RCIF
Research Center for International Finance
中国社会科学院世界经济与政治研究所国际金融研究中心
Working Paper No. 2013W10
May. 6, 2013
www.rcif.org.cn

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RMB NEER for Third Market Competition: An Approach Based on Disaggregated Trade Data

Abstract: While measuring the NEER, three factors should be considered: import competition, direct export competition and the third market competition. The traditional NEER methodology aggregating the export trade data underestimates the competition between producers of homogeneous goods and make the weight of the effective exchange rates too reliant on trade scale. Based on the 6-digit data of HS2002, this paper employs the competitive stress index to adjust the weighting system of the RMB NEER for third market competition. In the new weighting system, European countries and some emerging economies have a higher weights, while the contrary for some of the developed countries including US and Japan, and resources-dominated economies. This research can facilitate the understanding of changes in China's export competitiveness.

Key Words: Third Market Competition, RMB, NEER, Competitive Stress Index

JEL Classification: F30 F31

I. Introduction

Since April 2012, a group of emerging countries' currencies and the Euro have suffered depreciation against the US Dollar. In one single month, the Mexican Peso, the Indian Rupee and the Brazilian Real reported a depreciation of 10% against the US Dollar, while the depreciation of the Russian Ruble, the Euro and the Korean Won was 5% to 8%, and for major ASEAN currencies it was 2% to 4%. Meanwhile, the RMB remained stable against the US Dollar, with a slight depreciation of 0.8%. But the seemingly unchanged bilateral exchange rate between the RMB and the US Dollar implicitly led to a large appreciation of the RMB against almost all the currencies of the emerging economies and the Euro, resulting in declining competitiveness in the US market for China relative to other countries. This phenomenon represents a typical third market competition effect[①], i.e. the appreciation of currency A against currency B undermines the competitiveness of the products of country A relative to country B in a third market, say, country C.

After its entry into the WTO, China has seen dramatic growth in its proportion of the global trade market. In recent years, however, the expansion has decelerated as the external competitiveness of China has been eroded due to the appreciation of both the nominal effective exchange rate (the RMB appreciated against other currencies) as well as the real effective exchange rate (ascending labor costs and inflation in the domestic market). China's market share in the markets of its major trade partners even declined. Based on a comparison of China's trade data in 2008-2009 with the first half of 2011, Anderson (2011) figured out the turning point of China's ascending market share of light industry products in US and European markets. Vietnam, Bangladesh, Indonesia and Mexico in the US and Europe, and Poland, the Czech Republic and Hungary in Europe, are all major competitors to China, encroaching on China's market share.

However, how to measure external competitiveness still remains a question. This paper sets out to shed some light on this by introducing the third market competition effect. The third market competition effect is also critical to exchange rate and trade policy.[②] This

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① Apart from the third market competition effect in country C, the products of country A and B are also in competition in their own markets. For the firms in country A, the competition between the firms from country B in market A and B can be called the direct competition effect, namely direct import competition and direct export competition. The effective exchange rate weighting system, an indicator closely related to competitiveness, also covers the three factors mentioned above.

② According to McGuirk (1987), the third market competition effect is important for the following two reasons. Firstly, of the effective exchange rate weighting systems of all the 17 industrialized countries in the world, the arithmetic average of the third market effect was 34.5%, which was higher than that of both direct import and export. Secondly, if direct bilateral import and export are considered only, the weighting system will be misleading. Take Switzerland's effective exchange rate as an example. As McGuirk (1987) pointed out, of Switzerland's direct export, Japan's weight was only 2.43%; however, of the third market paper would also shed light on empirical researches including the relationship between exchange rate and current account surplus, the pass-through effect of exchange rates, and the equilibrium exchange rate. Our paper sets out to fill this gap because “there is almost no Chinese literature focusing on the third market competition effect of the RMB exchange rate” (Ba et al. 2007). We will establish a framework for re-estimating the RMB NEER which is suitable for future research on REER as well.

An even big problem is that the NEER methodologies currently adopted by the IMF and the BIS total up the export trade amount with a single product assumption (Klau and Fung, 2006), which would underestimate the competition between producers of homogeneous goods and make the weight of the effective exchange rates too reliant on trade scale. Based on the 6-digit data of HS2002, this paper uses the competitive stress index to adjust the weighting system of the RMB NEER for third market competition.

The paper is organized as follows. Following this introduction, a review of the studies on the weights of the effective exchange rates will be offered. In the third part, this research will, based on disaggregated export trade data and competitive stress index (CSI), design the weighting system for the third market competition. The forth part will analyze the selection and classification of trade flows, especially re-exports. The fifth part gives an explanation for the selection of sample data, as well as for the calculation results and policy implications of the weighting system and the exchange rate index. At last, limitations in this research and suggestions for further studies will be provided.

II. Literature Review

At present, the weights of the effective exchange rate, established by the International Monetary Fund (IMF) and the Bank for International Settlement (BIS), consist of two parts (Bayoumi et al., 2005； Klau and Fung 2006). Take the US Dollar’s weight in RMB NEER as an example: it partly comes from direct import competition, tracking China's imports from the U.S. It actually measures the competition between China’s producers and American exporters in China's domestic market. The other part is export competition, which can be further divided into two sub-components. The first is the weight of the direct export competition, considering China's exports to U.S, which is actually a competition

competition effect of Switzerland’s export, Japan’s weight was 14.19%. It is the other case with Norway, in whose market Japan’s weight was 9.65% of its direct export and 1.64% of the third market effect. Therefore, if the third market effect is excluded, Japan’s weight will be underestimated while Norway’s overestimated. For these reasons, the BIS, the IMF, the OECD, the European Central Bank, the Bank of England and the Federal Reserve all incorporate the third market effect in their effective exchange rate weighting systems.

between Chinese exporters and American producers in the U.S. domestic market. The second is the weight of the third market competition, which measures competition in third markets in addition to China and the US. So that it makes up the double export weighting system.

The weighting system concept is consistent in both IMF and BIS frameworks. However, these two are different in expressions and the choice of trade flows. The BIS weighting system is directly based on the research of Turner and Van 't dack (1993), which focuses mainly on the analysis is of trade flows, for example whether the commodities should be included, which goods should be labeled tradable goods and which not. As to the weight itself, BIS defines the weights of direct import and export as the respective ratio of total imports and exports. So the formulas considers the relative importance of direct import and export. But it fails to consider the significant role of the domestic market size. Competitive stress from imported products in domestic markets may not be important for a small open economy like Singapore, whose domestic market is relatively small but has a broad global market. On the contrary, competitive stress from imported products in the domestic market is much more important for a country like China, whose domestic market is huge.

The IMF's weighting scheme (Bayoumi et al., 2005) has taken the domestic market size into account, and its theoretical framework comes from McGuirk (1987)[③]. In the weighting system, it is assumed that each country produces one product, and the substitution elasticity between domestic and foreign products would be constant in the setup of a consumer utility function[④]. With the framework a foreign (such as a U.S.) product and a domestic product (such as a Chinese one) appearing in multiple markets including China, the US and the third markets (which are parallel to direct import, direct export and the third market effect) simultaneously, generating a competitive relationship. Then, the Chinese product will face stress caused by the changes in U.S. product prices in any of the three markets. It concludes that the competitive stress is proportional to the weighted sum of the market share of that U.S. product in each market. Here the denominator of market share is defined as all the products the host country consumes - that is the self-produced and self-consumed part plus the imported part.

The BIS and IMF methodologies are also different in the selection of trade flows. IMF

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③ Both Turner and Van 't dack (1993) and McGuirk (1987) are the researches following Armington (1969).
④ In fact, according to Armington (1969), trade flows are divided into goods and products. He assumed *m* countries and *n* goods, so that there are $m*n$ products. Armington finally simplified the goods and substitution elasticity for easier application. As for the choice of trade flow, McGuirk (1987) stressed the commodity disaggregation and uses the 3-digit data of the categories 5 to 8 in the SITC classification, but the micro information in the disaggregated data at last lost by the aggregated method.

trade flows (Bayoumi et al., 2005) includes the following content: commodities, manufacturing goods and services, whereas only manufacturing goods are selected in BIS trade flows, which are based on the categories 5 to 8 in the SITC classification. BIS excludes commodities as the global markets usually have a relatively uniform price, which rarely linked with exchange rate fluctuations in individual countries. In addition, service trade data quality is less good compared to manufacturing goods, therefore the IMF has a stronger hypothesis in dealing with service trade flows. Consequently, the BIS has a narrower range of trade flows compared with the IMF, but it seems to be more reliable.

Thus it can be seen that the calculations of NEER by IMF and BIS differ both in weighting system and trade flows. Apart from these two editions, there are other kinds of NEER calculated by central banks of major economies. Among them, the effective exchange rate system of the European Central Bank (Buldorini et al., 2002) is based on the framework of the BIS (Turner and Van 't dack, 1993), while the methodology of the Bank of England (Lynch and Whitaker, 2004) mainly refers to the IMF framework.

Despite differences in weight schemes, IMF and BIS arrived at quite similar results in the effective exchange rate. Highly consistence of the results with the different methods may be resulted from the following reasons: firstly, manufacturing goods are the most important tradable goods, thus weakening the impact of excluding commodities; secondly, for the direction of service trade flow, IMF assumes that it is identical with the manufacturing trade flow; thirdly, the practice of the Federal Reserve (FED) also shows that the selection of import and export weights is probably not critical. Loretan(2005) redesigns the FED’s effective exchange rate weights by assigning half the weight to imports and half to exports. Although it is logically arbitrary, only the settings of the 1970s and 1980s are sensitive according to the results. After 1985, the effect of weight scheme became quite limited, which might be due to the close trend of the two components of the effective exchange rate.

As a result, IMF and BIS get close results despite the different weighting schemes. And even the FED’s to some extent arbitrary assignment for the weighting system, which still seems effective. Thus, the divergences in the various weighting systems may not be that serious.

But there are still problems with the trade flows as the existing research relies on the aggregated volume of trade, neglecting the specified product structure. For example, both China and the U.S. export a large quantity of transportation equipment, but China concentrates more on the shipbuilding industry, while the U.S. exports more in the aircraft industry. In this case, China actually faces less stress in the shipbuilding industry as its main competitor is South Korea rather than the U.S. Thus, using aggregated information will possibly overestimate both of U.S. stress on China and dollar's weight in RMB's NEER. This example reveals the implication for methodology improvement as following: It is necessary to calculate with disaggregated trade flows so as to depict the real competitive relationship with counterparts.

Klau and Fung (2006) cast doubt on the single product assumption[⑤]. It is current methodology for measuring the effective exchange rate, based on which the calculation using the total trade amount while neglecting different products' elasticity of substitution. Klau and Fung (2006) also point out that this might not be a question for the case among developed countries, as their export baskets are quite similar. But when it comes to the relationships between the developed country and the developing, it matters. Especially for the case of China, with its variety of export products, the elasticity of substitution among different products varies. In this condition, the analysis based on disaggregated trade flow data becomes particularly necessary. Klau and Fung (2006) addressed that problem without solution, and that would be the main contribution of this paper.

Our method of estimating third market competition stress stems from Fan et al. (2006). Based on the disaggregated trade data, Fan et al. (2006) calculate the competitive stress index between China and the other competitors in the US market as the third market. Based on this method, this paper is attempt to improve the renminbi NEER's weighting scheme. As a beginning of the research, this paper focuses on the third market competition, without the consideration of direct import and direct export.

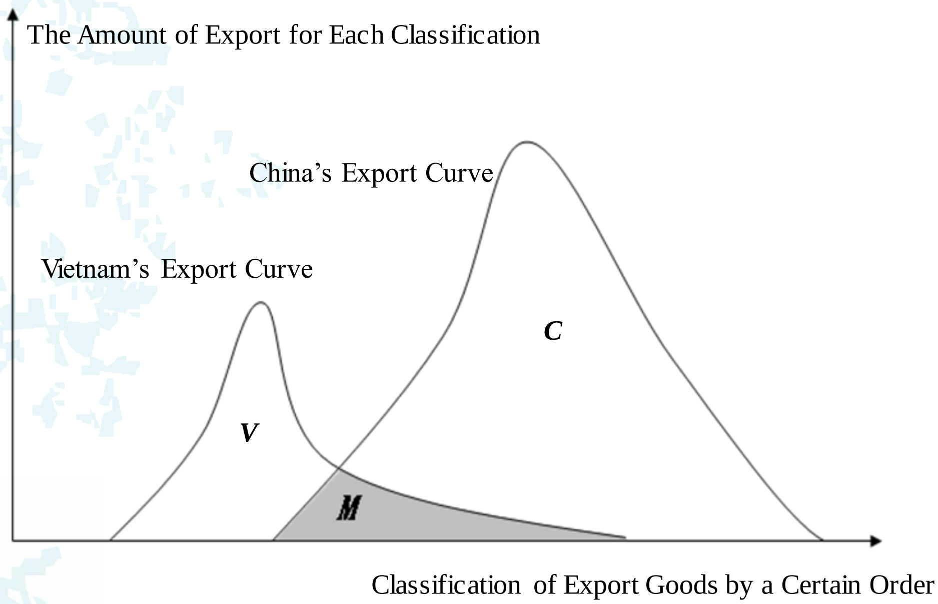
III. Weighting Scheme

The design of the weighting scheme has affinities with the micro foundation of trade flows. All weighting schemes in the existing literature are based on the aggregated data. For instance, the respectively aggregated data of commodities, manufacturing and services are adopted in the IMF's analysis (Bayoumi et al., 2005), while the BIS (Klau and Fung, 2006) selected the aggregated trade data of manufacturing from categories 5 to 8 in the SITC's

[⑤] Besides this, Klau and Fung (2006) also shed light on another import defect of the traditional metho. It is the defect results from the global value chains. Processing trade becomes more and more important in the international trade, while it leads to the misunderstanding of the directions of trade. Furthermore, it makes distortions in the calculation of weighting system for the effective exchange rate. Fortunately, Bems and Robert (2012) have introduced a new method based on the global input-output table to calculate the trade direction and weighting system. After that, OECD and WTO (2013) published the international trade data in value-added way for 40 economies including China, which also provide a solid base for the research of effective exchange rate. Of course, the new measurement of international trade have more meaning for China's economic policies(Wu and Xu, 2013).

classification. Despite the different definition in trade flows, they both chose aggregated data. As mentioned above, the weighting scheme which is based on such kind of trade flows might leave out some structural information. But there comes new problem when switching from aggregated data to disaggregated. How to aggregate the disaggregated data in order to get the final weighted effective exchange rates? This problem is going to be solved in this chapter. In fact, it involves the third market competition on different products and further aggregating works for all the products. Our aggregated effective exchange rate is able to reflect the disaggregated information.

Figure 1. Distribution Map of Tradables



1. The Calculation of Competition Stress Index

Fan et al. (2006) provide a foundation for our study of the competition stress. Their analysis describes the competition stress of exports from country A to B and defined it as Competition Stress Index (*CSI*). As shown in Figure 1, the detail of the method can be summarized as[⑥]:

(1) Sort the export products according to a certain sequence on the horizontal axis. For example, this sequence can be from the lowest to the highest ratio of value added.

(2) Each commodity classification of the horizontal axis corresponds to a certain

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[⑥] It should be noted here that tradables in the real world are discretely distributed. For easier understanding, figure 1 distributes tradables continuously but in Formula (1), the calculation is discrete.

amount of export, so we use the vertical axis to specify the export amount.

(3) Each point in the coordinate system corresponds to a value on the horizontal axis and a value on the vertical axis. These two values respectively represent the commodity classification and the corresponding export amount. The export distribution curve results forms the combination of all commodity points. The figure shows the hypothetical export distribution curves for China and Vietnam.

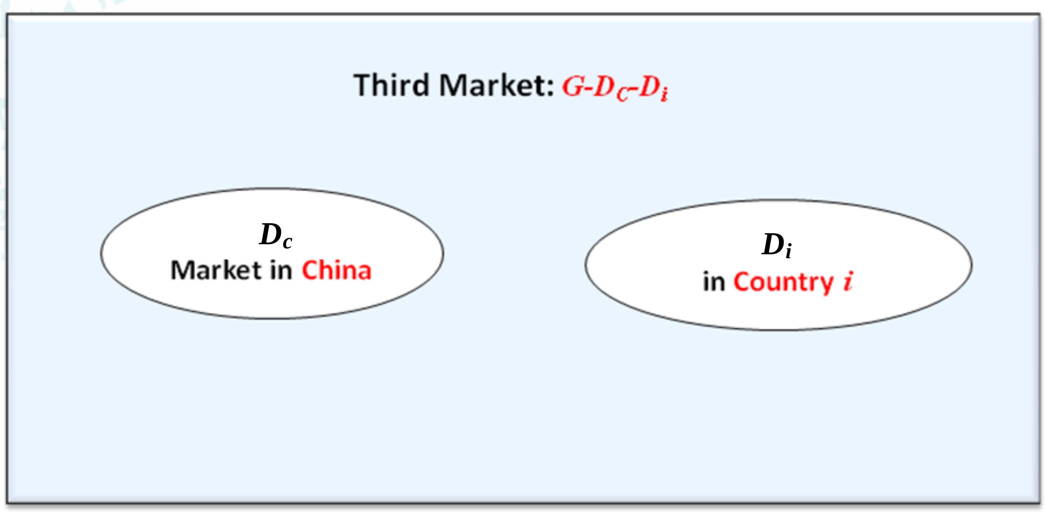
(4) The intersection area of the two curves illustrates that the two countries both export the same products; therefore the competition between these two countries limited in these fields. A bigger intersection area means a larger volume of these competitive products and hence stronger competition between the two economies. Suppose that ***C*** and ***V*** represent the coverage area of China and Vietnam's export curves respectively. ***M*** represents the intersection area (shaded area), then the percentage that ***M*** occupies of ***C*** shows Vietnam's export competition stress on China, and vice versa.

Based on Fan et al. (2006), country *i*'s export competition stress on China (CSI_i) can be calculated as follows:

$$CSI_i = S_M / S_C = \sum_{j=1}^{m} \min(X_{i,j}, X_{C\,j}) / \sum_{j=1}^{m} X_{C\,j}, \qquad \textbf{(1)}$$

S represents the corresponding area of the map, and m is the amount of the export goods types. $X_{i,j}$ shows country *i*'s trade volume for exporting product *j*, and $X_{C,j}$ shows China's trade volume for exporting product *j*. The competition stress index belongs to the range of [0,1], and a larger index indicates a stronger competition stress for China.

Figure 2. The Concept of the Third Market



2. The Definition of the Third Market and the Adjustment of Competition Stress

In the case of a three-country-world, country A's currency appreciates against B's, resulting in declining competitiveness of A relative to B in market C. Then the third market and its competition effect can be easily defined. That is to say, for A and B, C's market is the third market. As for the real world, the definition of the third market may be more complicated. As shown in Figure 2, G represents the global market (universal set), $\boldsymbol{D_c}$ represents the domestic market in China (subset of G), and $\boldsymbol{D_i}$ represents the case in country *i* (subset of G). The third market for China and country *i* can then be calculated as follows[7]:

$$TM_i = G - D_C - D_i \tag{2}$$

According to the formula, as country *i* varies, the scale of the corresponding third market will consequently changes. For instance, the third market for China and US is indicated as *TMUS*, and that for China and Mexico is *TMMX*. Obviously, the scale of *TMMX* is larger than *TMUS*. Therefore, when China combines with various countries, the importance of the corresponding third market is different. In this case, even though both countries' competition stress index (*CSI*i) to China may be the same, the importance of the third markets (TM *i*) is probably not equal. Thus we need to make an adjustment according to the importance of the third market. We define the adjustment index as α*i* :

$$a_i = 1 - \frac{X_i}{\sum_{l=1}^{n} X_l} \tag{3}$$

X_l represents China's exports to country *l*, with a total of *n* countries. α_i represents the importance of the third market of China and country *i*. The index is (0,1], and a larger index means a more important third market to China. On this basis, multiply α_i with CSI_i to obtain country *i*'s adjusted competition stress index to China (CSI_i'). If the value of *n* is confirmed, we can normalize CSI'_i of all countries with the adjust index, and then arrived at the weight TM_i. TM_i is the share country *i*'s currency occupies in the RMB effective

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[7] It is noteworthy that TM_i is just the space definition of the third market. In a certain commodity market, CSI will manifest whether country i has exports and is thus in competition with China. Therefore the space definition of the third market will not lead country i to overestimate or underestimate China's competitive stress.

exchange rate. Since the weighting system corresponds to the third market and reflects structural information, it is marked as $STMW_i$ to be differentiated from TMW_i which reflects the weighting system of the third market based on the totaled amount.

IV. The Selection Procedure of Trade Flow

The selection of trade flows is a problem related with trade counterpart, trade pattern and the classification of goods. For trade counterparts, the concern is on Euro-area countries. The question is whether to disaggregate or to add up the Euro countries as a whole. The choice is the former. This is in general, because although there is one currency in the Eurozone, there are actually no united goods or labor markets. Thus, there are remarkable differences in inflation and labor cost amongst the Eurozone. This leads to large deviations in the real competitiveness of Euro countries. With this in mind, it is very necessary to take every Euro country as a single economic entity as a starting point for measuring NEER as well as REER in the future. The BIS views the Euro countries as a whole and integrates intra-regional trade. This paper will discriminate these countries when comparing the two kinds of weighting systems.

As for the classification of trade flows, our research mainly follows the HS2002 6-digit level data from the UN Commodity Trade Statistics Database in order to accomplish the goal of a detailed analysis on third-market competitiveness. Taking the trade flow between Mexico and China as an example, the essential steps are:

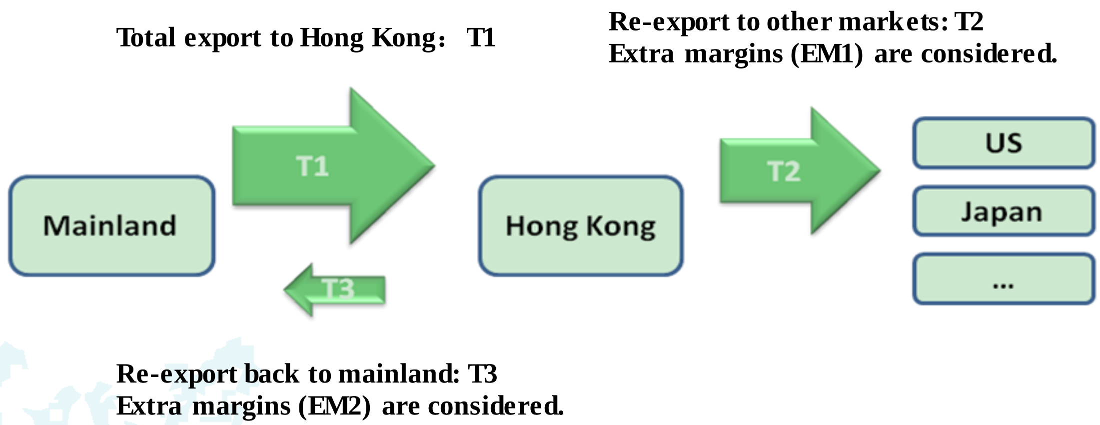
(1) Denote vector $\mathbf{V}_1$ and $\mathbf{V}_2$ as 6-digit level data of Chinese exports to the World and to Mexico respectively;

(2) Denote vector $\mathbf{V}_3$ and $\mathbf{V}_4$ as 6-digit level data of Mexico exports to the World and to China respectively;

(3) Obtain third-market exports of China $\mathbf{V}_5$ by subtracting $\mathbf{V}_2$ from $\mathbf{V}_1$, and similarly, obtain third-market exports of Mexico $\mathbf{V}_6$.

(4) The elements in $\mathbf{V}_5$ and $\mathbf{V}_6$ can be used to calculate third-market competitiveness stress CSI_{MX} based on formula (1), and we can use the adjusted factor a_i in order to get CSI'_{MX} .

Figure 3 Re-exports from Hong Kong



But due to the complexity of trade patterns, using the above trade flow might not fully reflect the real competitive relationship between different economies. This is an important argument, especially in the case of Mainland and Hong Kong. Around 20% of exports from Mainland to the World are channeled by the re-exports from Hong Kong[8], which means that the exports from Mainland to Hong Kong should be reduced, while the exports from Mainland to the world should be increased. If we do not take this re-exporting effect into account, the competitive stress of Hong Kong on China might be over-estimated, due to which Hong Kong's weight in calculating the NEER[9] will be overestimated. In order to eliminate this distortion, we need to analyze Hong Kong's re-export data[10]. Figure 3 shows that most of the total exports from Mainland to Hong Kong (Vector T1) will be re-exported to other countries (Vector T2) and only a relatively small proportion of the exports constitute direct trade with Hong Kong and are consumed by Hong Kong market. According to the data, it is necessary to get rid of margins (EM1). What is more, among T1, there are some exports from China to Hong Kong which are re-exported to China (T3). The estimation for T3 needs to get rid of margins (EM2) as well. The competitive stress of Hong Kong on Mainland can be calculated in the following procedure:

[8] WIOD (2009) points out that the difference between re-export and transit-export depends on whether ownership changes or not. Since Hong Kong data only provides the re-export classification, we only take re-export data into account.
[9] Hong Kong adopts the currency board as its exchange rate regime. Thus, the over-estimation of the Hong Kong Dollar is actually the over-estimation of the US Dollar.
[10] The data of re-exports in Hong Kong are from the *Annual Review of Hong Kong External Merchandise Trade* in each corresponding year. The data of re-export margin are from *Hong Kong's offshore trade statistics*. Due to the lack of the disaggregated margins for different commodities, we choose the gross margin as the measurement of margin for each commodity. Despite that, the country-specific re-export data is only available on a 2-digit level. This is the level we choose in the case of Hong Kong.

(1) Denote **T**4 as the exports from Hong Kong to Mainland;

(2) Denote **T**5 as the exports from Mainland to the World;

(3) Denote **T**6 as the exports from Hong Kong to the World

(4) Then, the real exports from Mainland to Hong Kong will be **t**1=**T**1-**T**2-**T**3, and the real exports from Hong Kong to Mainland China will be **t**2=**T**4-**T**3.

(5) The exports of Mainland China to the third market will be $\mathbf{T}_{ML}$=**T**5-**t**1, and the exports of Hong Kong to the third market will be $\mathbf{T}_{HK}$=**T**6-**t**2.

According to formula (1), we can obtain the third market stress of Hong Kong to Mainland China CSI_{HK}. Based on the adjustment parameter a_i, we get the adjusted stress CSI'_{HK}.

Our initial calculation result also shows that the third market stress from Belgium and the Netherlands rank significantly high. These two countries in general have very high re-export (GTAP, 2012) and transit-export trade (UN, 2010). It is necessary to make adjustments using a similar method to that we applied to Hong Kong. WIOD (2012) provides the re-export data of sample economies in 2009. UN (2010) provides the transit-export data of Belgium and the Netherlands to other European countries. We assume the same trade pattern for these countries with non-European countries. Finally we obtain re-export and transit-export accounts of 27.9% and 27.4% respectively for these two economies. We make adjustments for competitive stress with these parameters.

V. Sample selection and estimate results

The competition stress index is the basis for corresponding currency weight in the effective exchange rate. But the relative importance of the index is not completely determined by the trade volume, which means that countries with relatively small trade volumes might have a high competitiveness with China because of the similar export structure. Thus for the selection of sample countries, it is important to make sure the coverage of sample should be large enough in order to avoid missing those economic entities with smaller-scale trade but which exert a remarkable competitive stress on China. In this paper, we have selected the top 120 economies in terms of export value (except China) according to the International Financial Statistics (IFS) of the IMF.

As for the sample time, we should be cautious for the endogeneity problem. Many researchers also use effective exchange rate as an explanatory variable to do econometric work in order to understand the relationship between exchange rate and other variables, for instance, trade. As is pointed out in Goldberg (2004) and Xu et al.(2012), this kind of work may encounter the problem of endogeneity if the calculation use the synchronous trade value as the weight. Goldberg (2004) advised to use lagged trade value, so as to ease the endogenous problems. The new weighting system of the BIS is based on the trade data from 2008 to 2010 (BIS, 2012), while the update of the IMF weight is even older[11]. This study, in accordance with the BIS methodology, selects the data from 2008 to 2010 as its basis. After that we match China's trade flows data with other countries, calculating all sample countries' export competition stress index to China. Then we sort the 120 sample economic entities based on the average result of 3 years' data and keep the top 50 countries as our final sample[12]. By standardizing the re-adjusted competition stress index, we can obtain the corresponding $STMW_i$ weights to each currency.

We apply two methods to calculate the weights of the RMB NEER for the third market competitive effect, based on disaggregated and aggregated trade data. The latter method is the case of BIS, based on which we get the TMW_i weights. Table 4 compares the results of the two methods and it can be found that:

Firstly, economies with higher weights by the new methodology are mainly European countries and emerging countries. The former includes the Euro countries (whose weight is up by 9.1% as whole), Switzerland, Norway and Denmark of Northern Europe (up by 2.0%), as well as the Czech Republic, Poland, Hungary, Romania and Belarus of Central and Eastern Europe (up by 3.9%). The latter includes Mexico, Turkey and South Korea (up by 1.6%). All the above economies export less agricultural and primary products, but more manufactured, especially mechanical and electrical products. In recent years, mechanical and electrical products have accounted for more than 50% of China's exports, so the economies whose weights are adjusted higher reflect that their export structure is similar to China's, so that they exert higher competitive stress on China.

Secondly, economies with lower weights are some of the developed countries, or economies whose resources or primary products take up a larger share in exports. The former include the United States, Japan, Canada and United Kingdom (whose weight are

[11] The latest update for the IMF Effective Exchange Rates was in 2005 and it was based on the data between 1999 and 2001. Before 2005, the weights were based on 1989-1991 data. (Bayoumi et al.,2005)

[12] From the 120 alternative samples, 60 economies are selected based on the CSI, and the sample size is in the reference with BIS. The total exports of the 60 economies account for 95% of the world. In order to make a comparison between the method used in this study and that of the BIS, it is necessary to conduct recalculations based on the method of the BIS. During this process, due to the availability of data, 10 economies are removed, namely, Algeria, Costa Rica, Greece, Ireland, Lithuania, New Zealand, Oman, Syria, Venezuela and Taiwan. The ten economies only exert 4.85% of the total competitive stress generated by all the 60 economies on China, so the 50 samples are still highly representative.

down by 7.8%) and the latter include Australia, Russia, Malaysia, Brazil, Chile and the Philippines (down by 5.1%). The former have large-scale exports, but their export structures are less similar to China, so their weights need to be brought down. As to the latter, primary products are the bulk of their exports, but it is the opposite case with China, so their weights based on competitive stress on China is significantly lower than the weights based on trade volume.

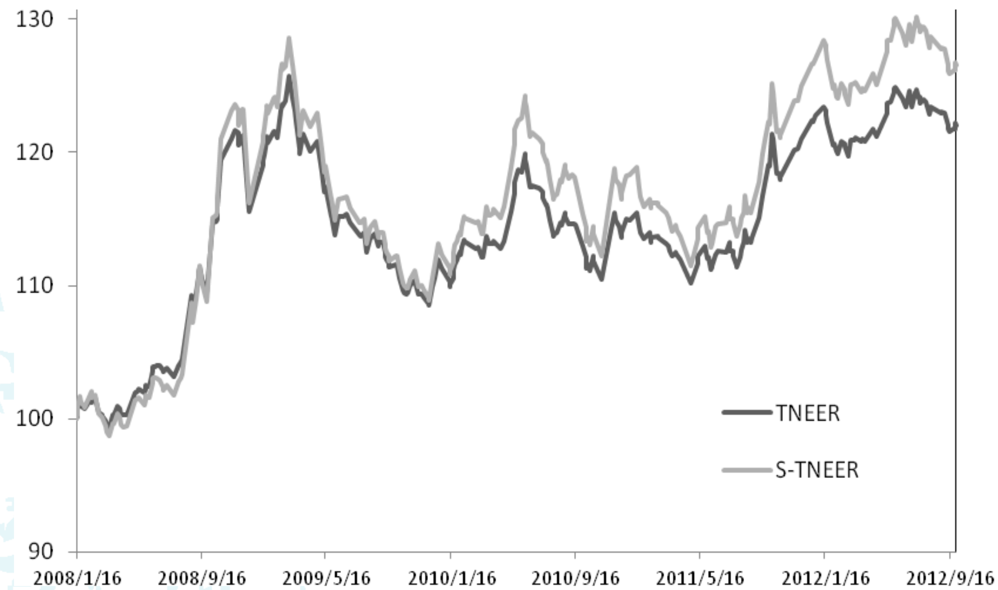
Table 4 Comparison of the results of $STMW_i$ and TMW_i

Higher weights		Lower weights	
The Euro countries*	9.11%	**The United States**	-5.20%
The Czech Republic	1.33%	**Singapore**	-1.91%
Switzerland	1.08%	**Australia**	-1.83%
Poland	0.92%	**Japan**	-1.49%
Hungary	0.84%	**Malaysia**	-1.08%
Mexico	0.81%	**India**	-1.04%
Denmark	0.76%	**The Philippines**	-0.91%
Turkey	0.55%	**The United Kingdom**	-0.61%
Romania	0.50%	**Canada**	-0.53%
Belarus	0.30%	**Russia**	-0.50%
South Korea	0.21%	**Vietnam**	-0.48%
Norway	0.20%	**Brazil**	-0.44%
		Chile	-0.33%
		Thailand	-0.29%

Note: Values are the differences between two weighting system for the same currency, namely, $STMW_i$ minus TMW_i . The table only exhibits economies whose weights are adjusted upward or downward by over 0.2%.

* The weight of the Euro countries is obtained through separate calculations and a final totaling.

Figure 5 RMB S-TNEER: Structural NEER for the third market



Based on the new weighting scheme and exchange rate time series [13], we accomplish the final result of the RMB NEER based the structural information on the third market competitive effect. We denote it as S-TNEER. And for comparison, TNEER is calculated exactly based on the aggregated data, namely BIS method. Both of them are shown in Figure 5. The base period is January 2008. We would be able to conclude that:

(1) From January 2008 to September 2012, the appreciation of TNEER and S-TNEER is 22.0% and 26.5% respectively. From 2008 to early 2010, the two were highly consistent, but since mid-2010, evident differences have arisen and grew substantially from 2011 onwards.

(2) There are two reasons for the difference between the two effective exchange rates: first, the salient feature of our weighting system, compared with the traditional method, is the downward adjustment for the US Dollar[14] and the Japanese yen, meanwhile the upward adjustment of the Euro. Second, in the sample period, there is a trend of depreciation for the Euro against the US Dollar. From January 2008 to September 2012, the exchange rate of USD/Euro has declined from 1.473 to 1.288 (12.5%).

[13] The data is from the CEIC database.
[14] The downward adjustment of the weight of the US Dollar is not only due to its direct downward adjustment of 5.2%, but also to the cut of the weight in the Hong Kong Dollar.

Because of the two reasons, the appreciation level of RMB's S-TNEER is far higher than that of TNEER. The differences between S-TNEER and TNEER provide insightful considerations:

(1) The Euro countries are major competitors of China in the third market. The impact of Euro's depreciation on China's export competitiveness in the third market is far greater than that of the US Dollar. In the RMB's TNEER weighting system, the weight of the Euro is 10 percentage higher than that of the US Dollar. While in the S-TNEER weighting system, the Euro is 24 percentage higher.

(2) When the Euro markedly depreciates against the US Dollar, the traditional TNEER weighting system will underestimate the appreciation of the RMB, which is described in Figure 5. At the same time, the impact of exchange rate changes on China's exports will also be underestimated.

(3) For other emerging economies, or economies whose primary products dominate their exports, their corresponding weights are also adjusted obviously. When exchange rates of these currencies fluctuate significantly, S-TNEER and TNEER will differ consequently.

VI. Limitations and further researches

If the data disaggregation is too coarse, of which simply totaling up the trade amount is the extreme case, we would underestimate the competitive stress from foreign competitors and overestimate the stress from non-competitive producers. On the contrary, if the disaggregation is too detailed, other kinds of problems will emerge as well, that is, overestimating the non-substitutability of similar products. For example, apples and oranges are similar fruits. If we make a distinction between them, the competition between producers of the two products will be underestimated. This paper adopts the 6-digit data of HS2002, so there might be such kind of problems. In further studies, it is therefore necessary to find an optimal degree for the disaggregation, or to index the substitutability between different kinds of products.

Secondly, this paper is confined to the analysis of third market, while the other two markets, direct import and direct export are not considered. So this weighting system for RMB's effective exchange rate is not a complete one. Analysis of disaggregated domestic production and consumption is essential, and the WIOD database makes it feasible.

Besides, the effective exchange rates studied in this paper are nominal. In order to extend to REER, we have to obtain corresponding price indexes. Since the disaggregated price indexes are available in the 6-digit data of HS2002, it is feasible to transform from

S-TNEER to S-TREER. As to the complete NEER that takes into account direct imports and exports, it can be figured out with the traditional method according to ULC and CPI.

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