Calculate the Exchange Rate Pass-Through of RMB by Using Disaggregated Data

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Abstract

In this paper, I analyze the impact of the RMB's exchange rate fluctuations on export/import prices index, in other words, the RMB's exchange rate pass-through rate. Existing empirical studies estimating the exchange rate pass-through based on the aggregated exchange rate data. However, these approaches have some major drawbacks. Because different major trading partners have different comparative advantage products to trade, using the aggregated normal effective exchange rate is not necessarily appropriate. For this reason, we calculate the "Nominal Effective Exchange Rate in Sector (based on the export/import weight)" to verify the relationship between exchange rate and the export/import price index. The results reveal that the exchange rate shock on the export/import price index is different from using aggregated data and disaggregated data.
Key words: exchange rate, export prices index, import prices index, RMB

1 Introduction

Since China joined WTO in 2001, China's economic international standing has been rising rapidly due to the development of international trade. China's export share, which was occupied 6% of the World's share in 2001, has expanded to around 16% in 2017 significantly, taking the top position in the world. Concerning China's import share, which is expanding steadily from 5% in 2001 to 13% in 2017, making it the third-largest in the world. That is to say, while ensuring its status as a "World's Factory", China has also made itself to be a "Global Consumer Market".

Along with the expanding of China's trade balance, trade friction between China and other countries are becoming fiercer. Under this background, the US implemented treat restrictions such as imposing tariffs on Chinese goods in September 2018. There is a growing debate on that the situation of China now is identical to Japan in the 1990s, the focus of the friction between the US and China is likely to shift from "Trade" to

"Exchange Rate". Since the friction between US and China started, the tendency for the depreciation of the RMB to the USD rate is accelerated. The US hopes to force China to adjust the RMB's exchange rate to reach its goal, which is to reverse the situation of the trade imbalance between these two countries. The undervalued RMB has been perceived as a major factor widening the US trade deficit with China, and driving global imbalances. Letting the RMB's exchange rate appreciate against the USD has been prescribed as an effective solution. As a matter of fact, since the RMB exchange rate reform in 21 July 2005 which People's Bank of China (PBC) announced to implement a reform of the exchange rate regime-switching from the "Dollar-peg Regime" to "A Managed Floating Regime with Reference to a Currency Basket and the Supply-demand Conditions", the nominal exchange rate of RMB to USD is depreciated about 17.32%, and the nominal effective exchange rate (NEER) and real effective exchange rate (REER) has been risen by 42.28% and 32.78% respectively. Despite the variation of RMB, China's trade balance is still having a huge surplus these years. Before the 2008 Financial Crisis, the trade balance of China has reached 296.5 billion dollars, and after that, it reached its peak to 601.6 billion dollars in 2015. Therefore, the issue of the relationship between RMB's revaluation and China's international imbalance is highlighted nowadays.

The phenomenon that the mechanism of exchange rate adjust trade balance does not work well does not only exist in China, but also other countries. Kimura (2018) exhibited some causes to illustrate that the exchange rate cannot adjust trade balance well. He pointed out that in spite of some macro causes such as elasticity approach, the J-curve effect, incomplete pass-through theory can explain why the mechanism mentioned above does not work well, but also some micro causes such as market structure, the pricing behavior of firms, are as important as macro factors too. The relationship between exchange rate movement and price adjustments of traded goods, which is termed as "exchange rate pass-through (ERPT)", has long been debated theoretically and empirically. As we all know, once the exchange rate changes, the variations will affect export/import prices (PEX/PIM) first, and then affect the export/import volume based on the expenditure switching effects. Due to the "Incomplete exchange rate pass-through" theory, a low or no degree of ERPT would make international trade remain insensitive to the movements of exchange rates. If export/import prices respond slightly to the variation of exchange rates, the trade balance would be severely stagnating. J.M Campa and L.S. Goldberg (2005) use the OLS model, Shioji and Uchino (2010) use the VAR model, Zou and Luo (2014) use the SVAR model to analysis the incomplete pass-through by using OECD, Japan, and China's data respectively. Their research proved that the movements of exchange rate has a very limited impact on international trade balance.

Not only does the Pass-through is incomplete, but also it has been widely recognized that ERPT will change along with time. In recent years, the fact of ERPT is decreasing has been discussed worldwide. F.S.Minshkin(2008) has indicated that the USD's pass-through is weakening nowadays. J.M Campa and L.S. Goldberg (2005) verify that some OECD countries support similar view. Otani, Shiratsuka, and Shirota (2005) and Shioji and Uchino (2010) confirmed that the pass-through of Yen has declined since 1990. J.lee and B.C.Yi (2006) pointed out that the ERPT of Won has also cut down since the 1997 Asian Financial Crisis. This phenomenon of declination of ERPT has important implications for every country because, with little or no pass-through, even a significant drop in the currency would have only a modest effect on export/import prices.

For the causes of the pass-through decline, Taylor (2000) points out that it is difficult for companies to adjust the export/import prices when the exchange rate changed because of the rise of competitive pressure worldwide and the low, stable inflation rate. Obstfeld and Rogoff (1996) observed that whether export companies set export prices in their currency (Producer's Currency Pricing, PCP), or the export destination's currency (Local Currency Pricing, LCP) will influence the degree of ERPT. Gagnon and Ihrig(2004) argue that monetary policy about the restraint on inflation may lead to a declination in ERPT.

Based on all the literature mentioned above, we present a question about whether the RMB's ERPT is incomplete and declining as well as currencies such as the USD, the Japanese yen, and Korea won. I provide a detailed examination on ERPT of China's export and import prices from August 2008 to June 2018. I use not only the aggregated export/import prices index, but also the disaggregated export/import prices index to calculate the disaggregated pass-through by using the VAR model. Given the fact that every country has its comparative advantage goods to export, and comparative disadvantage goods to import, it may not always be appropriate to use an aggregated exchange rate data to estimate the disaggregated ERPT. Hence, I build up a series of "Nominal Exchange Rate in sector (weighted by trade volume)", and use it to calculate the disaggregated ERPT.

The composition of this paper is as follows. Section 2 analyzes the ERPT by using the aggregated NEER and PEX/PIM data. Section 3 interprets how to build up the series of "Nominal Exchange Rate in Sector (weighted by trade volume)", and illustrates the features of the disaggregated NEER. Then I use the disaggregated NEER and PEX/PIM data to estimate the disaggregated ERPT. Section 4 enumerates some reasons that may cause the declination of ERPT. Section 5 is a conclusion.

2 Estimate Aggregated Pass-through

This section follows Shioji and Uchino (2010)'s method to measure the RMB's pass-through to China's export/import prices by using the VAR model. We obtained NEER data from the Bank of International Settlements(BIS), and China's export/import prices (Aggregated, in dollar) from WIND DATABASE. Throughout the analysis in this paper, all variables are logarithmic and taken first-order differences, the lag will be selected of 2 according to the AIC standard. I choose the NEER as the first variable to implement the impulse response function by using the Cholesky decomposition. All impulse response functions in this paper are accumulated.

Unlike the Japanese export/import prices index is Yen dominated which is used by Shioji and Uchino (2010), the Chinese export/import prices index is Dollar dominated, so the RMB's ERPT should be defined as follow. Concerning China's exports, when all RMB's variation can be reflected in the price in foreign currency, we say that there is a 100% pass-through from China to foreign countries. In other words, it means that the export price in the foreign currency can be changed completely when the RMB's exchange rate changed. On the figure of the impulse response function, the larger the shock that the variation of exchange rate give to export prices index, the higher the pass-through of RMB's ERPT is. On the other hand, in terms of imports of China, when the variation of RMB causes the import price in RMB totally, we call it a complete pass-through, at this time, the pass-through of import price in foreign currency is 0. So on the figure of the impulse response function, the smaller shock that the variation of exchange rate gives to export prices index, the higher the pass-through of RMB's ERPT is. The equation is as follows.

$$\mathrm{PT}(PEX_i) = \frac{IR(NEER, PEX_i)}{IR(NEER, NEER)} \tag{2-1}$$

$$\mathrm{PT}(PIM_i) = 1 - \frac{IR(NEER, PIM_i)}{IR(NEER, NEER)} \tag{2-2}$$

$\mathrm{PT}(PEX_i)$ and $\mathrm{PT}(PIM_i)$ represent the RMB's pass-through to export prices index and import prices index respectively. $IR(NEER, PEX_i)$ and $IR(NEER, PIM_i)$ indicate the variation of PEX/PIM when there was a unit shock happened to NEER, and $IR(NEER, NEER)$ indicates the extent of NEER's change when there was an unit shock happened to itself.

Figures 2-1 and 2-2 show the impulse response of PEX/PIM to a unit shock on the RMB's NEER from August 2008 to June 2018. Figure 2-1 corresponds to the export prices index, and the figure 2-2 corresponds to the import prices index. According to the results, the ERPT to export price is about 50%, and 75% can be observed in the case of

import price.

Exchange rate, export/import prices index(Aggregated) VAR model:
The impulse response results according to the shock of the exchange rate, 2008.08-2018.06

NEER→NEER NEER→PEX

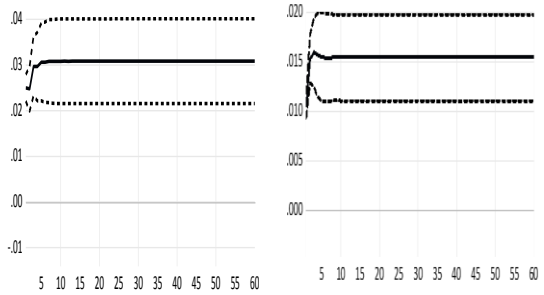

Figure2-1 ERPT of PEX

NEER →NEER NEER→PIM

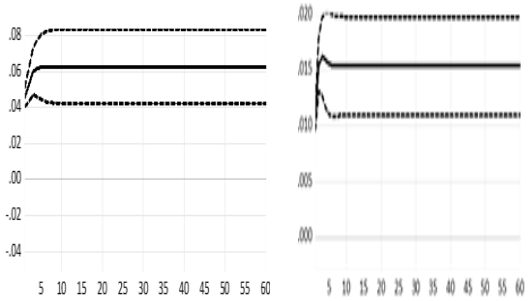

Figure 2-2 ERPT of PIM

Then, we divide the sample period into two, to calculate the pass-through before and after August 2015. In August 11th 2015, the PBC changed the quotation of the central parity of RMB against USD, with the intention of enhancing the market determination of RMB exchange rate. This reform of RMB's exchange rate system was accomplished by a 1.9% depreciation of the RMB/USD, and this change to the regime triggered a surge in global financial markets. So as the 1997 Asian Financial Crisis influenced on Korea Won's ERPT, I wonder whether the improvement of RMB/USD central parity quoting mechanism, may lead a change of RMB's ERPT.

Figures 2-3 and 2-4 correspond to the cases of the export prices index, and figures 2-5 and 2-6 correspond to the cases of the import prices index. For each of the figures, figures 2-3 and2-5 is the first half of the sample period (2008.01-2015.08), and figures 2-4 and 2-6 is the second half of the sample (2015.09-2018.06). As a result, although there is a slight decline in the ERPT of PEX, I hardly can tell there is a major change after the change of RMB's regime in August 2015. While the ERPT of PIM fell 13% in the second half of the sample period. The differentiate between ERPT to PEX and PIM might be explained by the disaggregated data.

Exchange rate, export/import prices index(Aggregated) VAR model:
The impulse response results according to the shock of the exchange rate, 2008.08-2015.08, 2015.09-2018.06

NEER→ NEER NEER →PEX NEER → NEER NEER →PIM

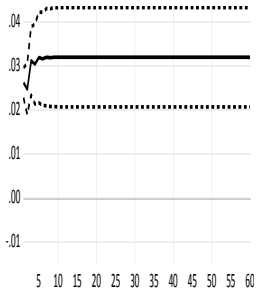

Figure 2-3 ERPT of PEX
（First half 2008.01-2015.08）

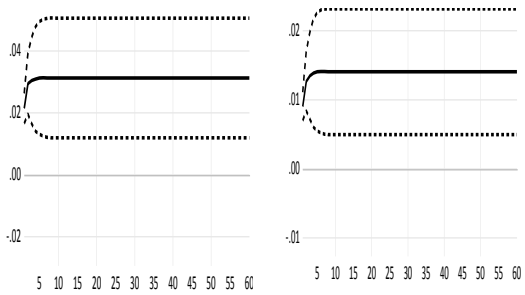

Figure 2-4 ERPT of PEX
（Second half 2015.09-2018.06)

NEER→ NEER　　NEER →PEX

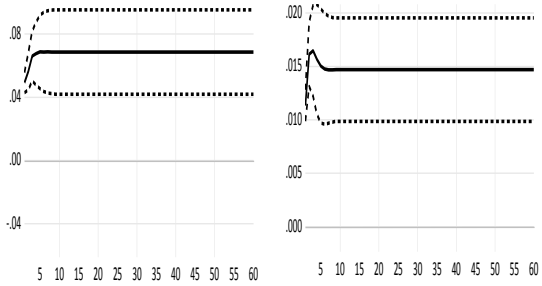

Figure 2-5 ERPT of PIM
（First half 2008.01-2015.08）

NEER → NEER　　NEER →PIM

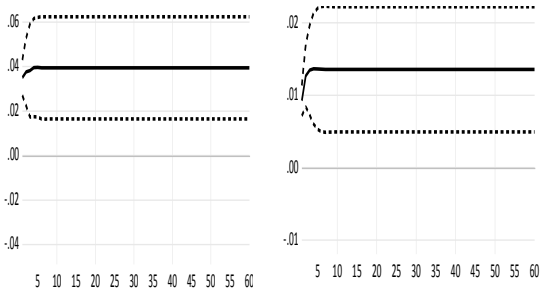

Figure 2-6 ERPT of PIM
（Second half 2015.09-2018.06)

Source: Author's calculation

Table 2-1 The Aggregated ERPT of PEX/PIM

Aggregated ERPT of PEX			**Aggregated ERPT of PIM**		
Period	**Pass-through**	**Trend**	**Period**	**Pass-through**	**Trend**
Total	50.32		Total	75.72	
First Half	48.75	**Decrease slightly**	First Half	78.6	**Decrease**
Second Half	45.04		Second Half	65.23	

Source: Author's calculation

3　Estimate the Disaggregated ERPT

As pointed out by J.M.Campa and L.S.Goldberg(2005), Otani, Shirotsuka, Shirota(2005), Shioji and Uchino(2010), the decline of the pass-through indicates the transition of international trade structure. Therefore, this section will discuss the impact

that RMB's exchange rate variation on the disaggregated export/import prices index. Considering about the series of effective exchange rate data published by International Organization nowadays are aggregated data, the trade weight is calculated by using the aggregated trade amount of every country's major trading partner, but the trade weight varies widely depending on trade partner. So if we use the aggregated NEER to estimate the ERPT of RMB by sector, we may cause "Aggregation Bias". Before estimating the disaggregated ERPT, we need to construct the disaggregated NEER first. There are several advantages of the construct of disaggregated NEER. First, it is possible that disaggregated data may obtain detailed information about the characteristics of the exchange rate. Second, using the disaggregated NEER to measure disaggregated ERPT may avoid the "aggregation bias" which might lead us to an insufficient result. Considering this, this section will construct disaggregated NEER, and illustrate it is characteristic first, and then estimate disaggregated ERPT using relevant data.

3.1 Construction Disaggregated RMB's NEER (Weighted by Trade Volume)

Before calculating the disaggregated NEER, it is necessary to give a simple illustration of the choice of sectors, trade partners, adjustment frequency about the weight of trade volume, and the method of calculation. First, I choose 8 sectors to estimate disaggregated RMB's NEER including FOOD, MINERAL, CHEMICAL, WOODS, TEXTURE, METAL, EMACHINE, and MACHINE regarding the H.S. code classification. Second, we choose 10 countries and areas including the US, EU, Australia, Canada, Hong Kong, Japan, Korea, Singapore, Thailand and UK which is the most important trade partner of China, and also their currency is included in the currency basket that RMB's exchange rate refers to. Third, we change the weight of trade volume every year, while the NEER published by BIS's weight change every 3 years.

We use the method of Shioji and Uchino (2010) mentioned to construct the disaggregated NEER of RMB. $w_{c,t}^{i}$ represents the trade weight of country c in sector i of year t (the entire target countries in sector i of year t is represented by $C_{t,i}$), defined as equation (3-1).

$$w_{c,t}^{i} = \frac{tradevalue_{c,t}^{i}}{\sum_{c \in C_{t,i}} tradevalue_{c,t}^{i}}, \qquad 0 \le w_{c,t}^{i} \le 1 \tag{3-1}$$

$tradevalue_{c,t}^{i}$ is the trade volume of country c in sector i of year t. Assuming that $e_{c,t,m}$ is the nominal exchange rate of the country c's currency to the RMB in t year m month, we can calculate the change of the NEER in sector i year t by using the trade weight mentioned above, which is represented by $I_{i,t,m}^{t}$.

$$I_{i,t,m}^{t} = \prod_{c \in C_{t,i}} \left(\frac{e_{c,t,m}}{e_{c,t,1}} \right)^{w_{c,t}^{i}} \tag{3-2}$$

Here, assuming $I_{i,t+1,1}^{t}$ indicates the variation of exchange rate from January year t to January year t+1, we can calculate the sector i's NEER of t year m month as follows.

$$CI_{i,t,m}^{t} = \prod_{\tau=2008}^{t-1} I_{i,\tau+1,1}^{\tau} \times I_{i,t,m}^{t} \tag{3-3}$$

3.2 The feature of Disaggregated NEER of RMB

Figure 3-1 shows the transition of disaggregated NEER from January 2008 to June 2018 calculated above. To indicate the difference between aggregated and disaggregated NEER, I put the aggregated NEER published by BIS into the figure too. As we can see, first of all, the aggregated NEER move gently, but the variation of disaggregated NEER is intensively Specifically, MINERAL's NEER reached a maximum of 115.90 in November 2008, and the aggregated NEER reached its maximum 105.31 in July 2015, which is 10.07% smaller than the MINERAL's. Second, the gap between maximum and minimum of aggregated NEER and disaggregated NEER is different. For example, the gap between maximum and minimum of aggregated NEER is 7.38, is smaller than the gentlest one in the disaggregated NEER, EMACHINE's ERPT, 7.42. and the largest gap is MINERAL's NEER, 31.59, which is the 4.04 and 4.28 times of EMACHINE'S NEER and aggregated NEER respectively. The distinction of disaggregated NEER indicates that the international competitiveness is quite different between different products. The logic of the argument is straightforward. The smaller the range is, the price is more steady, which is mean an enterprise has ability to maintain its products price in a market, in other word, this enterprise has advantage to competitive with other country's company. According to the results, we can say that the enterprise in China's MINERAL sector is inferior competitiveness in the international market, while the EMACHINE sector definitely in the superiority position.

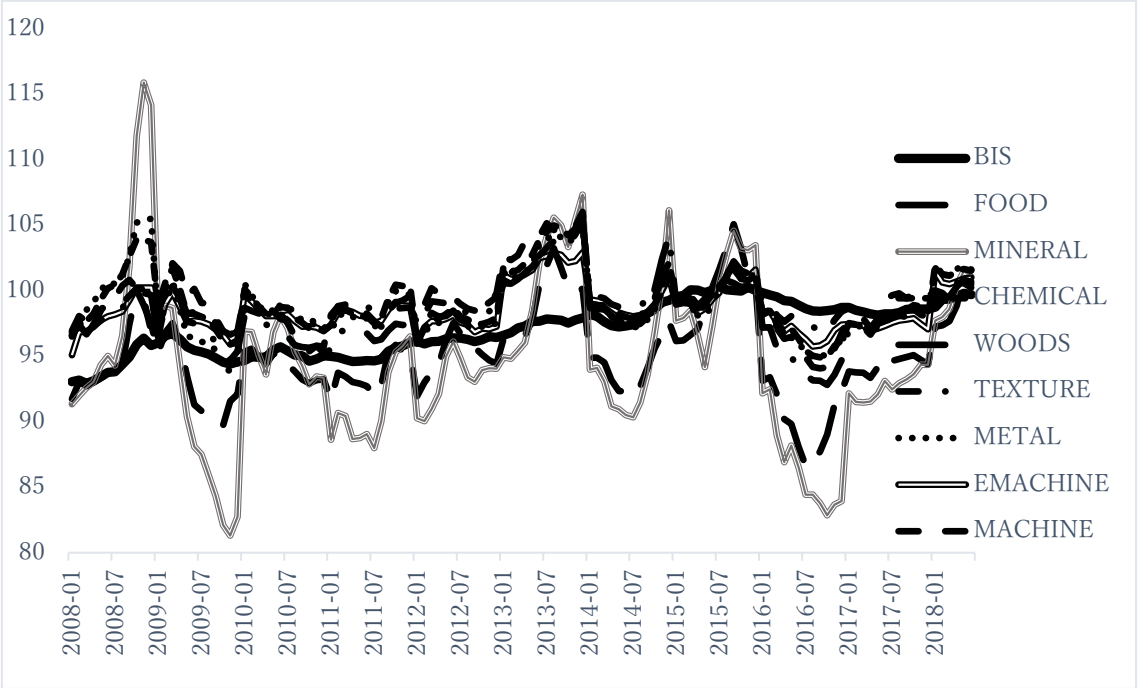

Figure 3- 1 Comparison of Disaggregated NEER (weight of trade volume) and Aggregated NEER

Source: Author's calculation

Table 3-1 The Basic Statistics of NEER

Category	Maximum	Minimum	Average	Variance
FOOD	106.09	94.47	99.91	2.60
MINERAL	105.16	94.10	99.36	9.98
CHEMICAL	107.43	97.07	100.90	2.15
WOODS	106.81	98.11	101.40	1.87
TEXTURE	106.62	98.06	101.17	1.60
METAL	107.44	97.30	100.69	2.08
EMACHINE	106.44	97.26	101.08	1.87
MACHINE	109.52	98.71	102.17	2.20
Aggregated	127.46	90.62	109.94	2.62

Source: The BIS statistics, Wind Database, and the Author's calculation.

Due to the diversity of China's demand and supply, some countries may take a considerable part in China's import, but its export share is very insignificant, vice versa. For example, China imports intermediate goods and material from Southeast Asia, and export industrial products to the US and Europe. So the import share of primary goods from Southeast Asia surpasses the US and EU. Hence, it is a matter of choose the total

trade volume ($TNEER_i$), or exports ($ENEER_i$), or imports ($INEER_i$) as weight when I calculate the disaggregated NEER. Table 3-2 shows the growth rate of disaggregated NEER of 3 different weights. As we can tell, each of these three indicators has its characteristics. In particular, in the case of CHEMICAL, EXTURE、 METAL、 EMACHINE、MACHINE, the $ENEER_i$ is bigger than $INEER_i$. While in the case of FOOD, the situation is reversed. Moreover, the MINERAL's $ENEER_i$ is greater than 0, while the $INEER_i$ is smaller than 0.

Table 3-2 Growth Rate of Disaggregated NEER in 3 Different Weight

Category	$ENEER_i$	$INEER_i$	$TNEER_i$
FOOD	3.57	4.84	4.27
MINERAL	4.32	-1.07	0.15
CHEMICAL	2.30	0.03	1.05
WOOD	2.14	1.56	1.74
TEXTURE	2.10	0.12	1.59
METAL	2.54	0.39	0.43
EMACHINE	4.17	0.71	2.72
MACHINE	3.38	0.60	1.40

Source: Author's calculation.

Figure3-3 to 3-10 put the 3 different disaggregated NEER of each sector together gave us an intuitive impression about the disparity of the choice of weight. Among them, for CHEMICAL, WOODS, TEXTURE, and METAL, the changes in the disaggregated NEER of 3 different weights are almost the same, but there are times when they quite differ from each other. For the remaining kind of disaggregated NEER, the tendency and fluctuation range are not the same. Therefore, it is necessary to choose the appropriate weight to construct disaggregated NEER, and use it to estimate the ERPT of PEX/PIM.

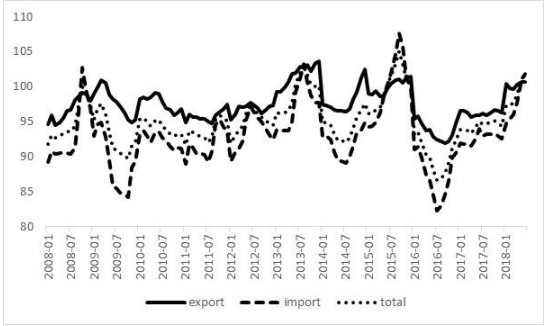

Figure 3-3 FOOD's NEER in 3

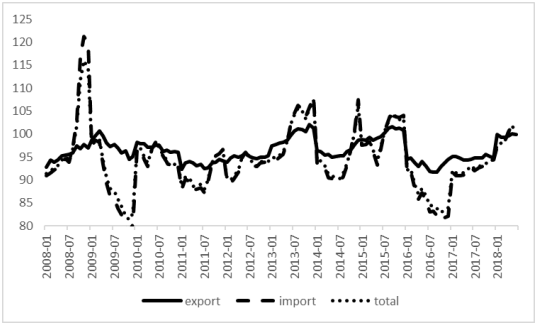

Figure 3-4 MINERAL's NEER in 3

Different Weight

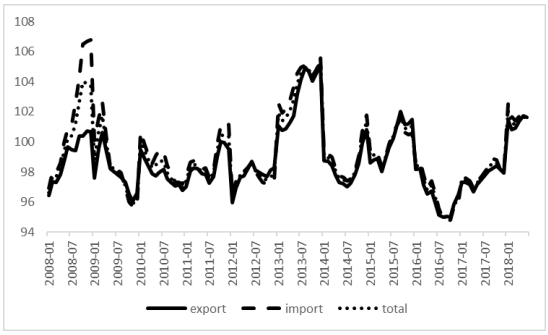

Figure 3-5 CHEMICAL's NEER in 3 Different Weight

Different Weight

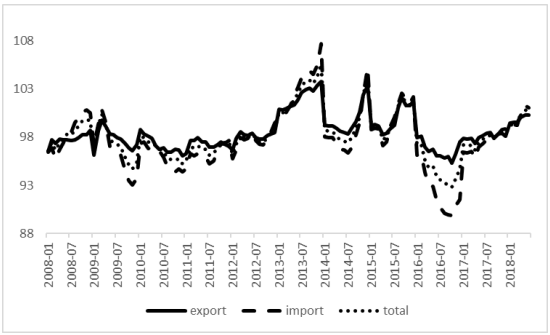

Figure 3-6 WOODS' NEER in 3 Different Weight

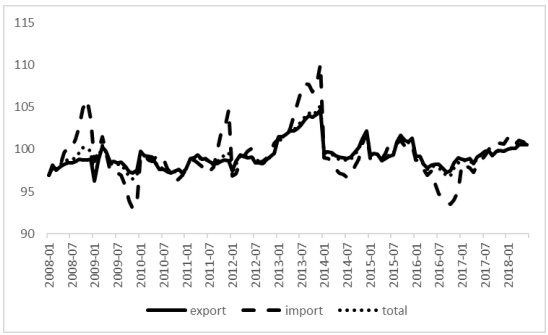

Figure 3-7 TEXTURE's NEER in 3 Different Weight

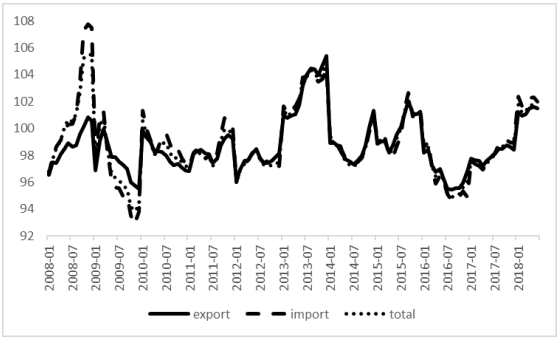

Figure 3-8 METAL's NEER in 3 Different Weight

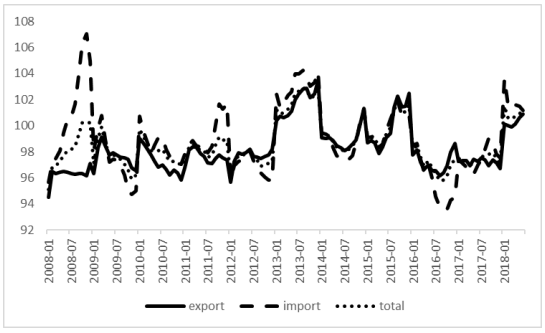

Figure 3-9 EMACHINE's NEER in 3 Different Weight

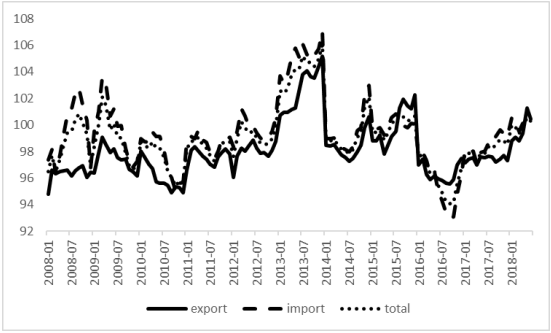

Figure 3-10 MACHINE's NEER in 3 Different Weight

Source: Author's calculation.

3.3 Estimate the Disaggregated ERPT

This section uses the same method mentioned in section 2 to estimate the disaggregated ERPT of each sector. All results summarized in Table 3-3. As we can see, the disaggregated ERPT differs a large extent across sectors. Especially, the differences between disaggregated ERPT of PIM is more remarkable than the disaggregated ERPT of PEX. For instance, the lowest ERPT of PEX is MINERAL, which is 10%, and the

highest ERPT of PEX is FOODS, which is 52.17%, there is 42% difference between these two ERPT. While in the case of ERPT of PIM, the lowest one is METAL, which is 18%, and the highest one is CHEMICAL, which reaches 80%, the gap between two of these disaggregated ERPT is about 62%, is bigger than the ERPT of PEX. The consequence proved the ERPT of primary good is higher than the manufactural goods mentioned by Mario Marazzi and Nathan Sheets (2007).

We also divide the whole sample period into two sub-sample periods and conduct VAR estimation. The results of ERPT also represented in Table 3-3. First, it is shown that the ERPT of PEX tends to increase or remain unchanged for most of the sectors. Only do TEXTURE, EMACHINE, MACHINE show the decline tendency of disaggregated ERPT. These 3 sectors account for16%, 49%, 6% of China's total exports in 2018 respectively; they play a decisive role in China's export. Therefore, even though only 3 sectors in 8 show the declination of disaggregated ERPT, considering of the decisive position these 3 sectors have, it may explain the whole ERPT of PEX shows a slightly decreased but almost remain the same level. Second, in the case of the ERPT of PIM, TEXTURE and MACHINE's ERPT tends to increase, the remaining sectors show the declination of disaggregated ERPT. Due to the disaggregated result, the reason that whole ERPT of PIM decrease is not because the import share shifting from primary goods, which's ERPT is relatively high, to the manufacturing goods, which's ERPT is low comparatively, but for most of the sectors' ERPT is incline to move down.

Table3-3 The Transition of Disaggregated ERPT

Disaggregate Data				Disaggregate Data			
Data	**Period**	**Pass-through**	**Trend**	**Data**	**Period**	**Pass-through**	**Trend**
FOODS	Total	52.17		FOODS	Total	50	
	First Half	42.85	Increase		First Half	66.25	**Decrease**
	Second Half	85			Second Half	25	
MINERAL	Total	10		MINERAL	Total	66.67	
	First Half	10	Increase		First Half	50	**Decrease**
	Second Half	20			Second Half	43.75	
CHEMICAL	Total	28.57		CHEMICAL	Total	80	
	First Half	26.32	Increase		First Half	80	**Decrease**
	Second Half	33.33			Second Half	75	
WOODS	Total	21.05		WOODS	Total	70	
	First Half	20	Increase		First Half	81.43	**Decrease**
	Second Half	23.68			Second Half	16	
TEXTURE	Total	35		TEXTURE	Total	50	
	First Half	47.05	**Decrease**		First Half	35.71	Increase
	Second Half	21.42			Second Half	50	
METAL	Total	20		METAL	Total	18	
	First Half	19.23	Same		First Half	77.59	**Decrease**
	Second Half	19.04			Second Half	70	
EMACHINE	Total	32		EMACHINE	Total	50	
	First Half	39	**Decrease**		First Half	50	**Decrease**
	Second Half	26.32			Second Half	45	
MACHINE	Total	33.33		MACHINE	Total	28	
	First Half	36	**Decrease**		First Half	70	Increase slightly
	Second Half	33.33			Second Half	71.43	

Source: Author's calculation.

4 The cause of Pass-through declination

Shioji and Uchino (2010) indicate that some industries' ERPT is relatively high, and others' ERPT is comparatively low, so if the share of sectors changed, the entire ERPT will change too. Thus, the transition of international trade will cause to a change of ERPT. J.M Campa and L.S. Goldberg (2005) mentioned that the increase in international competitiveness might shrink ERPT. Because given an increasingly competitive global market, exporters cannot fully benefit from foreign exchange changes as before and are forced to lower the export price itself to improve their export price competitiveness. As a result of this action, the adjust room of export price remained to exchange rate is narrowed. Mario Marazzi and Nathan Sheets (2007) indicate that exporters tend to increase their oversea production, and a share of intra-firm trade in a country's total exports becomes far larger than before. As long as doing business with subsidiaries overseas, exporters are more likely to share exchange rate risk with oversea subsidiaries and adjust their profit margin strategically. Hence the oversea investment of the company will give influence on the ERPT. Sasaki (2013) pointed out the higher the ratio that companies' PTM behavior, the lower the ERPT is. Exporters tend to change their export prices in local currency to maintain its market share. Given consideration of these points, this section will discuss 4 reasons that will cause the change of ERPT as the selection of settlement currency, the raise of international competitiveness, the increase of oversea investment, and the PTM behavior.

4.1 Selection of settlement currency

Under the global value chain, ever country imports goods from other countries, and exports goods overseas, so does China. If China's enterprises choose the same settlement currency when import from abroad and export to overseas, the variation of exchange rate can barely switch to the export/import prices.

On the one hand, as the "Factory of World", China's international trade as well as its economy growth is benefit a lot from the "Processing Trade". The share of processing trade, which imports cheap raw materials and parts from overseas, processes it in domestic and re-exports it as a industrial product to overseas again, occupying a substantial part in total trade of China. If China and its trade partner are choosing the same currency as a settlement currency while they are doing business with each other, the variation of the RMB's exchange rate can barely influence on the export/import prices. For instance, China mainly imports intermediate goods and parts from Southeast Asian countries, the settlement currencies of these countries are mainly the USD and the Euro. And China mainly exports high added value manufactural products to the US and

Europe, which settlement currency of is USD or Euro too. Therefore, there is no need to convert foreign currency into RMB while doing business with oversea companies.

On the other hand, since the China's government submits the project of "One Belt and One Road (OBOR)", the trade volume between China and the related countries has risen by 16% from 1410 billion dollars in 2013 to 1641 billion dollars in 2018. Among them, the export had risen 20% from 698 billion dollars in 2013 to 835 billion dollars in 2018, and import has risen13% from 712 billion dollars in 2013 to 805 billion dollars in 2018 (Figure 4-1). In the wake of economic developments between China and relative countries, the share of choosing RMB as a settlement currency is also upgrading. In 2012, China and relative countries selected RMB as the settlement currency was 9.7%, and in 2018, the share increased to 14%. Hence, it is reasonable to say the development of the OBOR project will carry RMB's international position a step forward. In pace with the upgrading of RMB's international position, the ratio that China and other countries choose RMB as a settlement currency will increase too. Hence, the ratio of China and its trade partner choose RMB as settlement currency becoming higher, the RMB's ERPT will decrease.

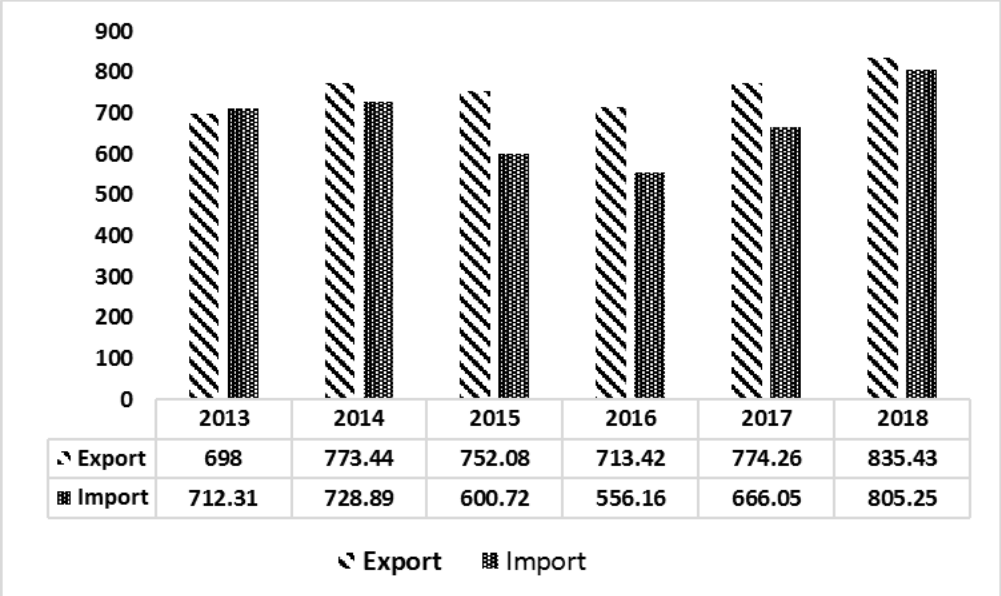

Figure 4-1 The Trade Volume between China and OBOR countries

Source: "One Belt and One Road" database, and the Author's calculation.

4.2 Improvement of International Competitiveness

It is also pointed out that changes in China's trade structure may reduce ERPT because of the international competitiveness of export/import products is changing. Exporters do

not need to adjust their export price if they can maintain their oversea market share when RMB is depreciation. Hence, the increase in the product's international competitiveness will sharpen the influence that the exchange rate gives to export/import prices. According to Figure 4-2, we can see that the international competitiveness of WOODS、TEXTURE、METAL、EMACHINE、MACHINE is relatively strong, and FOODS、MINERAL、CHEMICAL is weak. More specifically, TEXTURE's international competitiveness is the highest, at around 0.8. Even during the RMB depreciation period, the TEXTURE exporters can enjoy significant exchange gains because their product is still competing, and no need to adjust the local export prices. However, for MINERAL, which's international competitiveness is the lowest, -0.38. This indicates that MINERAL importers have low or no ability to discuss import prices with overseas' companies. They have to accept the price that foreign companies decide for China market.

Moreover, considering about the positive correlation between international competitiveness and added value of goods proved by J.M Campa and L.S. Goldberg (2005), we can say the higher the add value of goods, the lower the ERPT of RMB is. Figure 4-3 shows the major countries' manufacturing added value (nominal, dollar basis). China's manufacturing added value surpassed the US, became the 1st of the world. As a consequence, with the growth of value-added goods, the influence of exchange rate can give on foreign prices is lessening. However, even though the fact that China's total manufacturing added value has been grown rapidly, we cannot deny China's manufactural industries has been specialized in exporting consumer goods, which's added value is relatively low. The Chinese government has recognized the problem of China's manufactural industries relies too much on labor-intensive industries; technology and innovation's development is still far behind developed countries. To solve these problems, and bring about the reform of international trade construction, China submitted the project "Made in China 2025" in 2015. This project seeks to engineer a shift for china from being a low-end manufacturer to becoming a high-end producer of goods. This will heighten the international competitiveness, and the goods will not be involved in price competition. Thus, the higher the added value of goods is, the lower the ERPT is.

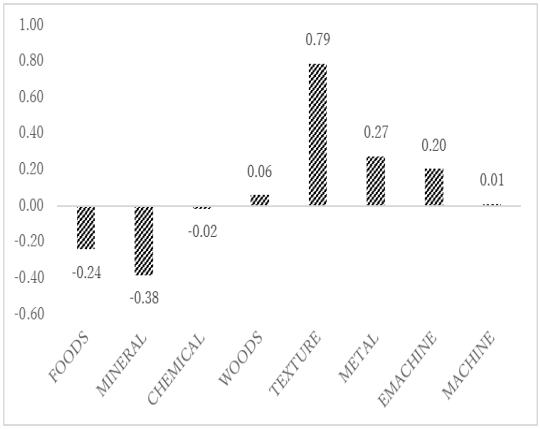

Figure 4-2 The International Competitiveness of Each Industry 2018

Note: The calculate method of International trade is:

$$\mathrm{IC} = \frac{EX_i - IM_i}{EX_i + IM_i}$$

EX_i represents to the class i's export volume, IM_i represents to the class i's import volume

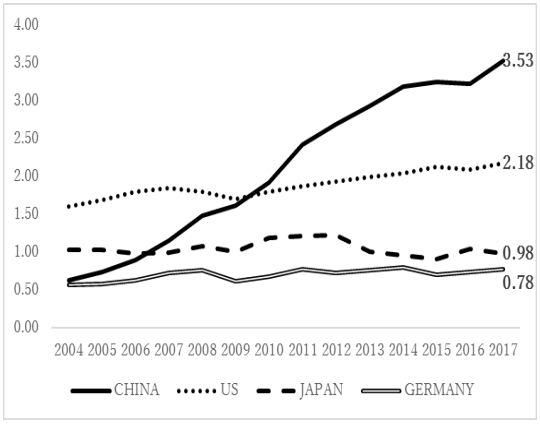

Figure 4-3 Manufacturing Value Added in Major Countries (Nominal)

Source : United Nations Statistics Division

4.3 Increase in overseas investment

Changes in exchange rates affect a company's decisions on expanding overseas business or not. When exchange rates are fluctuating rapidly, companies implement a strategy to go abroad to avoid exchange risks. Conversely, along with the expanding of overseas business, the share of intra-firm trade will become larger and larger, and enterprises would like to share the exchange risk with their subsidiaries overseas which will lessen the ERPT of RMB. In fact, since China joined the WTO, Chinese companies' oversea investment activities have significantly increased. With 18 years of rapid development, China has seen compelling achievements in overseas investment and Outward Foreign Direct Investment (OFDI) flow ranked second only to the US in 2016, rising from 26th in 2002 (Figure 4-4). "Going abroad" is becoming an inevitable trend for Chinese companies. With the rapid growth of overseas investment, the intra-firm also increase speedily. The production of the supply chain under intra-firm trade is a key factor in understanding the recent declination of ERPT. Multinational firms can import the materials and parts from their subsidiaries overseas, the parent company and their affiliate will share the exchange rate risk by choosing the same settlement currency. For the same reason mentioned in 4.1, the share of intra-firm trade is higher, the lower the ERPT is.

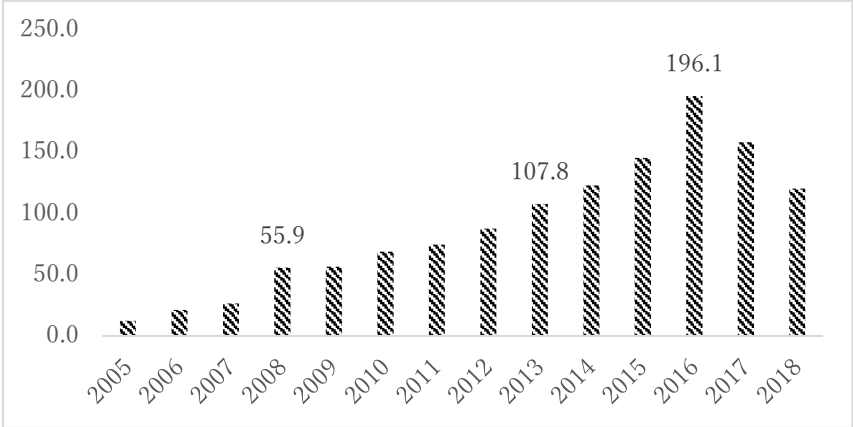

Figure 4-4　Chinese Oversea Investment (2005-2018)　Unit：billion dollar

Source: The Chinese National Bureau of Statistic

4.4　Behavior of PTM

Pricing to Market (PTM) affects correspond to the extent to which exporters adjust their prices to reflect the prevailing prices set by their competitors. In other words, PTM effects arise through the limited pass-through of foreign prices and the exchange rate. During the RMB appreciation period, it means the cost will increase, exporters tend to conduct the PTM strategy by stabilizing export prices in the local currency, even though it will squeeze their profit margin. While during the RMB depreciation period, it means the exporters can enjoy significant exchange rate gain if they do not change the price in foreign market. Therefore, the exchange rate movements have the same effect on the exporters' profits at a given export price. When exchange rate changed, exporters will react differently to the fluctuations in exchange rates, so that the pass-through might be different.

5　Conclusion

The paper examined RMB's ERPT of PEX/PIM by using the data from January 2008 to June 2018. Firstly, according to the analysis results in this paper, the ERPT of PEX only can see a slight declination in the second half of the sample period (September 2015 to June 2018). The reason for this situation is because, only TEXTURE, EMACHINE, MACHINE's ERPT of eight sectors show the inclination of decrease. These three industries have a decisive position in China's total export, the companies in these relative sectors play very actively since China open its market to the world, during numerous round of doing business with foreign enterprises, they already know how to share exchange rate risk with their trade partners. In this reason, their ERPT shows the tendency

of falling. And these 3 sectors play an important role in China's total export can explain wtehy only 3 sectors in 8 shows a decreasing trend can affect the total ERPT of PEX shows a slightly decrease in the second half of period.

Second, the ERPT of PIM is decreased 13% in the second half of the sample period. This paper proved that it is not because the share of primary goods in total imports is declining, for which ERPT is likely to be relatively high, but most of the sectors' ERPT including both primary and industrial goods are declining in recent years. Moreover, this paper points out several complementary explanations of this decline such as the selection of settlement currency, the raise of international competitiveness, the increase of oversea investment, and the PTM behavior.

This article examines the hypothesis that the declination of ERPT is not only existed in developed countries such as the United States, Japan, and OECD members, but also in developing countries like China. The selection of settlement currency, the raise of international competitiveness, the increase of oversea investment, and the PTM behavior can be the complementary explanations for this tendency of declination. However, the decline of ERPT does not necessarily mean the connection between the exchange rate and macro economy is weakening. The change of the RMB's exchange rate will force the relative companies to do some action to maintain their benefits overseas, and this actions from micro economies will finally cause macroeconomics revolution. Even though the fact that RMB's ERPT is low and shows the tendency of decline, but considering about the fluctuation range of RMB's exchange rate is relatively small, and the low value-added goods china products, the prices of china's goods may not have enough room to adjust. So along with the expand of RMB's exchange rate's fluctuation range, and the reform of China's international trade construction, the ERPT of RMB might enlarge or increase gradually in the future.

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