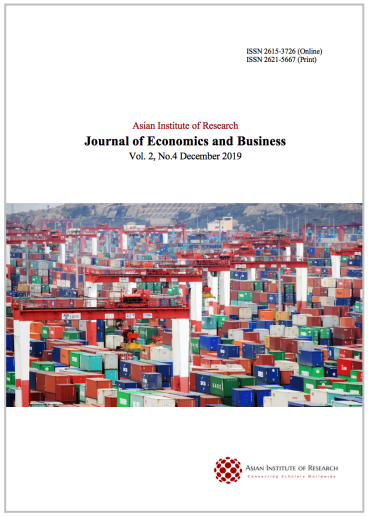

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Calculate the Exchange Rate Pass-Through of RMB by Using Disaggregated Data

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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 of RMB's 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 effective exchange rate is not necessarily appropriate. For this reason, I calculate the "Nominal Effective Exchange Rate of RMB's in Sector (based on the export/import weight)" to verify the relationship between the exchange rate and the export/import prices index. The results reveal that the exchange rate shock on the export/import prices index is different from using aggregated data and disaggregated data.

Keywords: Exchange Rate, Export Prices Index, Import Prices Index, RMB

1. Introduction

Since China joined the 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 2018 significantly, taking the top position in the world. Concerning China's import share, which is expanding steadily from 5% in 2001 to 13% in 2018, 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 trade 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 the 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 an effective way to settle the trade disputes between the US and China, and also the 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 can adjust trade balance does not work well does not only exist in China but also in other countries. Kimura (2018) exhibited some causes to illustrate that the exchange rate cannot adjust trade balance well. He points out that in spite of some macro causes such as demand elasticity, the J-curve effect, the 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 mentioned above too. The relationship between exchange rate movement and price adjustments of 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 the exchange rate have a very limited impact on the 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 a similar view. Otani, Shiratsuka, and Shirota (2005) and Shioji and Uchino (2010) confirmed that the pass-through of Japanese Yen (JPY) has declined since 1990. J.lee and B.C.Yi (2006) pointed out that the ERPT of Korea Won (KRW) has also cut down since the 1997 Asian Financial Crisis. The 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. Therefore, the extent to which export and import prices are affected by exchange rate fluctuation is limited. 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 JPY, and KRW. I provide a detailed examination of ERPT of China's export and import prices by using data from January 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 the aggregated exchange rate data when estimating the disaggregated ERPT. Hence, I build up a series of "Nominal Exchange Rate of RMB's in sector (weighted by export/import 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 of RMB's in Sector (weighted by export/import 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.

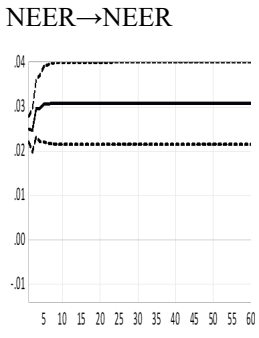
Unlike the Japanese export/import prices index is JPY dominated which is used by Shioji and Uchino (2010), the Chinese export/import prices index is Dollar dominated, so the RMB's ERPT should be defined as equation (1) and (2). On the one hand, in terms of exports of China, when all RMB's variation can be reflected in the prices 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 prices 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 the exchange rate gives 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 prices in RMB totally, we call it a complete pass-through, at this time, the pass-through of import prices in foreign currency is 0. So on the figure of the impulse response function, the smaller shock that the variation of the exchange rate gives to import prices index, the higher the pass-through of RMB's ERPT is.

$$\mathrm{PT}(PEX_i) = \frac{IR(NEER_i, PEX_i)}{IR(NEER_i, NEER_i)} \tag{1}$$

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

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

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



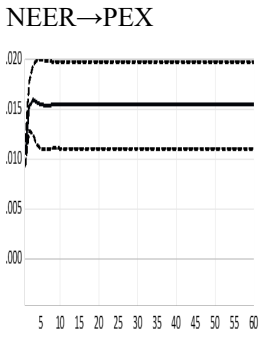
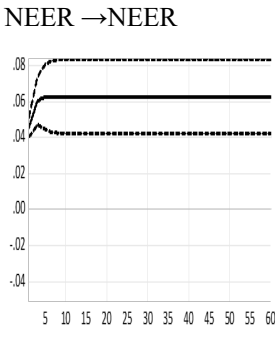


Figure1. ERPT of PEX



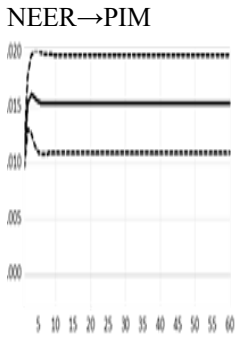


Figure2. ERPT of PIM

Then, I divide the sample period into two sub-sample periods, to calculate the pass-through before and after August 2015. On August 11th 2015, the PBC changed the quotation of the central parity of RMB against USD, to enhance the market determination of the 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. Since the exchange rate reform of China in June 2005, the exchange rate of RMB tends to devalued until August 2015, while after the "8.11 Exchange Rate Reform", the exchange rate of RMB tends to

appreciate. Therefore, as the 1997 Asian Financial Crisis influenced o Korea Won's ERPT, I wonder whether the improvement of RMB/USD central parity quoting mechanism may lead to a change of RMB's ERPT.

Figures 3 and 4 correspond to the cases of the export prices index and figures 5 and 6 correspond to the cases of the import prices index. Figures 3 and 5 are the first half of the sample period (2008.01-2015.08), and figures 4 and 6 are the second half of the sample (2015.09-2018.06). As a result, although there is a slight decline can be observed in the ERPT of PEX, the result hardly can tell there is an obvious 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.

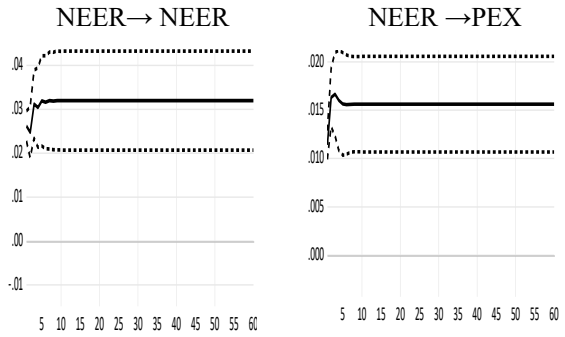


Figure3. ERPT of PEX
（First half 2008.01-2015.08）

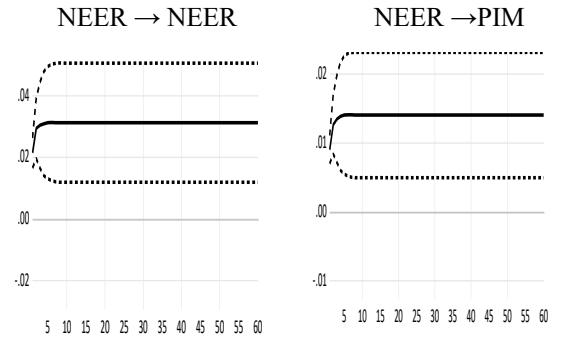


Figure4. ERPT of PEX
（Second half 2015.09-2018.06）

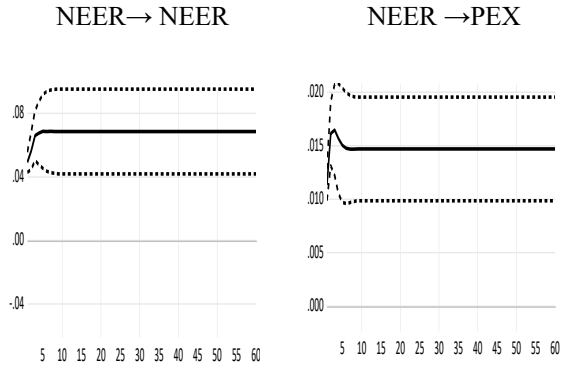


Figure5. ERPT of PIM
（First half 2008.01-2015.08）

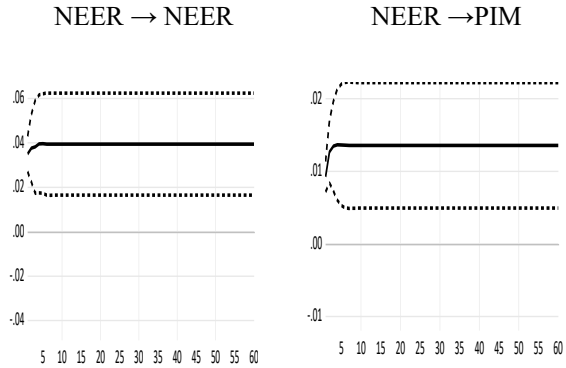


Figure6. ERPT of PIM
（Second half 2015.09-2018.06）

Source: Author's calculation

Table 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	

3. Estimate the Disaggregated ERPT

Mario Marazzi and Nathan Sheets (2007) mentioned that the ERPT of materials is relatively high, and the ERPT of manufactured goods is low comparatively. So the change of international trade's structure, such as the trade share of materials is decreasing, while the trade share of end products is increasing may explain the aggregated ERPT estimated above show the tendency of declination. Therefore, to explain why the aggregated ERPT declined

after August 2015, we have to estimate the disaggregated ERPT respectively. The series of effective exchange rate data published by the International Organization nowadays are aggregated data, the trade weight is calculated by using the aggregated trade amount of every country's major trading partners. But the trade weight varies widely from one trade partner to another trade partner. If I use the aggregated NEER to estimate the disaggregated ERPT of RMB, it may cause "Aggregation Bias". Before I estimate the disaggregated ERPT, it is necessary to construct the disaggregated NEER first. There are several advantages of the construct of disaggregated NEER. First, disaggregated NEER 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. This section will construct disaggregated NEER, and illustrate it is characteristic first, then use it to estimate disaggregated ERPT.

3.1 Construction Disaggregated RMB's NEER

Before calculating the disaggregated NEER, it is necessary to give a simple illustration of the choice of sectors, trade partners, adjustment frequency of the weight, 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, I 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 do 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).

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

$tradevalue_{c,t}^{i}$ 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 $I_{i,t,m}^{t}$.

$$I_{i,t,m}^{t} = \prod_{c \in C_{t,i}} \left(\frac{e_{c,t,m}}{e_{c,t,1}} \right)^{w_{c,t}^{i}} \tag{4}$$

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 equation (5).

$$CI_{i,t,m}^{t} = \prod_{\tau=2008}^{t-1} I_{i,\tau+1,1}^{\tau} \times I_{i,t,m}^{t} \tag{5}$$

3.2 The feature of Disaggregated NEER of RMB

Figure 7 shows the variation 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 more gently than the disaggregated NEER. 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 the maximum and minimum of aggregated NEER and disaggregated NEER is different. For example, the gap between the maximum and minimum of aggregated NEER is 7.38, which 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 international competitiveness is quite different between different sectors. The logic of the

argument is straightforward. The smaller the range is, the price is more steady, which is mean an enterprise can maintain its product price in the international market. 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.

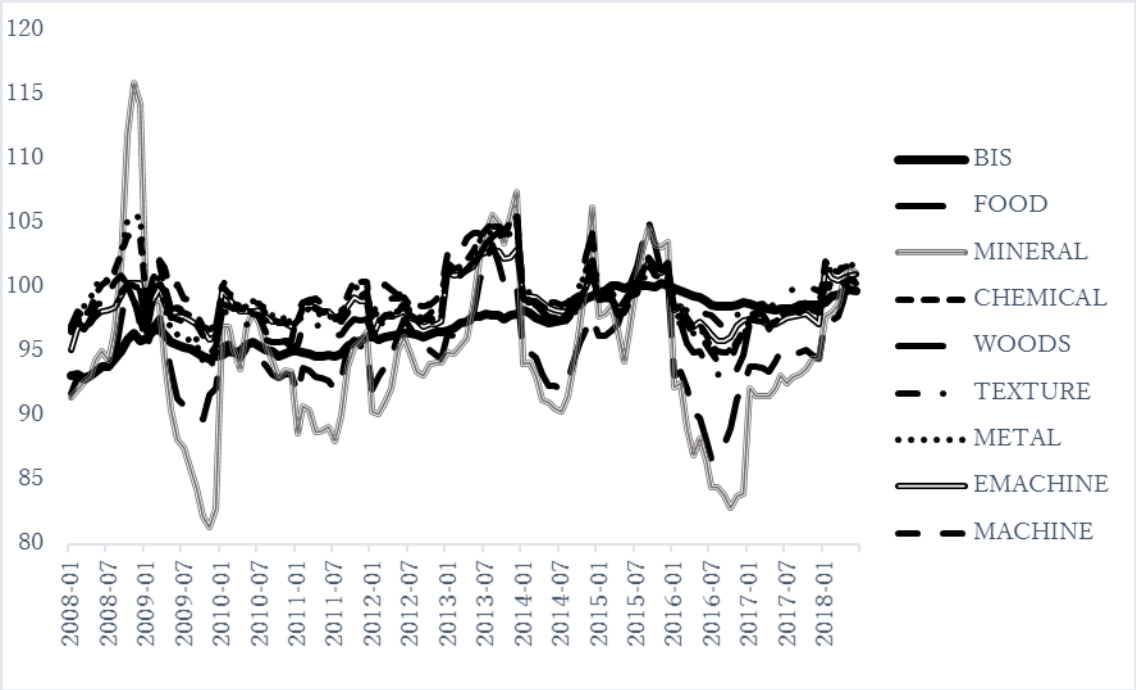


Figure7. Comparison of Disaggregated NEER (weight of trade volume) and Aggregated NEER
Source: Author's calculation

Table 2. 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 it's 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 to 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 shows the growth rate of disaggregated NEER of 3 different weights. As we can tell, each of these 3 indicators has its distinguishing features. 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. 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.

Figure 8 to figure 15 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, the CHEMICAL, WOODS, TEXTURE, and METAL's 3 different NEER show almost the same movement during the sample period, and quite from each other occasionally. For the remaining sectors' NEER, the tendency and fluctuation range are not the same as we can tell. Therefore, it is necessary to choose the appropriate weight to construct disaggregated NEER, and use it to estimate the ERPT of PEX/PIM.

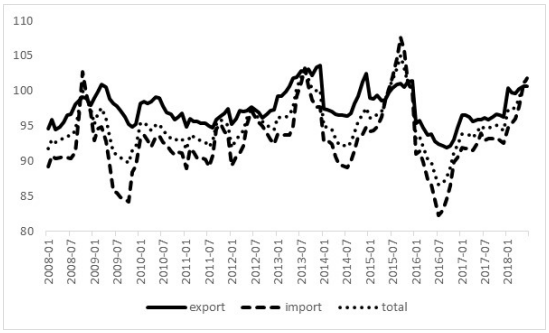


Figure8. FOOD's NEER in 3 Different Weight

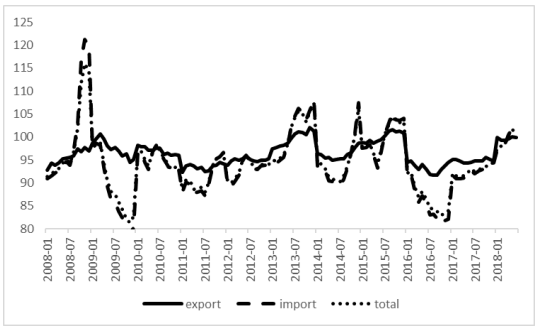


Figure9. MINERAL's NEER in 3 Different Weight

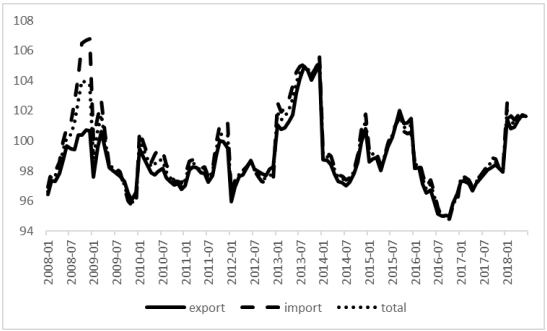


Figure10. CHEMICAL's NEER in 3 Different Weight

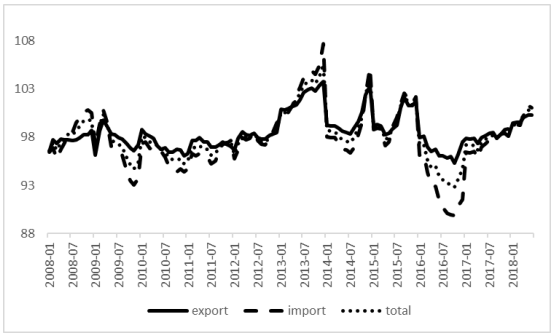
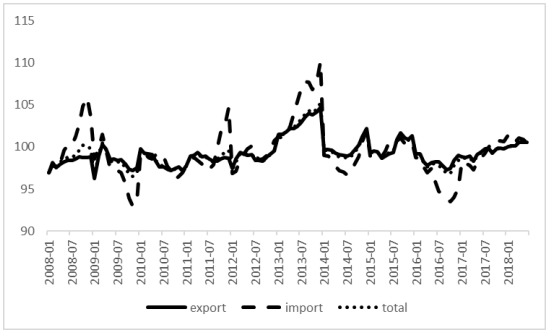


Figure11. WOODS' NEER in 3 Different Weight



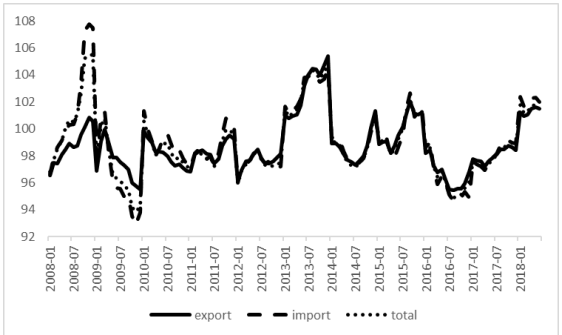


Figure12. TEXTURE's NEER in 3 Different Weight

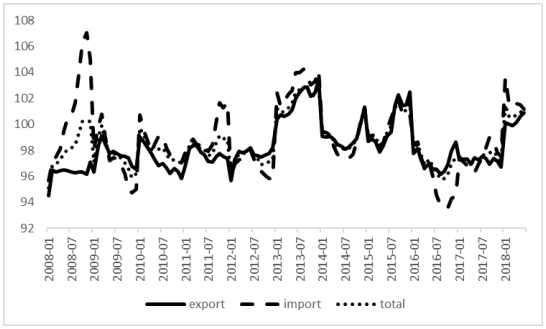


Figure13. METAL's NEER in 3 Different Weight

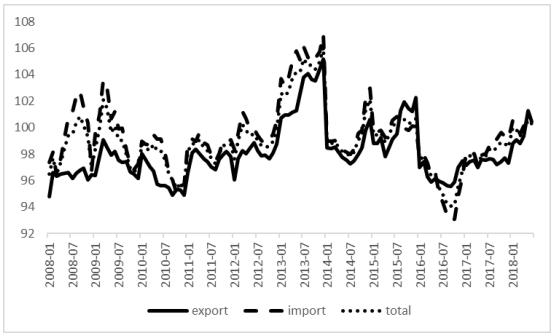


Figure14. EMACHINE's NEER in 3 Different Weight

Figure15. MACHINE's NEER in 3 Different Weight

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 4. 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 goods 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 estimate the ERPT respectively. The results of ERPT are also represented in Table 4 too. 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's ERPT show the tendency of declination. 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' ERPT in 8 is lessening, 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' ERPT is reducing since August 2015. 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.

Table4. 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	

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. J.M Campa and L.S. Goldberg (2005) mentioned that the increase in international competitiveness might shrink ERPT. Because under an increasingly competitive global market, exporters cannot fully benefit from foreign exchange changes as before, they are forced to lower the export prices itself to improve their export prices competitiveness. 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 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 structure of international trade, the rise of international competitiveness, the increase of oversea investment, and the PTM behavior.

4.1 Structure of International Trade

Figure 16 and figure 17 represent the movement of materials and manufactured goods' share in export and import from 2008 to 2018 respectively. As we can see, the export of materials only exists 5% of total exports, and the import of materials exist for 30% of total imports since 2008. Considering the fact that the material's ERPT is higher than manufactured goods, the share of materials and end products occupy of exports and imports can explain why the aggregated export's ERPT, which is 50%, is lower than the aggregated PIM's ERPT, which is 75%.

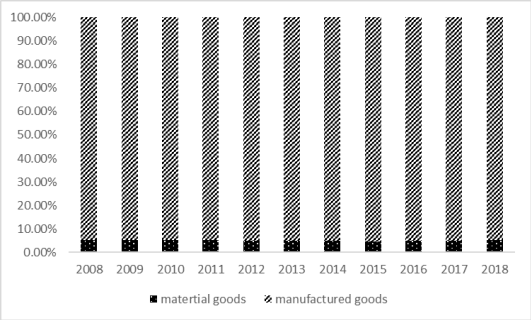


Figure16. The share of material goods and manufactured goods in export

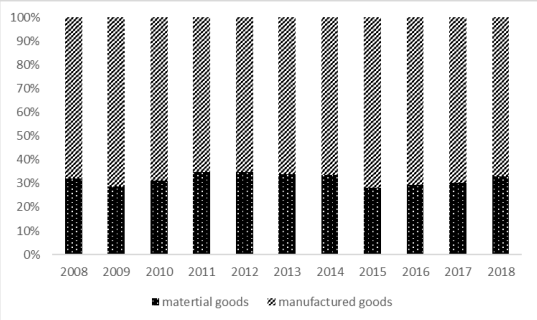


Figure17. The share of material goods and manufactured goods in import

4.2 Rise of International Competitiveness

It is also pointed out that the movements of the product's international competitiveness may reduce ERPT. Exporters who have strong international competitiveness do not need to adjust their export prices because they can maintain their oversea market share when RMB is depreciation. Hence, the increase of the sector's international competitiveness will sharpen the influence that the exchange rate gives to export/import prices. According to figure 18 to figure 20, the sectors of WOODS、TEXTURE、METAL、EMACHINE、MACHINE have maintained a relatively high international competitiveness since early 2000. It indicated that those sectors' exporters do not need to adjust their export prices even though the RMB is depreciated. They can maintain their market share while holding their price constant and enjoy the extra exchange rate gains. Therefore, manufactured goods' ERPT is low and decreasing in recent years.

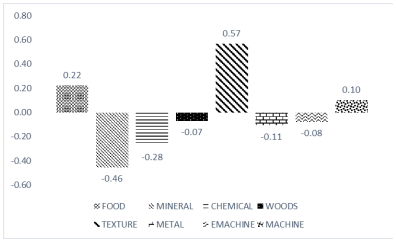


Figure18. The International Competitiveness of Each Industry 2000

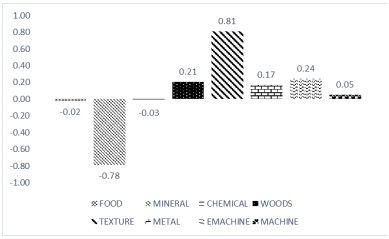


Figure19. The International Competitiveness of Each Industry 2010

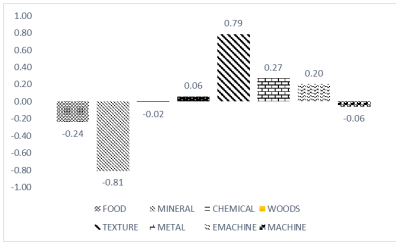


Figure20. The International Competitiveness of Each Industry 2018

Note: The calculate method of International trade is:

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

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

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. 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. 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 (Figure21). "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. Therefore, the share of intra-firm trade is higher, the lower the ERPT is.

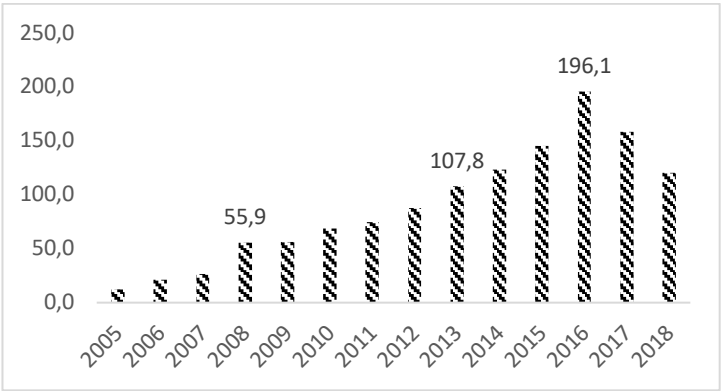


Figure21. Chinese Oversea Investment (2005-2018) Unit：billion dollar

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. For example, 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 the foreign market. Hence, firms take advantage of their market power and discriminate by changing a destination-specific mark-up on the marginal cost.

From a macroeconomics policy perspective, with the imbalance of international trade, it is important to know the extent to which export prices and import prices are affected by exchange rate fluctuations. However, the exporters adjust their prices in the international markets may shrink the ERPT, and then lessen the extent that the exchange rate can transmit to trade balance. According to Table 1 and Table 4, both aggregated and disaggregated ERPT's absolute value is less than 1, which is mean the ERPT of RMB is incomplete, and PTM behavior of exporters do exist. And the declination of ERPT can be interpreted as more and more exporters tend to adjust their prices to maintain their market share because the exchange rate fluctuates intensively after the exchange reform in August 2015.

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 is, only TEXTURE, EMACHINE, MACHINE's ERPT of eight sectors show the inclination of decrease. These three industries' exporters 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. For this reason, their ERPT shows the tendency of falling. And these 3 sectors play an important role in China's total export can explain why only 3 sectors' ERPT in 8 is reducing can affect the total ERPT of PEX shows a slight 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 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 structure of international trade, the rise 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 developing countries like China. The structure of international trade, the rise 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 macroeconomy 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 these actions from microeconomies will finally cause macroeconomics' revolution. Even though the fact that RMB's ERPT is low and shows the tendency of decline, but considering 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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