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MEASURING VALUE ADDED TRADE AND ITS POTENTIAL IMPLICATIONS FOR POLICY DEVELOPMENT

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MEASURING VALUE ADDED TRADE AND ITS POTENTIAL IMPLICATIONS FOR POLICY DEVELOPMENT.

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These comments are my own, and do not reflect the views of the United States International Trade Commission nor any of its individual Commissioners.

Introduction

1. Recently Pascal Lamy, Director General of the World Trade Organization, suggested "…by focusing on gross values of exports and imports, traditional trade statistics also gives us a distorted picture of trade imbalances between countries." He went on to argue that value added trade statistics helps reveal that the macro economic imbalances present in the current global economy are not likely to be corrected through focus on bilateral trade deficits.[2]

2. In the U.S. there has been great political and press attention paid to the long term current account deficit, and particularly the bilateral trade deficit with China. At the USITC, beginning shortly after China's accession to the WTO, in the early 2000's, we started receiving requests from our governmental customers regarding the growing trade imbalance with China.[3] We first gathered data similar to that seen in Figure 1, traditional import values showing rising imports from China, and much of the rest of the world in

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[1] This paper represents a summary and synthesis of a number of papers prepared by me and numerous coauthors working together and/or separately. In particular Zhi Wang, Shang-Jin Wei, William Powers, and Justino De La Cruz without whom this work would not have been started nor progressed. Numerous referees and editors have made substantial improvements in our work over a number of papers and to them we owe many thanks. However all errors that remain in this work are solely mine.

[2] Pascal Lamy, Keynote address at WTO, IDE-Jetro launch of joint publication "Trade Patterns and Global Value Chains in East Asia", June 6th, 2011. Found at http://www.wto.org/english/news_e/news11_e/miwi_06jun11_e.htm

[3] The USITC is an independent U.S. Government agency. It is not part of the Presidential Administration nor Congress and it does not make policy. The ITC provides independent and unbiased information and analysis to help inform policymakers such as the President, through USTR, and Congress – mainly the two Congressional Committees responsible for trade, the Senate Finance Committee and the House Ways and Means Committee. This separation, and its design, with balanced political representation, is to ensure it remains independent and objective.

value terms. Of course when the questions first came in we had not yet experienced the recession of 2008 related to the Financial Crisis so the path of import growth was fairly steadily upward, except for the 2001 recession. We next transformed the data into shares as seen in Figure 2. This figure makes it quite clear that something important was going on in Asia, and we knew that much of it was related to Asian supply chain realignment and a focus on China as a point of final assembly in those chains. However we had no way of clearly showing these links in the aggregate data at that time. Groups highly critical of trade referred to data such that as in Figure 1 and generally focused on China for keeping its currency artificially low in order to to increase exports to the U.S., among other countries. The view was articulated that since other Asian countries continued to expand exports to the U.S., and this would suggest that China's increased exports were essentially completely offsetting domestic production, not substituting for other Asian exports. Further, trade critics often pointed out that low prices from China, due to the currency undervaluation, stimulated demand in the U.S. for Chinese imports, and was then generating a growing current account deficit. To better address these kinds of comments we then developed data similar to that presented in Figure 3, which suggest that macro factors, particularly relatively strong economic growth, exhibited in this figure through a stable, low unemployment rate through most of the period, and relatively robust economic growth in the U.S. compared to other developed countries, combined with a low savings rate, were the main contributor to growing trade deficits. Despite the various forms of data presented there was no clear "smoking gun" linking other Asian countries to Chinese exports. Similar arguments and concerns were expressed regarding NAFTA trade flows.

Methods for Understanding Country and Global Macro Level Supply Chains

3. These efforts to inform our customers and the need to more fully understand what was happening in global trade flows led us to delve fairly deeply into value added trade issues.[4] In our first major effort (KWW 2008) in value added trade we focused specifically on China's exports, and particularly on accounting for the peculiarities of Chinese exports' extensive use of processing trade. We found that Chinese domestic value added in overall merchandise exports was 60 percent or less, and as low as 15 percent for certain electronics goods. In this paper we used very detailed information on China's trade regimes, bilateral and at the tariff line, to modify China's economy-wide input output (IO) data to reflect the substantial technology differences between its processing sectors and non processing sectors. Our goal was to build on existing literature to split China's IO table into two parts, processing and non processing, which would more accurately reflect the fact that the processing sector intensively used imported components that did not enter the domestic economy for other uses in final demand. We represented this in our paper as figure 4. One of the results of this work was to show that the path breaking work by Hummels, Ishii, and Yi (HIY, 2001) on vertical specialization needed to be interpreted with care, particularly in countries that made extensive use of processing trade. We found that for China the traditional HIY method substantially overestimated China's domestic content in its exports and underestimated foreign content in its exports as in table 1. The HIY method estimated total domestic value added in Chinese exports ranging from 82% to 71% between 1997 and 2007, and that domestic value added was declining. The KWW method estimated that Chinese domestic value added ranged from 46% to 39% during this period, much lower than the HIY method, and that Chinese domestic value added was rising.

4. Further, with our method and data we could provide fairly detailed sectoral estimates of domestic value added in exports, as in table 2 below. From this perspective you can observe that in 2002 China's domestic value added in telecommunications, ship building, electronic computers was less than 20 percent of exported value. Many "hi tech" or "sophisticated" exports contained less than 40 percent of Chinese domestic content. On the other hand many of China's historical export sectors, such apparel, textiles and

[4] KWW 1 and 2, DKWW, PWW, KPWW are among some of the papers generated from this effort. The discussions below, on value added trade in China and for global value added estimates I draw heavily from sections of KWW and KPWW.

fabrics, many steel or metal related items had domestic content in excess of 60 percent. These estimates suggest that work finding extraordinary sophistication of China's exports, such as that by Rodrik (2006) and Schott (2008), might need to be interpreted with some care as this sophistication may reflect the embodiment of sophisticated imported components. Further, if the domestic content in exports from China is low, especially in sectors that would have been considered sophisticated or high-skilled in the US, then imports from the PRC may still generate a large downward pressure on the wage of the low-skilled Americans after all (as pointed out by Krugman, 2008). These are important policy questions and have implications for both developing and developed countries. A good understanding of the nature and extent of global supply chains could provide important insights for economists and policy makers.

5. The work we did on China, similar work for Mexico (DKWW, 2009), and a growing literature on value added in trade led us to develop a method to look at global value added trade, while incorporating the insights we developed for large single country traders making heavy use of processing. Thus in KPWW 2010 we developed an estimation technique designed to tie, at a global level, value added estimates to gross trade flows, the most commonly available trade data, and as anyone in the policy world knows, quite heavily used and cited data to support various policy positions. Thus we use IO techniques to examine global value chain links using gross exports as a weighting mechanism. In this paper we fully characterized value-added contributions from direct and indirect sources in a country' gross exports, formally generalizing the concept of vertical specialization to account for all sources of value-added in gross exports in a multi-country multi-sector framework. It also connects the vertical trade literature with value-added trade literature, generalizing concepts such as domestic value-added that returns home in goods and services after being processed or finished abroad, denoted VS1* by Daudin et al. (2010). This measure can be sizable for some large advanced economies.

6. To do this, we first divide gross exports into final demand and intermediates. Within intermediates, we further divide those goods that are consumed by the direct importer from those goods that are processed and exported by the direct importer for consumption or further processing in a third country:

$$E_{rs} = Y_{rs} + A_{rs}X_s = \underbrace{Y_{rs}}_{\substack{\text{Final goods}\\ \text{exported to } s}} + \underbrace{A_{rs}X_{ss}}_{\substack{\text{Intermediates}\\ \text{absorbed in } s}} + \underbrace{\sum_{t\neq r,s} A_{rs}X_{st}}_{\substack{\text{Processed and exported}\\ \text{to third countries}}} + \underbrace{A_{rs}X_{sr}}_{\substack{\text{Processed and}\\ \text{exported back to } r}},$$

where Xst is the output of country s used to produce goods absorbed in country t. Note that the last three terms sum to the bilateral gross trade in intermediate goods, and all the three terms may include both intermediates and final products produced in the importing country s.

7. In KPWW we transform the above equation to arrive at our key decomposition equation that states that a country's gross exports to the world is the sum of the following five broad terms:

$$\begin{aligned} E_{r*} &= \mathrm{DV}_r + \mathrm{FV}_r \\ &= \underbrace{V_r B_{rr} \sum_{s\neq r} Y_{rs}}_{(1)} + \underbrace{V_r B_{rr} \sum_{s\neq r} A_{rs} X_{ss}}_{(2)} + \underbrace{V_r B_{rr} \sum_{s\neq r} \sum_{t\neq r,s} A_{rs} X_{st}}_{(3)} + \underbrace{V_r B_{rr} \sum_{s\neq r} A_{rs} X_{sr}}_{(4)} + \underbrace{\mathrm{FV}_r}_{(5)} \end{aligned}.$$

where,

1. (1) Domestic value-added embodied in exports of final goods and services absorbed by the direct importer;
2. (2) Domestic value-added embodied in exports of intermediate inputs used by the direct importer to produce its domestically needed products;
3. (3) Domestic value-added embodied in intermediate exports used by the direct importer to produce goods for third countries ("indirect value added exports')
4. (4) Domestic value-added embodied in intermediate exports used by the direct importer to produce goods shipped back to source ("reflected domestic value added")
5. (5) Value-added from foreign countries embodied in gross exports ("foreign value added used in exports").

8. This decomposition formula is also diagrammed in Figure 5. Our second equation above (or Figure 5) integrates the older literature on vertical specialization with the newer literature on value added trade, while ensuring that measured value-added from all sources accounts for total gross exports. The vertical specialization literature emphasized that gross exports contain two sources of value added, domestic and foreign. The second equation above shows that a country's domestic value-added could be further broken down into additional components that reveal the destination of a country's exported value added, including its own value-added that returns home in its imports.[5] The sum of (1), (2), and (3) equals each country's value-added exports to the world; the sum of (1),(2),(3), and (4) equals domestic content in a country's gross exports, thus nicely connecting the two major concepts in the vertical specialization and value-added trade literature on the one hand, and clearly distinguishing them on the other hand.

9. In addition, all other measures in the literature can be derived from a combination of the five basic measures. For instance, the sum of (3) and (4) equals HIY's VS1 in gross exports;the sum of (1),(2), and (3)divided by gross exports equals Johnson and Noguera's ratio of value-added exports to gross exports (VAX ratio); and the sum of (4) and (5) equals the portion trade that is "double counted"in official trade statistics.[6]

10. In table 3 we report the global decomposition by country or regional grouping in our database for 2004 and map it back to the existing measures in the literature. An interesting insight reported in table 3 is our estimate of the double or multiple counting (column 10) in global trade flows as a result of value added moving across multiple borders. We estimate that the global average is 25.6 percent. One observes a number of interesting insights from this global approach and to make this data easier to see we summarize the data in figure 6. We can see that some countries, such as Japan, Indonesia, and the Philippines are important intermediate suppliers, providing indirect value added through their exports to third countries (very light blue bars). Some countries such as Brazil, Russia, Canada, Australia and New Zealand export a lot of value added intermediates that are consumed by the direct importer (medium light blue bars). Another interesting insight is that the EU and US have a much greater share of their domestic value added exports return home to them embedded in other countries exports (the yellow bars).

11. This global approach also allows us to provide quite interesting policy relevant insights that otherwise might not have been evident. For example the USITC's recent study, The Economic Effects of Significant Import Restraints; Seventh Update 2011; Special Topic Global Supply Chains, we provided

[5] Since equation (27) decomposes all bilateral exports from country s to country r, it also simultaneously decomposes bilateral imports.

[6] Component (3) should not be included in double counting, because when this valuecrosses border the second time, it becomesforeign value in the direct importer's exports. For this reason, it is not included as double counting to avoid an over-correction.

insights on US trade using value added trade data.[7] Although U.S. imports from China and Mexico are considerable, these countries contribute less value added to U.S. imports than Europe, Canada, and Japan, the three largest contributors to value added (table 4). Remarkably, U.S. value added that returns home after receiving further processing elsewhere ranks fourth at 8.3 percent. Among all countries, the United States has the highest share of its own value-added exports returned home in its imports.[8] This high share reflects both the large size of the U.S. market and its tight integration with Canada and Mexico.

12. The value-added approach more accurately portrays the origin of the value in U.S. imports than standard gross import data can. For example, Japan has an 8.7 percent share of total U.S. imports, but accounts for 10.4 percent of the value added in U.S. imports. Japan's higher share of value-added imports indicates that a substantial share of its exports (26 percent) first journey to other countries and undergo additional processing before being exported to the United States. Specifically, Japan produces a large volume of high-value components that are shipped to other Asian countries, particularly China, where they are assembled into consumer goods and then exported.[9] In contrast, China's share of U.S. value-added imports (7.7 percent) is less than its share of total U.S. imports (11.1 percent). China is the final assembler in a number of supply chains in which Japan and other countries in East Asia supply parts. Similarly, exports from many smaller East Asian countries pass through third countries, such as China, before entering the United States. Canada and Mexico also have lower shares of U.S. value-added imports than their total U.S. imports. U.S. imports from Canada and Mexico contain many U.S.-produced components, which contribute to the large share of U.S. exported value that returns home. Obviously understanding the underlying geographic composition of value added in imports can ensure a deeper understanding of a large number of policy issues, ranging from FTA negotiations, to supply chain disruptions, to the impact of currency revaluations.

13. Various countries and regions contribute value to U.S. imports in different sectors (table 5). Europe is the largest source of value added for many sectors, particularly business services. U.S. returned value added is most significant in motor vehicles and parts (19.1 percent); much of this represents value added returned home from other NAFTA countries, as the United States is heavily involved in auto supply chains in this region. Europe and Japan also contribute significant amounts of value added to U.S. imports of motor vehicles and parts. U.S. returned value added is also fairly high for apparel (11.0 percent), since some rules of origin provide for duty-free imports of apparel made from U.S. yarns and fabrics. East Asia, which has abundant low-cost labor and is well integrated into supply chains with China, contributed the most value added to U.S. imports of apparel (27.8 percent).[10] Sectoral insights on value added imports can again inform FTA negotiations, provide insights on supply chain disruptions, and help identify potential indirect effects of protection measures.

14. The value-added shares of U.S. absorption (i.e., use of intermediate inputs plus consumption of final products, or equivalently total domestic expenditures on goods and services) provide another view of the sectors and regions where global value chains are important to the U.S. economy. Absorption can distinguish the relative U.S. and foreign value-added shares in products consumed in the United States. Overall, the United States itself generates a large share (89 percent) of the value of final and intermediate goods that it uses (table 6). This share is on a par with those of Japan (90 percent) and the EU-15 (88

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7 The discussion surrounding tables 4, 5, and 6 draws heavily on USITC 2011.

8 The world average is 4.0 percent. Other economies with high shares include the EU (7.2 percent) and Japan (3.4 percent). KPWW 2010.

9 Dean (2009).

10 Major changes have occurred in global supply chains involving textiles and apparel since 2004, and China's prominence in U.S. imports has likely increased.

percent), and is higher than those of most developing countries.[11] The many goods and services produced and consumed in the United States and the large portion of U.S. value returned in imports contribute to the high share.

15. Although overall U.S. value in absorption is high, the domestic value share is typically lower for sectors actively involved in global supply chains. There is substantial foreign content in electronic equipment, apparel, and motor vehicles. For apparel, consistent with value added in imports, China and East Asia contribute more value to U.S. absorption than Mexico and Latin America (largely from Central America). Japan, Canada, and Europe are major participants in supply chains for motor vehicles and parts, and together account for almost one-third of the value added in U.S. absorption in the sector. Japan, East Asia, Mexico, and Europe participate in the supply chain for electronic equipment, which is one of the largest in terms of the number of countries contributing significant value added. Electronics has the highest share of foreign content: fully two-thirds of the value of all electronics products used by U.S. industry and consumers originates abroad. Hence, foreign value in some U.S. industries may be substantially higher than estimates in previous studies based on gross input use or gross trade.

16. In business services, a category that includes consulting and computer support, the United States provides a large portion (88.5 percent) of its absorbed value added, while Europe contributes 5.9 percent. Despite the high profile of India's consulting and computer services and the prominence of some large suppliers, India supplied only 0.1 percent of the value added in U.S. absorption of business services in 2004, though this may have risen in recent years.

17. In addition the U.S. trade balance is a frequently discussed trade issue. The United States has had large trade deficits in recent years (e.g., $500 billion in 2010), and it has also had substantial bilateral deficits with major trading partners. The value added trade work discussed here, and in the literature more broadly, has demonstrated that many countries may add value to a particular good or service in a global supply chain, and that attributing the entire export value to the last exporting country can provide a misleading picture of the sources of value in trade. While the overall trade balance is not affected by value added calculations, examinations of bilateral trade balances on a value-added basis yield different conclusions about the extent to which specific foreign countries contribute to a country's deficit, and here we will focus on the U.S. deficit.

18. The contribution of China to the U.S. trade deficit differs substantially depending on which of the two measures is used. China is often the final assembler in a large number of global supply chains, and it uses components from many other countries to produce its exports. In figure 7 we see that the U.S.-China trade deficit on a value-added basis is considerably smaller (by about 40 percent in 2004) than on the commonly reported basis of official gross trade.[12] By contrast, Japan exports parts and components to countries throughout Asia; many of these components are eventually assembled into final products and exported to the United States. Thus the U.S.-Japan trade balance on a value-added basis is larger than the comparable gross trade deficit. The U.S. value-added trade deficits with other major trading partners (Canada, Mexico, and the EU-15) differ by smaller amounts from their corresponding gross trade deficits.

19. The insights from these kinds of calculations are invaluable to an agency such as the USTR. Since the USITC provides independent and objective information and analysis the data and insights generated from the value added trade work allows us to advise our governmental customers and the general

[11] EU-15 refers to the first 15 countries to join the EU. Domestic value-added shares for Japan, the EU-15, and other countries come from KPWW (2010).

[12] Using a slightly different method, a recent study by WTO, IDE-JETRO (2011) found that this discrepancy was about 53 percent in 2005 and 42 percent in 2008. Johnson and Noguera (2010) had roughly similar results also, though in their estimates the bilateral US deficit with Mexico reversed to a surplus.

public based on a more cohesive and integrated view of global trade flows that aligns well with recent developments in global commerce.

20. Why does a deeper understanding of value chains and value added trade matter to U.S. policy? It will help us better understand, among other things;

- Trade's net contribution to economic growth.
- Impact of exchange rate revaluation on trade flows.
- Employment impacts of trade and value chains.
- Better understand global effects/linkages of economic shocks, including natural disasters such as Japan's earthquake and tsunami.
- Full range of interested parties in trade disputes – including unexpected third country interest, or downstream domestic concerns in Anti-Dumping/Counterveiling Duty cases.
- Better understanding of true distribution of environmental impact/Green House Gas emissions resulting from trade.
- Better estimates of the true sources of sophistication in a country's exports.
- Real size/impact of tariffs and Non Tariff Measures on trade.
- Better estimates of concepts ranging from "revealed comparative advantage" to gravity models of trade.
- Better understand and measure role of quality institutions and policy transparency/stability, implications for deep vs. shallow Regional Trade Agreements (RTAs).

21. While there is not enough space in this short note to elaborate on each of these points let me discuss a couple of issues that are currently at the forefront of U.S. policy discussions, the impact of exchange rate revaluation on trade flows and what current value chain insights suggest for better understanding the role of quality institutions, policy transparency/stability and implications for deep versus shallow regional trade agreements.

22. There is significant political debate in the U.S. regarding efforts to encourage China to appreciate the RMB faster. The logic behind this argument is that if the RMB were to unilaterally appreciate by 30% then Chinese export prices will increase by 30%, raising prices in the U.S. of Chinese products and reducing U.S. demand for those imported products. Apparently expectations are then that U.S. consumers would then by other, U.S made products, or production of those products would shift back to the U.S., and/or U.S. consumers would decide to save the money they otherwise would have spent resulting in an overall decline in U.S. imports. Furthermore, a number of commentators have suggested that such an appreciation could raise U.S. employment anywhere from 600,000 to 2.3 million additional jobs.[13]

23. However, unilateral RMB appreciation will likely on raise the costs of Chinese content, or value added, in its exports. Thus for electronics products if Chinese value added is 15% of its exports prices then a 30% appreciation of the RMB could raise the price of Chinese electronics products by only 4.5%, not 30%. Of course historically exchange rate pass through has typically been much less than one, perhaps

[13] Bergsten (2010) estimates between 600,000 and 1.2 million jobs from a substantial appreciation, Krugman (2010) estimated the affect at 1.4 million jobs, while Scott (2010) estimates 2.3 million jobs with a return of the bilateral deficit to 2001 levels. It has been difficult to reproduce employment impacts like this using standard USITC general equilibrium models, even when we restrict the model to force substitution of foregone imports to U.S. production.

because of value added content related issues, but also because of competitive pricing decisions by exporters who may absorb some of the increase. Further it appears more likely that U.S. consumers would continue to demand similar products, probably imported from some other international supplier, at a higher price, though perhaps priced in a different currency. An excellent overview of these issues can be found in "How Changes in the Value of the Chinese Currency Affect U.S. Imports" by Bruce Arnold of the Congressional Budget Office. Thus with a more in depth understanding of value added trade one can better understand the potential impact on country specific export prices based on a currency appreciation. In fact the USITC is working on building an economic model based on a global database reflecting just such value added linkages, so as to potentially better measure the impact of value chains on trade policy and exchange rate flows.[14]

24. Shifting now to institutional quality, transparency and deep versus shallow RTAs. Deep RTA's often address behind the border policy areas in addition to border measures. The so called Washington Consensus laid out a proposed series of factors important for effective policy reform. John Williamson identified these as a list of policy instruments that "Washington" considered important for achieving some common economic objectives such as growth, low inflation, a sustainable balance of payments, and an equitable distribution of income. The instruments can be summarized as follows[15]:

1. Fiscal discipline – sustained fiscal deficits above 1 to 2% of GDP should be viewed as sign of policy failure;
2. Public expenditure priorities - redirect public spending from subsidies toward quintessentially governmental areas such as primary education, primary health care and infrastructure investment;
3. Tax reform – broaden the tax base and adopt moderate marginal tax rates;
4. Interest rates – should be market determined and positive in real terms to prevent capital flight;
5. Exchange rates – should be market determined;
6. Trade policy – import liberalization, and particularly the elimination of licensing, etc., and any if you have protection it should be tariffs that are low and relatively uniform;
7. Foreign direct investment - inward foreign direct investment should be liberalized;
8. Privatization - where possible and appropriate privative state enterprises in a way that ensures increased competition;
9. Deregulation – promote competition through deregulation;
10. Property rights – ensure secure property rights as they are fundamental to the satisfactory operation of the capitalist system.

25. This list intersects in a number of areas with the characteristics described for deep RTAs[16]. U.S. RTAs are typically characterized as relatively deep RTAs, where the agreements go well beyond tariff liberalization, encompassing areas such as investment rules and services schedules beyond GATS commitments. Often RTAs, are viewed as an external mechanism or catalyst to ensure significant domestic policy reforms take place, such as those identified with the "Washington Consensus," of which tariff liberalization is but one item. In fact it is quite clear that trade growth, particularly export growth, by itself is not a good indicator of economic growth. In Figure 8 we see that export growth as a share of GDP is not necessarily a good indicator of GDP growth, as Mexico, a country with relatively high ratio of export to

[14] Such a model was used in Li and Xu (2011).

[15] Williamson (1989).

[16] See Burfisher et al (2004).

GDP has had mixed GDP growth over the period, while countries such as Brazil and India, with relatively low shares of export to GDP growth are experiencing rather robust and extensive economic growth. McKinsey researchers illustrated that export growth's contribution to economic growth in China using traditional GDP growth decomposition methods was very misleading.[17] Using traditional methods suggest that exports contributed from 40 to 60% of China's economic growth from 1990 to 2008 They recalculated China's GDP growth for 2002-07, 2008 and 2009, adopting the KWW (2008) method, and found that exports contributed from 14 to 27% of overall GDP growth, and that the role of investment and private consumption are substantially more important. Generally economists view sustained economic growth as being driven by investment and consumption growth on the demand side.

26. In two very recent publications UNCTAD and the WTO and IDE-JETRO of Japan illustrate the importance for integration into global supply chains of things often associated with relatively deep RTAs.[18] This includes tariff liberalization, but also liberalization of foreign direct investment, liberalization in the services sector, particularly logistics and transportation sectors, clear and stable regulatory environment, particularly for contract enforcement and property rights. UNCTAD researchers found that removal of such Non tariff measures related to standards, technical regulation, rules of origin, and restrictive financial and investment regulations, among others, is found to double intermediate goods trade among RTA members.[19] Without attention to these broader policy issues it is very difficult for countries to integrate themselves into global supply chains, a major engine of growth for Asia. These findings would suggest that deep RTAs, particularly when combined with domestic policy reform provide a more useful vehicle for countries to integrate their supply chains, a demonstrated path to growth for Asia.

27. The implications of these findings are that deep U.S. RTAs, particularly if combined with, or used as a catalyst, for extensive domestic policy reform probably provide a stronger institutional environment that would favor the partner countries ability to better integrate into global supply chains. The US is currently approaching the TPP negotiations with the deep RTA approach. A recent piece by Petri, Plummer, and Zhai illustrates that the deeper RTA approach could generate greater gains when using traditional methods to assess them.[20] Such findings are very important for allowing U.S. administrations and the United States Trade Representative to consider how best to approach RTA design, and to articulate the overall policy objectives when negotiating specific RTAs. It is important to recognize all of the factors that drive growth, and that the role of trade is generally viewed as an important reinforcing factor, reinforcing effective domestic policy environments.

28. In sum, while the implications of value added trade work remain unknown for many important research areas while awaiting fuller data sets that will allow more empirical testing of traditional hypotheses, it is clear that the existing efforts to estimate value added trade are already providing substantive and valuable insights to the policy debate. The fact that we can now generate global value added trade databases now allows the insights generated from a vast array of value and supply chain case studies to be translated into more aggregated data tied to traditional measures of global trade. The ability to combine product level case studies with sector and country level data is a major step forward in our efforts to more accurately inform policy makers about the impacts and implications of trade and trade policy.

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17 Horn, et al (2010).

18 See UNCTAD (2011) and WTO, IDE-JETRO (2011).

19 See UNCTAD (2011) p. 14.

20 Petri et all (2011).

Figure 1. U.S. Imports from Asia and NAFTA, 1989 – 2009.

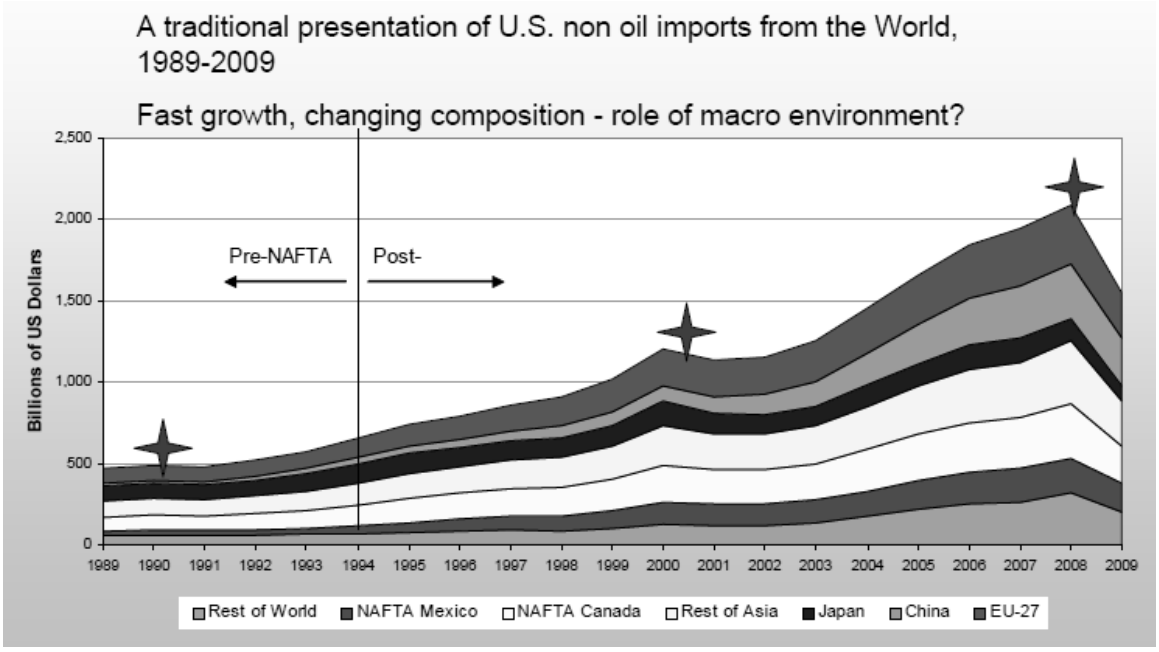


Figure 2. U.S. Import Shares from Asia and NAFTA, 1989 – 2009.

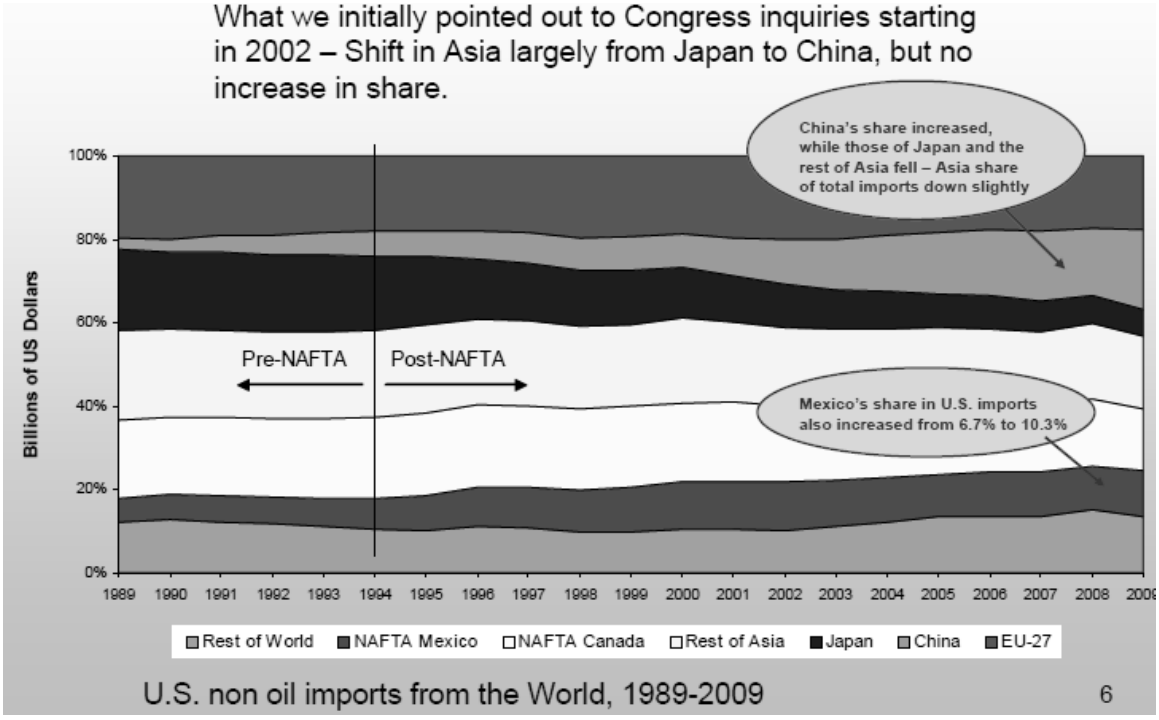


Figure 3. Current Account Deficits, U.S Unemployment and the RMB - $ Exchange Rate

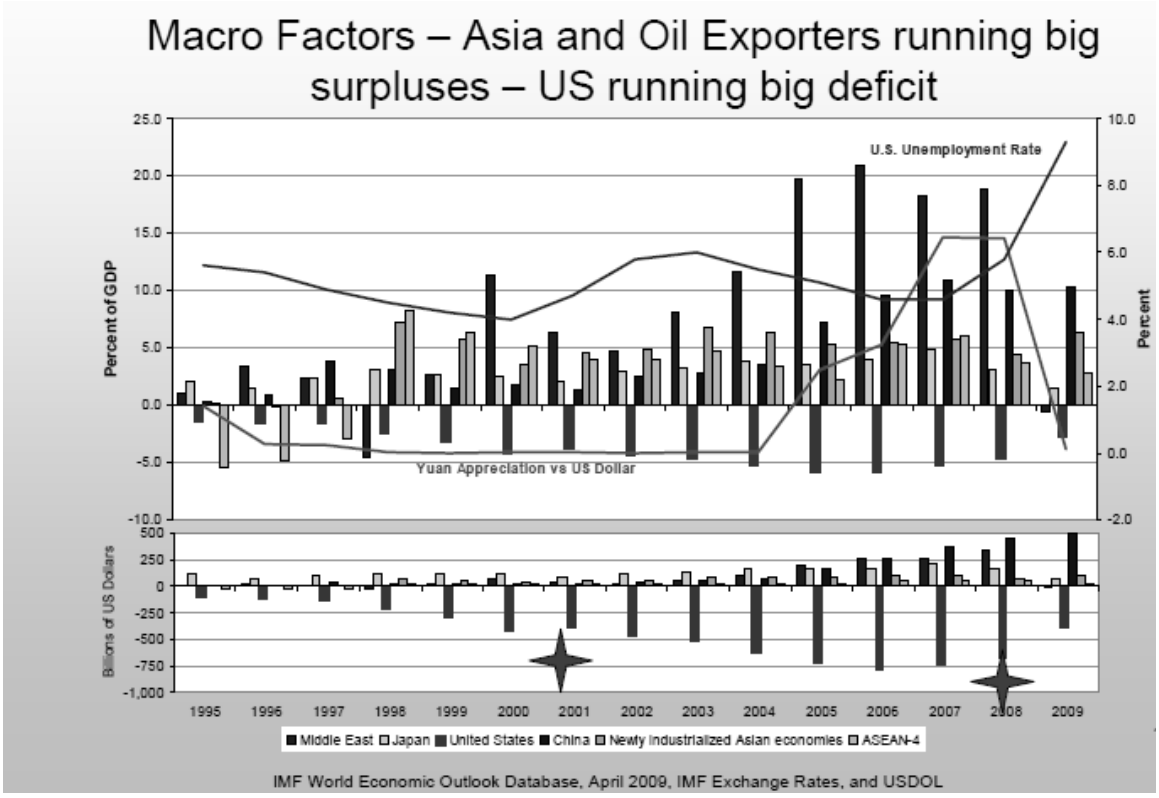


Figure 4.: Input-output table with separate production account for processing trade from (KWW 2008)

			Intermediate use			
			Production for domestic use & normal exports	Production of processing exports	Final use (C+I+G+E)	Gross Output or Imports
		DIM	1,2,…, N	1,2,…, N	1	1
Domestic Intermediate Inputs	Production for domestic use & normal exports (D)	1 . . . N	Z^{DD}	Z^{DP}	$Y^D - E^P$	$X - E^P$
	Processing Exports (P)	1 . . . N	0	0	E^P	E^P
Intermediate Inputs from Imports		1 . . . N	Z^{MD}	Z^{MP}	Y^M	M
Value-added		1	V^D	V^P		
Gross output		1	$X - E^P$	E^P		

Table 1. Shares of domestic and foreign value added in total exports (%) from KWW 2008.

	The HIY Method			The KWW Method		
	1997	**2002**	**2007**	**1997**	**2002**	**2007**
All Merchandise						
Total Foreign value-added	17.6	25.1	28.7	46.0	46.1	39.4
Direct foreign value-added	*8.9*	*14.7*	*13.7*	*44.4*	*42.5*	*31.6*
Total Domestic Value-added	82.4	74.9	71.3	54.0	53.9	60.6
Direct domestic value-added	*29.4*	*26.0*	*20.3*	*22.2*	*19.7*	*17.1*
Manufacturing Goods Only						
Total Foreign value-added	19.0	26.4	27.1	50.0	48.7	40.3
Direct foreign value-added	*9.7*	*15.6*	*16.3*	*48.3*	*45.1*	*32.4*
Total Domestic Value-added	81.1	73.6	72.9	50.0	51.3	59.7
Direct domestic value-added	*27.5*	*24.6*	*24.6*	*19.6*	*18.1*	*16.5*

Source: Authors' estimates based on China's 1997, 2002 and 2007 Benchmark input-output table published by Bureau of National Statistics and Official China trade statistics from China Customs.

Note: The HIY method refers to estimates from using the approach in Hummels, Ishii, and Yi (2001). The KWW method refers to estimates from using the approach developed in this paper that takes into account special features of processing exports.

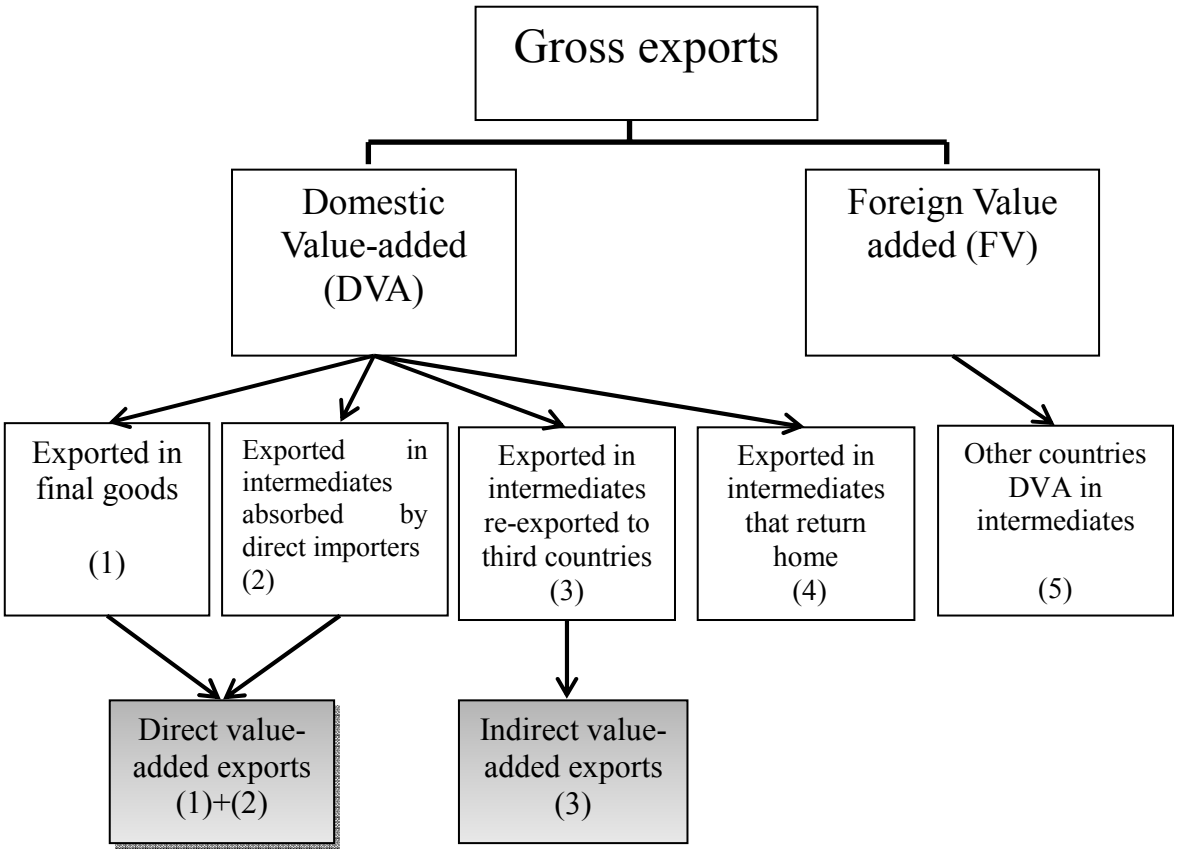
Table 2. Domestic Value-added Share in Manufacturing Exports by Sector, 2002, from KWW 2008.

IO Industry description	Value-added decomposition %						% of processing exports	% of FIE exports	% of merchandise exports
	Non-processing		Processing		Weighted sum				
	FVA	DVA	FVA	DVA	FVA	DVA			
Telecommunication equipment	12.6	87.5	94.7	5.3	87.5	12.5	91.2	88.4	3.2
Ship building	17.7	82.3	85.3	14.7	82.5	17.5	95.8	21.0	0.6
Electronic computer	16.4	83.6	81.3	18.7	80.7	19.3	99.1	89.7	7.0
Cultural and office equipment	20.3	79.7	80.7	19.3	76.7	23.3	93.4	71.6	4.3
Household electric appliances	11.8	88.2	93.2	6.8	76.2	23.9	79.1	56.9	1.9
Household Audiovisual Apparatus	17.5	82.5	78.7	21.3	73.0	27.0	90.6	62.3	5.2
Printing, Reproduction of Recording Media	8.9	91.1	80.3	19.7	68.1	31.9	83.0	62.7	0.3
Plastic	15.6	84.4	89.7	10.3	63.4	36.6	64.5	51.2	2.4
Electronic Component	15.4	84.6	67.2	32.8	61.9	38.1	89.7	87.5	3.4
Steelmaking	11.0	89.0	87.2	12.8	55.8	44.3	58.8	86.1	0.0
Generators	14.8	85.2	68.1	32.0	55.7	44.3	76.8	55.8	0.9
Other electronic and communication equipment	2.2	97.8	64.0	36.0	54.7	45.3	84.9	84.9	1.8
Rubber	9.4	90.6	87.8	12.2	51.1	48.9	53.1	44.4	1.6
Nonferrous metal pressing	13.8	86.2	92.5	7.5	50.7	49.3	46.9	48.7	0.4
Measuring Instruments	14.2	85.8	67.1	32.9	50.5	49.5	68.6	51.8	1.8
Paper and Paper Products	9.2	90.8	87.6	12.4	48.9	51.1	50.7	57.0	0.5
Furniture	11.7	88.3	87.5	12.5	47.5	52.5	47.2	56.8	1.7
Articles for Culture, Education and Sports Activities	12.5	87.5	61.8	38.2	47.3	52.7	70.6	56.3	3.3
Nonferrous metal smelting	11.1	88.9	89.4	10.6	46.4	53.6	45.0	17.4	0.8
Smelting of Ferroalloy	16.5	83.6	87.1	13.0	45.2	54.8	40.8	13.1	0.2
Synthetic Materials	19.5	80.5	62.9	37.1	44.8	55.2	58.3	65.4	0.3
Petroleum refine and Nuclear Fuel	20.6	79.4	94.5	5.5	44.3	55.7	32.1	24.9	0.8
Metal products	9.7	90.3	89.8	10.2	44.3	55.7	43.2	45.6	4.4
Other transport equipment	14.0	86.0	87.3	12.7	44.2	55.8	41.2	50.5	1.2
Other electric machinery and equipment	11.6	88.4	59.9	40.1	43.9	56.2	66.8	60.1	5.6
Special Chemical Products	17.1	82.9	68.6	31.4	41.3	58.7	46.9	48.4	0.8
Other manufacturing products	10.8	89.2	68.7	31.3	41.0	59.0	52.2	37.6	1.7
Woolen textiles	8.9	91.1	91.2	8.8	40.0	60.1	37.8	42.6	0.3
Paints, Printing Inks, Pigments and Similar Products	16.5	83.5	91.7	8.3	38.4	61.6	29.1	44.4	0.4
Motor vehicles	10.5	89.6	90.0	10.0	38.4	61.6	35.2	48.2	0.8
Glass and Its Products	13.2	86.8	83.5	16.5	36.4	63.6	33.0	48.8	0.5
Leather, fur, down and related products	8.1	91.9	59.7	40.4	36.1	63.9	54.3	50.3	4.5
Chemical Products for Daily Use	14.7	85.3	73.2	26.8	36.0	64.1	36.3	43.6	0.4
Wearing apparel	8.7	91.3	65.7	34.3	34.4	65.6	45.1	39.2	7.0
Chemical Fiber	19.8	80.2	90.8	9.2	34.3	65.7	20.5	29.2	0.0
Other special industrial equipment	10.8	89.3	68.0	32.0	33.6	66.4	39.9	44.0	1.3
Boiler, engines and turbine	14.1	85.9	86.9	13.1	33.5	66.5	26.7	28.4	0.4
Other industrial machinery	9.9	90.1	61.4	38.6	32.4	67.6	43.7	43.7	3.5
Iron-smelting	13.2	86.8	89.0	11.0	31.2	68.8	23.7	3.0	0.1
Railroad transport equipment	16.2	83.9	85.4	14.6	29.9	70.1	19.9	5.9	0.1
Wood, Bamboo, Rattan, Palm and Straw Products	12.2	87.8	88.7	11.3	27.2	72.8	19.6	45.6	1.0
Knitted and crocheted fabrics and articles	9.4	90.6	65.3	34.7	27.1	72.9	31.6	34.2	5.8
Agriculture, forestry, animal husbandry and fishing machinery	14.3	85.7	86.1	13.9	27.1	72.9	17.8	20.8	0.1
Pesticides	23.0	77.0	88.5	11.5	27.1	72.9	6.3	14.4	0.2

Hemp textiles	10.5	89.5	88.3	11.7	25.7	74.3	19.5	19.5	0.3
Textiles productions	9.9	90.1	71.1	28.9	24.6	75.5	24.0	31.8	1.4
Cotton textiles	8.2	91.8	64.5	35.6	24.3	75.7	28.7	28.8	3.3
Fire-resistant Materials	9.5	90.5	84.6	15.4	23.8	76.2	19.1	49.8	0.1
Metalworking machinery	12.8	87.2	81.2	18.8	21.9	78.1	13.3	27.0	0.2
Medicines	9.8	90.2	75.7	24.3	20.9	79.1	16.9	28.7	0.7
Pottery and Porcelain	11.8	88.2	85.3	14.8	20.2	79.8	11.4	33.1	0.7
Other non-metallic mineral products	9.6	90.4	83.3	16.7	19.9	80.1	14.0	35.7	0.4
Fertilizers	15.6	84.4	90.3	9.7	18.9	81.1	4.5	21.7	0.1
Basic Chemical Raw Materials	12.9	87.1	56.3	43.7	18.0	82.0	11.7	18.8	2.0
Rolling of Steel	9.8	90.2	59.5	40.5	17.7	82.3	16.0	16.8	0.3
Cement, Lime and Plaster	9.0	91.0	79.8	20.3	14.0	86.0	7.0	77.7	0.1
Coking	8.6	91.4	86.8	13.2	10.6	89.4	2.6	5.3	0.3
Total Merchandise	**10.4**	**89.6**	**74.6**	**25.4**	**46.1**	**53.9**	**55.7**	**51.8**	**92.5**

Data source: Authors' estimates. China 2002 and 2007 benchmark IO table have 84 and 90 goods producing sector respectively, they both concord to China's 4 digit classification of economic activities (GB/T 4754-2002). This concordance enable us aggregate both year's estimates to 77 consistent goods producing industries reported in this table.

Figure 5. Decomposition of gross exports: concepts, from KPWW.



Note:
a.(4) are also labeled as VS1* by Daudin et al (2011).
b. (5) is labeled as VS, and (3) + (4) is labeled as VS1 by HIY (2001).
c. (4) and (5) involve value added that crosses national borders at least twice, and are the sources of multiple counting of value added in standard trade statistics.
d. The share of domestic content in a country's exports equals (1) + (2)+(3)+(4)
e. (1) + (2) is the VAX ratio for each country's exports to the world defined by Johnson andNoguera (2011).

Table 3 Decomposition of gross exports, 2004 from KPWW.

	Basic decomposition						*Connection with existing measures*				
	DVA in direct exports of final goods	DVA in intermediates absorbed by direct importer	Indirect DVA exports to third countries	Retuned DVA	Foreign value added	Total	VAX ratio (J&N)	VS1 (HIY)	Domestic content (HIY)	Multiple counting	GVC Partici--pation (vertical trade, OECD)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Advanced economies											
Australia, New Zealand	27.0	33.6	27.4	0.6	11.5	100	88.0	27.9	88.5	12.0	39.4
Canada	23.5	36.2	10.9	1.3	28.1	100	70.5	12.2	71.9	29.5	40.4
EFTA	23.0	36.3	14.7	0.8	25.2	100	74.0	15.5	74.8	26.0	40.8
EU	38.1	29.6	13.5	7.4	11.4	100	81.1	20.9	88.6	18.9	32.3
Japan	38.4	18.5	28.0	2.9	12.2	100	84.9	30.8	87.8	15.1	43.1
United States	32.5	27.6	14.6	12.4	12.9	100	74.6	27.0	87.1	25.4	39.9
Asian NICs											
Hong Kong	27.2	25.8	18.9	0.6	27.5	100	71.9	19.5	72.5	28.1	47.0
Korea	29.5	13.5	22.3	0.9	33.9	100	65.2	23.2	66.1	34.8	57.0
Taiwan	19.2	12.6	26.4	0.8	41.1	100	58.2	27.1	58.9	41.8	68.2
Singapore	11.0	13.1	12.2	0.6	63.2	100	36.3	12.8	36.8	63.7	76.0
Emerging Asia											
China Normal	44.2	20.3	19.7	1.2	14.6	100	84.2	20.9	85.4	15.8	35.5
China Processing	28.8	10.2	4.1	0.3	56.6	100	43.1	4.4	43.4	56.9	61.0
Indonesia	20.0	28.1	28.4	0.6	22.9	100	76.5	29.0	77.1	23.5	51.9
Malaysia	16.7	17.7	24.1	0.9	40.5	100	58.6	25.0	59.5	41.4	65.5
Philippines	17.6	11.1	29.0	0.4	41.9	100	57.8	29.4	58.1	42.2	71.2
Thailand	27.9	14.0	18.1	0.3	39.7	100	60.0	18.5	60.3	40.0	58.1
Vietnam	32.9	15.3	14.4	0.4	37.0	100	62.6	14.8	63.0	37.4	51.8
Rest of East Asia	35.3	26.9	16.1	0.1	21.7	100	78.2	16.2	78.3	21.8	37.9
India	30.2	30.8	18.6	0.4	20.1	100	79.6	18.9	79.9	20.4	39.0
Rest of South Asia	48.8	19.2	10.6	0.1	21.3	100	78.6	10.7	78.7	21.4	32.0
Other emerging											
Brazil	27.4	40.7	19.0	0.3	12.7	100	87.0	19.2	87.3	13.0	31.9
EU accession countries	28.7	29.2	10.4	1.0	30.8	100	68.3	11.4	69.2	31.7	42.1
Mexico Normal	23.5	41.1	17.4	0.6	17.3	100	82.1	18.1	82.7	17.9	35.3
Mexico Processing	20.6	10.1	5.6	0.3	63.4	100	36.3	5.9	36.7	63.7	69.3
Rest of Americas	23.8	40.6	20.4	0.7	14.4	100	84.9	21.2	85.6	15.2	35.6
Russian Federation	9.5	49.1	30.5	0.7	10.2	100	89.1	31.2	89.8	10.9	41.4
South Africa	23.1	34.5	24.0	0.2	18.2	100	81.6	24.2	81.8	18.4	42.4
Rest of the world	15.0	45.6	22.4	2.5	14.6	100	83.0	24.9	85.4	17.0	39.5
World average	29.2	27.7	17.5	4.0	21.5	100	74.4	21.5	78.5	25.6	43.0

Source: Authors' estimates

Notes:All columns are expressed as a share of total gross exports. DVA refers to domestic value added.Country groupings follow IMF regions (www.imf.org/external/pubs/ft/weo/2010/01/weodata/groups.htm#oem).

Figure 6. Decomposition of Gross Exports, actual data, 2004, from KPWW

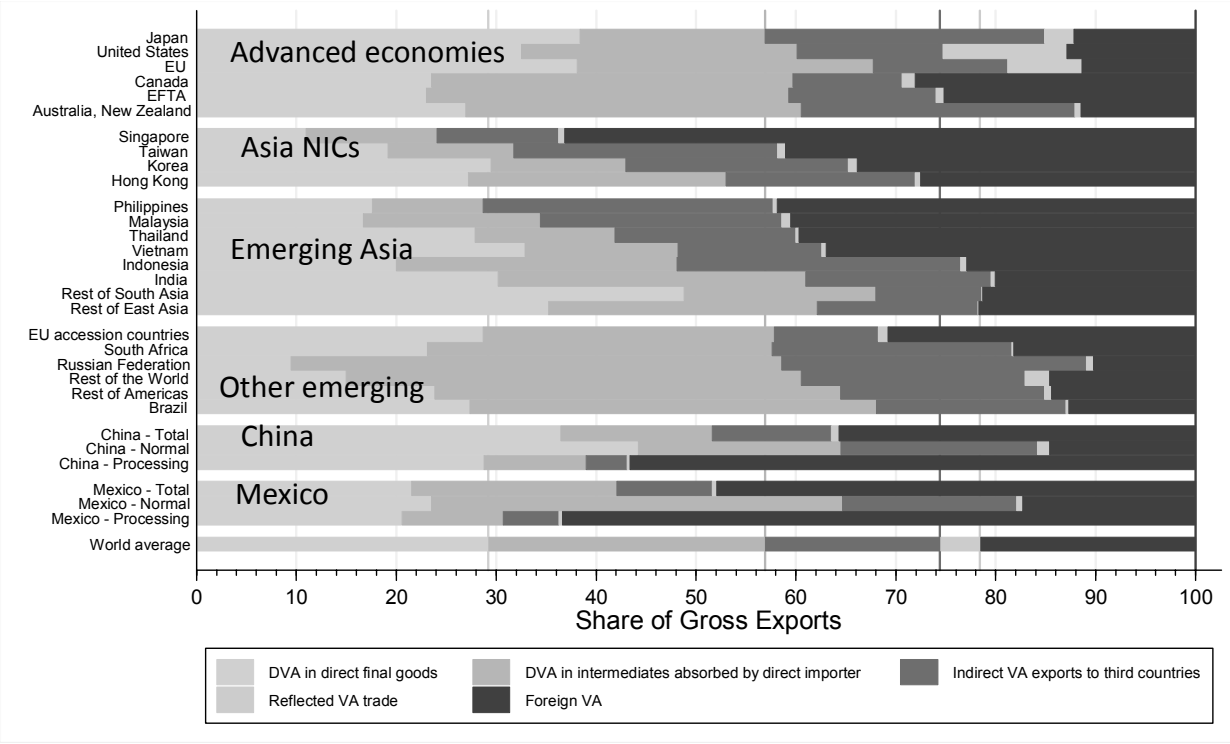


TABLE 4 U.S. imports and value-added shares in U.S. imports, 2004, by source

Region	Total imports	Share of general imports	Share of value-added imports	Share of value added passing through a third country before entering the United States
	Millions of $	Percent		
Europe	393,301	24.7	26.1	17.6
Canada	242,170	15.2	11.0	3.2
Japan	138,417	8.7	10.4	26.0
United States	—	0.0	8.3	100.0
China	176,879	11.1	7.7	14.8
Mexico	154,571	9.7	4.9	4.0
Rest of Americas[a]	76,183	4.8	4.7	13.2
Developing East Asia	79,250	5.0	4.5	32.4
Taiwan, Singapore, Hong Kong	73,066	4.6	4.3	36.7
Korea	51,707	3.3	3.3	31.8
Brazil	23,662	1.5	1.6	20.3
Australia and New Zealand	15,717	1.0	1.3	33.6
Russia	12,003	0.8	1.3	46.4
India	17,486	1.1	1.1	22.0
South Asia	9,557	0.6	0.5	10.2
Rest of world	120,320	7.6	8.5	23.5
Total	1,590,124	100.0	100.0	25.8[b]

Source: Commission estimates. Table 3.2 in the USITC study.

[a]Including South American, Central American, and Caribbean countries other than Mexico and Brazil.
[b]U.S. average, weighted by U.S. imports from all sources.

TABLE 5 Country or regional sources of value added in U.S. imports, selected sectors, 2004, percent

Sector	U.S returned	China	Japan	East Asia	Canada	Mexico	Latin America	Europe	Others	Total
Total	8.3	7.7	10.4	12.0	11.0	4.9	6.3	26.1	13.2	100.0
Selected Sectors										
Apparel	11.0	11.2	2.4	27.8	2.4	2.0	10.4	11.4	21.4	100.0
Chemicals, rubber and plastics	6.3	5.0	9.7	8.7	12.0	2.5	3.6	42.8	9.4	100.0
Motor vehicles and parts	19.1	2.5	23.0	7.2	16.0	3.8	1.9	23.1	3.4	100.0
Electronic equipment	8.6	14.4	19.0	29.6	2.4	9.3	1.3	11.4	3.9	100.0
Machinery and equipment	11.3	10.1	17.2	9.7	6.9	4.7	2.9	32.1	5.1	100.0
Business services	1.5	1.3	6.2	12.7	8.8	0.2	2.7	55.5	11.3	100.0

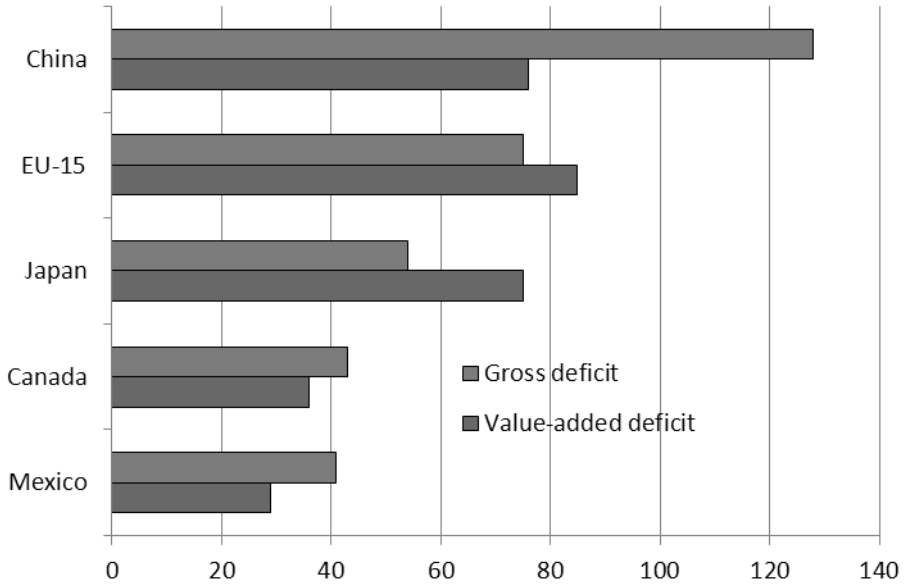
Source: Commission estimates. Table 3.3 in the USITC study.

TABLE 6 Country or regional sources of value added in U.S. absorption, selected sectors, 2004, percent

Sector	U.S.	China	Japan	East Asia	Canada	Mexico	Latin America	Europe	Others	Total
Total	89.0	0.9	1.3	1.5	1.3	0.6	0.7	3.2	1.4	100.0
Selected sectors										
Apparel	54.3	4.1	0.6	18.3	2.1	1.8	5.7	2.9	8.6	100.0
Chemicals, rubber and plastics	69.1	3.1	4.2	4.2	3.4	0.8	1.4	11.9	1.5	100.0
Motor vehicles and parts	57.3	1.5	11.3	3.4	10.1	4.6	0.6	10.6	0.5	100.0
Electronic equipment	33.3	9.3	12.7	23.3	1.8	10.9	0.8	7.0	0.8	100.0
Machinery and equipment	76.1	2.7	4.5	3.1	2.2	1.6	0.7	8.4	0.6	100.0
Business services	88.5	0.3	1.4	1.1	1.4	0.0	0.5	5.9	0.8	100.0

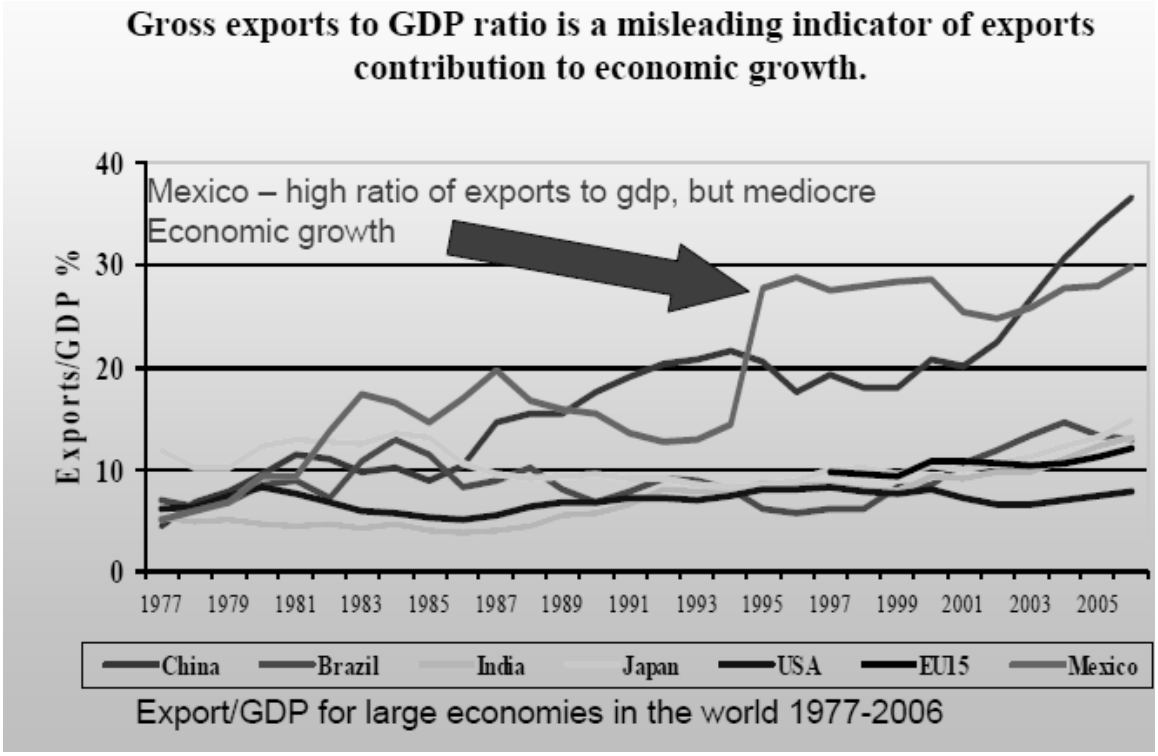
Source: Commission estimates. Table 3.4 in the USITC study.

Figure 1. Figure 5. U.S. Bilateral Trade Deficits with Major Trading Partners, 2004 (billions of dollars)



Source: Commission estimates. From box 3.4 of the USITC study.

Figure 6.


Gross exports to GDP ratio is a misleading indicator of exports contribution to economic growth.
Mexico – high ratio of exports to gdp, but mediocre Economic growth
Exports/GDP %
40
30
20
10
0
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
China
Brazil
India
Japan
USA
EU15
Mexico
Export/GDP for large economies in the world 1977-2006

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