	28.3	17.2	19.5	13.5	13.7	28.0	26.6
Mexico	8.9	9.4	8.5	10.4	10.2	14.0	10.9	15.7	7.1	7.8	8.6	10.2
EU 15 countries	10.3	9.9	19.4	19.8	17.2	17.3	9.3	7.2	15.3	13.1	17.9	17.4
World	100	100	100	100	100	100	100	100	100	100	100	100
(b) EXPORTS												
China + HK	5.3	10.8	4.1	6.2	4.0	6.6	4.7	9.5	3.3	5.4	4.3	6.8
China	3.1	9.7	1.8	4.3	1.8	4.7	1.1	5.6	1.2	3.1	2.0	5.0
East Asia	35.1	19.4	23.6	16.6	24.9	18.1	31.0	24.8	23.5	17.8	25.2	16.8
Japan	20.3	9.4	9.1	5.3	8.6	4.8	10.2	5.0	12.4	8.2	10.9	5.9
Korea	6.2	3.7	4.0	3.1	4.4	3.3	4.3	4.3	3.0	2.9	4.3	3.1
Taiwan	4.0	2.3	3.0	2.4	3.1	2.6	3.6	3.4	2.1	2.5	3.1	2.3
ASEAN	4.6	4.0	7.5	5.8	8.8	7.4	13.0	12.2	5.9	4.1	6.8	5.5
NAFTA	21.0	34.6	32.1	36.4	32.5	36.5	27.9	33.3	28.3	31.3	30.0	35.8
Mexico	7.3	14.0	8.8	13.0	8.3	12.8	10.3	17.1	9.9	10.7	8.5	13.1
EU 15 countries	18.0	14.2	21.2	21.1	21.0	18.7	22.7	17.3	22.6	26.3	20.9	20.1
World	100	100	100	100	100	100	100	100	100	100	100	100

Source: Compiled from UN COMTRADE database

Table 2: Commodity composition of U.S. trade by partner country

	Year	China + Hong Kong		East Asia					NAFTA		EU 15	World
		Total	China	Total	Japan	Korea	Taiwan	ASEAN	Total	Mexico		
(a) IMPORTS												
Primary products	1995/6	3.2	3.5	3.7	1.0	2.0	1.6	10.3	24.3	18.8	10.5	18.3
	2005/6	2.7	2.7	5.7	1.7	7.0	2.9	11.5	32.0	23.4	14.6	25.6
Manufactures	1995/6	95.4	95.7	94.7	97.4	96.5	97.0	88.0	70.3	77.1	84.7	78.3
	2005/6	96.0	96.1	91.6	95.4	91.1	93.8	85.8	63.1	72.5	80.9	71.0
Machinery	1995/6	26.4	26.3	70.3	77.9	67.8	58.5	62.7	46.5	54.4	44.0	45.8
and equipment	2005/6	43.3	44.1	65.2	75.7	68.6	57.4	52.4	40.3	52.0	37.7	38.0
CIT products	1995/6	23.0	22.4	46.2	36.0	55.3	48.2	60.7	13.7	28.3	11.6	22.3
	2005/6	37.0	37.6	34.6	20.2	36.7	43.5	49.9	13.0	27.3	7.3	17.7
Miscellaneous. Manufactures	1995/6	58.8	58.5	14.6	9.0	16.8	24.2	19.8	8.1	13.8	14.4	16.8
	2005/6	38.5	37.7	14.1	8.2	6.3	16.9	24.4	7.9	11.8	11.6	15.5
Total	1995/6	100	100	100	100	100	100	100	100	100	100	100
	2005/6	100	100	100	100	100	100	100	100	100	100	100
(b) EXPORTS												
Primary products	1995/6	21.6	27.6	24.6	32.8	25.5	22.4	11.9	12.4	15.1	15.3	17.7
	2005/6	24.4	29.8	17.6	24.1	18.3	15.1	11.3	14.7	16.3	10.8	15.3
Manufactures	1995/6	75.2	71.1	73.2	65.4	72.2	74.5	85.6	83.8	80.8	79.7	78.3
	2005/6	73.8	68.7	79.8	72.8	79.7	82.9	86.0	81.9	80.0	85.1	80.8
Machinery	1995/6	45.6	43.8	48.1	38.3	49.2	48.8	62.6	52.9	47.1	49.1	48.7
	2005/6	46.8	45.4	51.4	38.4	51.6	53.1	64.7	48.7	46.6	44.6	47.8
CIT products	1995/6	23.9	12.6	27.1	20.5	21.8	25.2	41.8	20.5	26.4	24.0	22.0
	2005/6	26.3	20.8	27.5	15.7	25.8	27.1	41.5	17.4	24.4	16.1	18.7
Misc. manufactures	1995/6	9.5	7.7	11.7	14.2	8.8	8.5	10.9	11.8	14.4	13.5	12.5
	2005/6	9.0	7.1	12.0	15.7	10.7	12.3	8.5	9.9	9.2	14.8	11.3
Total	1995/6	100	100	100	100	100	100	100	100	100	100	100
	2005/6	100	100	100	100	100	100	100	100	100	100	100

Source: Compiled from UN COMTRADE database

Table 3: Share of parts and components in US machinery trade (%)

	Imports 1995/6	2005/6	Exports 1995/6	2005/6
(a) Machinery & transport equipment*				
China + Hong Kong	32.1	24.4	45.6	56.0
China	25.0	24.2	36.1	50.8
East Asia	45.6	36.8	57.5	62.1
Japan	42.2	33.3	51.1	49.4
Korea	60.3	31.0	51.2	58.2
Taiwan	54.9	52.6	55.4	58.4
ASEAN	43.6	40.9	67.7	73.2
NAFTA	35.7	34.6	58.8	52.7
Mexico	42.7	37.7	68.9	61.9
EU 15	43.7	38.9	54.3	52.4
World	42.1	34.9	54.4	52.4
ICT products				
China + Hong Kong	31.9	20.9	59.2	72.7
China	23.5	20.7	51.2	72.8
East Asia	51.8	44.6	71.3	77.4
Japan	51.8	51.3	60.7	53.6
Korea	70.4	38.6	64.4	78.3
Taiwan	57.6	52.9	78.6	81.1
ASEAN	43.5	40.4	79.8	85.7
NAFTA	55.6	39.0	63.2	57.3
Mexico	50.5	36.2	70.4	65.9
EU 15	54.9	48.9	54.9	51.1
World	51.2	36.1	60.9	61.0

Note: * Including CIT products
Source: Compiled from UN Comtrade database.

Table 4: US: Determinants of manufacturing imports and exports, (1992-2005)[1]

Explanatory Variables[2]	Total Manufacturing	Machinery and transport equipment		
		Parts and components	Final goods[3]	
(a) Imports				
Ln GDP, exporter	0.84***	0.89***	0.68***	0.83***
	(3.50)	(3.40)	-2.63	-3.28
Ln PGDP exporter	0.40*	0.42*	0.67***	0.25
	(1.59)	(1.95)	(2.80_	(0.86)
Ln distance (*DST*)	-0.93*	-1.38***	-1.28**	-0.733
	(1.86)	(3.10)	(2.11)	(1.47)*
Ln relative unit labour cost (*RULC)*	-0.02	0.017	-0.373***	0.024
	(0.17)	(0.12)	(2.74)	(0.17)
Ln real exchange rate (*RER*)	0.01	-0.002	0.041*	0.004
	(0.71)	(0.11)	(1.71)	(0.31)
China dummy (*DCH*)	2.90***	2.40***	4.55***	2.60***
	(4.03)	(3.93)	(5.63)	(3.84)
Japan dummy (*DJP*)	0.53	1.19	2.01**	-0.37
	(0.60)	(1.37)	(2.34)	(0.34)
ASEAN dummy (*DAS*)	2.74***	3.51***	4.05***	1.78***
	(5.02)	(5.69)	(6.55)	(2.91)
Korea + Taiwan dummy (*DKT*)	1.79***	2.64***	2.79***	1.18***
	(4.97)	(7.21)	(8.32)	(2.76)
Mexico dummy (*DMX*)	1.23*	1.40**	2.13**	0.67
	(1.92)	(2.11)	(2.46)	(1.13)
Constant	-0.28	0.42	2.51	-0.90
	(0.03)	(0.05)	(0.28)	(0.09)
Observations	481	481	481	481
R^2 within	0.78	0.57	0.63	0.70
R^2 between	0.69	0.73	0.73	0.60
RMSE[4]	0.18	0.32	0.29	0.21
(b) Exports				
Ln GDP, importer	0.86***	0.89***	0.81***	0.75***
	(6.43)	(5.14)	(6.26)	(4.66)
Ln PGDP importer	0.33**	0.41**	0.41***	0.37**
	(2.36)	(2.19)	(4.03)	(2.46)
Ln distance (*DST*)	-0.81	-0.55	-0.58	-0.73
	(1.56)*	(1.69)*	(1.06)	(1.34)
Ln relative unit labour cost (*RULC)*	-0.02	-0.01	0.017	-0.06
	(0.36)	(0.11)	(0.18)	(1.10)
Ln real exchange rate (*RER*)	0.03*	0.01	0.07***	0.02**
	(1.63)	(0.25)	(3.43)	(2.18)
China dummy (*DCH*)	1.05**	1.05**	1.41***	1.27**
	(2.49)	(2.03)	(4.35)	(2.51)
Japan (*DJP*)	-0.54	-0.56	-0.66	-0.21
	(1.41)	(1.09)	(1.59)	(0.50)
ASEAN dummy (*DAS*)	2.00***	2.73***	1.56***	1.49***

	(5.34)	(5.25)	(4.31)	(4.27)
Korea + Taiwan dummy (*DKT*)	1.14***	1.54***	0.97***	0.98***
	(4.94)	(6.23)	(3.85)	(4.24)
Mexico dummy (*DMX*)	1.22*	1.26	1.29*	1.56**
	(1.75)	(1.62)	(1.83)	(2.16)
Constant	-0.81	-2.63	-3.35	0.06
	0.15	0.40	0.58	-0.01
Observations	478	478	478	478
R^2 within	0.696	0.648	0.707	0.674
R^2 between	0.612	0.495	0.280	0.670
RMSE[4]	0.175	0.279	0.282	0.151

Notes:

1 Estimated by applying the random effect estimator to annual data on bilateral trade of 41 countries over the period 1992 to 2003. The standard errors (SEs) of the regression coefficients (reported in parantheses) have been derived using the Huber-While consistent variance-covariance ('sandwich') estimator. Statistical significant (based on the standard t-test) is denoted as ***1%, **5%, and *10%. Results for the time dummies are not reported.

2. For variable definitions and details on variable construction see the Appendix.
3. Total manufacturing (SITC 5 though 8 – 68) less machinery and transport equipment (SITC 7)
4. Root mean square error.

Figure 1: US-China Trade, 1990-2006

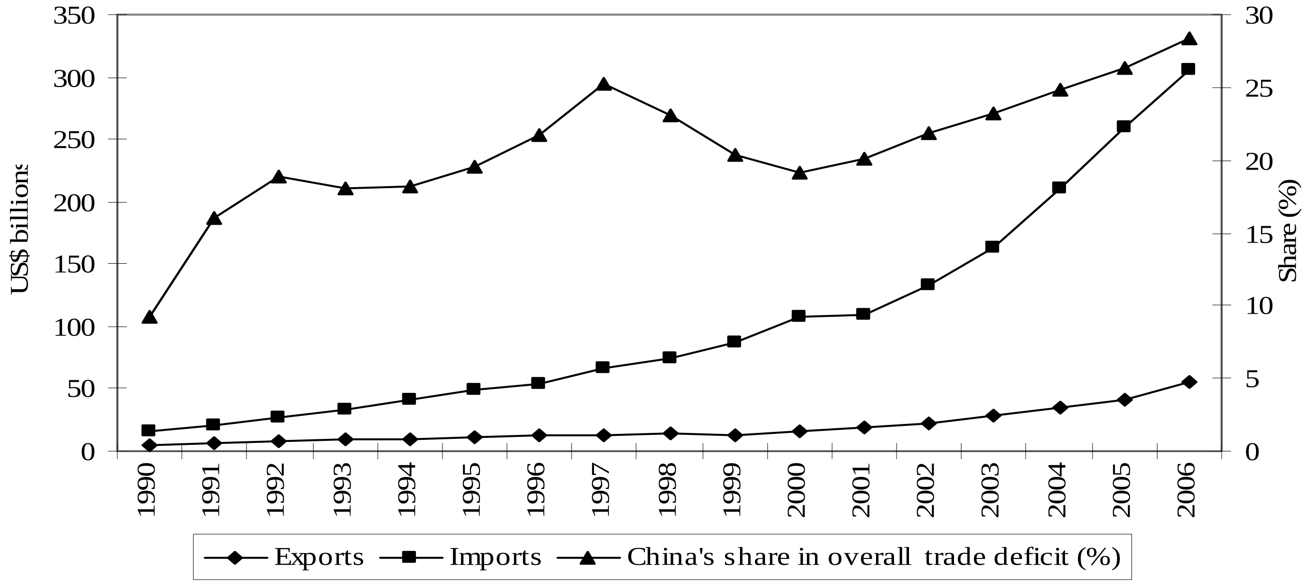
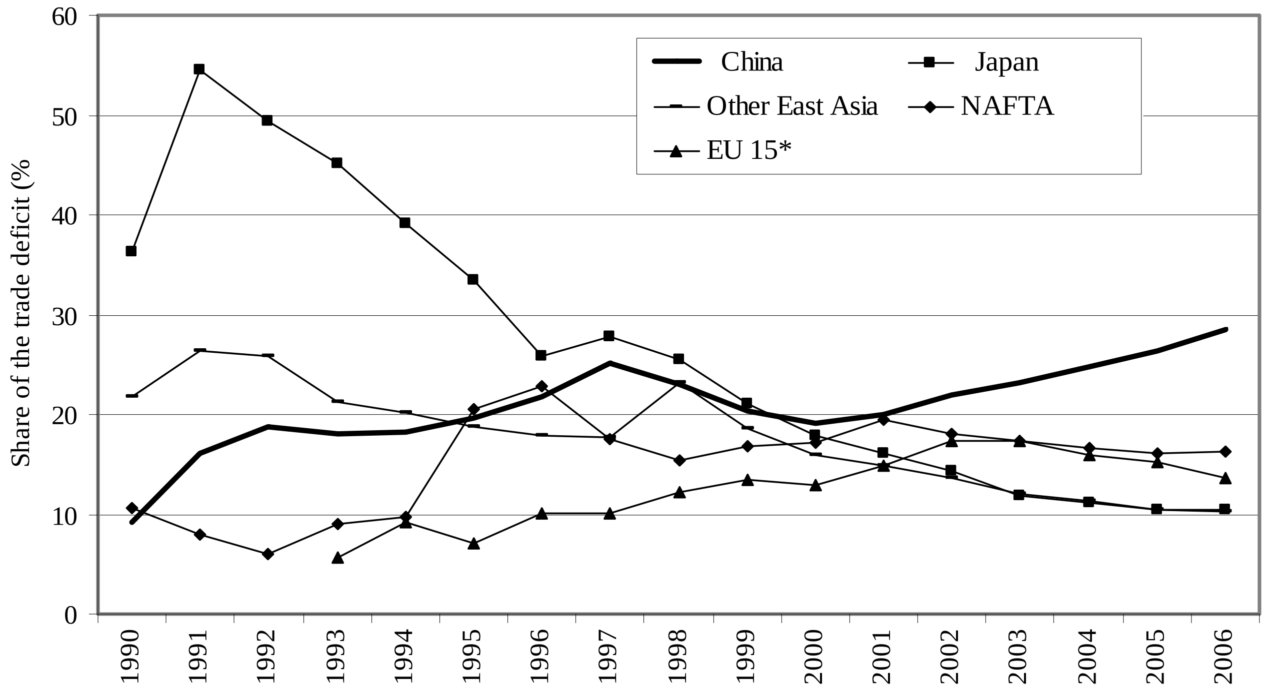


Figure 2: U.S. Trade Deficit: China's Share in Comparative Perspective, 1990-2006



* US had a small trade surplus with EU during 1990-1993.
Source: Based on data compiled from UN Comtrade database.

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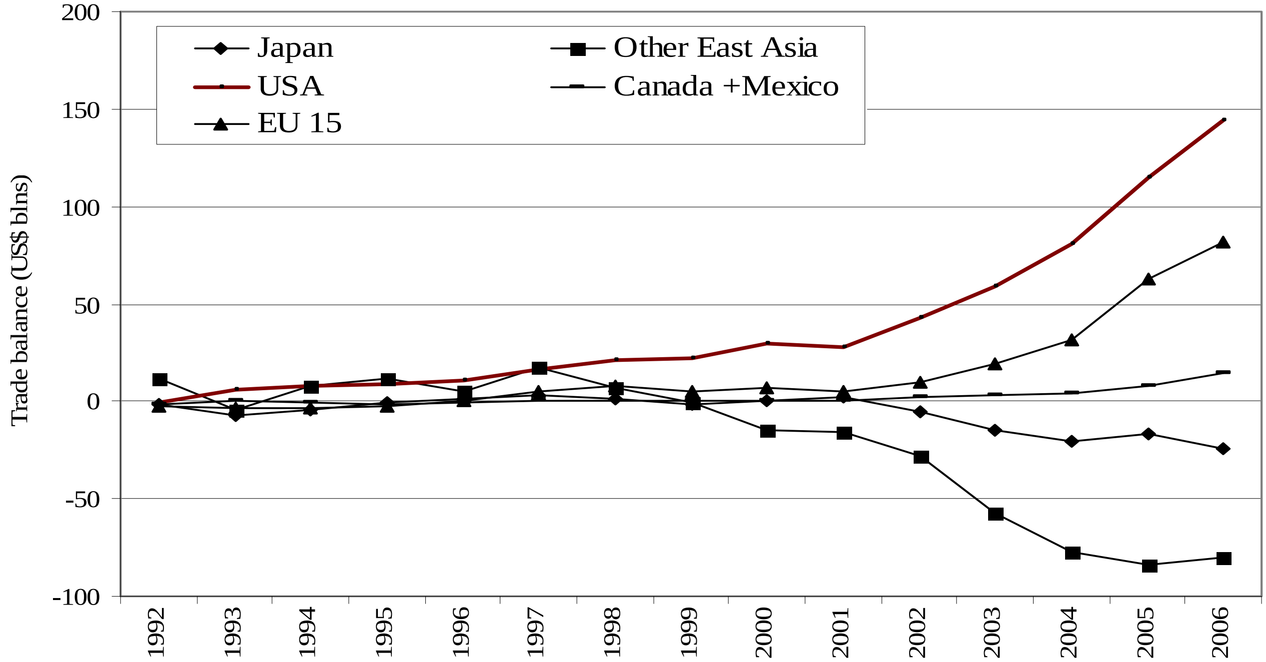
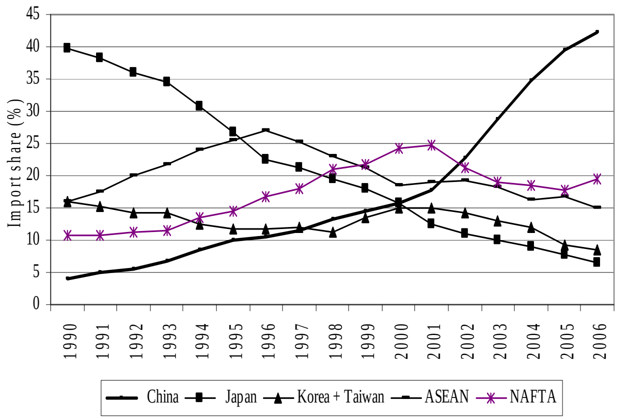
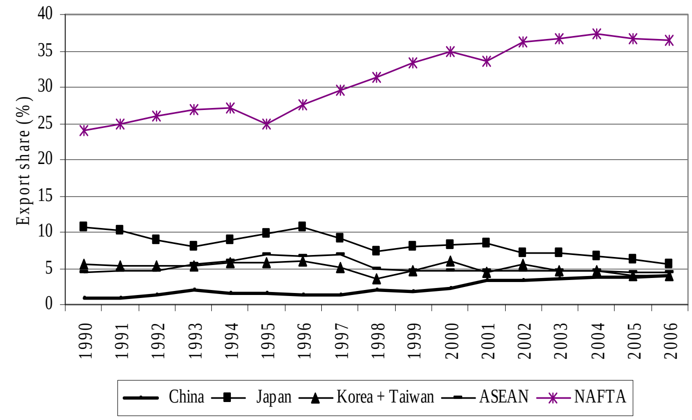
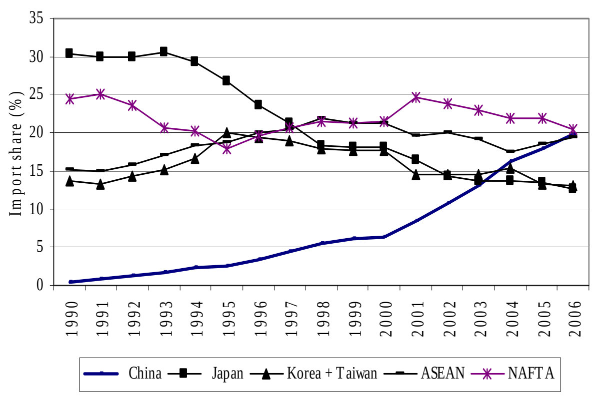
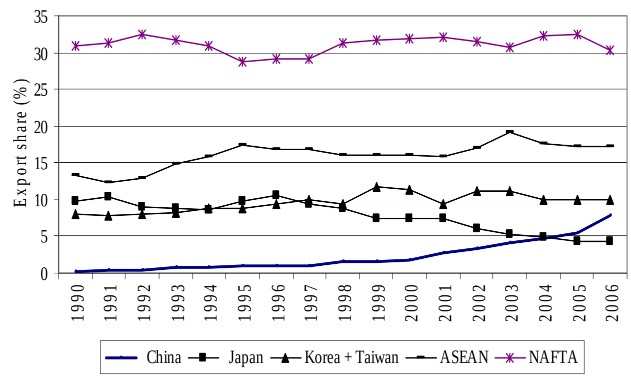
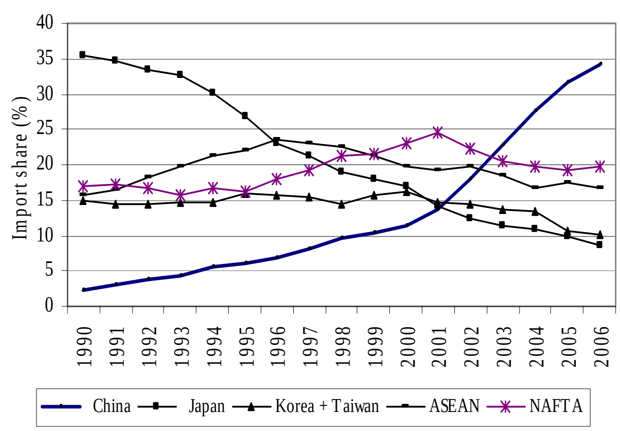
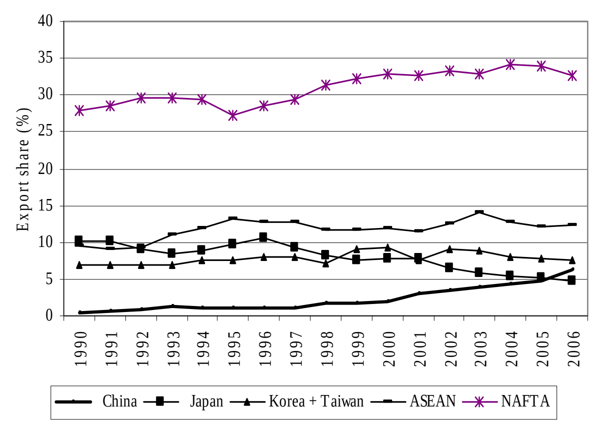
Figure 3: China's Bilateral Trade Balances (US$ billions), 1992-2006



Source: Based on data compiled from UN Comtrade database.

Figure 4: U.S. Trade in CIT Goods disaggregated into parts and components and final goods (%)

Imports	Exports
a.1: Final goods 	a.2: Final goods 
b:1: Parts and components 	b.2: Parts and components 
c.1: Total (reported) imports 	c.2: Total (reported) exports 

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