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Abstract

More and more American multinational corporations (MNCs) are outsourcing the production and assembly of their products to foreign companies. When they do so, they derive the largest share of their revenue from the intellectual property embedded in core technological innovation and brand names. However, conventional trade statistics are compiled based on the value of goods crossing national borders, as declared to customs. Generally, the value added associated with intellectual property rights and embedded in physical goods is not recorded as either export or import of any country. Hence, current trade statistics greatly underestimate US exports and substantially exaggerate its trade deficit. In this paper, we use the case of Apple, the largest American consumer products company, to illustrate the failure of conventional trade statistics to report actual US export capacity in the age of global value chains. According to our analysis of this case, if the value added of Apple intellectual property sold to foreign consumers were counted as part of US exports, total US exports would increase by 3.7%, and its trade deficit would decrease by 7.5%. In terms of bilateral trade, the value added under examination here would lower the US trade deficit with the Greater China region by 6.7% and that with Japan by 9.1%.

Key words : US, Exports, Apple
JEL : F1

1. Introduction

The US has run its largest world trade deficit ever in the last several decades. In 2015, it recorded a $754 billion trade deficit in goods. Many economists and American policy makers have been concerned with the sustainability of the US trade deficit and its potential negative impact on the US economy (Elwell, 2007). Most studies on US trade deficit are based on gross domestic product (GDP) accounting and interpret 'deficit' as an imbalance between saving and investment. Deteriorating domestic savings is widely accepted as the main reason for US trade deficit's continuing rise (Frankel, 2009). Former Fed Chairman Bernanke (2005) argued that the persistent and massive US trade deficit is a natural consequence of "savings glut," i.e. excess savings accumulated by trading partners of the US. Valderrama (2007) suggested that relatively high productivity growth in the US encouraged greater flow of foreign investment into the US and thus accelerated the trade deficit growth.

This paper argues that to a certain extent trade statistics are inconsistent representations of trade dominated by global value chains, and that they underestimate the actual value of US exports and thus overestimate its trade deficit. Conventional trade statistics are calculated based on the value of goods crossing national borders. If goods are shipped across a country's border and declared to its customs, the shipment is recorded as an export from that country, i.e. the physical crossing of a national border is the criterion for including the value of goods in export statistics. With the unprecedented globalization of the last several decades, global value chains (GVCs) have transformed how and where goods are manufactured and traded in the world market. Firms from a number of countries are involved in the manufacture of each product traded in the global market. Each firm specializes in one or several production tasks and contributes a fraction of the whole value added to a given product. Many American MNCs, such as Apple and Nike, have developed GVCs for their products and optimally allocate tasks (ranging from product design to research and development to manufacturing and marketing) to companies in different countries. These leading GVC firms concentrate primarily on brand marketing, product design and technological innovation, outsourcing manufacturing and assembling tasks to foreign companies.

This new international division of labor along GVCs has transformed many American MNCs into factory-less centers of product design and technology innovation. Those MNCs no longer manufacture any physical goods, but sell foreign consumers the value added of their intellectual property embedded in products assembled or manufactured in foreign countries.

For example, athletic footwear companies such as Nike and Reebok and fashion oriented clothing companies such as The Limited and Gap do not own any production facilities. They are "merchandisers" who design and market branded products in the global market (Gereffi, 1994). Apple too has phased out all of its production facilities in the US and concentrates on product design, software development and marketing. Consequently, many of the products, including shoes, apparel, and information communication products, sold by American MNCs in overseas markets are not exported from the US but from developing countries including China, Indonesia and Vietnam, where those products are manufactured and/or assembled. The value added exported by American MNCs is generally not recorded as part of US exports.

On the other hand, the brands and technologies for which American MNCs own the intellectual property rights, generally account for a very large share of the value added of the products sold in overseas markets. For instance, the gross profit margin of the iPhone exceeds 60% (Xing and Detert, 2010) and that of Nike products is more than 45%. When foreign consumers purchase American products such as iPhones, Nike shoes and Gap clothes, which are assembled or manufactured outside the US, they are paying not only for production costs but also for the value added associated with the brands and technologies built into the products. Regardless of where those products are manufactured or assembled, American MNCs receive payment for the value added of their intellectual property. That payment is automatically recorded in the current account of the US as part of income earned abroad by American companies. However, it does not show up in total US exports, despite the fact that American MNCs actually "export" that value added to foreign consumers. Therefore, current trade statistics, which only measure the value of goods crossing national borders, are inconsistent with the present situation of trade dominated by GVCs. A substantial portion of US exports is not included in current trade statistics. Actual exports of American companies are underestimated, and at the same time US trade deficit is exaggerated. To correctly assess the export capacity of the US economy and the sustainability of US trade deficit, it is imperative to make necessary adjustments to current trade statistics.

In this paper, we use overseas sales data of Apple, the largest American consumer products company, to illustrate how and to what extent conventional trade statistics have underestimated the actual value of US exports. Our analysis shows that if the value added of Apple intellectual property sold to foreign consumers is counted as a US export, US total exports would increase by 3.7% and its trade deficit would decrease by 7.5%. In terms of

bilateral trade, counting the value added of Apple embedded in its products sold to foreign consumers could lower the US trade deficit with the Greater China region by 6.7% and that with Japan by 9.1%.

It is important to emphasize that value added as discussed in this paper differs from license fees and royalties, which are generally included in the statistics of service trade. Value added here is not the lump sum payment that a domestic company charges a foreign company for leasing its intellectual property; rather, it can only be realized after MNCs sell physical products to foreign buyers. Xing and Detert (2010) pointed out that conventional trade statistics tend to exaggerate the exports of countries that import a lot of intermediate inputs for the creation of exports, and suggested that value added, not gross value of exports, should be used in estimations of bilateral trade balances. OECD and WTO constructed a database of trade in value added (OECD and WTO, 2013). Koopman, Wang and Wei (2014) showed theoretically how the value added of gross exports of individual countries could be traced with input-output tables. Value added as analyzed in all those studies is recorded in current trade statistics. It primarily measures manufacturing costs of goods, which do not include the value of intellectual property embedded. This paper focuses on the value added of intellectual property exported by American MNCs to foreign consumers, but not included in trade statistics.

2. Apple's Overseas Sales and Trade Flows

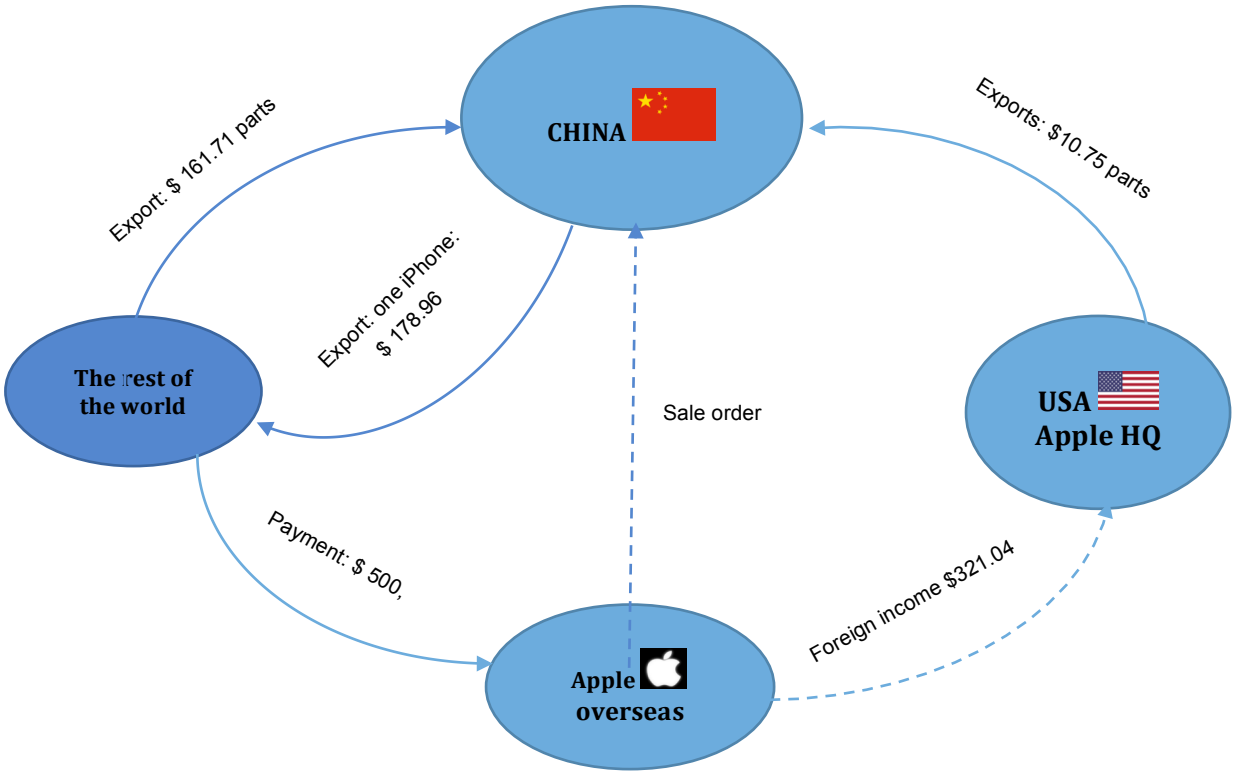
Since Apple deleted the word "computer" from its original name, "Apple Computer," it has become the largest consumer products company in the world. In 2015, the overseas sales of Apple amounted $139.8 billion, equivalent to 9.3% of US exports. Since all Apple products, iPhones, iPads, iPods and iMacs, are assembled in China, Apple's overseas sales contribute nothing to US exports figures. On the contrary, Apple overseas sales generate huge exports and trade surpluses for foreign countries.

Xing and Detert (2010) illustrated how iPhone sales contribute to the trade flow of non-US countries and why the volume of US exports is affected very little by such sales. To assemble one iPhone, China imports $172.46 worth of parts and components, of which $10.75 comes from the US. When Apple sells a $500 iPhone to a foreign consumer, first it sends the sale order to Foxconn, the exclusive assembler of iPhones in China; then the phone is shipped from China to the destination market. When the iPhone leaves China, China's customs

records a $178.96 export for the country. As a result, the sale of a $500 iPhone gives rise to a total $251.42 trade volume, the sum of the $172.46 in parts imported by China and the $178.96 iPhone exported from China. It is important to emphasize that, of the total trade volume, only $10.75 in parts (about 2% of the $500 sale value) is shipped directly from the US to China and recorded as a US export.

From the above transaction, Apple earns $321.03, payment for the value added of Apple's brand and technology. This is much higher than the total value of the iPhone's export from China and the parts made by the other countries. However, the $321.03 income of Apple is recorded neither in US export in goods nor in services. It is not recognized as American exports in trade statistics but only recorded as part of the income earned by American MNCs abroad in the current account of the US. Figure 1 illustrates the transaction and the corresponding trade flows between US, China and the rest of world. To summarize, then, the iPhone trade example yields three critical observations: first, the sale of one iPhone abroad creates significant trade flows for foreign countries; second, it increases US exports very little; and third, the $321.03 value added, sold by Apple to foreign consumers contributes nothing to US export figures. This analysis is based on the case of the 3G iPhone, (the first generation iPhone), but replication of the analysis for the most recent models of iPhones would yield identical conclusions. The iPhone trade unambiguously demonstrates that conventional trade statistics only capture the value of physical goods crossing borders and cannot trace export of the value added associated with intellectual property. It fails to reflect the "exports" of American MNCs' intangible intellectual property embedded in products manufactured and/or assembled in foreign countries. As more and more American MNCs derive most of their earnings from intellectual property, it is misleading to use existing trade statistics to evaluate US export capacity and trade deficit. Exports are relevant and important for national economies because it generates income. In terms of income flows between countries, the value added of American MNC intellectual property sold to foreign consumers through products manufactured abroad should be considered as part of US exports, and its trade deficit should be adjusted accordingly.

Figure 1 Sale of an iPhone abroad and corresponding Trade Flow



Source: Xing and Detert (2010)

3. Apple Overseas Sales and Missing US Exports

Generally the total value added of Apple products assembled in China can be written as

$$TV = V_1 + V_2 + V_3 + V_4 \qquad (1)$$

where V_1 is the value added of parts manufactured in foreign countries; V_2 is the value added of parts produced in the US; V_3 is assembly cost; and V_4 is the value added by Apple intellectual property, brand name and technology. As illustrated above, when these parts and ready-to-use iPhones are shipped between countries, V_1, V_2 and V_3 are automatically documented as trade flows. The value added V_4 can only be realized after Apple sells its products to foreign buyers. Conventional trade statistics, however, cannot capture that transaction. Therefore, V_4 is a missing US export.

With regard to Apple overseas sales, we can estimate V_4 with the formula below:

$$V_4 = \beta S \qquad (2)$$

where β is the gross margin of Apple and S is net overseas sales. Gross margin is a company's total sales revenue minus its costs of goods sold, divided by total sales revenue. Apple purchases V_1, V_2 and V_3 from other companies, and they are the cost of Apple products. Equation 2 precisely estimates the value added by Apple. According to Apple Form K-10, its gross margins in 2015, 2014 and 2013 were 40.1%, 38.6% and 37.6% respectively. Those figures are used in the following analysis.

The popularity of Apple products has driven the impressive growth of Apple overseas sales. According to Apple Form 10-K, its net sales in foreign markets totaled $93.8 billion in 2013 and surged to $139.8 billion in 2015, i.e. 49% growth over two years. Applying Equation (2), we found that, of 2013 foreign sales, was $35.6 billion attributed to the value added of Apple intellectual property. In 2015, the value added of Apple brand and technology accounted for $55.9 billion of overseas sales, implying a 57% increase compared with 2013, much higher than the increase in the sales. This was due to the increase in sales of iPhones, which have the highest gross margin among Apple products (Table 1). Despite the high growth of Apple overseas sales, the US export volume benefited very little, because all Apple products are assembled in China and shipped from the assembling country to destination markets. Whether Apple repatriates its overseas earning back to the US or not, that earning is payment by foreign consumers and thus part of the leakage of those countries' expenditures. Additionally, that overseas earning supports Apple operations such as research and development in the US, and also supports Apple's stock price, so it constitutes a financial asset of Apple shareholders, most of whom are American families and pension funds. Hence, Apple's value added should be considered as an integral part of US exports. Compared with current trade statistics, in 2015 the estimated value added by Apple brand and technology in its overseas sales was about 3.7% of US exports and 7.5% of US trade deficit. In other words, if the value added by Apple were included, US exports would rise by 3.7% and its trade deficit would fall by 7.5% (Table 1). Table 1 also lists the estimates of 2013 and 2014. It shows that the value added of Apple rose substantially from 2013 to 2015 while the reported export of the US decreased and its trade deficit widened. Adding the value added by Apple would change all the numbers considerably. In general, trade statistics are compiled using

gross values, not value added of goods. In the case of Apple, none of the foreign parts and components of its products are imported to the US, and ready-to-use products are not assembled in the US either. We should only consider the value added by Apple for adjusting the trade figures.

Table 1. US Exports and Apple Overseas Sales (Billions of US Dollars)

	2015	2014	2013
US exports	1,503.1	1,621.9	1,578.5
US trade deficit	745.1	631.8	595.7
Apple foreign sales	139.8	102.7	93.8
Apple value added	55.9	40.1	35.6
Apple value added/US exports (%)	3.7	2.5	2.3
Apple value added/US trade deficit (%)	7.5	5.5	5.2

Source: the author's calculations based on the data of the United States Census Bureau and Apple Form 10-K.

In the same fashion, the value added of Apple can greatly modify bilateral trade imbalances between the US and its trading partners. China has the largest trade surplus with the US, accounting for almost half of the US trade deficit. After the rapid economic growth of last decades, China has emerged as the global center for assembly of manufactured products, so China's exports include a large portion of foreign value added, which exaggerates China's exports as well as its trade surplus with the US. Moreover, many American products sold in China, such as Nike shoes and iPhones, are mainly manufactured inside China and not directly imported from the US. American MNCs generally pocket the largest share of whole value added of their products sold in China. But, neither sales revenues of these products nor the valued added attributing to American MNCs is reported as US exports. Unambiguously, current trade statistics underestimate the US exports to China. This is another reason why the US trade deficit with China remains very large, despite that Chinese consumers have been purchasing more and more American branded manufactured products.

Chinese consumers' passion for trendy Apple products has turned China into the largest foreign market of Apple. Its sales in the Greater China (including mainland China, Hong Kong, Taiwan and Macau) grew drastically and surged from $27 billion in 2013 to $58.7 billion in 2015, more than 100% growth over two years. The statement on the back of Apple

products "Designed by Apple in California Assembled in China" reveals that Apple has outsourced the assembling task of its products to firms located in China. Hence, all Apple products purchased by consumers of the Greater China look like "made in China" products, which are shipped from the factories in China not from the US. No matter how many billion dollars of products are sold there by Apple, the US customs simply cannot even add one dollar to US exports. In spite of Apple's huge success in the market of the Greater China, the US trade deficit with the region rose almost 20%, from $294.1 billion to $351.6 billion during the period 2013–2015. This is a very strange phenomenon. It is due to a systematic error stemming from the use of an outdated definition of exports that only covers goods crossing national borders. Applying equation (2), we derived that, from 2013 to 2015 Apple value added sold to the consumers of the Greater China jumped from $10.3 billion to $23.5 billion, approximately a 130% increase (Table 2). If the value added obtained by Apple from sales of iPhones, iPads and iMacs in the Greater China were included in the US exports to the region, the US exports would rise by 13.1% and its trade deficit with the region would decrease by 6.7%. Hence, recognizing the value added of Apple as part of US exports would narrow the trade gap between the US and the Greater China region and mitigate markedly the trade imbalance between them. It is noteworthy to mention that the possible change is due to just one American company Apple. Many American MNCs operate in the same fashion like Apple. If all the value added of their intellectual property were recorded as part of the US exports to the Greater China region, the trade would be more balanced than it looks like under current trade statistics. Apple does not publish its sales by country. That is why the Greater China region is used here instead of China.

Table 2. US Trade with and Apple Sales in Greater China* (Billions of US Dollars)

	2015	2014	2013
US exports	179.4	191.6	189.6
US trade deficit	351.6	323.6	294.1
Apple sales	58.7	31.9	27.0
Apple value added	23.5	12.4	10.3
Apple value added/US exports (%)	13.1	6.5	5.4
Apple value added/US trade deficit (%)	6.7	3.8	3.5

Source: the author's calculations based on the data of the United States Census Bureau and Apple Form 10-K.

* Greater China includes mainland China, Taiwan, Hong Kong and Macau.

Similarly, by adding the value added of Apple derived from the Japanese market could also lower the trade imbalance between Japan and the US. In 2015, Japan's trade surplus with the US totaled $70 billion, second only to that of China. Japanese automobile exports account for most of the trade imbalance between the two countries. When Japanese auto makers ship their cars from Japan to the US, all cars are declared with the US customs and are automatically recorded as the US imports from Japan, eventually becoming part of US trade deficit. On the other hand, all Apple products (iPhones, iPads and iMacs) sold in Japan are exported from China. They are not regarded as the US exports to Japan in current trade statistics. This asymmetric reporting artificially widens the trade imbalance between the two countries. Table 3 compares the US exports to Japan and the value added of Apple derived from its sales in the Japanese market. The US exports to Japan decreased slightly in 2015 to $62.4 billion from $65.2 billion in 2013, while in the same period Apple sales rose significantly to $15.7 billion from $13.9 billion. Using equation (2), we calculated that the total value added by Apple accounted for $6.3 billion, $6.0 billion and $5.3 billion of the Japanese sales in 2015, 2014 and 2013 respectively. In 2015, the value added of Apple was equivalent to 10.1% of the US exports to Japan. Hence, including the value added of Apple could increase US exports to Japan by 10.1% and accordingly reduce the US trade deficit with Japan by 9.1%. Table 3 lists the estimates of the three years.

Table 3. US Trade with and Apple Sales in Japan (Billions of US Dollars)

	2015	2014	2013
US exports	62.4	66.9	65.2
US trade deficit	69.0	67.6	73.3
Apple sales	15.7	15.3	13.9
Apple value added	6.3	6.0	5.3
Apple value added/US exports (%)	10.1	8.9	8.1
Apple value added/US trade deficit (%)	9.1	8.8	7.2

Source: United States Census Bureau, Apple Form 10-K, and the author's calculations.

4. Missing Exports and the US Current Account

Current account of a country can be defined as

$$CA = NX + NS + NI \qquad (3),$$

where NX is the net exports in goods, NS the net exports in services, and NI net income transfers, which comprise the earnings of domestically owned firms operating aboard. Current account is more comprehensive than trade balance in goods, which is often cited by economists and policy makers for evaluating the balance of trade. If American MNCs report all their foreign earnings to the US government, the net income transfer NI of the U.S. current account should include the value added of their intellectual property imbedded in products sold to foreign consumers. Therefore, to assess the trade balance of the US, current account should be a better indicator than net exports in goods. There is no need to adjust the current account of the US with foreign earnings of American MNCs. On the other hand, if we examine the performance of US exports and attempt to investigate to what extent American companies have benefited from free trade agreements and unprecedented trade liberalization, conventional export data is not reliable, thus should be adjusted by including the value added of American MNCs' intellectual property. With regards to bilateral trade relations, the adjustment is needed because there exist no bilateral current accounts. To accurately assess trade balances of the US with its trading partners, it is imperative to incorporate the value added of American MNCs' intellectual property sold to foreign consumers. Focusing merely on trade in goods is misleading and tends to underestimate what the US actually exported, thus exaggerating the bilateral trade imbalance.

The case of Apple is not unique. Nike, an American company with about one third share of the global sports shoe market, "concentrates on the 'D' (develop) and 'S' (sell) rather on the 'M' (make) and 'B' (buy)" (Kaplinsky, 2000). It no longer manufactures any shoes but market globally Nike shoes made in China, Vietnam and other developing countries. The company mainly gains earnings from the intellectual property "Nike" brand, which is labeled on each shoe. According to Nike's Form 10-K, in 2015 its foreign sales amounted $16.4 billion with 46% gross margin. In the Greater China region, Nike achieved $3.1 billion sales in the same year. Similar to the case of Apple, the value added by Nike derived from overseas markets does not contribute a cent to the US exports figure. Incorporating the value added of American MNC's intellectual property in trade statistics would make the global trade system more balanced than it seems to be according to current trade statistics.

5. Concluding Remarks

Conventional trade statistics only measure the value of physical goods crossing national borders. With the proliferation of GVCs, more and more American MNCs have specialized

in brand marketing and technological innovations, and outsourced product manufacturing and assembling to foreign companies. They sell foreign consumers the value added of their intellectual property, which is embedded in products assembled and/or manufactured in foreign countries. Despite American MNCs making vast profits in overseas markets, neither their overseas sales nor value added is counted as US exports. Therefore, current trade statistics greatly underestimate US exports and overestimate its trade deficit. The failure of trade statistics in capturing exported value added of intellectual property has widened the US trade imbalances with China and Japan. Current trade statistics is incompatible with the trade dominated by GVCs. Reforming trade statistics by incorporating the value added of intellectual property attached with goods in the global market is an essential step towards a better understanding of how trade benefits all countries involved, in particular countries specializing in brand marketing and technological innovations.

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