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Measuring the International Trade in Goods Based on Ownership for China: 2006-2010

Minxue Gao[1]   Xiaojuan Xu[2]

Abstract: In the context of globalization, multinational enterprises arrange production all over the world, so that the foreign commercial presences broaden the coverage of international trade. China is involved in globalization deeply where more than half of its surplus in commodity trade is created by the China's affiliates, especially the processing trade enterprises. What is the impact of the multinational enterprises to Chinese System of International Trade? In this paper, we discuss the methods to measure international trade both in goods and in services, collect the data dispersed in several government organizations such as the National Bureau of Statistics, Ministry of Commerce and Administration of Foreign Exchange of China, and provide the ownership-based evaluation of trade in goods. We find wholly-foreign owned firms impact the surplus in trade of goods in China significantly. Our research is a kind of complement for Balance of Payments of China and provides the experience to use existent data of Chinese system of government statistics to evaluate the international trade in goods by the ownership-based approach.

Key words: trade in goods; ownership-based framework; China; foreign direct investment enterprises

1. Introduction

The international trade statistics of China Customs shows the international trade of China increased like the blowout and the surplus of international trade expanded substantially in the decade years, which fix a lot of countries' eyes upon. However, it is not difficult to find that there are obviously structural characteristics in the international trade scale and surplus of China when we observe the detailed statistics of trade further that the China's affiliates (or China's affiliates) had become the main source of international trade and trade surplus. Moreover, the share of China's affiliates grew up gradually. According to the statistics from China Customs, the share of China's affiliates in the international trade of China raised from 64% in 2000 to 84% in 2009. At the same time, foreign parents had been strengthening the control of their affiliates in China and Wholly Foreign Owned Enterprises (WFOE) had become the common investment vehicle for China. The share of WFOE in the surplus made by China's affiliates was up to 68% in 2008. The global financial crisis since 2007 affects the export and trade balance of China's international trade. In this context, how to regard the influence of multinational enterprises to the scale and balance of international trade of China and compile international trade statistics more consistent with the practice become a hot issue and difficult problem for researchers. From the view of China, the research is very important. The results are not only related to the understanding of the international trade of China, but also affect the specific judgments for the bilateral and

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multilateral trade.

Residency-based and ownership-based frameworks are the two basic approaches to measure the balance of international trade. The *System of National Accounts 2008*(SNA2008), *Balance of payments and international investment position* (BPM6, 2008) and *International merchandise trade statistics* (IMTS-2010) are the examples of residency-based frameworks which are complied by the member countries to compile international trade statistics. The location of an establishment of economic activities is the main evidence to identify which country it should be classified by the residency-based frameworks. The foreign direct investment affiliates are the residencies of the host country and thus their export and import are included in the export and import of the host country based on this approach. It can be called BOP method. Stone & Hansen (1953) considered this method conform to the aggregate production function and suit to measure total output. In the context of globalization, the international trade of most counties such as United States, Japan and China faced different degrees of imbalance.

The ownership-based framework was popular in first half of 20th century. It was discussed to the treatment of ownership across state lines within the United States at first. At the end of 20th century, along with the increasing development of multinational enterprises and trade in services and the huge balance of payment deficit, the United States began to publish the Ownership-Based Disaggregation of the U.S. Current Account which becomes a complement for the balance of payment to provide the information about sales, import and export of foreign affiliates. （Landefeld、Whichand& Lowe（1993）、Whichand& Lowe（1995））. The owner of the establishment of economic activities is the main evidence to distinguish the region it should be classified. Robert R. Nathan concluded that the ownership-based measure was the central one, because it was the investor decided the output rather than the capital and if the capital decided the output, the measure based on geography should be the central at the Fourth Income and Wealth Conference in 1939. （Baldwin, Lipsey, & David(1998), p.2）

General Agreement on Trade in Services (GATS), which took effect in 1995, provide the definition of services including both cross board trade in services and Foreign Affiliates Trade in Service. *Manual on Statistics of International Trade in Services*, which has been published by UNSTATS in 2002, is the evidence that the statistics of trade in services based on ownership was got approval and the sales of foreign affiliates in host country would be included in the statistical system of trade in services. For this reason, the international trade in services statistics, which is an example of ownership-based framework, can be called BOP+FATS statistics (Balance of Payment and Foreign Affiliates Trade in Services).

Whether the idea of FATS statistics can be applied in merchandise trade and Balance of Payment? Li, Whalley & Chen (2010) thought both trade in services and merchandise should be estimated by ownership-based approach. They estimated the scales of the two kinds of trade for OECD countries and found that the unbalance of trade of G20 countries likes the US and Japan wasn't terrible as the statistics based on residency. The international statistical standards such as SNA2008 and BPM6 also encourage countries to compile the current account based on ownership to supply the existent trade statistics.

The System of National Accounts, Balance of Payment and Customs statistics of China comply with the international statistical standards and belongs to the residency-based framework. Along with the development of trade in services and foreign direct investment and to follow the new progress of international statistics standard, China has implemented the *Statistical System* of

Direct Investment and *Statistical System* of *International Trade in Services.* The construction of these statistical system means Chinese official statistics has created the ownership-based statistical system pertinently.

Academically, there are two kind of research about the international trade statistics. Some of the researches were focus on the trade balance between the US and China. They answered the question why there was difference between the trade statistics provided by the two countries and evaluated the specific sources such as time delay, valuation methods, transit trade and the effect of foreign direct investment. Fung & Lau（1998、2006），Feenstra, Hai, Woo, & Yao（1998），Shen （2005, in Chinese），Schindler&Beckett（2005），Wan & Liu（2007, in Chinese）attend the discuss and they think the most important factor to effect the difference between the two countries trade statistics is the foreign direct investment. According to the result, Xu, Lin, & Sun （2010）estimated the US-China bilateral trade statistics by the ownership-based approch and found there was huge difference between the residency-based and ownership-based framework, the surplus of bilateral trade of China with the US are small by the ownership-base approach.

Another kind of researches was focus on the unilateral trade. Li (2006), Wu (2006), Sun and Xu (2006), and Chen and Liu (2008) were comment on the necessity and feasibility to build the ownership-based unilateral trade statistical system. Yao & Liu (2006), Liu & Song(2007), Gao & Xu(2010) showed the international trade of China by ownership-based approach was different from the government statistics based on residency. The challenge to compile the trade statistical system for China is deficient in data. Since there weren't activities statistics of China's parents and foreign direct investment enterprises abroad China (or Chinese affiliates), the above estimations considered only the import, export, sales and purchases of China's affiliates. However, as the Statistical System of Outward Direct Investment of China has carried out since 2003, the activities statistics for Chinese affiliates abroad are available. The control of foreign investor has been changing along with the end of transition period after China's entry into WTO. The situation of trade of China changed after the financial crisis since 2007. Therefore, it is necessary to measure the ownership-based trade for China continually.

This paper contributes the research in two aspects. First, we discuss the methods and available data for measuring trade in goods for China. We distinguish the China's affiliates with three kinds of coverage so that the control of the foreign investor can be considered into the estimates. We compare three kinds of methods to estimator the purchases of foreign affiliates in China which is difficult to measure. And the activities of Chinese affiliates abroad are considered by adding measures from statistical system of outward direct investment of China what are newly available. Second, we renew the estimates from 2006 to 2010 to analysis the affect of the financial crisis on trade balance of China. We limit the research in goods trade since the trade scale and trade balance of China are mainly contributed by goods, the Statistical System of Trade in Services has constructed in BOP and FATS statistics which is an ownership-based framework itself.

2. Method and Data

2.1 NAS-Julius-BEA method

In late 1980s and early 1990s, Lipsey and later Kravis found the share of cross board trade in merchandises decreased but the share of sales of multinational enterprises almost didn't change

when analysis the data of operation of multinational enterprises. The reason that the contradiction perform is that the foreign affiliates invested by multinational enterprises belongs to the residency of the host country and there sales are accounted to the Balance of Payment of host country other than investor country.

To provide information of multinational enterprises to supply the Balance of Payment of the US, NAS (1989) designed a ownership-based framework. They introduced the concept of foreigner which is abreast of resident in Balance of Payment and consider the U.S. affiliates was the residents and foreigners of the US, the foreign affiliates aboard was not the residents of the US but was the non-foreigners of the US. They measured the net export for cross trade, net sales of foreign affiliates in the US to other countries and net sales of foreign affiliates in the US to native etc. The method they used is called NAS method. The NAS method didn't consider the labor employed in the host country and the statistics couldn't reply the effect of sales of foreign affiliates on the income and employment of home country.

DeAnne Julius (1990) provided another method to consider the factors of production. They thought foreign affiliates were not residents of host country and were not residents of home country. The purchases of foreign affiliates include not only the expenditures for goods and non-factor services but also expenditures for labor and other factor of production. They accounted the total amount (not the net amount) to reserve information about the relationship between foreign affiliates and host country. The statistics was coordinate with BOP. The net income from foreign countries was equal to the sum of the balance of goods and services and income of direct investment. This method is called Julius method.

Steven Landefeld etc. (1993) was developed a new method based on NAS method and Julius method to mesure the net export by including the net income of foreign affiliates into the import and export of the US. The formulas are as the following:

US Export = Cross board export + net income of US parents obtained from their foreign affiliates abroad

US Import = Cross board import + net income of foreign parents obtained from their US affiliates

US Net export = US Export - US Import

Obie G. Whichand & Jeffrey H. Lowe (1995) estimates the Ownership-Based Disaggregation of the U.S. Current Account from 1982 to 1993. It is different from Steven Landefeld etc. (1993) to reserve the concept of import and export in BOP and the information of foreign affiliates can be found in the Account. Now, the Account is regularly published on *Survey of Current Business* by BEA every year.

2.2 Estimation method for China

2.2.1 Basic method

According to the NAS-Julius-BEA methods, there are two steps to get the ownership-based measures from cross board trade as for the host county. First, the affiliates in host country export and import are need to minus from cross board export and import in host country, because the affiliates in host country aren't the resident of host country. Second, the purchase and sales of the US affiliates in the host county are needed to consider. Their purchases belong to the export of host country and their sales belong to the import of the host country. As the home country, on

the contrary, the export and import of home country with foreign affiliate abroad are needed to be minus from the cross board export and import of home country. The sales and purchases of foreign affiliates abroad and the export and import of foreign affiliate abroad with the other countries should be added with the cross board export or import.

2.2.2 Identify foreign direct investment enterprises

Generally, the standard to distinguish the foreign direct investment enterprise (also called foreign affiliate) is that the foreign investor which is a non-resident own more than ten percent of its common stocks or voting powers. It doesn't mean that it is controlled by the foreign investor. Sometimes fifty percent of common stocks or voting powers is the standard to confirm the company as a foreign direct investment enterprise.

There are three characteristics for the standard to judge the foreign direct investment in China. First, the standard of share of ownership is twenty-five percent of common stocks or voting powers in China for inward foreign direct investment. And for outward foreign direct investment, the proportion is ten percent. Second, the investment from Hongkong, Macao and Taiwan are account as foreign investment as the investment from the US and the other countries. If there wouldn't be special explain, foreign direct investment enterprises include companies whose investor are the resident of Hongkong, Macao and Taiwan. Third, the official statistics of China provide related measures for WFOEs whose share of ownership is 100% of foreign investor, which accounts a huge share of foreign direct investment enterprises in numbers of foreign affiliates and so on. Its share of sales account more than 50% in sales of foreign affiliates recent years and its share of export in export of foreign affiliates increase from 67.81% in 2006 to 70.54% in 2010.

In this paper, we design three kinds of standards to confirm the inward foreign direct investment. The first standard is consistent with the official statistics of China, which are more than 25% for the inward FDI, and more than 10% for the outward FDI. We call it the coverage 3. The second standard accords the foreign control of the affiliates. Since there aren't statistics available for this standard, we estimate it by add the relate measures of the WFOEs with half of measures of joint ventures. We call it the coverage 2. The third standard is 100% stocks or voting powers which means only WFOEs are included in the statistics. We call it the coverage 1. The three standards to distinguish the foreign direct investment enterprises provide exaggerated, compromise and conservative estimates for ownership-based trade statistics respectively.

2.2.3 Estimate foreign direct investment enterprises' purchases

The purchases of foreign direct investment enterprises are not available from the official statistics of China. But it can be measured by three kinds of approaches. The first approach was proposed by Yao & Liu (2006):

The purchases of foreign direct investment enterprises = the intermediate inputs of foreign direct investment enterprises

The intermediate inputs of foreign direct investment enterprises = total output of foreign direct investment enterprises × the share of intermediate inputs in total output

The share of intermediate inputs in total output = the share of intermediate inputs in total output for above designated size foreign direct investment enterprises

The total output of foreign direct investment enterprises = export of foreign direct

investment enterprises/ (export of above designated size foreign direct investment enterprises/ total output of above designated size foreign direct investment enterprises)

The purchase of foreign direct investment enterprises is $1989 billion in 2002 according to this method. It is supposed that the export propensity and value added rate are same of different scales of enterprises, and the intermediate input of the foreign direct investment are all purchased in China. Since the value added rate of the big enterprises is more than small ones and part of intermediate input of foreign direct investment are purchased from the other countries, the purchase of foreign direct investment enterprises may be overestimated by this approach.

The second approach was proposed by Wang (2008):

The good purchased by a industrial sector= the intermediate consumption of the industrial sector + inventory changes of the industrial sector

The share of sales of foreign direct investment enterprises in a industrial sector=the sales of foreign direct investment enterprises in the industrial sector/ total sales of industrial sectors

The purchases of foreign direct investment enterprises in a industrial sector= The good purchased by a industrial sector×The share of sales of foreign direct investment enterprises in a industrial sector/exchange rate

The purchase of foreign direct investment enterprises is $1305 billion in 2002. The assumption of this method is that the purchase rate of the foreign direct investment enterprises in China are the same as the domestic companies. Since the purchase rate of the foreign direct investment enterprises in China is less than the domestic companies, the purchase of foreign direct investment enterprises may also be overestimated by this approach.

We propose the third approach:

Value added rate of foreign direct investment enterprises=1－intermediate input/total output

The purchase of foreign direct investment enterprises=income from main business of foreign direct investment enterprises×(1-value added rate of foreign direct investment enterprises)

The purchase of foreign direct investment enterprises in China= The purchase of foreign direct investment enterprises－import of foreign direct investment enterprises

The purchase of foreign direct investment enterprises in China is $701 billion in 2002 according to this method. Its assumption is the value added rate of foreign direct investment enterprises is the same as domestic companies. However, if there are transfer-pricing in foreign direct investment, the value added rate may be less than domestic companies, then imports of foreign direct investment enterprises may be overestimated and the purchase of foreign direct investment enterprises in China may be underestimated.

In all, the purchase of foreign direct investment enterprises should fall in between the results accounted by the second approach and the third approach.

2.3 Data

2.3.1 Statistics of cross board trade of China

The cross board trade of China is the beginning of our estimate. There are two sources to get the data, one is the import and export of merchandise issued by China Custom and the other is Balance of Payment issued by the State Administration of Foreign Exchange. The statistical coverage is different between the two. We use the import and export in goods as shown in the

BOP of China.

2.3.2 Statistics of foreign direct investment enterprises' activities in China

As for the Statistics of foreign direct investment enterprises' activities in China, we need two groups of data. One is the statistics of cross board trade activities of them and the other is the statistics of their sales and purchase activities.

The first group of statistics can be found in the statistics issued by China Custom. The second group of statistics can't be found directly. We use the income of main business of foreign direct investment enterprises in industrial sectors on behalf of the sales of goods of foreign direct investment enterprises. The statistics are issue by the national Bureau of Statistics of China. The data comes from economic census in 2004 and 2008, but in the other years, the data comes from regular investigation which covers only state-owned and non-state-owned industrial enterprises above designated size. We use the third method in 2.3.3 to estimate the purchase of foreign direct investment enterprises. The intermediate input and output of industrial sectors can be got from the Input-Output Table in 2007 which is issued in *2011 China Statistical Yearbook*. Import and export by ownership and income of main business of foreign direct investment enterprises in industrial sectors are issued in *China Trade and External Economic Statistical Yearbook* over the year.

2.3.4 Statistics of foreign direct investment enterprises' activities abroad China

As regard to the Statistics of foreign direct investment enterprises' activities abroad China, we also need two groups of data. One is the statistics of cross board trade activities of them with China's parent and the other is the statistics of their sales and purchase activities abroad. The related statistics is issued in *Statistical Bulletin of China's Outward Foreign Direct Investment* by Ministry of Commerce of China.

2.4 Accounting time

We limit the accounting time in 2006 to 2010 according to the data's availabilities. *Balance of Payment of China* has been revised back to 2005 after the revision of BPM6. The income of main business by ownership in industrial sectors has been issued in *China Trade and External Economic Statistical Yearbook* since 2006. *Statistical Bulletin of China's Outward Foreign Direct Investment* starts to publish the export and import though Chinese affiliates abroad since 2006. The newly available *China Trade and External Economic Statistical Yearbook* and *Statistical Bulletin of China's Outward Foreign Direct Investment* are in 2010. So we can get all of the data we need from 2006 to 2010.

3. Measuring trade in goods based on ownership

3.1 Start point

The scale and balance of cross board trade are the start point for the estimation. As it shown in the figure 1, the international trade in good of China increase fast including both import and export scale and trade balance. The export has increased from $1837 billion in 1998 to $14346 billion in 2008. The import has increased from $1402 billion in 1998 to $10739 billion in 2008. The trade surplus has increased from $435 billion in 2008 to $3607 billion in 2008. After the

financial crisis, the export and import and trade surplus decreased in 2009. Although the import and export return to growth, trade surplus remain $2500 billion in 2010.
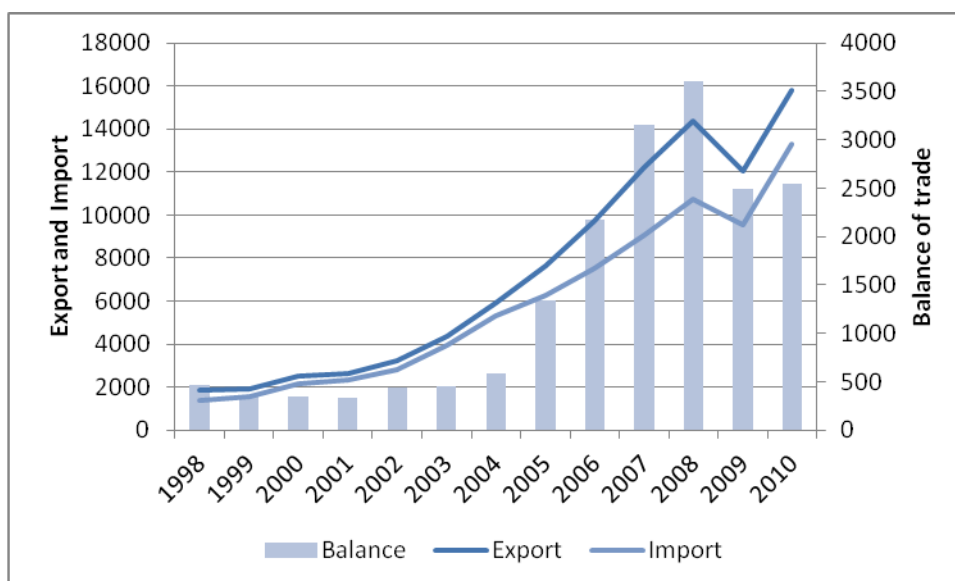

Figuer 1. China's Cross Board Trade and Balance, 1998-2010 (in billions of US$)

3.2 Estimation process in 2007

In this part, we take 2007 as an example to introduce the detail estimation process for ownership-based trade. The reason we choose this year is that the Input-Output Table we use is in 2007. The cross board trade and balance in 2007 are shown in table 2 in line 1 to line 3. The export is $12200 billion and import is $9046 billion. The trade balance is $3154 billion.

The first step of the estimation is to minus the cross board trade of China's affiliates from the total cross board trade of China. According to the three standards to define foreign direct investment enterprises, there are three kinds of statistical coverage. Coverage 1 means only WFOEs are included in China's affiliates. Coverage 2 means only foreign controlled enterprises are included in China's affiliates. The measure including cross trade export, import and balance and sales and purchases are estimated by the corresponding measures of WFOEs in coverage 1 add half of the corresponding measures in Joint Adventures. Take cross board export as an example, cross board export of China's affiliates in coverage 2 which is $5779 billion equals to cross board export of China's affiliates in coverage 2 which is $4785 billion add half of cross board export of China's affiliates in joint ventures which is $1988 billion. Coverage 3 means foreign direct investment enterprises whose foreign investor owns more than 25% of their common stocks or voting powers are all included in China's affiliates. The results after the adjustment of the first step are shown in table 2 in line 7 to 9. Since the huge effect of foreign direct investment enterprises, the results are reduced. In coverage 1, which is the most conservative one, the export decreased to 60.8% of cross board export, and import decreased to 56.22% of cross board import and the balance of trade decreased to 73.84% of cross board trade balance.

The second step of the estimation is to add the sales and purchase of China's affiliates in China based on the results get from the first step. The purchases of China's affiliates are added into the export of China and sales of China's affiliates are added into the import of China. The

results are shown in table 2 in line 13-15. Since the purchase of China's affiliates are smaller than their cross board export, the exports estimated after the second step are less than the cross board trade. However, since the sales of foreign direct investment enterprises are more than their cross board import, the results estimated after the second step are greater than the cross board trade in coverage 2 and 3. Then the balance of trade is declined. In coverage 1, the balance of trade decreased to $449 billion. The balance of trade in coverage 3 even becomes deficit.

In the third step, we consider deducting the export and import of Chinese affiliates abroad with their parents in China from the results of step two. Since we are lack of the trade statistics of Chinese affiliates abroad by ownership proportion, we can't define the Chinese direct investment enterprises by proportion of common stocks or voting powers. As a result, there is only one kind of coverage to define the export and import through Chinese direct investment enterprises which is nearest to the coverage 3 of the definition of China's affiliates. The results are shown in table 2 in line 19-21. Along with the implementing the strategy of going global of China, the trade with Chinese affiliates abroad has begun to take shape which account for 5.6% of cross board trade. Furthermore, the import with Chinese affiliates abroad is greater than the export with them. So the deficits produced by the sales and purchases of China's affiliates in China are offset. The trade balance changes to $1144 billion, $14 billion and $-1513 billion for the three kinds of coverage defined in the first two step.

Finally, we need to add the sales and purchases of the Chinese affiliates abroad. Since the sales are more than the purchases of Chinese direct investment enterprises, the balance of trade will increase further. As it shown in table 2 in line 25-27, The trade balance changes to $2240 billion, $1111 billion and $-416 billion for the three kinds of coverage defined in the first two step.

Table 2. Estimation process from cross board trade to ownership-based trade of China in 2007
(Billions of US$)

			Coverage 1	Coverage 2	Coverage 3
1		Export	12200	12200	12200
2	Cross board trade of China	Import	9046	9046	9046
3		Balance	3154	3154	3154
4	Cross board trade of	Export	4785	5779	6954
5	China's affiliates with China	Import	3960	4735	5598
6	(-)	Balance	825	1044	1356
7(1-4)	The results of	Export	7415	6421	5246
8(2-5)	the first steps of	Import	5086	4311	3448
9(3-6)	adjustment	Balance	2329	2110	1798
10	Sales and purchases	Export	1662	3233	5544
11	of China's affiliates	Import	3542	6024	9550
12	(+)	Balance	-1880	-2791	-4006
13(7+10)	The results of	Export	9077	9654	10790
14(8+11)	the second steps of	Import	8628	10335	12998
15(9+12)	adjustment	Balance	449	-681	-2208
16	Cross board trade of	Export	247	247	247
17	Chinese affiliates abroad	Import	942	942	942

18	(-)	Balance	-695	-695	-695
19(13-16)	The results of	Export	8830	9407	10543
20(14-17)	the third steps of	Import	7686	9393	12056
21(15-18)	adjustment	Balance	1144	14	-1513
22	Sales and purchases	Export	3376	3376	3376
23	of Chinese affiliates abroad	Import	2279	2279	2279
24	(+)	Balance	1097	1097	1097
25(19+22)	The results of	Export	12206	12783	13919
26(20+23)	the fourth steps of	Import	9965	11672	14335
27(20+24)	adjustment	Balance	2240	1111	-416

3.3 Analyses the ownership-based trade in 2006 to 2010

3.3.1 Comparison between cross board export and ownership-based export

If we ignore the inflation, the export is increased from \$9697 billion in 2006 to \$15814 billion in 2010. The annual average growth rate of cross board export is 13.01% which is less than the annual average growth rate of ownership-based export. The annual average growth rates of ownership-based export are 22.09% in coverage 1, 23.76% in coverage 2 and 25.31% in coverage 3. Thus, the difference between cross board export and ownership-based export is small in 2006. However, the difference become bigger and bigger over time.

According to coverage 1, the cross board export is more than ownership-based export in 2006 and the cross board export becomes smaller than ownership-based export after 2008. And the cross board export is more than ownership-based export in these years according to coverage 2 and 3. The result is different from the past results get from Yao & Liu (2006), Liu & Song (2007) and Gao & Xu (2010) who thought the cross board export was more than ownership-based export. Besides the reasons of methods, the accounting time is import to explain the difference. The financial crisis affects the trade pattern of China since the two kinds of approaches to measure trade provide different relationships of them.

Table 2. Comparison between cross board export and ownership-based export

(Billions of US\$, %)

Year		2006	2007	2008	2009	2010	Annual growth rate
Cross board export		9697	12200	14346	12038	15814	13.01
Ownership-based export	Coverage 1	9417	12206	17092	15056	20919	22.09
	Coverage 2	9645	12783	18001	16483	22628	23.76
	Coverage 3	10198	13919	19521	18628	25142	25.31
Rate of difference	Coverage 1	-2.89	0.05	19.14	25.07	32.28	69.81
	Coverage 2	-0.53	4.78	25.47	36.92	43.09	82.70
	Coverage 3	5.17	14.09	36.07	54.75	58.99	94.58

3.3.2 Comparison between cross board import and ownership-based import

As for the import, it is increased from \$7519 billion in 2006 to \$13272 billion in 2010. The annual growth rate of cross board import is 15.26%. The annual growth rates of ownership-based import are 26.76%, 27.84% and 28.31% according to three kinds of coverage respectively. The differences between cross board import and ownership-based import grow over time. The rates

of difference increase to 52.44%, 79.63% and 117.26% respectively. So we think the cross board import is less than ownership-based export and the difference expandes.

Table 3. Comparison between cross board import and ownership-based import
(Billions of US$, %)

Year		2006	2007	2008	2009	2010	Annual growth rate
Cross board import		7519	9046	10739	9543	13272	15.26
Ownership-based import	Coverage 1	7837	9965	14194	14183	20232	26.76
	Coverage 2	8926	11672	16522	17117	23841	27.84
	Coverage 3	10638	14335	19886	21218	28835	28.31
Rate of difference	Coverage 1	4.23	10.16	32.18	48.62	52.44	75.30
	Coverage 2	18.71	29.03	53.85	79.37	79.63	82.40
	Coverage 3	41.48	58.47	85.18	122.34	117.26	85.47

3.3.3 Comparison between balance of cross board trade and ownership-based trade balance

As it drawn in figure 2, the balance of cross trade can be divided into two stages. In the first stage, the balance of cross trade increased steadily from 2006 to 2008. In the second stage, the balance of cross trade decreased to a low level in 2009 and 2010. The ownership-based trade balance in coverage 1 performs the same change trend with the balance of cross trade from 2006 to 2010 but is less than it and the difference of them become large after 2008. Ownership-based trade balances in coverage 1 are $873 billion in 2009 and $687 billion, less than half of the balance of cross trade. If we observe the ownership-based trade balance in coverage 2 and 3, deficits of trade appear in 2009 and 2010 and deficits of trade persist from 2006 to 2019 if we adopt the ownership-based trade balance in coverage 3. The result is the same as estimations of Yao & Liu (2006), Liu & Song (2007) and Gao & Xu (2010). We can conclude that the balance of cross trade is more than the ownership-based trade balance.
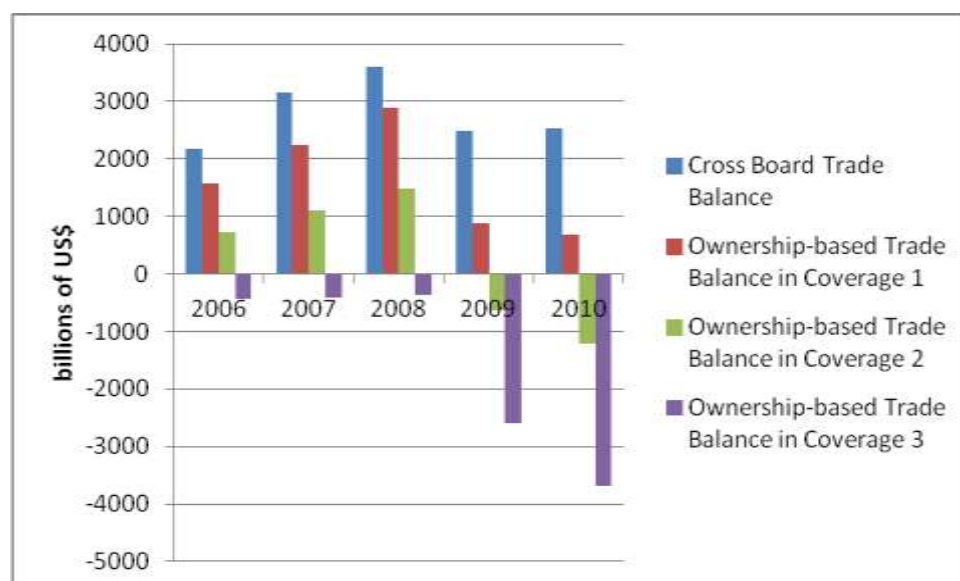

Figuer 1. China's Cross Trade Balance and Ownership-based Trade Balance, 2006-2010

3.3.4 Analysis on the source of differences

The ownership-based trade balance is estimated from cross board trade trough four steps which are the sources of difference between them. The first two steps reflect the effect of China's affiliates and the last two steps reflect the effect of Chinese affiliates abroad. The first step and the third step reflect the effect of cross board trade of direct investment enterprises, and the second and the fourth step reflect the effect of sale and purchase of direct investment enterprises.

As it shown in table 4, take coverage 1 as an example, the ownership-based trade balance in 2006 is $599 billion less than cross board trade in which, the difference between net export of China's affiliates and net import of Chinese affiliates contribute $44 billion, and the difference between net purchase of China's affiliates and net sale of Chinese affiliates in host country contribute $-642 billion. In 2010, the ownership-based trade balance is $1855 billion less than cross board trade balance in which, the difference between net export of China's affiliates and net import of Chinese affiliates abroad contribute $-355 billion, and the difference between net purchase of China's affiliates and net sale of Chinese affiliates in host country account $-1500 billion.

Table 4. The sources of difference between cross trade balance and ownership-based trade balance (in billions of US$)

Year	2006	2007	2008	2009	2010
cross trade balance	2178	3154	3607	2495	2542
Ownership-based trade balance in coverage 1	1579	2240	2898	873	687
Ownership-based trade balance in coverage 2	720	1111	1478	-634	-1212
Ownership-based trade balance in coverage 3	-440	-416	-366	-2590	-3693
Net export of China' affiliates in coverage 1 (一)	553	825	1161	953	870
Net export of China' affiliates in coverage 2 (一)	694	1044	1388	1070	1009
Net export of China' affiliates in coverage 3 (一)	913	1356	1711	1267	1073
Net purchase of China' affiliates in coverage 1 (+)	-1556	-1880	-2434	-2731	-3808
Net purchase of China' affiliates in coverage 2 (+)	-2275	-2791	-3626	-4121	-5568
Net purchase of China' affiliates in coverage 3 (+)	-3216	-4006	-5148	-5880	-7985
Net import of Chinese affiliates abroad with China (一)	-597	-695	-1150	-626	-515
Net sale of Chinese affiliates in host country(+)	914	1097	1736	1436	2308

The cross board trade of direct investment enterprises is the first source to produce difference between cross board trade balance and ownership-based trade balance. The cross board export of foreign direct investment enterprises is more than their import that tends to enlarge the surplus of cross board trade of China. The export of Chinese direct investment enterprises to China is more the import of them from China, which tends to promote the deficit of cross board trade of China. The surplus of cross board trade of foreign direct investment enterprises is greater than the deficit of Chinese direct investment enterprises except 2006, and the difference is grown over the years except 2008. This is one source for the less of ownership-based trade balance and it account for 19% of the difference in 2010.

The second source is the sale and purchase activities of direct investment enterprises. The sales are more than the purchases for both China's affiliates and Chinese direct investment

enterprises. But the former produce ownership-based trade deficit and the latter make ownership-base surplus. The former is more than the latter and the difference has grown over the years except 2008. This is the second source for the less of ownership-based trade balance and it account for 81% of the difference in 2010.
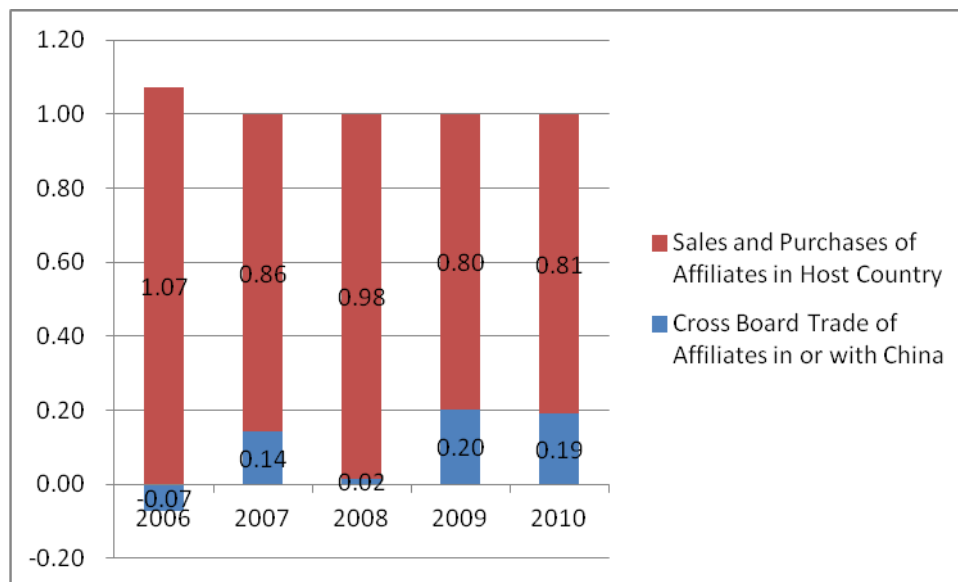

Figure 3. The proportion of sources of difference (in percentage)

4.   Conclusion

This paper discusses the effects of FDI and multinational enterprises to the statistics of international trade. We take China as an example to explore how to show the effects based on the available official statistics. Our research also provides the observation of effect of financial crisis to the international trade of China. The cross board trade balance is more than the ownership-based trade balances whether before or after the financial crisis and we may exaggerate the China's surplus of trade by the cross board trade statistics. This result is the same with the researches before the financial crisis. In contrast to them, we find the cross board import and export are less than the ownership-based measures. It means we may underestimate the scale of international trade of China using the cross board trade statistics. This perspective is different from the researches before the financial crisis since we introduced the trade statistics of Chinese direct investment enterprises. The effect of financial crisis is reflected in that the difference between cross board trade and ownership-base trade measures becomes large. It means China' affiliates enlarge the sales in China to reverse the crisis. In a word, China is not a country with high surplus of trade whether by the cross board trade or by the ownership-based trade. In contrast, China should watch out for the potential danger of deficit of trade.

Be confined to the available data, the estimation are rough and can't replace the official statistics of cross board trade. But it is sure if only the international trade is incorporated with the measures of foreign direct investment, can the situation of international trade be evaluated fairly.

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Appendix

		Coverage 1 Only-foreign owned enterprises					Coverage 2 Foreign controlled enterprises					Coverage 3 Foreign direct investment enterprises				
		2006	2007	2008	2009	2010	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Cross board trade of China	Export	9697	12200	14346	12038	15814	9697	12200	14346	12038	15814	9697	12200	14346	12038	15814
	Import	7519	9046	10739	9543	13272	7519	9046	10739	9543	13272	7519	9046	10739	9543	13272
	Balance	2178	3154	3607	2495	2542	2178	3154	3607	2495	2542	2178	3154	3607	2495	2542
Cross board trade of foreign direct investment enterprises of China(-)	Export	3823	4785	5454	4752	6082	4642	5779	6588	5664	7270	5638	6954	7905	6721	8622
	Import	3270	3960	4293	3799	5212	3948	4735	5200	4594	6261	4725	5598	6194	5454	7549
	Balance	553	825	1161	953	870	694	1044	1388	1070	1009	913	1356	1711	1267	1073
The results of the first steps of adjustment	Export	5874	7415	8892	7286	9732	5056	6421	7759	6375	8544	4059	5246	6441	5317	7192
	Import	4249	5086	6446	5744	8060	3572	4311	5540	4950	7011	2794	3448	4545	4089	5723
	Balance	1625	2329	2446	1542	1672	1484	2110	2219	1425	1533	1265	1798	1896	1228	1469
Sales and purchases of Foreign direct investment enterprises of China(+)	Export	961	1662	3178	3855	4509	2008	3233	5220	6193	7406	3557	5544	8058	9396	11272
	Import	2517	3542	5612	6586	8317	4283	6024	8846	10315	12975	6773	9550	13205	15276	19257
	Balance	-1556	-1880	-2434	-2731	-3808	-2275	-2791	-3626	-4121	-5568	-3216	-4006	-5148	-5880	-7985
The results of the second steps of adjustment	Export	6835	9077	12070	11141	14241	7063	9654	12979	12568	15950	7616	10790	14499	14713	18464
	Import	6766	8628	12058	12330	16377	7854	10335	14386	15264	19986	9567	12998	17750	19365	24980
	Balance	69	449	12	-1189	-2136	-791	-681	-1407	-2696	-4035	-1951	-2208	-3252	-4652	-6516
Cross board trade of Chinese oversea direct investment enterprises(-)	Export	164	247	321	505	426	164	247	321	505	426	164	247	321	505	426
	Import	761	942	1471	1131	941	761	942	1471	1131	941	761	942	1471	1131	941
	Balance	-597	-695	-1150	-626	-515	-597	-695	-1150	-626	-515	-597	-695	-1150	-626	-515
The results of the third steps of adjustment	Export	6671	8830	11749	10636	13815	6899	9407	12658	12063	15524	7452	10543	14178	14208	18038
	Import	6005	7686	10587	11199	15436	7093	9393	12915	14133	19045	8806	12056	16279	18234	24039
	Balance	666	1144	1162	-563	-1621	-194	14	-257	-2070	-3520	-1354	-1513	-2102	-4026	-6001
Sales and purchases	Export	2746	3376	5343	4420	7104	2746	3376	5343	4420	7104	2746	3376	5343	4420	7104

of Chinese oversea direct	Import	1832	2279	3607	2984	4796	1832	2279	3607	2984	4796	1832	2279	3607	2984	4796
investment enterprises(+)	Balance	914	1097	1736	1436	2308	914	1097	1736	1436	2308	914	1097	1736	1436	2308
The results of	Export	9417	12206	17092	15056	20919	9645	12783	18001	16483	22628	10198	13919	19521	18628	25142
the fourth steps of	Import	7837	9965	14194	14183	20232	8926	11672	16522	17117	23841	10638	14335	19886	21218	28835
adjustment	Balance	1579	2240	2898	873	687	720	1111	1478	-634	-1212	-440	-416	-366	-2590	-3693