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the Value-added Approach to Understand International Trade

Dr. Yingying Xu

Economist and Council Director, Manufacturers Alliance for Productivity and Innovation (MAPI)

Introduction

The past two decades have seen a significant acceleration in the globalization of production process, thanks mainly to trade policy reforms and technology-led decline in transportation and communication cost. As a result of the fragmentation of the production chain across borders, intermediate inputs, including both goods and services that are incorporated into other products, usually cross national borders several times before being transformed into a final product. Therefore, trade in intermediate inputs has been growing steadily and represented about two-thirds of global trade flows in recent years, and the share varies greatly by country (Figure 1).[1]

As more and more products are effectively "made in the world", traditional customs-based trade statistics—which record the full value of trade flows at each border crossing (rather than the net value-added)—have become less reliable as a measure for understanding the importance of trade as a source of economic growth. There is increasingly widespread agreement among researchers and policy makers around the world that focusing on the value-added part of trade flows can distinguish the foreign and domestic content in gross exports and better reflect the contribution of trade to economic growth and job creation. However, a systematic and accurate assessment of value-added in trade has remained a challenge since it requires cross-country cooperation in order to construct a consistent and systematic global input-output (IO) table.[2] Truly global analysis of value-added in trade has become possible only in recent years with the development of World Input-Output Database (WIOD) and Global Trade Analysis Project (GTAP), which help unravel the long global supply chain and identify the origin and the use of intermediate inputs produced and traded among countries and industries.[3] Although many statistical and methodological issues remain unresolved under this approach, various studies have already offered preliminary results on different aspects of value-added trade to help better explain the global trade pattern and how a country fits into the integrated world economy. [4]

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[1] See Sébastien Miroudot, Rainer Lanz, and Alexandros Ragoussis, "Trade in Intermediate Goods and Services," OECD Trade Policy Working Paper No. 93, TAD/TC/WP(2009)1, Paris, November 2009

[2] For a detailed discussion about the related challenges, see the National Research Council's 2006 report, "Analyzing the U.S. Content of Imports and the Foreign Content of Exports," www.nap.edu/openbook.php?record_id=11612.

[3] The OECD and the WTO have been collaborating on this issue since early 2009 and have launched the Made in the World initiative and the Global Forum on Trade Statistics. An inter-country IO table covering 50 countries for three benchmark years (1995, 2000, and 2005) is under construction. A worldwide time series of multi-country IO tables called the World IO Database (WIOD) have been made available to public in early 2012 as well; it includes 27 EU members and 13 other major economies and runs from 1995 to 2009. Four international organizations (United Nations Statistics Division, Eurostat, WTO, and United Nations Conference on Trade and Development) set ambitious goals for 2020, including establishing a specialized satellite account of trade in value-added.

[4] Guillaume Daudin, Christine Rifflart, and Danielle Schweisguth, "Who produces for whom in the world economy?" *Canadian Journal of Economics* 44, no. 4 (November 2011): 1403-37; Robert C. Johnson and Guillermo Noguera, "Accounting for Intermediates: Production Sharing and Trade in Value Added," *Journal of International Economics* (October 2011); Abdul Azeez Erumban, Bart Los, Robert Stehrer, Marcel Timmer, and Gaaitzen de Vries, "Slicing Up Global Value Chains: The Role of China," The Fragmentation of Global Production and Trade in Value-Added—Developing New Measures of Cross Border Trade, World Bank Trade Workshop, June 2011, http://bit.ly/zwqxQN. For a summary of these empirical studies, see Yingying Xu, "Understanding International Trade in an Era of Globalization: A Value-added Approach", PA-105, MAPI, March 2012

This testimony will first use case studies to explain problems with current trade statistics in the environment of global production sharing, and then focus on how value-added trade can enhance our understanding of issues related with China's trade, especially the U.S.- China bilateral trade relationship. Policy implications will be briefly discussed in the end.

Issues with Gross Trade Statistics

In a globalized production network, various stages of production are regularly performed in different countries. At each stage, a producer purchases inputs and adds value which is included in the cost of the next stage of production. As intermediate inputs cross national borders several times for further processing before reaching their final destination, their values are implicitly counted multiple times in traditional trade statistics. This has created three major problems for current trade statistics:

1) This well-known "double counting" problem implicates that the conventional export statistics, which includes trade in both intermediate and final goods, will overstate the domestic value-added content of exports, making it difficult to identify the real contribution that exports can make to economic growth and employment in a country. According to a recent study from the IMF, the foreign content embedded in global gross exports has increased on average from 18 percent in 1970 to 27 percent in 1995 and 33 percent in 2005.[5] The gap between gross and value-added exports varies greatly by country, and can indicate a country's position in the global value chain. Compared to advanced countries, emerging countries tend to have relatively low domestic content in their exports since they largely use imported raw materials and intermediates to assemble final goods for exports. Such processing trade currently accounts for about half of exports from China, which, together with several other developing countries in the region, serves as a downstream hub in the Asian supply chain. Mexico and Eastern European countries have somewhat similar roles in North America and European markets respectively (Figure 2).

2) Meanwhile, by assigning the total commercial value of an import to the last country of origin, import statistics might not only overstate the degree of competition that comes from one's trading partners, leading to miscalculations about the economic dimension of bilateral trade imbalances, but also understate the degree to which the importing country's own firms benefit from trade if part of their output are already incorporated in the goods.

Case studies on this issue date back to the 1990s, and well-known examples include products from toys, apparel, and automobile industries.[6] More recent studies on Apple's popular iPhones have received lots of attention. The production of iPhone primarily takes place outside the U.S. though it is designed and marketed by Apple. The major producers and suppliers of iPhone parts and components include eight companies from Japan, Korea, Germany, and the U.S.; in 2009, they accounted for 70 percent of the $179 total manufacturing cost. All components were eventually shipped to mainland China for final assembly, where Chinese workers added only $6.50 to each iPhone, less than 4 percent of the total manufacturing cost. However, when a ready-to-use iPhone is exported from China to the U.S., the traditional method of measuring trade records all of the $179 as a U.S. import from China when most of the value should be attributed to parts and components from countries that precede the final assembly. Breaking down the value-added along the manufacturing value chain suggests that of the US$2 billion worth of iPhones exported to the U.S. from China, 96 percent in fact should be attributed to Germany (18 percent), Japan (36 percent), Korea (14 percent) and other countries (29 percent). China only contributed

[5]Riad, Errico, Henn, Saborowski, Saito, Turunen and Jarkko, "Changing Patterns of Global Trade", Departmental Paper No. 12/01, January 2012

[6] For more about other case studies, see Rone Tempest, "Barbie and the World Economy," *LA Times*, September 22, 1996, http://articles.latimes.com/1996-09-22/news/mn-46610_1_hong-kong; Peter Burrows, "The Global Chip Payoff," *BusinessWeek*, August 7, 1995, www.businessweek.com/archives/1995/b3436126.arc.htm; Pietra Rivoli, *The Travels of a T-Shirt in the Global Economy: An Economist Examines the Markets, Power, and Politics of World Trade* (Wiley, 2005); Gene M. Grossman and Esteban Rossi-Hansberg, "Task Trade between Similar Countries," Princeton University, August 2011, www.princeton.edu/~grossman/TTSC081111.pdf.

US$73 million, or 3.6 percent, of the US$2 billion trade deficit that the U.S. had for importing iPhone (Table 1).[7]

3) In addition, because of the need to link and hold the global production chain together, the service content of manufactured goods has been rising over time. However, official trade data are not necessarily able to reveal those sectors of the economy where value-added originates. This is especially troublesome for industrial countries where the so-called "multiplier effect"—services generated by manufacturing, including marketing, transport, distribution, finance, and even intellectual property rights—are gaining importance in a product's final price and can be a significant share of the domestic content of a manufactured product by the time it reaches the final user. Disentangle the domestic value chain into its sectoral components can therefore shed new light on the sources of international competitiveness and the direct and indirect employment impacts of trade.

Use another popular Apple device iPod as an example. In 2007, the total manufacturing cost (including components and assembly) for a 30GB model was estimated at $144 while the U.S. retail price was $299. The $155 markup can be separated into $75 for distribution and retail in the U.S. and $80 for Apple's design and R&D, which is the largest piece of value-added in the entire supply chain.[8] In fact, for many electronic products, if the value-added at each stage of the supply chain is plotted in a chart, it follows the shape of a "smile of value" curve, which was named after the U-shaped arc of a smiley face. It starts "high for branding and product concept, swoops down for manufacturing, and rises again in the retail and servicing stages."[9] Typically, Western companies' activities are at the two ends of the curve and capture the majority of the value in a globalized supply chain.

As for the impact on employment, the iPod line is estimated to support 41,000 jobs worldwide in 2006, of which about one-third were located in the U.S. While the Asia-Pacific region accounted for almost all of the low-wage production jobs, the U.S. workers held more than 60 percent of the high-wage professional jobs in management, engineering, computer support, and retail, and earned about $750 million—three-quarters of the $1 billion total earnings for all iPod-related jobs (Table 2: iPod related job).

However, one thing that needs to be pointed out is that consumer electronics are relatively small, lightweight, high value, and produced in high volume, which makes them suitable for a long global supply chain. These characteristics are not necessarily applicable to other manufactured products, especially for those that are heavyweight and not so easily divisible. In some cases, the benefits to have assembly operation close to R&D and software engineers are neglected and the impact of physical location of manufacturing operations on firms' overall competitiveness has not been fully realized. A greater understanding of global sourcing of intermediate components and where value is added will help us better understand the benefits and challenges created from the global value chain.

Understanding U.S.-China Trade Relations from an Value-added Perspective

After three decades of rapid growth, China has grown from having a negligible role in world trade to being the world's largest exporters, and is on its way to become the world's largest importer as well. However, a less well-known fact is that a large part of China's trade involves contracting manufacturing for goods that are designed elsewhere, and this phenomenon is known as "processing trade". Compared to "ordinary trade" which includes imports that are subject to general tariff rates and exports that are based on local inputs, processing trade encompasses imports that enter the country duty-free and are assembled or transformed in China and then re-exported to foreign countries. Combined together, these two categories

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[7] Yuqing Xing and Neal Detert (2010), "How the iPhone Widens the United States Trade Deficit with the People's Republic of China," Asian Development Bank Institute Working Paper No. 257, December 2010, http://adbi.org/files/2010.12.14.wp257.iphone.widens.us.trade.deficit.prc.pdf.

[8] For a detailed discussion about the distribution of value-added in the iPod's supply chain, see Greg Linden, Kenneth Kraemer, and Jason Dedrick, "Who Captures Value in a Global Innovation Network? The Case of Apple's iPod," *Communications of the ACM* 52, no. 3 (March 2009), http://pcic.merage.uci.edu/papers/2008/WhoCapturesValue.pdf.

[9] James Fallows, "China Makes, The World Takes," *The Atlantic*, July/August 2007, www.theatlantic.com/doc/200707/shenzhen.

account for more than 90 percent of China's exports and over 80 percent of its imports.[10] Although the nominal value of China's exports has risen by more than twenty times from 1992-2011, the share of processing export in total exports does not change much, and it rose from 47 percent in 1992 to 57 percent in 1999 and then fell back to 44 percent by 2011. On the import side, the share of processing trade rose to almost 50 percent of total imports before the financial crisis in 1997-1998 and was surpassed by ordinary imports after that because of the rapid decline in tariff rates and the anti-smuggling measures implemented by the government. Since 2007, the share started to decline rapidly when China imported large amounts of raw materials and high-end equipment to fuel its investment boom in infrastructure and property market, and by 2011 it only accounted for 27 percent of China's total imports (Figure 3).

The pervasiveness of processing trade in China has often led to distorted views about China's competitiveness in high-tech manufacturing industries and the bilateral trade imbalances between China and its major trading partners.

1) China's Role in Global Production Sharing

Lots of literature has demonstrated that international production sharing has become an essential part of all major East and Southeast Asian countries since 1990s, and China became a major production hub in the region's production and distribution network with its 2001 accession to the WTO. More specifically, advanced East Asian countries such as Japan and the Newly Industrialized Economies (NIE)[11], who used to export finished goods directly to the western markets, have gradually moved their production capacity to overseas export platforms located in the less developed neighboring countries. At the end of last century, the displacement of alternative supply sources in the region mainly focused on labor-intensive industries, and in early 2000s, a similar process began to work at more capital- and technology-intensive industries.[12]

As a result, China's export structure has transformed dramatically over the past two decades. The share of agriculture and traditional labor-intensive manufacturing products such as textiles, apparel and toys fell from about two-thirds of China's total exports in 1992 to about 30 percent in 2011[13] while the share of capital- and technology-intensive manufacturing products, such as industrial machines, chemicals and metals, grew from less than 40 percent to more than 70 percent. The strongest overall export growth has been in machinery, among which information and communication equipment, electrical machinery and office machines have experienced the highest growth and make up the largest shares in this category (Figure 4). As a result, China's share in the U.S. imports of all "Advanced Technology Products" (ATP) more than tripled over the past decade, up from 10 percent in 2002 to 34 percent in 2011, and led to $109 billion trade surplus for China.[14]

Foreign-invested enterprises (FIEs), including both joint venture and wholly-owned affiliates of foreign multinationals, have played a vital role in the rising importance of China in the global production chain. While FIEs' share in China's ordinary exports has increased from 5 percent in 1992 to 28 percent in 2011, it accounted for 84 percent of China's processing exports and 82 percent of China's processing imports in 2011, up from 39 percent and 42 percent respectively in 1992 (Figure 5). In recent years, there has been a shift in the ownership from joint venture to wholly-owned as well, with wholly-owned foreign enterprises

[10] There are also international aid flows, contracting projects, goods on lease, barter trade, and other categories of trade flows.

[11] The NIEs include South Korea, Taiwan, Singapore and Hong Kong.

[12] Lee Bransteller and Nicholas Lardy, "China's Embrace of Globalization", Published in "*China's Economic Transition: Origins, Mechanisms, and Consequences*", Cambridge University Press, 2008; Guillaume Gaulier, Françoise Lemoine and Deniz Ünal-Kesenci, "China's Integration in East Asia: Production Sharing, FDI and High-tech Trade," CEPII Working Paper No 2005-09, June 2005

[13] It includes industries classified as 1-4 (Agriculture and Raw Materials) and 8 (miscellaneous Manufacturers) in Standard International Trade Classification (SITC) system.

[14] ATP includes products in biotechnology, life science, Opto-Electronics, Information & Communications, Electronics, Flexible Manufacturing, Advanced Materials, Aerospace, Weapons, Nuclear Technology. A detailed description can be found at http://www.census.gov/foreign-trade/reference/glossary/a/atp.htm.l

(FOEs) taking up more than three quarters of processing exports and about 80 percent of processing imports from all FIEs. FIEs are also responsible for the changing structure of China's exports, and have generated more than 90 percent of all Chinese ATP exports over the past decade. FIE firms are the largest contributors to Chinese ATP trade surplus with the United States while China's collective and private firms contributed very little to the ATP trade surplus, and the state-owned firms had an ATP trade deficit with the U.S.[15]

2) Value-added Perspective on China's Export Competitiveness

The increasing sophistication of China's exports has drawn considerable attention from the public. On the surface, it appears to suggest that the skill content of China's exports is rising and China's export structure increasingly resembles that from industrial countries. This could represent competitive pressure for producers in developed countries, and a major concern is whether it poses a serious challenge to U.S. commercial and security interests.

There is no question about China's enlarged market shares in the world market, with China's share in global manufacturing exports up from 2 percent to 14 percent during the past two decades. However, a closer examination of China's trade data reveals that if processing trade is taken into consideration in which the valued added is the difference between processing exports and processing imports and hence less than for ordinary trade, the share of domestic content in China's overall manufactured exports is estimated to be around 50 percent, meaning that only half of value in China's exports is generated domestically. Although the overall foreign content in China's exports has steadily declined over the past two decades, the decline is concentrated at the traditional labor-intensive industries such as toys, sports products, and textiles, in which the domestic share of value-added can be as high as 70 percent. As the skill-intensity of exports rises, the percentage of value-added in the final products that derives from imported components rises sharply. For those sectors that are usually labeled as high skill-intensive, including computers, telecom equipment and electronic devices, processing trade accounted for over two-thirds of the industry trade. The majority of the value embedded in China's exports came from parts and components imported from foreign countries, mainly Japan, the U.S., and Europe, and China's domestic value-added in those exports is estimated to be particularly low, about 30 percent or less.[16]

These findings are consistent with conclusions from other studies which have shown that there is a sizable gap between China's ATP exports and imports. Chinese ATP imports from the U.S. consist of large-scale, sophisticated, high-valued equipment and devices, whereas China's ATP exports to the U.S. are small-scale products or components in the low-end of the ATP value-added chain.[17]

Therefore, the increase in the sophistication of China's exports over the past two decades largely represents FIEs bring more capital- and skill-intensive processing imports into China which are then assembled for exports. Even though the final product is classified as skill-intensive when it shows up at the customs, Chinese producers could still specialize in the labor-intensive and low value-added stage in the production process, therefore would not compete directly with producers in developed countries.

3) Value-added Perspective on the U.S.-China Trade Imbalance

In recent years, the bilateral trade relations between China and the U.S. have become increasingly strained and one major concern is the large and growing U.S. trade deficit with China, which rose from $84 billion in 1990 to $296 billion in 2011, accounting for more than 40 percent of the U.S. overall trade deficit in goods.

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[15] Ferrantino, Koopman, Wang, Yiung, Chen, Que and Wang, "Classification and Statistical Reconciliation of Trade in Advanced Technology Products: The Case of China and the United States", Joint Working Paper on U.S.-China Trade in Advanced Technology Products, US International Trade Commission, 2010

[16] Koopman, Wang and Wei, "How much of Chinese exports Is Really Made in China? Assessing Foreign and Domestic Value-added in Gross Exports," NBER Working Paper 14109; Koopman, Wang and Wei, "A World Factory in Global Production Chinas. Estimating Imported Value-added in Chinese Exports", Center for Economic Policy Research, UK, Discussion Paper 7430, September 2009,

[17] Ferrantino, Koopman, Wang, Yiung, Chen, Que and Wang, *op.cit*

The fast rise of trade balance between these two countries is closely related with the global production sharing and the "triangular trade pattern" formed in East and Southeast Asia in which China became a mediator between advanced countries in the region and western markets. It helps us to explain the simultaneous rise of China and falling of Japan and the NIEs in their relative importance in U.S. imports data. The share of total U.S. imports in goods that came from East and Southeast Asian countries remained relatively stable during the past decade, down only slightly from 36 percent in 1998 to 34 percent in 2011, while China's share went up from 8 percent to 18 percent. In other words, while China was becoming an increasingly important source for U.S. imports in goods, the relative importance of other countries in the region was declining (Figure 6). Therefore, China's trade surplus with the United States and, to a lesser extent, Europe, largely reflects its large deficit with its trading partners in East Asia. In 2011, China's trade deficit with Japan and NIEs, excluding Hong Kong, was about $216 billion while its trade surplus with the U.S. was about $203 billion.

Recent value-added analysis on international trade not only provides further evidence that bilateral trade statistics can be scaled down in value-added terms relative to gross terms, but also was able to calculate the gap between gross and value-added trade. In general, the more connected two countries are in production sharing, the bigger the gap is. Various studies find that the U.S. bilateral value-added trade with its trading partners in East Asia (Japan, South Korea, Taiwan and China) and NAFTA (Canada and Mexico) is usually 30-50 percent lower than gross trade. As a result, its trade deficit with China is 20-40 percent smaller when measured on a value-added basis while its deficits with Japan and Korea are underestimated at similar magnitudes. Its trade deficit with Mexico and Canada falls as well after adjusting for production-sharing (Figure 7).[18]

The dominate presence of FIEs in China's processing trade also has importance implications for understanding China's growing trade surplus. A closer look at China's growing trade surplus by custom regime reveals that the main source of China's trade surplus is still processing trade even though the share of ordinary trade in both China's imports and exports has been rising. In 2000, China obtained $5 billion and $45 billion trade surplus from ordinary trade and processing trade respectively. In 2011, the trade surplus obtained from the processing trade reached $367 billion compared with the $90 billion trade deficit recorded from the ordinary trade (Figure 8). The trade surplus generated by FOEs alone reached $105 billion, more than two thirds of China's total trade surplus.[19] One common misconception about the U.S.-based multinationals operating in China is that U.S. affiliates are contributing to the large U.S. trade deficit by producing there and selling back to the U.S. However, the data illustrates that over the past decade, the role of foreign affiliates has not changed much and they continue to serve as a means for U.S.-parents to access foreign markets rather than as a low cost base of production from which to sell to their U.S. customers. In both 1999 and 2009, about 90 percent of the goods and services produced by foreign affiliates were sold to foreign customers, and the scale remains small compared to the size of the U.S. trade deficit.[20] The majority of FIEs in China are indeed from Taiwan, Hong Kong and South Korea.

Policy Implications

The insights we have gained from measuring international trade on a value-added basis have important policy implications.

1) Recognizing the discrepancies between gross and value-added exports can help avoid overestimating the importance of exports as a driver of short-term demand and underestimating the importance of trade

[18] Robert Koopman, Zhi Wang, and Shang-Jin Wei, "A World Factory in Global Production Chains: Estimating Imported Value-Added in Exports by the People's Republic of China," in *Costs and Benefits of Economic Integration in Asia*, eds. Robert J. Barro and Jong-Wha Lee (Oxford University Press, January 2011); Johnson and Noguera, "Accounting for Intermediates: Production Sharing and Trade in Value-added", *Journal of International Economics*, Oct. 2011

[19] China's reported processing trade may be exaggerated due to some firms desire to evade tariffs on the domestic sale of imported inputs. For detailed discussion, see Fisman and Wei, "Tax rates and tax evasion: Evidence from "missing trade" in China", *Journal of Political Economy* 112 (2): 471– 96, 2004; Fisman, Moustakerski and Wei, "Outsourcing tariff evasion: A new explanation for entrepot trade", *Review of Economics and Statistics*, 2008

[20] Barefoot and Mataloni, "Operations of U.S. Multinational Companies in the United States and Abroad", U.S. Bureau of Economic Analysis, Nov. 2011

and specialization as sources of increased efficiency in the longer term. This is especially the case for emerging markets, which tend to be downstream in the global supply chain and have large shares of imported content in their exports, therefore haven't benefited nearly as much as shown in the top-line trade data (Figure 9). Take China as an example. While gross exports accounted for more than 40 percent of its GDP growth since the 1990s, only half of its exports represented domestic value-added, which contributed to 19 percent of total GDP growth in 2008.[21]

2) It is important to state that analyzing trade flows and reassigning the value-added contribution to different countries in the supply chain does not change the top-line U.S. trade deficit, which is ultimately the result of the larger macroeconomic imbalance that comes from low saving (particularly large federal budget deficits) relative to investment. However, value-added trade data demonstrates that acting on bilateral imbalances without addressing the underlying causes of the aggregate imbalance simply redistributes that imbalance across trading partners. In addition, the real impact of exchange rate adjustment on global rebalancing can be better assessed with value-added, rather than, gross trade data.

3) While the globalization of production chains helps firms in industrial countries to enormously improve efficiency and gain access to new emerging markets, and provides a new option for developing countries to quickly participate in global trade and enter global markets, it raises many important challenges for all countries that are engaged in the global production chain. For developing countries that are nearly at the end of the value chain and mainly engaged in low-skilled labor-intensive activities in most industries (including the high-tech industries such as electronics and telecommunications[22]), the gains from the labor division on the global value chain are gradually falling and the profit space of their enterprises continues to dwindle when labor and land get more expensive and pollution and other environmental damage can no longer be overlooked. To move up the value chain, it will be necessary for these countries to develop their own technological capabilities, which requires not only increasing spending on R&D but also creating a supportive environment for innovation, including stronger intellectual property rights protection and improved compliance with international standards.

It is increasingly difficult for developed countries to compete with developing countries in products that are labor-intensive but do not require cutting-edge technology. Advanced economies have to rely more on a high-skilled and knowledge-based workforce, incorporate more technology into their products, and bring intangible assets that are not easily replicated in other countries to make their manufacturing sector competitive. The primary benefit to trade for a nation is that the expanded competition forces domestic industries to continuously reinvent themselves, employ new technology, create innovative products and processes, design new management methods, and increase productivity in order to lower costs. Superior productivity growth in manufacturing is ultimately passed on to the consumer in the form of less inflation in manufactured goods and thus a higher standard of living.

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[21] John Horn, Vivien Singer, and Jonathan Woetzel, "A truer picture of China's export machine," *McKinsey Quarterly,* September 2010, www.mckinseyquarterly.com/A_truer_picture_of_Chinas_export_machine_2676.

[22] Empirical studies have found evidence that China's exports in high-tech industries, including machinery and telecommunications, have high foreign content that is sourced from Japan, Korea, the U.S., and the EU. For details, see Judith M. Dean and K.C. Fung, "Explaining China's Position in the Global Supply Chain," prepared for the Joint Symposium on U.S.-China Advanced Technology Trade and Industrial Development, October 2009, Tsinghua University, http://bit.ly/wQ7Y2n.

Table 1: 2009 U.S. Trade Balance in iPhones, in Million US$

	China, P.R.	Japan	South Korea	Germany	ROW	World
Gross	-1901	0	0	0	0	-1901
Value-added	-73	-685	-259	-341	-543	-1901

Source: WTO, Global Forum on Trade Statistics April 2011

Table 2: iPod-related jobs by country and category

	Engineering and other Professional	Production	Retail and other non-professional
Total	9366	19190	12614
Share, %			
U.S.	65	0	62
China	6	61	-
Japan	12	4	-
Korea	6	3	-
Taiwan	3	0	-
Singapore	1	4	-
Philippines	3	23	-
Thailand	1	4	-
Other	3	0	38*
Total	100	100	100

* Includes all non-U.S. retail and other non-professional

Source: Linden, Kraemer and Dedrick (2011)