Import Response to Exchange Rate Fluctuation: Evidence from Chinese Firms

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Abstract

This paper presents theory and evidence on import response to exchange rate fluctuations from highly disaggregated Chinese data. The paper first develops a heterogeneous-firm trade model and predicts firms' import responses at both extensive and intensive margins: when domestic currency appreciates, more firms start importing and more products are added into the imported inputs bundle (extensive margin effect); the import value by each firm also increases (intensive margin effect); those import responses are more profound for firms in "ordinary trade" regime than those in "processing trade" regime. Next, the paper presents the empirical evidence on Chinese firms' import response to domestic currency appreciation in both the short run and the medium run and confirms the predictions from the model. The results show that the extensive margin effect dominates: an appreciation of local currency significantly increases probability of firm entry and products adding, which counts for a major source of the increase in China's aggregate import value during 2000 to 2006. We also find that the pattern is more robust for ordinary trade than processing trade, more profound under a fixed exchange rate regime than (both expected and confirmed) a managed floating regime.

Keywords: exchange rate, trade imbalance, intensive margin, extensive margin, products churning, processing trade

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1 Introduction

How do importing and exporting firms respond to exchange rate changes? This is a central question in international macroeconomics. This question is of greater importance recently, given the existence and persistence of substantial global imbalance over the last two decades. Several studies, such as Campa and Goldberg (2005) and Marazzi and Sheets (2007) suggest that exchange rate pass-through to import prices has declined in recent years in industrialized countries. For example, Dong (2012) show that both U.S. exports and imports have become much less responsive to exchange rate movements in recent years and firms' pricing behavior and global trade pattern may help to explain this decline. Hence, it will be informative to study importing and exporting firms' response to exchange rate changes using firm-level data, since a micro level analysis of firm import and export decision could suggest which factors are crucial in understanding firms' behavior. There are already several studies on this issue using disaggregate level, but they mainly focus on the export side(for example, Berman, Martin and Mayer (2009)). In this paper, we intend to study the response of importing firms to exchange rate changes, using a highly disaggregated Chinese firm-level data. Since China is playing a more and more important role in the global imbalance, understanding the effect of exchange rate movements on Chinese importing firms is essential for examining the source of trade balance and also predicting consequences of RMB appreciations on global imbalance. This paper provides a first step towards our understanding on this important issue. This will also shed some light on the long-lasting policy debase on Chinese exchange rate policy.

The reason why we want to use the disaggregate firm level data to study the import response is twofold. First, existing literatures on the Chinese import response to exchange rate fluctuations presents ambiguous estimates of elasticity of Chinese imports with respect to exchange rate. The earlier studies find that an appreciation of RMB would increase Chinese imports (Dayal-Gulati and Cerra (1999); Dees (2001)), and the more recent ones reached a very different finding (Lau et al, 2004; Marquez and Schindler (2007)). Cheung, Chinn and Fujii (2010) find estimates of US-China's exchange rate elasticity of import are inconsistent with the standard model. Overall, there is no clear consensus regarding the impacts of real appreciation of RMB on China's trade balance based on earlier studies. Marquez and Schindler (2007) concludes that the estimated response of imports is negligible and lack of precision. This inconsistency in these literatures may be due to the fact that they study Chinese imports using an aggregate data at either industry level or major product level, which leads to the inconsistence due to the lack of firm-level information. That perhaps explains why Garcia-Herrero and Koivu (2009) suggest that the exchange rate policy alone will not be able to address the trade imbalance. They argue that the real appreciation of RMB reduces China's trade surplus in the long run, but the effect would be limited in short term.

Another reason to use the firm-level data is that recent research in international trade emphasizes the importance of firms' extensive margins for understanding the overall pattern, as well as the number

of goods firms import, the number of countries from which they import. Previous literature on Chinese import response to exchange rate often ignores the distinction of different margins of trade. This arose the major motivations of our investigation of import response to exchange rate fluctuation using detailed transaction level Chinese Customs data.

To study the response of importing firms to exchange rate changes, we model importing firms response when facing a domestic currency appreciation using a heterogeneous-firm framework. It predicts that, during appreciation the threshold productivity for importing decreases, which means more firms with lower productivity begin import from abroad. The increasing number of importing firm corresponds to extensive margin (firm level) shift. Also, we assume that there exists fixed cost of importing in our model. So during appreciation, since marginal profit for each import goods rise, the varieties of imports also increase consequently. It corresponds to extensive margin shift at products level. If importing goods are highly substitutable, then the increase of value dominate pass through effect, the intensive margin will increase as well. However, a currency appreciation may have two-way effects on processing trade profit; this pattern could be violated when referring to processing trade.

Our empirical part utilizes the highly disaggregated transaction-level Chinese Customs data to evaluate the impact of exchange rate fluctuations on import. A big advantage of our dataset is that the detailed information on the value and quantity of each product at HS8-digit level that each firm imports from each destination country. Each transaction documents the data at the firm-product-country level. So we can use unit value as proxy for the f.o.b. (free-on-board) import price at firm-product-destination level. Thus we could estimate both exchange rate elasticity and pass-through at a micro level, which complements the literature that usually only adopt aggregate volume and price index.

This transaction-level dataset enables us to investigate in detail the shift of importing behavior at both firm and product levels as well as both extensive and intensive margins. Extensive margin is defined at both firm level and products level. Firm level extensive margin is referred to the number of firms that engaging in importing; product level extensive margin is for total number of products imported from various destination country. In the empirical investigation, we use both Probit and linear probability regressions to test the probability change in firm entry/exit, product or product-country adding/dropping as response to exchange rate fluctuation. The firm-product-country level dataset makes it possible to examine extensive margin, defined as entry and exit decision in response to exchange rate, which may be a useful indicator of import switching to exchange rate fluctuation.

We find that extensive margin response dominates intensive margin response, which contributes to majority rise on aggregate import value. This is quite different from the conclusion in previous literature regarding importers' response to exchange rate changes in other small open economies, as suggested in Lu, Mariscal and Mejia (2012). They show that the intensive margin dominates the extensive margin when Columbia importers faces a big real appreciation. Some additional patterns

are found from trade margins tests during exchange rate fluctuation. When considering both a short term (within three months) and a long term (within four quarters) response, our tests show that importers' response follows our prediction in more significantly way in a long run than a short one.

Besides import volume test, we also check price pass-through effects during RMB appreciation since previous literature finds a decline of import price pass-through in industrial countries. Using this disaggregated transactional level data, we find some patterns for price adjustment for Chinese importers. We find that price adjustment is less responsive than volume change because the magnitude of price change is rather small during currency appreciation. Also, price pass through effect displays a difference between short run and long run. Within a short run, price level of imports from OECD countries may decrease around 10 percent when RMB appreciates, while this reduction of import prices disappears gradually in a long run. If we look at import from US only, price decreases in a short run, but it even increases slightly in a long run. We further test pass through of exchange rate fluctuation into import price at HS6 product level. We find short run pass through is highly incomplete. Also there is a declining trend of pass through value over years. Those findings of pass through effect are consistent with previous literature which are based on developed countries.

According to Manova and Zhang (2009) and Manova and Zhang (2012), Chinese trade has its distinctive characteristics in term of both trade pattern and pricing behavior. A distinguished feature is that a large proportion of processing trade in total trade volume and the potential interaction between imports and exports, as shown in Yu (2010). Several papers explore this issue from exporters' perspective to examine how processing trade interacts with export price and quantity responses, such as Thorbecke and Smith (2012), Liao, Shi and Zhang (2012), Koopman, Wang and Wei (2012), Xing (2011) and Ahmed (2009). On the other hand, not only trade volume but also price behavior could be influenced by the two-way trade (both importing and exporting). For example, Amiti, Itskhoki and Konings (2012) find that firms varies in exchange rate pass through due to various import shares and market shares. Another feature of Chinese trade lies in that trade performed by foreign owned firm and joint venture firms takes a significant portion of total trade value in China. A transfer pricing issue may also affect importers or exporters' pricing decision as typical trade theories will predict. Taking all these features of Chinese trade into consideration, we have good reasons to believe that import response and price pass through could be rather heterogeneous in China, although little previous research has explored that.

In this paper, we aim to shed some light on those issues associated with features of Chinese trade. To avoid an influence of a two way trade, we test our predictions for ordinary trade and processing trade separately and confirm that the responses of ordinary traders are more profound than those of processing traders. Also, to control transferring price issue associated with foreign invested firms, we conduct a robustness test for different ownership type firms. By this way, we could compare those response between foreign invested firms to non foreign invested firms. We find that that the ownership structure does not affect our main conclusions about the response of Chinese import to exchange rate

changes.

Another important event in China's exchange rate policy change is that on July 21, 2005, China announced a move from fixed exchange rate regime to a managed floating exchange rate regime. Afterwards, a series of appreciation of RMB against U.S. dollars take place. Hence, China's exchange rate reform offers a unique laboratory to test trade response to policy change. So in this paper we also investigate the importing firms' response to real exchange rate changes before and after this regime shift.

Interestingly, as suggested by the change of RMB-USD forward exchange rate, this exchange rate regime reform is not one shot event, but a systemically process. Before 2003, a pegged to USD exchange rate had been used for several decades. However, since 2003 China has been under great pressure for RMB appreciation, market expectation has changed accordingly. The shift of expectation could be seen from the increase in forward rate between USD/RMB since the fourth quarter of 2003. During this period, there was national wide debate and discussion about coming reform. Uncertainty aroused for when and how a reform could be performed. This situation lasted till July 2005, when China government announced a managed floating policy would be adopted and gradually appreciation of RMB was foreseen then.

Intuitively, during different phases of exchange rate reform, firms may respond differently. Expecting a future uncertain appreciation, the firm may or may not want to delay its import, depending on the uncertainty and the exchange rate changes. These response patterns have important implications for exchange rate policies. Thus, a test is conducted in our paper. In this test, we segment the overall sample periods into three; before mid 2003, 2003-2005, and after July 2005. They represent three different stages in exchange rate regime switching in China. We analyze import response to exchange rate for each specific phase. This test suggests that firms response differently facing a fixed exchange rate regime, an expectation appreciation, and a confirmed appreciation regime. We find that firms importing behavior follows prediction more in a fixed exchange rate regime rather than an expected and confirm appreciation regime. We also examine different firm import responses to exchange rate by ownership and confirm the robustness of our results.

Our study relates to several branches of literature. The first one is the international macroeconomics literature use a aggregate level of import (export) data and focus on exchange rate elasticity of import (export) price, e.g.Campa and Goldberg (2002);Campa and Goldberg (2005); Marazzi and Sheets (2007), and Dong (2012). In Campa and Goldberg (2005), for example, they find a partial pass through of exchange rate into import price in short run and a dominant effect in the long run, especially for countries with high exchange rate volatility.

The second branch of literature use a dis-aggregate level data set but focus on export side. For example, Berman, Martin and Mayer (2009) examines the heterogeneous exporters' adjustments in prices and export volume in response to exchange rate movements using French firm data. Within

this branch, there are also several literature explore the response of Chinese exporters to exchange rate, such as Yu (2009), Li et al. (2012) ,Tang and Zhang (2012) and Thorbecke and Smith (2010). Li et al. (2012) find that exchange rate movements have a small and insignificant effect on export quantity, and a significant and large pass-through to export price in destination currency. They also test heterogeneous response for Chinese exporters. The most productive firms may be able adjust their mark-up against a RMB appreciation rather than change export volume or exit from exporting market. Our paper, instead, focus on the response of importers using Chinese custom firm-level data.

The third branch of literature uses a disaggregate level of data and focus on importers' behavior. For example, Gopinath and Neiman (2011) explores the mechanism of trade adjustment during the Argentine crisis 1996-2008 and find within-firm input churning or the sub-extensive margin rather than firm level extensive margin plays a significant role in import collapse during crisis in Argentine. Also, Lu, Mariscal and Mejia (2012) use Columbia trade date and find that firm select imported varieties and reorganize their imported inputs and production over time when exchange rate appreciates. Our study focus on unique response of Chinese importers under a change of trade climate. In China, in contrast, when RMB appreciate, the most responsive change comes from extensive margin at firm level. By decomposing the change in import response to new firm entrants, new product adding, and the net import value increase by each firm, we find the first factor contributes most to aggregate change of import value.

Our study is also related to the studies focusing on different margins of trade. For example, Chaney (2008), Arkolakis (2010), Eaton, Kortum and Kramarz (2011). Bernard et al. (2009) find evidence of extensive margin accounts for a larger share of variation in import and export across countries. Also, Hummels and Klenow (2005) offers that extensive margin at product bundle level plays an important role in trade value, and it also shed light on why extensive margin weights more for a big country trade.

The rest of paper is organized as follows. Section 2 builds a simple model to capture import response to exchange rate fluctuation at both extensive and intensive margins as well as the difference between processing and ordinary traders. Section 3 describes data and measurements and offers a short description of changes term of both extensive and intensive margin. Section 4 provides detailed tests to verify the predictions from the model. Section 5 present robustness checks for different groups of firms by ownership and different stages in exchange rate regime reform in China. Section 5 concludes.

2 A Simple Model

2.1 Production Side

In this part we derive a simple model of import response to exchange rate following Gopinath and Neiman (2012) . It is assumed that firms draws its productivity from a uniform distribution support

$(0, A_{\max})$, and firm i follows the production function below.

$$Y_i = A_i(K_i^{\alpha} L_i^{1-\alpha})^{1-\mu} X_i^{\mu}$$

Given its productivity, firms choose capital input K_i, labor input L_i and intermediate input X_i. The input X_i is composed by domestic products Z_i and imported products M_i. The substitution between domestic inputs and foreign inputs is ρ, according the CES aggregate, the final intermediate input bundle is

$$X_i = [Z_i^{\rho} + M_i^{\rho}]^{\frac{1}{\rho}}, \text{where } \rho < 1$$

The price of final intermediate input bundle P_{xi} follows

$$P_{xi} = (P_{Zi}^{\frac{\rho}{\rho-1}} + P_{Mi}^{\frac{\rho}{\rho-1}})^{\frac{\rho-1}{\rho}}$$

For simplicity, we normalize domestic input price to one, that is

$$P_{xi} = (1 + P_{Mi}^{\frac{\rho}{\rho-1}})^{\frac{\rho-1}{\rho}} < 1$$

Import input bundle is a aggregation of each import variety N, and the price each variety j is p_{mj}. Then imported bundle price index P_{Mi} follows

$$P_{Mi} = [\int_{j=1}^{N} p_{mj}^{\frac{\theta}{\theta-1}}]^{\frac{\theta-1}{\theta}}, \text{where } \theta < 1$$

Each variety has a price defined as p_{mj}.We assume a simple case that imported all input variety j are identical. Thus price identically denoted as p_m for all variety N; quantity of each imported foreign variety is m_i. Then price index for import input bundle takes a simpler form as below

$$P_{Mi} = N^{\frac{\theta-1}{\theta}} p_m$$

If firm only use purely domestic input, the input price index is one; if it uses imported intermediates input, the price level will be reduced. Imported input price faced by firms is a function of exchange rate of domestic currency. We define the exchange rate as the price of domestic currency in terms of foreign currency. Hence an appreciation of local currency stands for a decrease of imported price.

$$P_{Mi} = P_{Mi}(e)$$

Consequently, a reduction of P_{Mi} generates a decrease in P_{Xi}. In this way, an appreciation of domestic currency reduced the price index of intermediate input if firms choose to import anyhow.

$$\frac{\partial P_{xi}}{\partial e} < 0$$

Overall, unit cost function of production for firm i unit is

$$\begin{aligned} C_i &= \frac{1}{\mu^\mu(1-\mu)^{1-\mu}}\frac{P_V^{1-\mu}P_{Xi}^\mu}{A_i}, \\ where\ P_V &= \alpha^{-\alpha}(1-\alpha)^{-1+\alpha}r^\alpha w^{1-\alpha} \end{aligned}$$

Since capital price r and labor price w are all identical for all firms, price of non-intermediate input P_V are also identical for firms. Under this framework, heterogeneity of cost only depends on firm's own productivity A_i and intermediate input bundle $P_{Xi.}$. Let $\phi = \frac{1}{\mu^\mu(1-\mu)^{1-\mu}}P_V^{1-\mu}$ which is a constant, the cost function for firm i follows

$$C_i = \phi\frac{P_{Xi}^\mu}{A_i}$$

2.2 Demand Side

Suppose the demand function firm i faces for for product is downward sloping

$$Y_i = oP_i^{-\eta}, \text{where } \eta > 1 \text{ and } o \text{ is a constant}$$

P_i is the price it charges for its product in the market. By maximizing profit, firms set a constant mark up over its unit cost C_i

$$P_i = \frac{\eta}{\eta-1}C_i$$

The profit for firm i denoted as π_i, which equals revenue minus fixed cost of production. If firm imports, it incurs an additional fixed cost of import denoted as F_{imp}, and a variable import cost fN,which depends on N, the number of varieties imported.

$$\begin{aligned} \pi_i &= Y_iP_i - Y_iC_i - F_{imp} - fN \\ &= \frac{o}{\eta}(\frac{\eta}{\eta-1})^{1-\eta}(\frac{1}{\mu^\mu(1-\mu)^{1-\mu}}\frac{P_V^{1-\mu}P_{Xi}^\mu}{A_i})^{1-\eta} - F_{imp} - fN \\ &= \lambda(\frac{P_{Xi}^\mu}{A_i})^{1-\eta} - F_{imp} - fN, \text{where } \lambda \text{ is a constant} \end{aligned}$$

Let's disregard with fixed cost and take logarithm to revenue function. We use small capitalized letter to denote logarithm and get the following equation of revenue

$$\begin{aligned} R &= \lambda(\frac{P_{Xi}^\mu}{A_i})^{1-\eta} \\ r &= \bar{\lambda} + (\eta-1)(a_i - \mu p_{xi}) \text{ where } \bar{\lambda} = \log(\lambda) \end{aligned}$$

Similarly, we take the logarithm of fixed cost and get

$$f = \log(F_{imp} + fN)$$

2.3 Import Decision

From firm's profit maximizing problem, we can see that firm faces a trade off of reducing production cost by importing more from abroad and potential incurred cost of importing. The threshold productivity of importing products can be solved from zero profit condition. Facing a variable import cost, the more variety firm imports, the larger cost it must pay. After solving zero profit condition, we get the cut-off value of productivity for import, a_i^*.

$$a_i^* = \frac{\log(F_{imp} + fN) - \bar{\lambda}}{\eta - 1} + \mu p_{xi}$$

Notice that p_{xi} decreases when domestic currency appreciates, and cut-off productivity decrease consequently.

$$e \uparrow, a_i^* \downarrow$$

This implies for the mass of importing firms shift from $(a_i^*, a_{\max})$ to $(a_i^{'*}, a_{\max})$, where $a_i^{'*} < a_i^*$, so more firms start to import after a currency appreciation.

Proposition 1. *When domestic currency appreciates, more firms start to import from abroad, which suggests an increase of extensive margin of importers at firm level.*

How does importing varieties change after an appreciation? In our framework, the price index for intermediate import input P_{Mi} decreases with imported varieties N, or $\frac{\partial P_{Mi}(N)}{N} < 0$. Thus the price index for intermediate input bundle P_{Xi} also decreases with import varieties N, that is $\frac{\partial P_{Xi}(N)}{N} < 0$.

Given firm i's productivity a_i,firms choose N to maximize its profit

$$N = \arg_N[\max\lambda(\frac{P_{Xi}^{\mu}(N)}{A_i})^{1-\eta} - F_{imp} - fN]$$

Marginal benefit for increasing one variety of imported input

$$\mu(\eta - 1)(a_i - \mu p_{xi}) * \frac{\partial p_{xi}}{\partial N}$$

Marginal cost of increase one variety of input is f, which is a constant. (We assume the marginal benefit equation is concave.) The optimal variety of imports becomes the crossing point of marginal cost and marginal benefit. Under this condition, if exchange rate appreciates, the marginal cost keeps constant. But price level of intermediate input bundle decreases due to a decreasing cost of imported varieties. Thus the marginal benefit curve shifts upwards, leading the crossing point N^* to a higher position. Stands for a increase of number of imported varieties for importers.

Proposition 2. *when domestic currency appreciates, firm tends import more varieties form abroad, which suggests an increase of extensive margin at products level.*

From above setting, price index for importing bundle is $P_{xi} = [(P_{zi}Z_i)^{\frac{\rho}{\rho-1}} + (P_{Mi}M_i)^{\frac{\rho}{\rho-1}}]^{\frac{\rho-1}{\rho}}$ and

for aggregated imported bundle is $X_i = [Z_i^\rho + M_i^\rho]^{\frac{1}{\rho}}$. Firms minimize their cost of intermediate input for a fixed amount X_i by choosing the optimal quantity of Z and M.

$$\min_{Z,M} P_{xi} = [(P_{zi}Z_i)^{\frac{\rho}{\rho-1}} + (P_{Mi}M_i)^{\frac{\rho}{\rho-1}})^{\frac{\rho-1}{\rho}}$$
$$s.t. X_i = [Z_i^\rho + M_i^\rho]^{\frac{1}{\rho}}$$

F.O.C.

$$M_i^* = Z_i P_M^{\frac{1}{\rho-2}}$$

After solving the minimizing cost problem, we get

$$M_i^* = X_i(1 + P_M^{\frac{-\rho}{\rho-2}})^{-\frac{1}{\rho}}$$
$$Z_i^* = X_i(1 + P_M^{\frac{\rho}{\rho-2}})^{-\frac{1}{\rho}}$$

Import quantity is a decreasing function of imported price index P_M.If we consider exchange rate in imported inputs, $P_{Mi} = P_{Mi}^n/e$, imported quantity should reduce as exchange rate increases, that is $\frac{\partial M^*}{\partial e} > 0$.

$$e \uparrow, P_{Mi} \downarrow, M^* \uparrow$$

We define the expenditure on imported and domestic intermediate input are C_m and C_z

$$C_m = X_i(1 + P_M^{\frac{-\rho}{\rho-2}})^{-\frac{1}{\rho}} P_M$$

Imported value C_m is an increasing function of importing price P_M, that is $\frac{\partial C_m}{\partial P_M} > 0$, given ρ is large enough. It means if exchange rate appreciates,expenditure on imports increase given that intermediate inputs is highly substitutable.

$$e \uparrow, P_{Mi} \downarrow, C_m \uparrow \text{ if } \rho \text{ is high}$$

Proposition 3. *When domestic currency appreciates, quantity of each imported variety, or the intensive margin also increases.*

2.4 Global Value Chain

In this part, we explore the case when firm is engaging in global value chain to perform a two-way trade? In this case, firms may engage in purely assembling using imported intermediaries provided by foreign partners; or it imports intermediates input by itself to export final product. In both cases, the marginal benefit of exchange rate rise may varies comparing with previous model. In the first case, or so called pure assembling trade, if foreign firms provide intermediaries we assume there is little change in term of input cost. In this sense there is no incentive for Chinese assembling firms to change import value when facing exchange rate fluctuates. However, if firm engaging in the processing trade without

provided input by foreign partners, then the response of those would be different from the former ones. We use a simple model to illustrate that. The profit for this kind of processing firm i equals revenue minus fixed cost F_{imp} of production and variable cost C_i . If firm imports, it incurs an additional fixed cost of import F_{imp} and variable import cost fN,which depends on number of varieties imported.We define the expenditure on imported and domestic intermediate input are C_m and C_z.We assume that processing firm would only reap a proportional profit depending on its input share.

$$\pi_i = (Y_i P_i - Y_i C_m - Y_i C_z - F_{imp} - fN)(\frac{C_m + C_z + fN}{C_m + C_z + F_{imp} + fN})$$

$$where\ C_i = C_m + C_z, C_m = X_i(1 + P_M^{\frac{-\rho}{\rho-2}})^{-\frac{1}{\rho}} P_M$$

when include exchange rate into profit function, it becomes

$$\begin{aligned} \pi_i &= (Y_i P_i - Y_i C_m/e - Y_i C_z - F_{imp} - fN/e)(\frac{C_m/e + C_z + fN/e}{C_m/e + C_z + F_{imp} + fN/e}) \\ &= \pi^{OD} * B \end{aligned}$$

We note the first item π^{OD} is the profit for parallel to those in ordinary trade, the second item B is the share of inputs provided by processing firm.

$$\begin{aligned} \frac{\partial \pi^{OD}}{\partial e} &> 0, \frac{\partial B}{\partial e} < 0 \\ \frac{\partial \pi_i}{\partial e} &< \frac{\partial \pi^{OD}}{\partial e} \end{aligned}$$

For processing trade, since the marginal benefit of import is smaller than ordinary trade, so adjustment of import would be much less than in ordinary trade. If the second item become small enough, response of firms engaging processing to exchange rate may become ambiguous. To summarize those two cases of two -way trade, we have the following proposition.

Proposition 4. *When domestic currency appreciates, processing trade has ambiguous response to exchange rate comparing with ordinary trade.*

3 Data and Measurement

We test predictions of imports using a transactional level Chinese customs data. Specially, imports from 27 OECD countries are included for our investigation, which accounts a majority weight in total import value. (It has Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.)

The China customs data records monthly import and export at transactional level between 2000

and 2006. The custom data contains a comprehensive of import information, such as import values (in US dollars), quantity of imports, HS 8-digit classification, firm identity information, trade destination and route information. Nominal exchange rate is obtained from Bloomberg daily exchange rate. (since we only use monthly data, we calculate the average monthly rate as mean of spot daily exchange rate for a month). It covers spot all exchange rate between China and OECD trade partners. Those currency include USD, AUD, EUR, CAD, DKK, HUF, NZD, GBP, JPY, SEK, KRW, NOK, CHF,MXN, PLN CZK. In total we have 16 kinds of currency for 27 OECD trade partners (some countries share a common currency of exchange like EU countries). In the flowing subsections, we discuss construction of dataset and measurements.

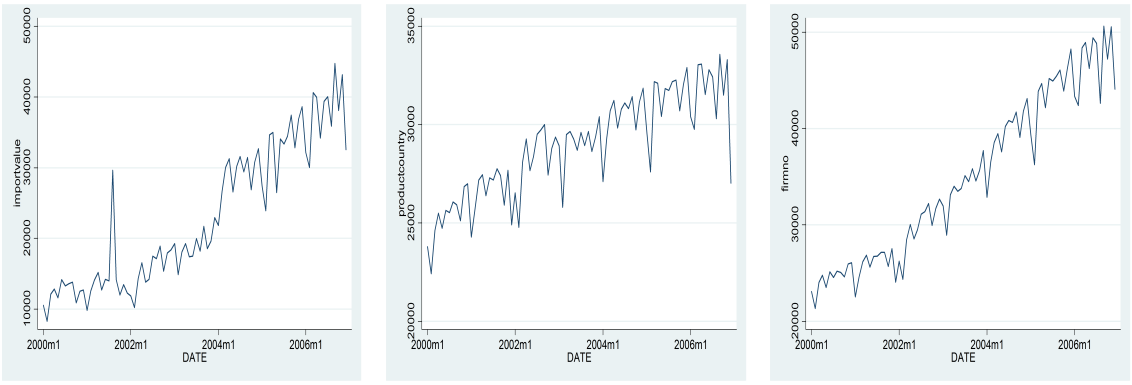
3.1 A Glance at Custom Import Date

Using customs data, we firstly process the original transaction record to generate a "firm-product-destination" combination data. To be specific, we collect all transactions for a certain firm who imports a certain product from a certain destination country during one month and aggregate them as one observation for our"firm-product-destination" bundle . In this procedure, we use a HS 6 digit level instead of HS8 level sine the latter lacks variation. Import price is calculated as import value divided by quantity for each transaction.

As well known, export and import increase dramatically since China joining WTO at the end of year 2001. According to statistics, in year 2000 China export value, import value are almost 266 billion and 243 billion US dollars respectively. After 5 years, according to statistics, export and import increase by 264.31% and 225.50% to reach more than 969 billion and 791 billion US dollars respectively in the year of 2006. Graph 1(a) displays monthly total import value from Jan 2000 to Dec 2006. Although, there is fluctuation between months, the overall trend of import is stably increasing. Joining WTO at Dec 2001 lead to a soar of import afterwards and an long-term increasing pattern afterwards. If further looking into the increasing import value, we entangle total value into different layers, e.g. the number of importer, number of product and origin countries imported from. Figure 1(b) and 1(c) display change of different margins at product level and firm level respectively. We combine product and origin countries to a bundle, in other words, product import from different countries to treated as different variety of product. In our picture, both number of firms and product bundle show a steady increasing pattern, which jointly contributes to a soar of aggregate import value .

3.2 Constructing Real Exchange Rate

We use real exchange rate instead of nominal exchange rate for empirical tests. To construct real exchange rate, we use monthly consumer price index (CPI) to deflate nominal exchange rate. CPI , CPI_f stand for consumer price index of China and corresponding import partner respectively. CPI date is obtained from IMF website. We use E_f to denote real exchange rate and E_x to denote nominal



(a) Aggregate Import Value (b) Product + Country Number (c) Import Firm Number

Figure 1: Decompose Import Change

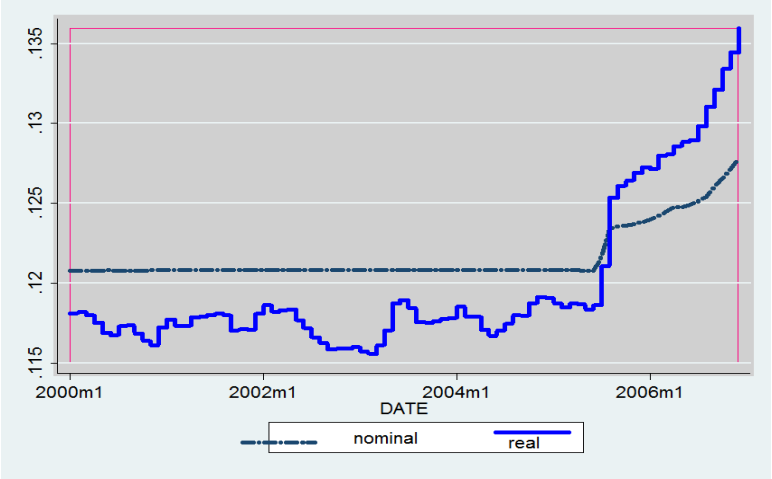


Figure 2: Nominal and Real Exchange Rate Fluctuation

exchange rate. Bilateral real exchange rate is calculated as

$$E_f = \frac{E_x * CPI}{CPI_f}$$

To be parallel with import customs data, real exchange rate in our analysis covers from January 2000 to December 2006. We use a log difference to measure the change of bilateral real exchange rate during given period. (The time period could be monthly for short run or quarterly for longer run.)

$$\triangle e_{ft} = \log(\frac{E_{xt}}{E_{xt-1}}) + \log(\frac{CPI_t}{CPI_{t-1}}) - \log(\frac{CPI_{ft}}{CPI_{ft-1}})$$

Before July 2005, China had adopted a pegged foreign currency policy to USD. In July 2005, China announced the adoption of a managed floating exchange rate regime to replace original pegged policy. Under a managed floating regime, based on market supply and demand, exchange rate of RMB to USD would be managed in relation to a basket of currencies. When look into exchange rate between

RMB and USD, nominal exchange rate had not changed before 2005 and fluctuation only occurs after shift of policy in 2005. However, if we investigate real exchange rate rather than nominal exchange rage, we observe fluctuation of real exchange rate between RMB and US dollars for overall sample period. In figure 2, we capture both a nominal and real exchange rate fluctuation from 2000 to 2006. The increasing trend of curve stands for an appreciation of RMB, in both nominal and real value.

3.3 Decomposing Import Values

This section investigates in detail the contribution of intensive and extensive margins to these cross-sectional differences. According to Bernard et al. (2009), we decompose import value into intensive margin and extensive margin. Total import x_{imp} are composed of number of firms f_{imp}, the unique number of products p_{imp} imported from other countries and the average value of import for each firm-product bundle, $\frac{x_{imp}}{f_{imp}p_{imp},}$. However, note that item $\frac{x_{imp}}{f_{imp}p_{imp},}$ is not the intensive margin. Because the full firm-product bundle $f_{imp}p_{imp}$ may not all import at a given time period, thus we need an additional item to account for density of actual trade for that time. The additional item used is import density d_{imp} which is defined as the fraction of all possible firm-product combinations that is non zero for a given sample period. $d_{imp} = \frac{o_{imp}}{f_{imp}p_{imp}}$ where o_{imp} is total number of firm-product observations for which import value is non zero. Intensive margin $\bar{x}$ can be calculated as $\frac{x_{imp}}{o_{imp}}$. Firm only imports a small portion of total product bundle$f_{imp}p_{imp}$, so trade density d_{imp} is usually negative related with total number of firms f_{imp} or number of products p_{imp} . We decompose import value according to the following formula

$$x_{imp} = f_{imp}p_{imp} * \bar{x} * d_{imp}$$

The two extensive margins are firm entry and exit and continuing firms' adding and dropping of country-products. The intensive margin is continuing firm-country-products' growth or decline. In our analysis, the decomposition import value into the above four items for each year. To implement, we take logarithm of import value and then regress on logarithm of each margin and density function. Using OLS, the sum of coefficients for extensive margin, intensive margin and density is predicted to be one. The coefficients of f_{imp} , p_{imp} and $\bar{x}$ represent the share of each margin in explaining total value of import. The following Figure 3 offers decomposition of aggregate import value during Jan 2000 to Dec 2006. According to our calculation, taking import from US as an example, average firm level extensive margin counts for about 0.42 of aggregate trade value; product level extensive margin counts for 0.37 ; intensive margin takes a weight of 0.53; trade density counts for the rest of -0.35. We also did a similar calculation for imports from EU and Japan. Similar to US, extensive margin also takes a large potion of aggregate value. But for EU and Japan, intensive margin and firm extensive margin are slightly smaller than US. For Chinese import, extensive margin which includes both firm level and product level takes almost two thirds of total import value, which contributes to the major part of aggregate import increase. Comparing this results with Bernard et al. (2009), it

Figure 3: Proportion of Margins of Import

shows that 0.58 of US import comes from extensive firm margin, 0.54 from product churning, and 0.318 for intensive margin. There are two difference between China's import and US import suggests by results. By comparing US and China, we find that for negative value of US trade density is smaller than that of China. It shows that US has a higher fraction of importing firms than China. Although both China and US import have a high portion on extensive margin, but China's import value depends less in product level extensive margin than US.

When it comes to the level of change, we find firm level extensive margin changes counts for more than 0.57 of total import change for China import. However, for US import, product and country bundle changes counts for the largest portion 0.47 of total change. It means that firms entry or exit plays a major role for total import in China, while in US products churning within firm or country partner dominates the change of import .

3.4 Margin Changes of Import with Exchange Rate Fluctuation

In this part, we use a simply regression to capture effect of exchange rate fluctuation on changes of extensive and intensive margin . We use the first difference to denote changes of import value and different margins. We calculate changes of firms as the first order difference of net entry out of exit for importing firms in a given month. Similarly, we calculate change of products bundle as the net change for adding or dropping of products. Adjustments of intensive margin is the change of import value of continuing products country pair of existing firms in our sample.The following Figure 4 displays the decomposed changes of margins and change of import value. If we observe how those lines fluctuates with each other, we find that all of them share a similar pattern, and import value fluctuates most among all. It means that both changes of extensive margin of intensive margin contributes to change of import value fluctuation. Also extensive margin and intensive margin response in a quite similar way with each other.

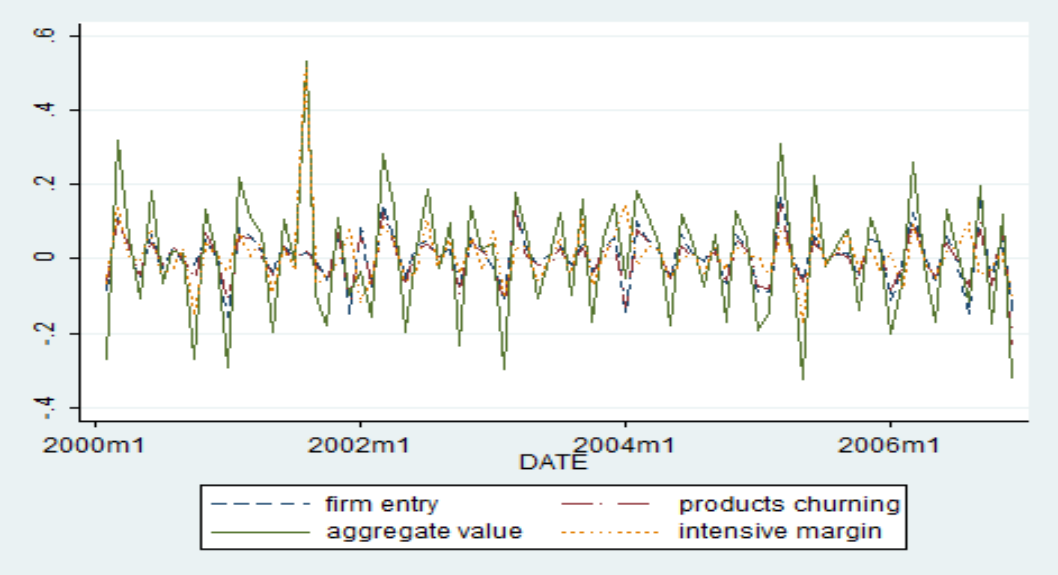


Figure 4: Margins of Import

In a further analysis, we checked how changes in each margin respond to exchange rate fluctuation. Using Chinese customs data, we construct a sample of US-China bilateral import data, which includes import value, firm number and product numbers for each month during 2000 to 2006.Then we can calculate the change of import value, firm numbers and number of product by comparing current month to previous month. In order to test how exchange rate fluctuation contributes to change of various margins, we regress the first order difference of firm number, products and intensive margins on exchange rate changes respectively.

In Table 1 Column 2 shows coefficient for exchange rate for aggregate import values, column 3 and 4 for firm entry rate and product adding rate, and the last column for intensive margin change. In the results table, after controlling country fixed effect, we find that exchange rate fluctuation play a significant role in firm entering and products variety shift, which lead to a overall change in import value change. But exchange rate fluctuation gets a insignificant positive coefficient in intensive margin. An appreciation of currency has a significant increase of firm probability of entry for 0.23 and product adding for 0.24. The insignificant coefficient for intensive margin is also positive, which suggest an unstable change of increasing pattern of continue firm's import. All of which contribute to the change of total import value, which is a insignificant positive one. The extensive margin seems to be driving factor for import response under exchange rate fluctuation.

4 Exchange Rate Fluctuation on Import Response

In the model part, we predict that an appreciation of domestic currency stands for a reduction of import price than before, consequently, firm has more incentive to enter importing market and import

more variety than before. If substitution of imported input is high enough, import quantity increase may cover the price reduction, which lead to an increasing of total import value. In this section, we investigate import response more detailed to exchange rate fluctuation empirically.

We use micro level regression to test change pattern of both intensive and extensive margin to exchange rate respectively. In extensive margin we unfold the margin into firm level and product level. In intensive margin, we test both import value changes and price changes for a specific firm-product-country bundle. In this way, we could further look into importer's import decision and pricing behavior.

In reality, importing firm's response and exchange rate fluctuation may not at the same pace. For example, there is transpiration lag between firm's decision and import reporting to customs. Also firms may import this month and import less next month to keep inventory at a constant level. Thus we doubt short run response may be quite different from long run response. In our test, we include both a monthly regression and quarterly regression.

If our prediction is correct, we expect to see a significant positive coefficient of exchange rate for both extensive margin and intensive margin, and a negative coefficient of import price at intensive level. Also, this pattern should be more robust in a long term than a short term.

Since we are using a monthly time series panel data, we perform a DickeyFuller test for stationary of RMB fluctuation with trading partners' currency. The p value suggests we reject the null hypothesis of a unit root for both monthly or quarterly change of exchange rate at all common significance levels for our sample. Thus, we do not use a typical VEC model in time series analysis.

4.1 Exchange Rate on Intensive Margin

We estimate the following two regression specifications:

$$\Delta\ x_{icp(t,t-3)} = \sum_{k=3}^{0} \beta_{k1} \Delta\ e_{c,(t-k,t-k-3)} + \beta_{z1} Z_{ict} + \beta_{g1} g_t + [F_i + F_c + F_p + F_t] + \epsilon_{ijpc}$$

$$\Delta\ p_{icp(t,t-3)} = \sum_{k=3}^{0} \beta_{k2} \Delta\ e_{c,(t-k,t-k-3)} + \beta_{z2} Z_{ict} + \beta_{g2} g_t + [F_i + F_c + F_p + F_t] + \epsilon_{ijpc}$$

wherei, p, c, t represent firm, product, country and month , respectively. x_{cpt} stands for logarithm of import value of firm i from country c of product p during month t. e is the logarithm of exchange rate between RMB and importing country c's currency at the corresponding time slot. We use the difference level to stand for changes of both import value and price $\Delta\ x_{icpt}$, $\Delta\ p_{icpt}$ as well as exchange rate $\Delta\ e_{icpt}$ in our regressions. Z_{ic} is a specific dummy for whether it engaging in two way trade . k_{ct} is a GDP growth to control for demand changes in domestic market. F are set of fixed effect variables for regression. We fixed firm, trade destination countries, product and time for regression. ϵ_{ijpc} denotes as

any unobserved time specific and firm product specific characteristics that influences import value.In the second specification we focus on exchange rate pass through effect on domestic import price at intensive margin level. The dependent variable becomes p_{icpt}, which is price for product p imported from country c in month t instead of import value x_{icpt}.

To take into account the potentially sluggish import responses to exchange rate shocks, as postulated by the standard arguments for the J-curve, we exploit the high frequency nature of the data and include a number of lagged exchange rate depreciation terms ($e_{t-k,t-k-3}$). Our main interest for the sum of elasticity coefficient of exchange rate over four quarters $\sum_{k=3}^{0} \eta_k$ in our regressions.

The baseline result is reported in Table 2. The left four columns report import covering imports from all OECDs and right four columns report for only US imports. Odd Column 1,3,5,7, report import value and even column 2,4,6,8 report for import price regressions. Among those, column 1,2, 5,6 are for a long term (within 4 quarters) quarterly regression and column 3,4, 7,8 reports for short term (within 3 months) monthly regression. The net coefficient for long run is by adding coefficients within four quarters, similarly net effect coefficient in short run is summation of monthly coefficients within three months. The p value of net effects is a joint F statistics of whole set of regressions within 4 quarters or 3 months.

Since firm import decision could not be reflected in customs data immediately, we focus on response within a time interval. The net effects for both long term and short term offers us such information. The coefficients for net effect in long run is 0.53 for OECD countries. It suggests from a longer perspective, the average import value from OECD for current product country pair increase 5.3 after ten percentage appreciation of RMB. The effect is robust after controlling for fixed firm, product, country and time effects. For import price change, if local currency appreciation, the representative price of imports in terms of local currency should be reduced. In our results, in long run price imported from OECD reduces 0.344 for a ten percent appreciation of RMB.

In a short run, when look at net effects coefficients, the results turns to be less robust to support our prediction. To be specific, import value even decreased by 0.6 percent after a 10 percent appreciation which is contradict to our prediction. The price is still robust in that it reduces by 1.05 percent in a short run. By comparing long term response to short term, we find that short term response is less robust as what we predicted in theory. However, in terms of price, response of importing price becomes smaller in a long run than in a short run. Also,The response is noisy for each quarter or month because there is not uniform positive coefficient for each quarter or month. In this sense, short term response offer litter information about firm importing pattern. For imports from US, we observe that intensive margin response greatly in a short run with an increase of import value to 7.8 percent. For a long run perspective, import from US also increases as much as 4.5 percent. Also we find for import from US, price decrease a little in a short run but slightly increase in a longer run. Pricing changes is not as robust as import value to our prediction according to our finding, which suggests a

unexpected firm pricing behavior under currency appreciation.

4.2 Exchange Rate on Extensive Margin

4.2.1 Firm Entry and Exit Decision

We first test extensive margin at firm level by examining exchange rate fluctuation on firm's probability of entry or exit. To be specific, we set entry and exit dummy as dependent variable for both Probit regression and linear probability regression in our test. In the definition, entry equals one if firm import in t but not import in $t-1$; entry is set to be 0 if firm import in both time t and $t-1$.

$$\Pr(Entry)_{i,(t,t-k)} = \Phi(\sum_{k}^{0} \gamma_{k1}\Delta\ e_{i,(t,t-k)} + \gamma_{z1}Z_{it} + \beta_{g1}g_t + [F_i + F_t] + \epsilon_{it})$$

In the regression, exchange rage fluctuating is calculated at firm level, which is calculated as sum of weighed exchange rate among all trade pattern for the firm. The weight used is the share of import from each country over all import values. We include firm and time fixed effect in our regression.

Similarly, we test same variable for firm exit decision during period t according to the following equation. Specifically, Exit is set to 1 if firm$i$ exports in time $t-1$ but not in time t; exit equals 0 if firm i continue import in both time$t$ and $t-1$

$$\Pr(Exit)_{i,(t,t-k)} = \Phi(\sum_{k}^{0} \gamma_{k2}\Delta\ e_{i,(t,t-k)} + \gamma_{z2}Z_{it} + \beta_{g2}g_t + [F_i + F_t] + \epsilon_{it})$$

In Table 3, we see that for OECD countries, firm entry has a positive sign when domestic currency appreciates. The positive coefficient in front of exchange rate in entry tests suggests that it is more likely for firm to overcome fix cost and import from other countries when RMB appreciates. In contrast, the significant negative coefficient for exit regression suggests it is unlikely firms exit from importing market. In the result table, as in previous test, net effect coefficients for both long run and short run test are aggregated of lagged month or quarters coefficients. In the long run, a 10 percent RMB appreciation , improve probability importing by 5.38 percent, and reduce exit probability by more than 26 percent for OECD countries. In a short run, entry probability increase by 6.02 percent, and exit rate reduces by 8.63 percent for imports from OECD countries.

The extensive margin response follows our prediction for both long run and short run, which contributes aggregate increase of firm numbers after appreciation. In right hand side of Table , we list results for extensive margin test for only imports from US. As a robustness check(has not displayed and reported), we also use a linear probability regression model which use the number of firms within a product level as dependent variable.The coefficients show a similar pattern as appearing coefficient in Probit. It also show that an appreciation increase the possibility of entry importing market for

both OECD and US firms.

4.2.2 Product Adding and Dropping Decision

In the next section, we test exchange rate on products churning. We define products at six HS digit level, we construct our product and importing country bundle and test the impact of exchange rate fluctuation on it. When facing a currency appreciations would expect that firm will add products or import from more countries abroad, while drop less product varieties or import from less countries. We regress product adding and dropping using Probit regression. For controlling variables, we include two way trade status and market demanding indicators in time t. Time dummy is added in our regression to control the trend .

$$\Pr(Adding)_{itpc} = \Phi(\sum_{k}^{0} \eta_{k1} \Delta\ e_{c,(t-k,t)} + \eta_{z1} Z_{it} + \eta_{g1} g_t + [F_i + F_c + F_p + F_t] + \epsilon_{itpc})$$

$$\Pr(Dropping)_{itpc} = \Phi(\sum_{k}^{0} \eta_{k2} \Delta\ e_{c,(t-k,t)} + \eta_{z2} Z_{it} + \eta_{g2} g_t + [F_i + F_c + F_p + F_t] + \epsilon_{itpc})$$

A probit regression is used for the regression. We define dummy variable adding and dropping in the following way: adding equals one if a product appears in period t but not in period $t-1$; dropping equals one if a product appears in period $t-1$ but not in period t Exchange rate is difference of exchange rate for quarter or month, and dependent variable is dummy of product adding and dropping. In Table 4, we notice rise of exchange rate has a positive impact on import for product adding significantly, although the magnitude is small in both Probit regression. In column 3 and 4,there is a significant negative of exchange rate coefficients on product dropping. It suggests the prediction is supported that currency appreciation has a positive effect on import product variety adding and negative effect on dropping. However, the product churning effect has a comparably smaller marginal effect than firm participation effect. This pattern is hold for imports from both OECD countries and US. It suggests, parallel to a firm extensive margin, an appreciation of local currency leads a increase of probability of products adding.

5 Further Discussion

5.1 Subsample: Ordinary Trade VS. Global Value Chain

One of unique feature of Chinese importing is that importers could engage in global value chain. Importer may use imported intermediate good to sell abroad. A possible trade pattern is that importer may import raw and auxiliary materials, parts and components, accessories or materials from abroad, and re-exporting the finished products after processing or assembly by enterprizes within China. Hence there are differences between ordinary and processing trade. Processing trade links import and export

together. In this way, exchange rate may exert a different effect on import for processing Trade. In this section we group all observations into processing trade group and ordinary group. If the transaction belongs to either pure assembling or processing in transaction record, we label the this one as trade in a global value chain. Since one firm may involve both processing and non processing transactions, we can not grouping firms according to current custom dataset. So we ignore the firm level extensive margin tests in this section. Instead, we re-check intensive margin and product extensive margin with response to exchange rate fluctuation. We first look at intensive margin regression results,which is displayed in Table 5. The left four columns display results for ordinary trade, while right four columns display processing trade. For processing trade import value, short run net effect is instable with a negative coefficient. But if we look at a long run effect, the effect is positive significant with a large magnitude of 0.5994 for processing. If we look at only ordinary trade, import value increase for both long run and short run, and with a large magnitude than processing trade. We also investigate price changes to exchange rate In both short run and long run, import price reduces when RMB appreciates. Short run response of price is larger than that of a long run. Price elasticity are similar for both processing and ordinary trade, but it is larger for processing trade in a long run.

In the following test, we check effect of exchange rate appreciation on product churning for both ordinary and processing trade. The results is displayed in Table 6. For ordinary trade, coefficients for exchange rate response in a way following our prediction. Product adding is positively related with appreciation for both ordinary and processing trade. RMB appreciation rises change of entry while reduce chance of exit in a long run. However, our prediction has not supported by processing trade. In a long run, entry probability decreases for processing firms facing RMB appreciation. Since export cost increase during RMB appreciation, its effects offsets the positive effects on reduction of importing input for process importer. In this way, predicted pattern is not obvious for those importers who involve in global value chain. Generally speaking, ordinary trade fit our prediction on exchange rate theory better than processing.

5.2 Different Stage in Exchange Rate Regime Switching

Although exchange rate regime reform takes place on July 2005, there is still several phrase during reform period. Before early 2003 , China was adopted a firmly pegged US dollar exchange rate policy, and there is no shift in foreseeing a reform in Chinese foreign currency policy. However, in 2003 February Japan suggested a exchange rate reform should be taken in China. Since then there had been a lot of debate and discussions about exchange rate reform for future. Then Chinese government had been facing more and more pressure from western society to reform the foreign currency policy. Western countries believe RMB is undervalued severely and it lead to a huge trade surplus for China. Starting from 2003, the foreign currency market also anticipated an appreciation of RMB. The forward exchange rate between USD and RMB reflected peoples' expectation in that forward rate appreciate since late 2003. It was believed that a reform would certainly to come. But there is still uncertainty of

in what form this reform is to be taken: is it a steady increase or a abrupt adjustment? Those discussion lasted until July 2005 when China government announced reform,which is a steady appreciation of RMB against USD in exchange rate policy instead of previous pegged USD. Since then RMB had been gradually appreciated.

Although, a reform in exchange rate regime is announced in 2005 July, the change is not of one shot shock. With changing of information of expectation , firms could response differently for each phases of reform. We would also like to explore the difference in response during each period. In this section, we construct there dummies to indicator three phases of exchange rate regime during 2000 to 2006. The first one dummy is from 2000 to late 2003. At that time there is neither change of exchange rate policy nor expectation of a change of exchange rate policy. The second period lasts from the forth quarter of 2003 to 2005 July, when the debate of a exchange rate reform is heated and market has expected an appreciation of RMB/ USD. The last period begins from 2005 July, when the exchange rate regime shift is announced officially. We test a following specification by adding three dummies which indicate different period in exchange rate regime reform. P_i is set of period dummy for $\{P_1, P_2, P_3\}$,corresponding to three different periods in our sample. Then we interact exchange rate fluctuation with those three dummies to investigate their respect effect on import response.

$$\Delta\ y_{ipt} = \Delta\ e_t * P_1 + \Delta\ e_t * P_2 + \Delta\ e_t * P_3 + F_i + F_p + F_t + \varepsilon_{ipt} \tag{1}$$

To test different margins, we include intensive margin for per firm-products import as well as extensive margin for firm level and products level. Table 7 lists results for intensive margin, Table 8 and Table 9 shows extensive margins for firm level and products level respectively.

For those results, the left four columns show the import changes to exchange rate in different periods in a long run. The right four columns show the results in a short run. The odd columns are import value and even columns are import price. For OECD countries, the first two periods that is before regime shock in 2005 July the import has a positive response to exchange rate appreciation in a long run. The first fixed foreign currency regime has a largest coefficient in magnitude of 0.541. However, after the shock in 2005, the negative -0.0132 coefficient of the third period suggests that import value decreases than before after the regime shock. For the price side, during all periods in our sample, price reduces as RMB appreciates all the time. In a short run, import value for OECD countries has largest response during the first period (0.0085) and the magnitude reduces afterwards. It shows that in a short period, exchange rate regime is not included in firms' consideration when they make import decision.

For import from US, we compare the response to exchange rate in three different periods. During the first period from 2000 to late 2003, import response to exchange rate is of the highest (0.228) of all. During the second period, when appreciation is anticipated, the response of marginal increase reduces to 0.049. In a third period, when appreciation is realized, the marginal increase of import

from US began to rise slight ly to 0.063. Price pattern of import from US is worth of emphasizing. There is no significant response to exchange rate appreciation during the first two periods (from 2000 to late 2003). However, when the RMB appreciation is realized in 2005 July, price begins to change significantly. If we move to the last four columns where shows the short run response in different periods. We find that in a short run, there are no obvious difference in response between different periods in both value and price.

To summarize the patterns related with those results listed above: (1) In short run, firm's response to exchange rate has no difference among different stages during reform. (2) However, in long run, firms display different response for different stages of reform, both in extensive margin and intensive margin. The first phase, that is fixed exchange rate from 2000 to early 2003, importers are most responsive to exchange rate. However after that , in phase 2 or 3, this responsive pattern is diminished a lot, importers seems to be less willingly to change their import value according to exchange rate.(3) Import price has no significant different response in different stages in short run, but in long run, import price changes mostly in the third phase, especially for bilateral trade between US and China. (4) Overall, price response is less responsive than import value in our tests.

When we turn to check extensive margin at firm level. We find that for OECD countries, entry probability increase only in the first stage, and exit only reduce in the first stage during RMB appreciation. For the rest of stages, exchange rate effect on entry is either insignificant or contradicts prediction. It suggests that firm level extensive margin, entering happens mostly in the first stage rather in the other two. (We also checked with products level extensive margin. Due to products churning effect at importing country level, the result is lack of robustness and consistence.)

The above finding suggests that firms are more willing to entry into import market or adjust import value according to exchange rate under a pegged exchange rate regime. Under such a fixed exchange rate context, firm's response to exchange rate fluctuation is most predicable comparing to other stages. However, during an expected appreciation or steady appreciation, firms reduce their participation into importing either due to uncertainty about future or delay response to later appreciation in the future.

5.3 Import Pass Through

Import price elasticity, which is also known as pass-through of exchange rate, is also one of the most important issue of literature. We test pass through of China using this highly dis-aggregate level data. We check HS6 product price changes with response to nominal exchange rate fluctuation. Since before 2005, China fixed RMB to USD, we drop observations before July 2005. We test both short run (within one month)and long run (whith 12 month)pass through of exchange rate fluctuation.

Our results are listed in Graph 5(a) and Graph 5(b) for both short run and long run. In short run, the ratio is quite small as to around 0.02-0.03, while this ratio grows to larger value in long run to around 0.4 to 0.5. This suggests that pass through effect of exchange rate has accumulative

effect;also in a short run, this pass through effect is highly incomplete. As our sample period covers from 2000 to 2006, we noticed that both short run and long run pass through has a declining pattern over time. The declining pattern is very obvious in long run that short run. The pass through ratio reduced from 0.55 in 2000 to around 0.4 in 2006. Although pass through with short run is rather volatile, we still find pass through ratio is adjusted towards smaller value. Both incomplete patterns and declining pass through patterns are very similar to those patterns found in developed countries, which are documented in Campa and Goldberg (2005) and Marazzi and Sheets (2007). The former finds incomplete pass through to import price for major developed countries, while the latter used a reduced form analysis and find pass through is declining over time for US.

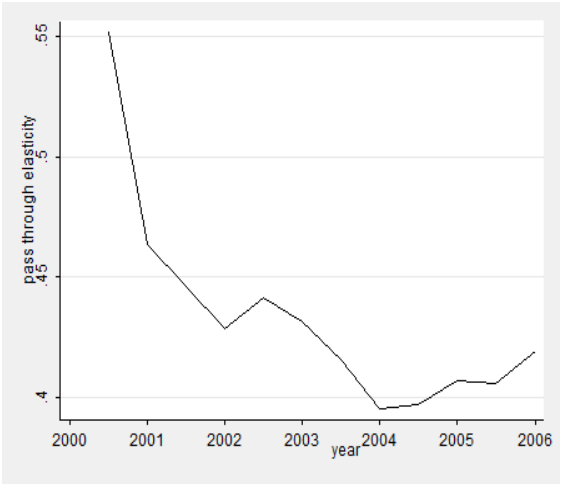
6 Robustness

6.1 Subgroups by Ownership

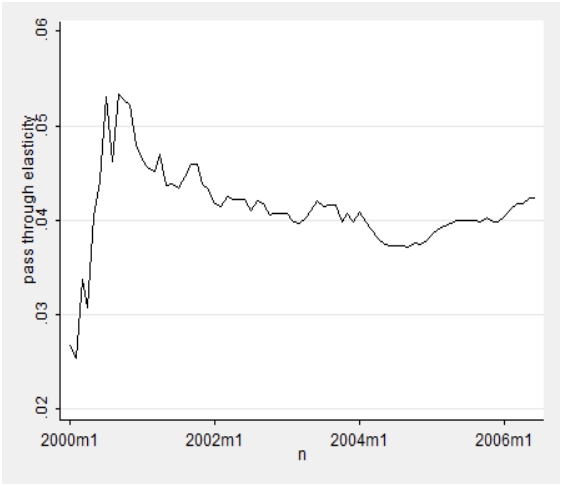
In this section, we divided full sample according to ownership of importers. There are four types of firms in our sample: state owned firms, private firms, multinational firms and joint ventures. As previous section, we test import response for both short run and long run. This test aims to find out whether importer's response affected by their ownership.

Table 10 lists the results for response of import values to exchange rate for different subgroups. The odd column is for import value and even column is for import price. The sum variable indicates the overall response of importers to exchange rate in both long term and short term. In long term, we note that Joint venture group and State owned firms group have a larger coefficients (0.345 and 0.364) on exchange rate fluctuation on import than that of private firms or multinational firms (0.241 and 0.239). For price change, both joint ventures and multinational have facing a decreasing import price that before when RMB appreciates. This decreasing pattern of price is more obvious for Joint Ventures and MNEs than SOEs or Private firms. This difference pricing behavior pattern may suggest that transfer pricing issue exists among foreign invested firms in China. In the short run, it shows that SOEs have the largest marginal increase (0.55) of import than other types of firms during RMB appreciation. The second responsive group is for MNEs and Joint Ventures. Private firm is the least responsive of all during a short term. In price side, all groups have negative coefficient between price and exchange rate.

In this part, we also test response of each group in different exchange rate regime. Table 11 tests import response in different regime during exchange rate reform period. We find that all of the subgroups follows a similar pattern, however the magnitude of response is different for each subgroups. By comparing coefficients for different subgroups, we find the SOEs and joint ventures response greater than private or MNEs. For different exchange rate reform stages, all of them follow a similar pace with each other. They response in a more predictable in earlier period under a fixed exchange rate



(a) Pass Through of Import Price in Long Run



(b) Pass Through of Import Price in Short Run

than in the following two stages under appreciation. In the long run, MNEs price behavior may be noise due to transfer pricing issue. However, generally speaking, for all four types of firms in China, response in different regime follows our previous prediction. Besides, we explore how different group of firms response to exchange rate in different period. We find that all types of firms show a similar pattern to exchange rate within different periods as previous finding for whole sample. During the first phase (2000 to 2003), the response is largest among other periods. In the following period (from 2003 to 2006), firms' response to exchange rate decreases. The shift is most dramatically for joint ventures, where the coefficient even turns to negative during that period. However, in the short run different period have little influence in the magnitude of firms' response to exchange rate.

7 Conclusion

In this paper, we use micro level data we empirically checks importers response to real exchange rate fluctuation covering the RMB exchange rate reform in 2005 . To conclude, although the exchange rate on import is not stable, an overall positive effect still be observed for an appreciation of local currency. After decomposing the change of import, the extensive margin, classified both as firm entry and products adding rate, contributes to a magnificent part of overall aggregate change. It stands for that, there more firms participating importing. Also, once starting import, they tend to import more varieties and more value when domestic currency appreciates. The drastically rise of importer or imported products from abroad drives up the import value during the sample period.

A potential direction of future project along this research line will be heterogeneous response of firms to exchange rate fluctuation using a merged customs firm data . Previous study has only focus on export side. Berman, Martin and Mayer (2009) and Li et al. (2012) find that high productivity firms has a lower pass through and more price-to-market behavior in exporting. Besides, other heterogeneous

firm level characteristics (e.g. financial status, ownership) may be also attributed to import behavior or pass-through. As exchange rate changes dramatically, such kind of study may focus on which group of firms will respond with exiting from market, which group of firms will respond with a shift of products bundles or trade partners, which has import policy implication for aggregate value change. It also sheds light on analysis of trade imbalance under a change of exchange rate regime.

References

Ahmed, Shaghil. 2009. "Are Chinese exports sensitive to changes in the exchange rate?"

Amiti, Mary, Oleg Itskhoki, and Jozef Konings. 2012. "Importers, Exporters, and Exchange Rate Disconnect." National Bureau of Economic Research, Inc NBER Working Papers 18615.

Arkolakis, Costas. 2010. "Market Penetration Costs and the New Consumers Margin in International Trade." *Journal of Political Economy*, 118(6): 1151 – 1199.

Berman, Nicolas, Philippe Martin, and Thierry Mayer. 2009. "How do different exporters react to exchange rate changes? Theory, empirics and aggregate implications." , (7493).

Bernard, Andrew B., J. Bradford Jensen, Stephen J. Redding, and Peter K. Schott. 2009. "The Margins of US Trade." *American Economic Review*, 99(2): 487–93.

Campa, Jose Manuel, and Linda S. Goldberg. 2002. "Exchange rate pass-through into import prices: a macro or micro phenomenon?"

Campa, Jos Manuel, and Linda S. Goldberg. 2005. "Exchange Rate Pass-Through into Import Prices." *The Review of Economics and Statistics*, 87(4): 679–690.

Chaney, Thomas. 2008. "Distorted Gravity: The Intensive and Extensive Margins of International Trade." *American Economic Review*, 98(4): 1707–21.

Cheung, Yin-Wong, Menzie D. Chinn, and Eiji Fujii. 2010. "China's Current Account and Exchange Rate." In *China's Growing Role in World Trade. NBER Chapters*, 231–271. National Bureau of Economic Research, Inc.

Dayal-Gulati, Anuradha, and Valerie Cerra. 1999. "China's Trade Flows-Changing Price Sensitivies and the Reform Process." International Monetary Fund IMF Working Papers 99/1.

Dees, Stephane. 2001. "The opening policy in China: Simulations of a macroeconometric model." *Journal of Policy Modeling*, 23(4): 397–410.

Dong, Wei. 2012. "The role of expenditure switching in the global imbalance adjustment." *Journal of International Economics*, 86(2): 237–251.

Eaton, Jonathan, Samuel Kortum, and Francis Kramarz. 2011. "An Anatomy of International Trade: Evidence From French Firms." *Econometrica*, 79(5): 1453–1498.

Garcia-Herrero, Alicia, and Tuuli Koivu. 2009. "Chinas exchange rate policy and Asian trade." *BIS Working Papers*, , (282).

Gopinath, Gita, and Brent Neiman. 2011. "Trade adjustment and productivity in large crises."

Hummels, David, and Peter J. Klenow. 2005. "The Variety and Quality of a Nation's Exports." *American Economic Review*, 95(3): 704–723.

Koopman, Robert, Zhi Wang, and Shang-Jin Wei. 2012. "Estimating domestic content in exports when processing trade is pervasive." *Journal of Development Economics*, 99(1): 178–189.

Liao, Wei, Kang Shi, and Zhiwei Zhang. 2012. "Vertical trade and China's export dynamics." *China Economic Review*, 23(4): 763–775.

Li, Hongbin, Hong Ma, Yuan Xu, and Yanyan Xiong. 2012. "How do exchange rate movements aect Chinese exports? A firm-level investigation."

Lu, Dan, Asier Mariscal, and Fernando Mejia. 2012. "Imports Switching and the Impact of Large Devaluation."

Manova, Kalina, and Zhiwei Zhang. 2009. "China's Exporters and Importers: Firms, Products and Trade Partners." National Bureau of Economic Research, Inc NBER Working Papers 15249.

Manova, Kalina, and Zhiwei Zhang. 2012. "Export Prices Across Firms and Destinations." *The Quarterly Journal of Economics*, 127(1): 379–436.

Marazzi, Mario, and Nathan Sheets. 2007. "Declining exchange rate pass-through to U.S. import prices: The potential role of global factors." *Journal of International Money and Finance*, 26(6): 924–947.

Marquez, Jaime, and John Schindler. 2007. "Exchange-rate Effects on China's Trade." *Review of International Economics*, 15(5): 837–853.

Tang, Heiwai, and Yifan Zhang. 2012. "Exchange Rates and the Margins of Trade: Evidence from Chinese Exporters." *CESifo Economic Studies*, 58(4): 671–702.

Thorbecke, Willem, and Gordan Smith. 2012. "ARE CHINESE IMPORTS SENSITIVE TO EXCHANGE RATE CHANGES?" *China Economic Policy Review*, 01(02): 1250012.

Thorbecke, Willem, and Gordon Smith. 2010. "How Would an Appreciation of the Renminbi and Other East Asian Currencies Affect China's Exports?" *Review of International Economics*, 18(1): 95–108.

Xing, Yuqing. 2011. "Processing Trade, Exchange Rates and Chinas bilateral Trade Balances." National Graduate Institute for Policy Studies GRIPS Discussion Papers 10-30.

Yu, Miaojie. 2009. "Revaluation of the Chinese Yuan and triad trade: A gravity assessment." *Journal of Asian Economics*, 20(6): 655–668.

Yu, Miaojie. 2010. "Processing Trade, Firm's Productivity, and Tariff Reductions : Evidence from Chinese Products." East Asian Bureau of Economic Research Macroeconomics Working Papers 22799.

Table 1: General Regression: Change of Margins w.r.t.Exchange Rate

	Margins of Imports			
	(1)	(2)	(3)	(4)
	Total Value	Firm Number	Products Number	Intensive
EX	0.2360	0.235***	0.243***	0.1950
	-0.1566	-0.0909	-0.0739	-0.3531
cons	0.0341***	0.0311***	0.0116**	0.0446**
	-0.0096	-0.0056	-0.0045	-0.0216
country fixed	yes	yes	yes	yes
N	2205	2205	2205	2205
adj. R-sq	0.0110	0.0090	0.0070	0.0120

Robust standard errors in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 2: Baseline Regression: Intensive Margin

	-1 OECD	-2 OECD	-3 OECD	-4 OECD	-5 US	-6 US	-7 US	-8 US
	deltavalue	deltaprice	value	price	deltavalue	deltaprice	value	price
deltaquanter1	-0.388***	0.0455***			-0.443***	0.0117		
	-0.0157	-0.0087			-0.0504	-0.0317		
deltaquanter2	0.923***	0.00361			0.977***	0.117**		
	-0.0248	-0.0137			-0.0786	-0.0494		
deltaquanter3	-0.251***	-0.0775***			-0.210***	-0.0402		
	-0.0235	-0.013			-0.0732	-0.0459		
deltaquanter4	0.246***	-0.00609			0.127**	0.0294		
	-0.0175	-0.0097			-0.0548	-0.0344		
net effect long term								
	0.53***	-0.03448***			0.451 ***	0.0117 ***		
lag1month			0.0878***	-0.0539***			2.239***	0.233
			-0.0174	-0.0114			-0.3647	-0.2666
lag2month			0.340***	0.00635			-0.895***	-0.593**
			-0.018	-0.0118			-0.329	-0.2405
lag3month			-0.490***	-0.0513***			-0.563***	0.343**
			-0.0136	-0.0089			-0.2039	-0.1491
net effect short term			-0.0622***	-0.1052 ***			0.781***	-0.017 **
growth	0.811***	0.0787***	-0.276***	-0.0349***	0.651***	0.180***	-0.292***	-0.152***
	-0.0207	-0.0115	-0.0093	-0.0061	-0.0629	-0.0395	-0.0296	-0.0216
expdum	0.171***	-0.00327*	0.0410***	-0.00632***	0.148***	0.0125*	0.00971*	-0.0154***
	-0.0033	-0.0018	-0.0019	-0.0012	-0.0118	-0.0074	-0.0052	-0.0038
cons	-6.474***	-0.618***	12.63***	5.177***	-5.322***	-1.489***	12.82***	7.213***
	-0.1641	-0.0908	-0.0772	-0.0505	-0.52	-0.3266	-0.2364	-0.1729
time fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
product-country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	3115504	3115504	14525409	14525409	340465	340465	2658169	2658169
adj. R-sq	0.11	0.112	0.736	0.914	0.109	0.098	0.715	0.9
F	959.8	186.4	1813.6	3695.2	79.9	5.455	401.2	601.9

Robust standard errors in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 3: Baseline Regression: Extensive Margin at Firm Level

	-1 OECD entry	-2 OECD entry	-3 OECD exit	-4 OECD exit	-1 US entry	-2 US entry	-3 US exit	-4 US exit
deltaquanter1	0.0236		-1.047***		-0.0950*		-2.286***	
	-0.035		-0.0352		-0.0504		-0.0499	
deltaquanter2	0.119**		-1.175***		0.619***		-1.422***	
	-0.0551		-0.0556		-0.0793		-0.0784	
deltaquanter3	-0.0494		0.200***		-0.574***		0.227***	
	-0.0501		-0.0506		-0.0718		-0.071	
deltaquanter4	-0.0652*		-0.673***		0.334***		-0.734***	
	-0.0372		-0.0374		-0.0534		-0.0531	
net effect long term	0.0538***		-2.695***		0.284***		-4.215***	
lag1month		0.0408		-1.343***		5.563***		-23.69
		-0.0575		-0.0575		-0.6276		-0.6191
lag2month		0.135**		1.596***		-3.074***		25.88***
		-0.0576		-0.0576		-0.5671		-0.5644
lag3month		-0.0748*		-1.116***		0.232		-21.81***
		-0.0422		-0.0422		-0.3493		-0.3498
net effect short term		0.0602***		-0.863***		2.721***		-19.62***
Growth	-0.196***	-0.0747**	-4.820***	-2.467***	0.161***	-0.0277	-5.976***	-5.080***
	-0.0438	-0.0293	-0.0454	-0.0297	-0.0619	-0.0495	-0.063	-0.0496
expdummy	-0.160***	-0.166***	-0.119***	-0.171***	-0.135***	-0.142***	-0.0877***	-0.168***
	-0.006	-0.0052	-0.006	-0.0052	-0.0086	-0.007	-0.0086	-0.0069
time fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
Firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	887947	975027	887947	975027	457078	604945	457078	604945

Robust standard errors in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 4: Baseline Regression: Extensive Margin at Products Bundle

	-1 OECD add	-2 OECD add	-3 OECD drop	-4 OECD drop	-1 US add	-2 US add	-3 US drop	-4 US drop
deltaquanter1	0.396***		-0.661***		0.176*		-2.310***	
	-0.0313		-0.0311		-0.0955		-0.094	
deltaquanter2	2.442***		-1.780***		4.932***		-2.843***	
	-0.0493		-0.0484		-0.1532		-0.1438	
deltaquanter3	-0.928***		0.047		-1.904***		1.286***	
	-0.0477		-0.0465		-0.1502		-0.1382	
deltaquanter4	-0.130***		0.415***		-0.0993		-0.699***	
	-0.0351		-0.0346		-0.1101		-0.1053	
net effect long effect	1.78 ***		-2.026***		3.1047 ***		-4.565***	
lag1month		-0.770***		-1.877***		13.35***		-35.98***
		-0.0668		-0.0655		-1.2419		-1.2098
lag2month		0.809***		2.520***		6.039***		37.32***
		-0.0662		-0.0653		-1.1491		-1.1349
lag3month		-0.300***		-1.676***		-10.30***		-18.51***
		-0.0435		-0.0429		-0.6467		-0.6533
net effect short term		-0.261 ***		-1.033 ***		9.089***		-17.17 ***
expdummy	0.214***	0.361***	0.248***	0.285***	0.272***	0.366***	0.336***	0.273***
	-0.0058	-0.006	-0.0058	-0.006	-0.0199	-0.016	-0.02	-0.016
time fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
product-country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	1050585	936434	1050585	936434	122434	155462	122434	155462

Robust standard errors in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 5: Robustness: Ordinary Trade V.S. Processing Trade (Intensive Margin)

	-1 Ordinary deltavalue	-2 Ordinary deltaprice	-3 Ordinary value	-4 Ordinary price	-5 Process deltavalue	-6 Process deltaprice	-7 Process value	-8 Process price
deltaquanter1	-0.219***	0.0530***			-0.510***	0.0255**		
	-0.0236	-0.014			-0.0216	-0.0111		
deltaquanter2	0.920***	0.0259			1.045***	-0.0287		
	-0.0363	-0.0215			-0.0353	-0.0181		
deltaquanter3	-0.454***	-0.0899***			-0.0445	-0.0439**		
	-0.0331	-0.0196			-0.0343	-0.0176		
deltaquanter4	0.365***	0.0269*			0.0644**	-0.0536***		
	-0.0241	-0.0142			-0.0264	-0.0135		
net effect long term	0.612 ***	-0.01***			0.5994***	-0.072 ***		
deltalag2ex			0.259***	-0.0364**			-0.142***	-0.0940***
			-0.0237	-0.0168			-0.0254	-0.0144
deltalag3adex			0.287***	0.00742			0.435***	-0.00236
			-0.0251	-0.0178			-0.0255	-0.0145
deltalag4adex			-0.482***	-0.0760***			-0.459***	-0.00618
			-0.0187	-0.0132			-0.0196	-0.0111
short term net			0.064***	-0.1124***			-0.166 ***	-0.10018***
growth	0.553***	0.0652***	-0.369***	-0.0818***	1.075***	0.0795***	-0.128***	0.00777
	-0.0303	-0.0179	-0.013	-0.0092	-0.0288	-0.0148	-0.0132	-0.0075
expdummy	0.112***	-0.00271	0.0127***	-0.0154***	0.232***	-0.00385	0.103***	0.00954***
	-0.0048	-0.0028	-0.0024	-0.0017	-0.0048	-0.0024	-0.0032	-0.0018
time fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
product-country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	1597503	1597503	9078587	9078587	1518001	1518001	5446822	5446822
adj. R-sq	0.12	0.114	0.744	0.908	0.11	0.111	0.745	0.903
F	430.5	112.2	1709.2	1892.4	639	52.23	782.9	2035

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 6: Robustness: Ordinary Trade V.S. Processing Trade (Extensive Margin)

	(1) Ordinary entry	(2) Ordinary entry	(3) Ordinary exit	(4) Ordinary exit	(5) Process entry	(6) Process entry	(7) Process exit	(8) Process exit
deltaquanter1	0.197***		-1.084***		0.00437		-0.551***	
	-0.0451		-0.0453		-0.0662		-0.0666	
deltaquanter2	-0.327***		-0.654***		0.188*		-2.014***	
	-0.0708		-0.0714		-0.1072		-0.1084	
deltaquanter3	-0.0336		0.145**		0.341***		-0.146	
	-0.0627		-0.0633		-0.101		-0.1024	
deltaquanter4	0.150***		-0.181***		-0.593***		-0.535***	
	-0.0468		-0.047		-0.0739		-0.0745	
net effect long term	0.02***		-1.774 ***		-0.064***		-3.1 ***	
lag1month		-0.00064		-0.00583		-0.408***		-1.727***
		-0.0768		-0.0769		-0.1044		-0.1045
lag2momth		0.0102		1.256***		0.271***		1.003***
		-0.0791		-0.0792		-0.1003		-0.1004
lag3month		-0.0967*		-1.504***		0.302***		-0.229***
		-0.0571		-0.0572		-0.0746		-0.0747
short term net		-0.0967***		-0.248***		0.165 ***		-0.953 ***
growth	-0.119**	0.00596	-3.854***	-2.065***	-0.219***	-0.0391	-4.871***	-2.160***
	-0.0566	-0.0394	-0.0589	-0.04	-0.0818	-0.0517	-0.0848	-0.0524
expdummy	-0.0649***	-0.0625***	-0.0152**	-0.0613***	-0.0804***	-0.0630***	-0.0588***	-0.0773***
	-0.0077	-0.0072	-0.0077	-0.0072	-0.0117	-0.0093	-0.0117	-0.0093
time fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
product-country fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	568673	578005	568673	578005	241378	296803	241378	296803

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 7: Response in Different Exchange Rate Regime

	(1) OECD deltavalue	(2) OECD deltaprice	(3) US deltavalue	(4) US deltaprice	(5) OECD value	(6) OECD price	(7) US value	(8) US price
	long term	long term	long term	long term	short term	short term	short term	short term
deltaitp0	0.541***	-0.0470***	0.228***	0.0102	0.00853***	-0.0341***	0.197***	0.0908***
	(0.0120)	(0.0065)	(0.0382)	(0.0240)	(0.0015)	(0.0010)	(0.0249)	(0.0182)
deltaitp1	0.0446***	-0.00914***	0.0489**	0.00885	0.00635***	-0.0354***	0.196***	0.0889***
	(0.0065)	(0.0035)	(0.0196)	(0.0123)	(0.0015)	(0.0010)	(0.0250)	(0.0182)
deltaitp2	-0.0132**	-0.0220***	0.0628***	0.0230**	0.00510***	-0.0355***	0.195***	0.0873***
	(0.0057)	(0.0031)	(0.0166)	(0.0104)	(0.0015)	(0.0010)	(0.0253)	(0.0185)
expdummy	0.177***	-0.000110	0.155***	0.0191***	0.0354***	-0.00663***	0.0119**	-0.0136***
	(0.0034)	(0.0019)	(0.0117)	(0.0074)	(0.0020)	(0.0013)	(0.0052)	(0.0038)
N	2775039	2775039	340465	340465	11867240	11867240	2658169	2658169
adj. R-sq	0.109	0.113	0.108	0.098	0.741	0.915	0.715	0.900

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 8: Response in Different Exchange Rate Regime with Extensive Margin at Firm Level

	(1) entry	(2) entry	(3) exit	(4) exit	(5) countfirm	(6) countfirm
deltaitp0	0.0427**		-0.412***		0.0108***	
	(0.0197)		(0.0197)		(0.0005)	
deltaitp1	0.0134		0.339***		-0.121***	
	(0.0131)		(0.0132)		(0.0003)	
deltaitp2	0.0158		0.434***		-0.0125***	
	(0.0122)		(0.0122)		(0.0003)	
logitp0		-0.0168***		-0.0151***		-0.000423***
		(0.0002)		(0.0002)		(0.0000)
logitp1		-0.0182***		-0.0180***		0.000225***
		(0.0002)		(0.0002)		(0.0000)
logitp2		-0.0178***		-0.0179***		0.000811***
		(0.0002)		(0.0002)		(0.0000)
expdummy	-0.149***	-0.155***	-0.118***	-0.106***	-0.000328**	-0.0117***
	(0.0059)	(0.0053)	(0.0059)	(0.0053)	(0.0002)	(0.0002)
N	924902	975069	924902	975069	924902	975069
adj. R-sq					0.988	0.980

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 9: Response in Different Exchange Rate Regime with Extensive Margin at Product Level

	-1	-2	-3	-4	-5	-6
	add	add	drop	drop	countpdtcty	countpdtcty
deltaitp0	-0.675***		0.719***		-0.192***	
	-0.0174		-0.0174		-0.0017	
deltaitp1	1.154***		-0.594***		-0.801***	
	-0.0121		-0.0115		-0.0011	
deltaitp2	0.656***		0.162***		0.0269***	
	-0.0117		-0.0117		-0.0011	
logitp0		-0.220***		-0.189***		0.217***
		-0.0103		-0.0103		-0.0011
logitp1		0.347***		0.326***		-0.523***
		-0.0105		-0.0106		-0.0011
logitp2		-0.539***		-0.614***		0.0975***
		-0.0147		-0.0143		-0.0015
expdummy	0.290***	0.336***	0.328***	0.321***	-0.0915***	-0.0939***
	-0.0058	-0.006	-0.0057	-0.006	-0.0006	-0.0007
N	1211073	936468	1211073	936468	1211073	936468
adj. R-sq					0.783	0.749

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 10: Robustness: Subgrouping by Ownership

	soe	soe	soe	soe	private	private	private	private	mne	mne	mne	mne	jv	jv	jv	jv
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	deltavalue	deltaprice	value	price	deltavalue	deltaprice	value	price	deltavalue	deltaprice	value	price	deltavalue	deltaprice	value	price
deltaquanter1	-0.559***	0.125***			0.125**	0.0482			-0.256***	0.00653			-0.120***	0.0778***		
	(0.0385)	(0.0221)			(0.0608)	(0.0324)			(0.0223)	(0.0124)			(0.0312)	(0.0168)		
deltaquanter2	1.186***	-0.0152			0.269***	0.0804*			0.499***	-0.0195			0.667***	-0.0433		
	(0.0630)	(0.0362)			(0.0866)	(0.0462)			(0.0335)	(0.0187)			(0.0491)	(0.0264)		
deltaquanter3	-0.429***	-0.131***			-0.0595	-0.185***			-0.0853***	-0.0224			-0.424***	-0.0815***		
	(0.0637)	(0.0367)			(0.0805)	(0.0429)			(0.0321)	(0.0179)			(0.0485)	(0.0261)		
deltaquanter4	0.147***	0.0245			-0.153**	0.0924***			0.0815***	-0.0413***			0.241***	-0.0278		
	(0.0453)	(0.0261)			(0.0614)	(0.0327)			(0.0237)	(0.0132)			(0.0351)	(0.0189)		
Net long term	0.345 ***	-0.006 ***			0.241***	-0.0122 ***			0.2392***	-0.0413***			0.364 ***	-0.0784 ***		
loglagadex			0.536***	-0.276***			0.0777	-0.239***			0.285***	-0.196***			0.319***	-0.206***
			(0.0416)	(0.0282)			(0.0541)	(0.0346)			(0.0256)	(0.0166)			(0.0338)	(0.0217)
loglag2adex			-0.159***	0.0461			0.169***	0.0582*			-0.000672	0.0557***			-0.111***	0.0290
			(0.0421)	(0.0286)			(0.0544)	(0.0348)			(0.0258)	(0.0168)			(0.0339)	(0.0217)
loglag3adex			-0.428***	-0.00643			-0.389***	-0.0764**			-0.370***	-0.0307*			-0.279***	-0.0243
			(0.0435)	(0.0295)			(0.0567)	(0.0363)			(0.0270)	(0.0175)			(0.0354)	(0.0227)
loglag4adex			0.606***	0.00374			0.347***	0.0485*			0.430***	-0.00518			0.431***	0.0316*
			(0.0319)	(0.0216)			(0.0431)	(0.0276)			(0.0203)	(0.0132)			(0.0266)	(0.0171)
net short term			0.555***	-0.276 ***			0.127***	-0.2087***			0.345***	-0.171 ***			0.36 ***	-0.1744***
expdummy	0.242***	-0.0165***	0.0346***	-0.0142***	0.0762***	0.00611	0.0597***	-0.0203***	0.140***	-0.00293	0.0335***	-0.00261	0.210***	0.00903***	0.0381***	-0.00369
	(0.0081)	(0.0047)	(0.0041)	(0.0028)	(0.0222)	(0.0118)	(0.0090)	(0.0057)	(0.0048)	(0.0027)	(0.0030)	(0.0019)	(0.0061)	(0.0033)	(0.0036)	(0.0023)
N	540947	540947	2788472	2788472	236147	236147	1580841	1580841	1484794	1484794	5930167	5930167	775454	775454	3106415	3106415
adj. R-sq	0.097	0.094	0.740	0.919	0.135	0.154	0.783	0.932	0.118	0.125	0.739	0.915	0.108	0.114	0.740	0.908
F	197.1	37.47	158.3	750.4	33.67	8.042	117.7	406.0	421.4	132.0	1229.4	1893.4	272.5	108.4	344.2	849.0

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 11: Robustness: Subgrouping with Ownership in Different Exchange Rate Regime

	soe	soe	soe	soe	private	private	private	private	mne	mne	mne	mne	jv	jv	jv	jv
	(5)	(6)	(7)	(8)	(5)	(6)	(7)	(8)	(5)	(6)	(7)	(8)	(5)	(6)	(7)	(8)
	deltavalue	value	deltaprice	price	deltavalue	value	deltprice	price	deltavalue	value	deltaprice	price	deltavalue	value	deltaprice	price
deltaitp0	0.421***		-0.0557***		0.249***		-0.00764		0.381***		-0.0158		0.718***		-0.0399***	
	(0.0252)		(0.0145)		(0.0630)		(0.0335)		(0.0181)		(0.0101)		(0.0221)		(0.0119)	
deltaitp1	0.0311**		0.00866		0.102***		0.00364		0.0318***		-0.0146***		0.0800***		-0.0121*	
	(0.0154)		(0.0089)		(0.0226)		(0.0120)		(0.0086)		(0.0048)		(0.0124)		(0.0067)	
deltaitp2	0.0397**		0.000821		0.0105		-0.00468		0.0265***		-0.0206***		-0.113***		-0.0234***	
	(0.0155)		(0.0089)		(0.0172)		(0.0092)		(0.0072)		(0.0040)		(0.0113)		(0.0061)	
logitp0		0.00221		-0.0251***		0.00627		-0.0259***		0.0249***		-0.0318***		-0.00130		-0.0441***
		(0.0032)		(0.0022)		(0.0047)		(0.0030)		(0.0020)		(0.0013)		(0.0029)		(0.0018)
logitp1		-0.000223		-0.0259***		0.00265		-0.0279***		0.0237***		-0.0332***		-0.00524*		-0.0457***
		(0.0033)		(0.0022)		(0.0048)		(0.0031)		(0.0021)		(0.0014)		(0.0029)		(0.0019)
logitp2		-0.00474		-0.0275***		0.000175		-0.0277***		0.0221***		-0.0341***		-0.00745**		-0.0469***
		(0.0033)		(0.0022)		(0.0048)		(0.0031)		(0.0021)		(0.0014)		(0.0029)		(0.0019)
expdummy	0.234***	0.0338***	-0.0106**	-0.0150***	0.0800***	0.0495***	0.00835	-0.0213***	0.131***	0.0291***	-0.00166	-0.00649***	0.196***	0.0313***	0.0132***	-0.00747***
	(0.0081)	(0.0041)	(0.0047)	(0.0028)	(0.0222)	(0.0090)	(0.0118)	(0.0058)	(0.0048)	(0.0030)	(0.0027)	(0.0019)	(0.0061)	(0.0036)	(0.0033)	(0.0023)
N	540947	2788472	540947	2788472	236147	1580841	236147	1580841	1484794	5930167	1484794	5930167	775454	3106415	775454	3106415
adj. R-sq	0.097	0.740	0.094	0.919	0.135	0.783	0.154	0.932	0.119	0.739	0.125	0.915	0.109	0.740	0.114	0.908
F	198.3	173.8	35.56	904.2	34.98	150.2	6.864	487.8	473.9	1444.9	144.0	2292.7	397.8	420.7	113.3	1027.5

Robust Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01