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# Do Exporters Respond to Both Tariffs and Nominal Exchange Rates? Evidence from Chinese Firm-Product Data

by

**Zhe Chen and Yoshinori Kurokawa**

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UNIVERSITY OF TSUKUBA
Department of Economics
1-1-1 Tennodai
Tsukuba, Ibaraki 305-8571
JAPAN

# Do Exporters Respond to Both Tariffs and Nominal Exchange Rates? Evidence from Chinese Firm-Product Data*

Zhe Chen† Yoshinori Kurokawa‡

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**Abstract**

Past evidence on exchange rates and exports implies that nominal exchange rates might not matter for the extensive margin of exports. Using Chinese firm-product data during 2000-2006, however, this paper finds that the effect of nominal exchange rates on exporter numbers is significant and even comparable with that of tariffs. The effects are larger for processing trade, low income destinations, and differentiated products. Financial constraints are a factor that significantly enlarges the effect of nominal exchange rates on exporter numbers.

*JEL classification:* F12, F14, F31

*Keywords:* exchange rates, tariffs, extensive margin of exports, financial constraints, China

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†School of International Trade and Economics, University of International Business and Economics. 1302 Boxue Building, 10 Huixin Dongjie, Chaoyang District, Beijing 100029, China. E-mail: zhechen@uibe.edu.cn.

‡Faculty of Humanities and Social Sciences, University of Tsukuba. 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8571, Japan. E-mail: kurokawa.yoshi.fw@u.tsukuba.ac.jp.

# 1 Introduction

One observation about recent China is that more and more Chinese firms have been entering foreign markets. Another observation is that China has faced significant changes in both tariffs, charged by trade partners, and nominal exchange rates in recent years (see Figure 1). These observations suggest that both tariffs and nominal exchange rates might significantly affect the number of China's exporters—the extensive margin (EM) of China's exports.

Theoretically, the answer is yes. The introduction of nominal exchange rates and sticky wages into the Melitz (2003) model predicts that the EM of exports can respond to not only trade liberalization but also nominal exchange rates (e.g., Rodríguez-López, 2011). Empirically, on the other hand, the answer might not be yes. The empirical literature has generally found that the effect of nominal exchange rates on exports is limited unlike that of real exchange rates (e.g., Baxter and Stockman, 1989). Moreover, Fitzgerald and Haller (2018) argue that even real exchange rates have a much less important effect on the EM of exports than tariffs. Thus nominal exchange rates might not matter for the EM of exports. However, China is the largest developing country with a managed floating rate system, which is a unique case compared with the cases analyzed by the above empirical studies. It is thus important to investigate whether this argument is valid for China.

Based on this background, we now use Chinese firm-product annual data from 2000 to 2006 with 138 trade partners to test whether the number of China's exporters—the EM of China's exports—responds to both changes in tariffs and changes in nominal exchange rates. The benchmark results support the theoretical prediction. Overall, changes in tariffs and nominal exchange rates have comparable effects on exporter numbers at the product level. Specifically, if the tariffs decrease by 1 standard deviation, the exporter numbers would increase by 0.071 standard deviation. If the nominal exchange rates depreciate by 1 standard deviation, the exporter numbers would increase by 0.249 standard deviation. We further construct another measurement of the EM of exports that is based on China's export variety numbers of a product. We find that if the tariffs decrease by 1 standard deviation, the export variety numbers would increase by 0.043 standard deviation. If the nominal exchange rates depreciate by 1 standard deviation, the export variety numbers would increase by 0.351 standard deviation. In sum, our paper finds strong evidence that the changes in nominal exchange rates affect the EM of exports in terms of both exporter numbers and export variety numbers and that the effect of nominal exchange rates is even larger than that of tariffs in terms of standard deviation. These findings are different from some past evidence (e.g., Fitzgerald and Haller, 2018) suggesting that tariffs are much more important than exchange rates for the EM of exports.

We further perform several robustness checks. We find that the benchmark results are robust for main trade partners, quarterly data, and real exchange rates. When we restrict our sample to positive trade flows, the coefficient on tariffs remains significant while that on nominal exchange rates becomes insignificant. This finding indicates that nominal exchange rates have a larger effect on new export product-destination pairs. In addition, we find that the effects of tariffs and nominal exchange rates are larger for processing trade, low income destinations, and differentiated products.

Then we provide a possible explanation for our results. We suggest the financial constraints (FCs) of exporters as a possible factor that might enlarge the impact of nominal exchange rates on China's exporters at the product level. As mentioned by Héricourt and Poncet (2015), exchange rate risk creates uncertainty for the variable costs of exporters and therefore FCs can disable exporters from hedging exchange rate risk, magnifying the negative effect on exports. As pointed out by Foley and Manova (2015), developing countries usually suffer from weak financial institutions. Our product-level results show that the interaction terms between the nominal exchange rates and the FC index are positive and significant, while the interaction terms between the tariffs and the FC index are negative but insignificant. This suggests that the impact of nominal exchange rates on China's exporters are more significant for financially constrained products.

Finally, we discuss implications from our results on trade elasticity. We particularly compare our product-level elasticities of the EM of exports with elasticities estimated by other studies. The comparisons reveal that our trade cost elasticities are smaller than and our real exchange rate elasticities are similar to others.

The contributions of our paper are fivefold. First, our paper contributes to the literature on tariffs vs. exchange rates. There are studies that have empirically investigated the responses of firms or exporters to trade liberalization vs. exchange rates (e.g., Baggs et al., 2009; Fitzgerald and Haller, 2018). Motivated by Feenstra's (1989) symmetric hypothesis,[1] Baggs et al. (2009) (BBF) use Canadian industry-firm annual data and find that the overall effect of the real exchange rate changes on Canadian firm survival/exit is comparable to that of the Canada-U.S. Free Trade Agreement (CUSFTA) tariff changes. Fitzgerald and Haller (2018) (FH) use Irish firm-product annual data and find that tariffs are much more important than real exchange rates for Irish exporters. While our nominal results are in line with the real results by BBF and FH in that the ordinary least squares (OLS) coefficient on exchange rates is smaller than that on tariffs, we also show the results based on standardized beta coefficients[2] to more appropriately estimate the relative importance of exchange rates to tariffs. In addition, FH and BBF both provided evidence for developed countries, our paper for the developing country China. Therefore, our paper is a satisfactory complement to the existing literature.

Second, our paper contributes to the literature on nominal exchange rates and exports. Although past aggregate-level evidence has found that nominal exchange rates do not affect exports significantly, some recent studies at the firm-level find the significant effect of nominal exchange rates. Using Japanese firm-level data, Dekle and Ryoo (2007) find the significant effect on the export quantities of firms. Corsetti et al. (2019) use Chinese customs data to show the significant effect on the markups of exporters. Our paper now adds to this literature by first showing that nominal exchange rates significantly affect the EM of China's exports such as exporter numbers and export variety numbers.

Third, our study contributes to the literature on the effect of exchange rates on the EM of China's exports. Some past studies (e.g., Tang and Zhang, 2012; Li et al., 2015) also showed the significant effect of exchange rates on China's exporters. However, our paper, the different version from these studies, is necessary. We mainly look at the effect of exchange rates on exporter numbers at the product-destination level, whereas these studies mainly examine the effect on firms' entry & exit decisions. In addition, one interest of our paper is to investigate the heterogeneous effects of exchange rates across different sectors/products, destinations,

[1] Feenstra (1989) theoretically argues that the responses of the import price to tariffs and exchange rates are symmetric, and empirically verifies this argument using U.S. import prices of Japanese cars, trucks, and motorcycles.

[2] The standardized beta coefficient standardizes the OLS coefficient to capture the change in standard deviation units of the dependent variable in response to a one standard deviation increase in the independent variable.

and trade modes. These past studies are interested in the heterogeneous effects across firms. We think that it would be important to investigate differences in sectors/products as well as those in firm productivity.[3]

Fourth, our paper contributes to the growing empirical evidence on FCs and trade. One set of studies analyzes the effect of FCs on exporters. Manova (2013) introduces financial frictions into the Melitz (2003) model and applies it to aggregate trade data for a large panel of countries. She finds that both the EM and intensive margin (IM) are affected by credit constraints. Using Chinese firm-level data, Li and Yu (2009) find that firms that are more capable of obtaining external finance have higher levels of exports. Another set of studies extends the argument by adding exchange rates. There are studies that empirically show that the effect of exchange rates on trade can be larger for firms/industries that are more financially constrained. For example, Héricourt and Poncet (2015), Strasser (2013), and Dekle and Ryoo (2007) show firm-level evidence for China, Germany, and Japan, respectively. Chen et al. (2020) show industry-level evidence for China. In this line, our paper now adds the product-level evidence for China. While Chen et al. (2020) highlight the effect of FCs on the relationship between exchange rate risk and trade mode choice, our paper highlights that on the relationship between nominal exchange rates and the EM of exports.

Finally, our paper makes contributions to the literature on trade elasticity, in particular, the elasticity of EM with respect to trade costs or exchange rates. Our elasticity of exporter numbers with respect to trade costs is 1.031; that with respect to nominal exchange rates 0.113; and that with respect to real exchange rates 0.112. Our results also imply that the elasticity of export variety numbers with respect to trade costs is 0.336; that with respect to nominal exchange rates 0.0873; and that with respect to real exchange rates 0.107. Our trade cost elasticities are smaller than past estimates (Bas et al., 2017; Feenstra and Kee, 2007), whereas our real exchange rate elasticities are similar to past estimates (Tang and Zhang, 2012; Colacelli, 2010). To our knowledge, no past studies have estimated the nominal exchange rate elasticity of exporter numbers or export variety numbers.

The rest of this paper is organized as follows. Section 2 provides theoretical motivation for our empirical question. Section 3 documents the regression specification and data. Section 4 reports the regression results and robustness checks and provides a possible explanation for

[3] Fan et al. (2019), for example, also point out the heterogeneous effects of China's trade liberalization across sectors.

our results. Section 5 discusses some implications from our results. Section 6 concludes.

# 2 Theoretical Motivation

We provide a theoretical motivation for our empirical analysis on the relationship between trade costs/nominal exchange rates and the EM of exports. Rodríguez-López (2011) introduces nominal exchange rates and sticky wages to the Melitz (2003) model of heterogeneous firm trade. First, he introduces the exogenous nominal exchange rates defined as the price of the foreign currency in terms of the home currency (e.g., China's yuan per U.S. dollar). Second, he assumes that nominal wages are fixed in the home currency. Then the model shows that the number of exporters—the EM of exports—in an industry can respond to a change in nominal exchange rates, like the Melitz (2003) model shows that it can respond to a decrease in trade costs—trade liberalization. The intuitions are straightforward. A decrease in trade costs would make exports more profitable for firms, and thus encourage more firms entering foreign markets. Similarly, an increase in nominal exchange rates—depreciation—would decrease the production costs for firms, given the sticky wage, and thus force more firms entering foreign markets.

As shown by the Rodríguez-López (2011) model, nominal exchange rates can affect the firm-level exports and thereby the number of exporters in an industry. Empirical studies (e.g., Dekle and Ryoo, 2007; Strasser, 2013; Chen et al., 2020), however, show/imply that the effect of nominal exchange rates is different across firms/industries. One factor that can lead to differences in the effect of exchange rates is FCs.[4] Héricourt and Poncet (2015) mention that exchange rate risk creates uncertainty for the variable costs of exporters. Then FCs can disable exporters from hedging exchange rate risk, magnifying the negative effect on exports. This argument implies that the effect of nominal exchange rate changes can be larger for firms/industries that are more financially constrained. In fact, for the firm level, Strasser (2013) finds that financially constrained German firms have higher levels of exchange rate pass-through than those that are not financially constrained and that the effect of exchange rates on the expected export volumes of financially constrained firms is twice as large as that of firms that are not. Dekle and Ryoo (2007) find that financially constrained

[4]Foley and Manova (2015) have a detailed literature survey about how financial frictions shape multinationals' export decisions.

Japanese firms have higher elasticities of export volumes with respect to exchange rates than those that are not. For the industry level, Chen et al. (2020) find that Chinese firms choose the pure assembly trade mode to mitigate exchange rate fluctuations and the pattern is more pronounced for firms in liquidity-constrained industries and mitigated by better local financial development.

In this paper, we investigate the effect of trade costs/nominal exchange rates on exporter numbers at the product level. Thus, the theoretical arguments described above yield two hypotheses, which we will explore empirically:

(a) An increase in nominal exchange rates—depreciation—causes an increase in exporter numbers (the EM of exports) at the product level as does a decrease in trade costs.

(b) FCs enlarge the effect of nominal exchange rates on exporters at the product level.

# 3 Regression Specification and Data

We now present the regression specification to empirically test the two hypotheses in the previous section using comprehensive Chinese export data at the product-country-year level.

## 3.1 Regression Specification

### 3.1.1 Exporter Numbers and Export Value/Quantity per Exporter

First, we investigate the responses of exporter numbers to trade costs and nominal exchange rates. The regression specification is as follows:

$$\begin{aligned} \ln(E_{ijt}) = \; & \alpha_0 + \alpha_1 \ln(1 + Tariff_{ijt}) + \alpha_2 \ln(NER_{jt}) + \alpha_3 \ln(Relative\ CPI_{jt}) \\ & + Processing_{ijt} + S_{it} + Z_{jt} + \rho_i + \theta_j + \eta_{kt} + \epsilon_{ijt} \end{aligned} \tag{3.1}$$

Here, $E_{ijt}$ is the number of exporters of product $i$ from China to country $j$ at time $t$. $Tariff_{ijt}$ is the import tariff of product $i$ charged by country $j$ at time $t$. We use $1 + Tariff_{ijt}$ to proxy trade costs (this way is the same as that in previous studies, such as Bas et al., 2017; Fitzgerald and Haller, 2018). $NER_{jt}$ is the nominal exchange rate, which is defined as China's yuan per currency of country $j$ at time $t$; thus, when $NER_{jt}$ increases (decreases), China's yuan depreciates (appreciates). Notably, using nominal exchange rates in our estimation is not only from the theoretical demand, but also from the methodological consideration. As also pointed out by Corsetti et al. (2019), using real exchange rates in the estimation implicitly imposes a one-to-one linear relationship between nominal exchange rates and the Consumer Price Index (CPI) ratio. This restriction, however, may not be true. Thus we relax this restriction and decompose real exchange rates into two parts: nominal exchange rates and the relative CPI. The relative CPI is defined as the CPI ratio between country $j$ and China; thus, when the relative CPI increases, the inflation in country $j$ is larger than that in China. As explored by previous studies (e.g., Yu, 2015; Dai et al., 2016; Marquez and Schindler, 2007), the trade mode would affect Chinese exporters' behaviors; thus, we use the processing trade dummy,[5] $Processing_{ijt}$, to capture the heterogeneity between trade modes. The same kind of product could be exported under both trade modes: processing and ordinary trade modes. We thus divide the same product into the processing traded product and the ordinary traded product, and calculate exporter numbers for each. Accordingly, the dummy is 1 for the former and 0 for the latter.

Before China's entry to the WTO in 2001, only eligible firms were allowed to export directly.[6] Thus, some firms have to export through intermediaries (Ahn et al., 2011). As required by the WTO, China gradually relaxed the export requirements, and all firms were allowed to export directly after 2004. This policy change would affect the EM of exports from China. One way to take into account the export right issue is to control the eligible firm share (the ratio of eligible firms to all firms) at the product-year level.[7] We, however, cannot get the product-year-level share due to the data limitation. Instead we control the direct export share and its square at the product-year level, which are included in $S_{it}$. Following

[5] Processing trade refers to importing all or part of the raw and auxiliary materials and re-exporting the finished products after processing.

[6] Bai et al. (2017) discuss this export right issue at the firm level in details. Only firms, whose registered capital was above the requirement, were allowed to export directly. Ahn et al. (2011) also point out another export restriction: the export licensing system at the product level. By issuing the export licenses of crucial products, mostly agriculture and steel related products, Chinese government can control the exports of these products. Before China's entry to the WTO in 2001, there were 245 HS8 codes listed for trading license liberalization out of roughly 7000 HS8 codes. Though the export values of these products only accounted for 0.9 percent of total export values in 2000, this relaxation of export restriction might affect the EM of exports from China. Our main results remain robust even when we exclude these products.

[7] Bai et al. (2017) calculate the eligible firm share at the industry-year level. Since we use industry-year fixed effects to control the time-variant industry heterogeneity, the eligible firm share variable would be absorbed by the industry-year dummies.

Ahn et al. (2011), we identify intermediaries by firm names and calculate the direct export share defined as the ratio of export values by non-intermediary firms to total export values.

In addition, the macroeconomic situation in country $j$ could affect the demand of Chinese goods, and thus we control for ln(GDP), ln(GDP per capita), and ln(Trade) in country $j$ at time $t$, which are included in $Z_{jt}$, to capture these demand shocks. The trade index is defined as the sum of exports and imports of goods and services measured as a share of GDP.

Finally, we control for the product fixed effect $\rho_i$, country fixed effect $\theta_j$ and industry-time fixed effect $\eta_{kt}$. Here, industry $k$ is defined at the HS2 level. We use the industry-time fixed effect to capture the demand shock of industry $k$ at time $t$. The independent variables that we are interested in are tariffs at the product-country-year level and nominal exchange rates at country-year level. Thus, we cluster the regression at the country-year level. If $\alpha_1$ is negative and $\alpha_2$ is positive, then the hypothesis (a) is supported. When tariffs decrease and China's yuan depreciates, the EM of exports increases.

Using the same regression specification, we also empirically investigate the responses of export value/quantity per exporter—the IM of exports—at the product-country-year level. In that case, $E_{ijt}$ is the export value/quantity per exporter of product $i$ from China to country $j$ at time $t$.

#### 3.1.2 Entry and Exit of Exporters

A change in exporter numbers could be caused by entry or/and exit of exporters. We also investigate the responses of the entry and exit of exporters to tariffs and nominal exchange rates, respectively. If the export value of a firm is 0 in year $t-1$ but positive in year $t$, then we consider this firm as a new exporter in year $t$. If the export value of a firm is positive in year $t-1$ but 0 in year $t$, then we consider this firm as an exit exporter in year $t$. We normalize the number of new (exit) exporters by the total number of exporters of product $i$ from China to country $j$. In particular, we normalize the new exporter numbers in year $t$ by the total number of exporters in year $t$ while we normalize the exit exporter numbers in year $t$ by the total number of exporters in year $t-1$. Thus, the sample sizes are different between entry and exit regressions.[8] The regression specification is as follows:

$$\begin{aligned}\ln(EN_{ijt}) = \ & \beta_0 + \beta_1 \ln(1 + Tariff_{ijt}) + \beta_2 \ln(NER_{jt}) + \beta_3 \ln(Relative\ CPI_{jt}) \\ & + Processing_{ijt} + S_{it} + Z_{jt} + \rho_i + \theta_j + \eta_{kt} + \mu_{ijt}\end{aligned} \tag{3.2}$$

Here, the regression specification is similar to equation (3.1). The only difference is that $EN_{ijt}$ now is the normalized number of new (exit) exporters of product $i$ from China to country $j$ at time $t$. When $EN_{ijt}$ is the normalized number of new exporters, if $\beta_1$ is negative and $\beta_2$ is positive, then a decrease in tariffs and China's yuan depreciation cause additional Chinese firms to enter foreign markets. When $EN_{ijt}$ is the normalized number of exit exporters, if $\beta_1$ is positive and $\beta_2$ is negative, then a decrease in tariffs and China's yuan depreciation cause less Chinese firms to quit foreign markets.

### 3.1.3 Export Variety Numbers

The growth of exports is not only driven by more exporters but also by more export product varieties. We construct another measurement of the EM of exports that is based on the export variety numbers of a product. We define the product category at the HS4 level and then use the number of HS6 product varieties within HS4 category from China to country $j$ as the measurement of the EM of exports. The regression specification is as follows:

$$\begin{aligned}\ln(EV_{ijt}) = \ & \gamma_0 + \gamma_1 \ln(1 + Tariff_{ijt}) + \gamma_2 \ln(NER_{jt}) + \gamma_3 \ln(Relative\ CPI_{jt}) \\ & + Processing_{ijt} + S_{it} + Z_{jt} + \rho_i + \theta_j + \eta_{kt} + \nu_{ijt}\end{aligned} \tag{3.3}$$

Here, $EV_{ijt}$ is the number of HS6 product varieties within each HS4 category $i$ from China to country $j$. The independent variables are the same as equation (3.1). If $\gamma_1$ is negative and $\gamma_2$ is positive, then a decrease in tariffs and China's yuan depreciation increase China's export variety numbers of a product.

[8] We also use other definitions of new and exit exporters as robustness checks. If a firm never exported in previous years and year $t$ is the first year in which this firm exports, then we consider this firm as a new exporter in year $t$. If a firm quits foreign markets in year $t$ and never returns to foreign markets, then we consider this firm as an exit exporter in year $t$. The results for these new definitions are robust. Note, however, our dataset is from 2000 to 2006 and thus the new definitions are not accurate for an exporter that actually enters or exits foreign markets beyond this period.

### 3.1.4 Financial Constraints

As implied by the hypothesis (b) in Section 2, the responses of the EM of exports to tariffs and nominal exchange rates might also be different depending on product-level FCs. FCs can enlarge the responses of exporter numbers to tariffs and nominal exchange rates at the product level. The regression specification is as follows:

$$\begin{aligned} \ln(E_{ijt}) = \; & \alpha_0 + \alpha_1 \ln(1 + Tariff_{ijt}) + \alpha_2 \ln(NER_{jt}) + \alpha_3 \ln(Relative\ CPI_{jt}) \\ & + \alpha_4 \ln(1 + Tariff_{ijt}) \times FC_i + \alpha_5 \ln(NER_{jt}) \times FC_i \\ & + Processing_{ijt} + S_{it} + Z_{jt} + \rho_i + \theta_j + \eta_{kt} + \nu_{ijt} \end{aligned} \tag{3.4}$$

Here, $E_{ijt}$ is the number of exporters of HS6 product $i$ from China to country $j$ at time $t$. $FC_i$ is the FC index of product $i$. Other independent variables are the same as equation (3.1). If $\alpha_4$ is negative and $\alpha_5$ is positive, then the responses of exporter numbers to tariffs and nominal exchange rates are larger for the more financially constrained products.

## 3.2 Data

The nominal exchange rate and CPI data are from the International Monetary Fund (IMF) at the annual level. The macroeconomic data (GDP, GDP per capita, and trade values) are from World Bank at the annual level. The tariff data is from the United Nations Conference on Trade and Development (UNCTAD)—Trade Analysis Information System (TRAINS). The tariffs of each HS6 level product charged by each country are at the annual level. In this study, we use the effectively applied (AHS) tariff, which is defined as the lowest available tariff. In most cases, AHS tariffs are the same as most-favored nation (MFN) tariffs. In rare cases, however, AHS tariffs are lower than MFN tariffs, which indicates that China has a trade agreement with these products. China's export data is from their customs agency at the transaction level. We aggregate these transactions to the firm-product-country-year level. Thus, we have the number of exporters and export value/quantity per exporter for each HS6 product. The HS code changed in 2002 at the HS6 level. In order to keep the product category consistent, we firstly aggregate the product to the HS6 level and then convert all products to HS1996 by using the concordance between HS2002 and HS1996. The FC data is from the U.S. Compustat dataset at the firm level. We aggregate them to the 4-digit

Standard Industrial Classification (SIC) level. We then map these SIC codes to the HS6 level. Thus, the FC data is at the HS6 level. The sample period is from 2000 to 2006.

Table 1 presents the data summary, which merges the tariff, exchange rate, export and macroeconomic datasets. The first part of Table 1 demonstrates that both the exporter numbers and the export destination numbers increased over time. From 2000 to 2006, the exporter numbers increased by 197 percent and the destination numbers increased by 35 percent. The exported product numbers were almost constant. The second part of Table 1 shows that the export values share of direct trade increased from 67 percent to 79 percent. After the export right reform, more exporters began to export directly.

The third part of Table 1 demonstrates that the tariffs, charged by partners, decreased over time.[9] In 2000, the simple average tariffs were 9.47 percent, and in 2006 the tariffs were 7.96 percent. In addition, we divide trade partners into two groups: high income and low income destinations. The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. The simple average tariffs of the high income destinations decreased by 13 percent and those of the low income destinations decreased by almost 27 percent from 2000 to 2006. Figure 2 shows the average evolution of tariffs charged by China's selected trade partners. The selected trade partners are China's top 21 export destinations minus Hong Kong and Singapore. The tariffs charged by Hong Kong and Singapore are almost zero, and thus we exclude these two destinations from our analysis. Germany, Netherlands, United Kingdom (UK), Italy, France, Spain, and Belgium are members of European Union (EU) during the sample period and charge the same tariffs, and thus we use EU to represent them. The average log deviation of gross tariff from 2000 was stable for high income destinations.[10] However, this index decreased sharply for low income destinations, in particular India and Thailand. The pattern is similar to that of Table 1. Liu and Ma (2020) find that the reductions in foreign tariffs on China's exports favored processing exports. We confirm it in our data. The weighted AHS tariffs is much smaller in processing trade than that in ordinary trade. From 2000 to 2006, the tariff reduction for processing trade was 34 percent and that for ordinary trade was 31 percent.

[9] Table 1 shows the average of tariffs, calculated by us, over the destinations included in our merged dataset, while Figure 1 shows the average of tariffs, calculated by TRAINS, over all the destinations included in the original tariff dataset.

[10] We use coefficients on year dummies in country-by-country regression of $\ln(1 + Tariff)$ on HS6 fixed effects and year dummies.

The fourth part of Table 1 and Figure 1 demonstrate the time trend of China's nominal effective exchange rates (NEERs). After China's WTO accession in 2001, the NEERs decreased until 2005—depreciation. On July 21, 2005, the People's Bank of China announced a revaluation of the yuan and a reform of the exchange rate regime. After 2005, the NEERs began to increase—appreciation—and did so until 2015.[11]

#### 3.2.1 Tariffs and Exchange Rates for Selected Trade Partners

In this section, we present more detailed data for tariffs and nominal exchange rates. Figure 3 shows the time trends of tariffs charged to China and nominal exchange rates for China's selected trade partners from 2000 to 2006. Here, Germany, Netherlands, Italy, France, Spain, and Belgium are labeled as Euro Area. The tariff data is at the annual level, and the exchange rate data is at the monthly level. The figures show that both tariffs and nominal exchange rates significantly changed during this period. In the case of Euro Area, for example, tariffs, charged by Euro Area, decreased and the yuan depreciated from 2002 to 2004. In the case of Japan, the tariffs charged by Japan decreased and the yuan first appreciated and then depreciated during the period 2001 to 2005. Thus the changes in both tariffs and nominal exchange rates might have contributed to the fast growth of Chinese exporter numbers.

#### 3.2.2 Product-level Financial Constraints

There are two ways to measure the dependence on external finance. Rajan and Zingales (1998) use the share of capital expenditure not financed by cash flow, and Raddatz (2006) uses the ratio of inventory to sales. As pointed out by Raddatz (2006), the first measurement is more of a long-term proxy. In this study, we examine the effect of exchange rates on exports, and we think that the exchange rate shocks are better to be considered as short-run financial shocks. Thus, we use the ratio of inventory to sales as a proxy for product-level FCs. First, we extract firm-level information from the U.S. Compustat dataset from 2000 to 2006 and calculate the industry median of the inventory to sales ratios at the 4-digit SIC level. Second, we map these SIC codes to HS6 level. Figure 4 presents the distribution of

[11] Here, an increase (decrease) in the NEERs means China's yuan appreciation (depreciation), whereas an increase (decrease) in the independent variable $NER$—defined as China's yuan per a foreign currency—means China's yuan depreciation (appreciation).

inventory/sales ratio across products. The mean is 17 percent and the standard deviation is 0.07.

# 4 Regression Results

We first show our regression results for the relationship between tariffs/nominal exchange rates and the EM of exports. We next perform their robustness checks. We finally provide a possible explanation for our results on the basis of FCs.

## 4.1 Exporter Numbers and Export Value/Quantity per Exporter

Table 2 presents the coefficients of equation (3.1), that is, the coefficients of the EM and IM of exports on tariffs and nominal exchange rates. Note that for some product-country-year triplets, the export flows are zero. Thus, we use $\ln(E_{ijt} + 1)$ in equation (3.1).[12] According to the hypothesis (a) in Section 2, a reduction in tariffs charged by trade partners and the depreciation of China's yuan would increase the number of China's exporters. The benchmark results in the column 1 verify the hypothesis. If the tariffs decrease by 1 percent, the exporter numbers would increase by 1.031 percent. If China's yuan depreciates by 1 percent, the exporter numbers would increase by 0.113 percent. The coefficient of the EM of exports on tariffs is larger than that on nominal exchange rates.

Table 2 also demonstrates that the reductions in tariffs and the depreciation of China's yuan stimulate the IM of exports from China. If the tariffs decrease by 1 percent, the export value per exporter would increase by 3.456 percent. If China's yuan depreciates by 1 percent, the export value per exporter would increase by 1.022 percent. The results are similar for the export quantity per exporter. If the tariffs decrease by 1 percent, the export quantity per exporter would increase by 2.478 percent. If China's yuan depreciates by 1 percent, the export quantity per exporter would increase by 0.699 percent. Again, the coefficient on tariffs is larger than that on nominal exchange rates.

In addition, Table 2 demonstrates that exports from China would expand when the inflations in export destinations are higher than that in China. Less exporters participate in

[12] Since the number of exporters is count data, following Silva and Tenreyro (2006), we also run the Pseudo Poisson maximum likelihood estimation for exporter numbers. The results are shown in Appendix A.2.

the processing trade mode, and their average export value/quantity is also smaller. GDP in the destination has a minor impact on exports, but GDP per capita has a positive and significant effect on exports. If the export destination has a higher trade/GDP ratio, both the EM and IM of exports are higher. Finally, the relationship between the direct export share and the EM (IM) of exports is inversely U-shaped. This implies that the EM (IM) of exports increases with the direct export share firstly, and then decreases with it.

One concern is that the coefficients on tariffs and nominal exchange rates cannot directly be interpreted as the relative importance of these two factors due to their heterogeneous variances. Thus, the column 2 reports the standardized beta coefficients based on the specification in the column 1. If the tariffs decrease by 1 standard deviation, the exporter numbers would increase by 0.071 standard deviation. If the nominal exchange rates depreciate by 1 standard deviation, the exporter numbers would increase by 0.249 standard deviation. For the IM of exports, we have the similar results. The beta coefficients indicate that the response of the EM of exports to nominal exchange rates is even much larger than that to tariffs in terms of standard deviation. Thus, nominal exchange rates have a significant effect on China's EM of exports. In this sense, our results are similar to BBF, who also point out the importance of exchange rates and argue that the overall effect of real USD/CAD changes was comparable to that of CUSFTA although the OLS coefficient of exchange rates is smaller than that of tariffs. In addition, the beta coefficient of the relative CPI is much smaller than that of nominal exchange rates. Thus, the effect of nominal exchange rates would dominate that of the relative CPI.

## 4.2 Entry and Exit of Exporters

In this section, we discuss the exporter dynamics in greater details. Exporter numbers depend on the entry of new exporters and the exit of incumbent exporters. Thus, we separately examine the responses. Again, we use $\ln(EN_{ijt} + 1)$ in equation (3.2) to solve the zero trade flows for some product-country-year triplets. The column 1 of Table 3 shows that the reductions in tariffs, charged by trade partners, increase not only entry but also exit of exporters. If the tariffs decrease by 1 percent, the new exporter numbers would increase by 0.080 percent and exit exporter numbers would increase by 0.073 percent. The coefficient of entry is larger than that of exit. Thus, the net response to the tariff reductions is an increase in the exporter numbers. At first sight, the results for exit might appear odd. In the Melitz model, a tariff reduction causes the entry of new exporters but does not cause the exit of incumbent exporters. As Feng et al. (2017) argue, however, an extended Melitz model can show that a tariff reduction increases both the entry and exit of exporters. This is because an increase in exporters due to the tariff reduction could increase the competition in foreign markets, forcing low productivity exporters to exit. Feng et al. (2017) also empirically document that the entry and exit of China's exporters increased following China's WTO accession in 2001. On the other hand, the column 1 of Table 3 shows that the changes of nominal exchange rates only affect entry but not exit of exporters. If China's yuan depreciates by 1 percent, new exporter numbers would increase by 0.032 percent and exit exporter numbers would, though insignificantly, increase by 0.017 percent.

To gauge the relative importance of the two factors, the column 2 reports the standardized beta coefficients based on the specification in the column 1. If the tariffs decrease by 1 standard deviation, new exporter numbers would increase by 0.022 standard deviation. If the nominal exchange rates depreciate by 1 standard deviation, the new exporter numbers would increase by 0.293 standard deviation. Thus, the response of new exporter numbers to nominal exchange rates is even much larger than that to tariffs in terms of standard deviation. If the tariffs decrease by 1 standard deviation, exit exporter numbers would increase by 0.02 standard deviation.

## 4.3 Export Variety Numbers

In this section, we discuss the responses to tariffs and exchange rates from the perspective of China's export variety numbers of a product. We use $\ln(EV_{ijt} + 1)$ in equation (3.3) to solve the zero trade flows for some product-country-year triplets. The column 1 of Table 4 shows that the reductions in tariffs, charged by trade partners, increase the export variety numbers of a product. If the tariffs decrease by 1 percent, the export variety numbers of a product would increase by 0.336 percent. If China's yuan depreciates by 1 percent, the export variety numbers of a product would increase by 0.087 percent. The column 2 reports the standardized beta coefficients based on the specification in the column 1. If the tariffs decrease by 1 standard deviation, the export variety numbers of a product would increase by 0.043 standard deviation. If the nominal exchange rates depreciate by 1 standard deviation, the export variety numbers of a product would increase by 0.351 standard deviation.

In sum, our benchmark results indicate that (1) changes in tariffs and nominal exchange rates significantly affect the EM of exports in terms of both the exporter numbers and the export variety numbers; (2) the changes of tariffs significantly affect both entry and exit of exporters while the changes of nominal exchange rates significantly affect the entry but not exit of exporters; (3) in particular, the response of the EM of exports to nominal exchange rates is much larger than that to tariffs in terms of standard deviation.

## 4.4 Robustness Checks

In this section, we examine whether trade modes, export destinations (high income vs. low income destinations; main trade partners), positive trade flows, data frequency, real exchange rates, and sectoral/product differences would affect the benchmark results.

**Trade Modes**

In processing trade, exporters import all or part of materials and re-export the assembled products. It is possible that the effect of an exchange rate appreciation on the export price of assembled products is canceled by the effect on the import price of the materials for assembly. Thus, the response to exchange rate fluctuations on processing trade is likely to be different from that on ordinary trade. We thus divide trade into two groups: ordinary and processing trade. The columns 3 and 4 of Table 2 show that the coefficients of the EM and IM of exports on tariffs and nominal exchange rates are larger for the processing trade. Thus, firms doing the processing trades are more responsive to the tariff and nominal exchange rate shocks. The columns 3 and 4 of Table 3 show the opposite results. The coefficients of entry and exit on tariffs and nominal exchange rate are higher in ordinary trade. In this study, however, we are more interested in the net effects on the EM of exports. Combining the results in Tables 2 and 3 reveals that, although the entry and exit of exporters in ordinary firms are more sensitive to tariffs and nominal exchange rates, the net effects are larger in the processing trade. The columns 3 and 4 of Table 4 show that the change of tariffs mainly affects the export variety numbers of a product in processing trade while the change of nominal exchange rates mainly affects the export variety numbers of a product in ordinary trade. In sum, the responses of exports in two trade modes to the changes of tariffs and nominal exchange rates are mixed.

The difference in the effects of tariffs and nominal exchange rates between trade modes could be due to the different distributions of products and destinations. Most products in processing trade were electrical equipment (30.2 percent of total export values) and mechanical appliances (27.5 percent), and the major export destinations in processing trade were high-income countries (USA 35.6 percent and JPN 18.2 percent). On the other hand, the exported products and destinations in ordinary trade were more diverse.

For the different effects of tariffs on exporter numbers in processing and ordinary trade, there are two more possible explanations. First, similar to our results, Liu and Ma (2020) also find that the reductions in foreign tariffs on China's exports favored processing exports. They argue that the results are driven by the fact that relative to ordinary producers, processing producers were more concentrated in sectors that experienced large export tariff reductions. We confirm it in our table 1. Second, processing firms import intermediate inputs and capital equipment duty free but are not allowed to sell the resulting output on the domestic market. On the other hand, ordinary firms are required to pay tariffs on imports but are then free to sell the resulting output on the domestic market. That is, all products of processing firms are exported, whereas not all products of ordinary firms are exported. Ordinary firms have more room to absorb tariff shocks while processing firm are more sensitive to tariff changes. Thus this can be another possible reason why processing firms are more affected by a reduction in tariffs imposed by foreign countries.

**High Income vs. Low Income Destinations**

After China became a WTO member in 2001, the tariffs charged by trade partners, especially low income destinations, decreased considerably; for example, the comparison among India and high income destinations (Figure 2). Last two columns in Tables 2, 3 and 4 show that the results are mixed. In terms of the EM of exports (exporter numbers, new exporter numbers, exit exporter numbers, and export variety numbers), the coefficients for low income destinations are either larger than or similar to those for high income ones. In terms of the IM of exports (export value/quantity per exporter), the coefficients are larger for high income destinations.

**Main Trade Partners**

Our data covers about 138 destinations, many of which are small economies. The trade with these small economies might be significantly affected by unobservable factors other than tariffs and nominal exchange rates, such as political relationship.[13] Thus, we restrict our sample to the top 50 partners for robustness checks. The export value with these partners is about 97.6 percent of China's total export value from 2000 to 2006. The results in the column 1 of Table 5 show that our main findings are still robust.

**Positive Trade Flows**

For some product-country-year triplets, the trade flows are zero. Thus, in our regression specifications, we add a small constant (1) to the value of trade before taking logarithms, which might yield inconsistent results. In order to mitigate this concern, we restrict our sample to the product-country pairs that appear in the whole period (2000-2006). The export value in the positive trade flows is about 87 percent of that of the full sample. The column 2 of Table 5 shows the results. For the continuing product-country pairs, the coefficient on tariffs is smaller than that for the benchmark, and the coefficient on nominal exchange rates is not significant. This result indicates that the tariffs and nominal exchange rates have a larger effect on the new product-country pairs than the continuing product-country pairs. The appreciation/depreciation of exchange rate would significantly affect Chinese firms to build new product-destination trade relationship, but it would not affect the exporter numbers in existing product-destination trade relationship.

**Quarterly Data**

The tariffs are at the annual level. In order to be consistent with tariffs, we also use the annual nominal exchange rates. However, the fluctuations of the annual exchange rate data might be small. Thus, we perform robustness checks with the quarterly nominal exchange

[13] We also discuss other unobservable shocks in Appendix A.3.

rate data.[14] We conduct a stacked regression as follows:

$$\begin{aligned}\ln(E_{ijt}) = \; & \alpha_0 + \alpha_1 \ln(1 + Tariff_{ijt}) + \sum_{h=0}^{3} \alpha_{2h} \ln(NER_{jt-h}) + \alpha_3 \ln(\textit{Relative CPI}_{jt}) \\ & + Processing_{ijt} + S_{it} + Z_{jt} + \rho_i + \theta_j + \eta_{kt} + \epsilon_{ijt}\end{aligned} \tag{4.1}$$

Here, $\sum_{h=0}^{3} \alpha_{2h}$ measures the response to exchange rate fluctuations over the current and last three quarters. The column 3 of Table 5 demonstrates that the coefficient of nominal exchange rates remains robust for the EM of exports. However, the coefficients for the IM of exports are not significant.

**Real Exchange Rates**

The nominal and real exchange rates present very different movements in the United States from 2000-2006 (Figure A1 in Appendix A.1). Motivated by this observation, we perform robustness checks with the real exchange rates. Table 6 presents the results with the real exchange rates. Notably, the results are qualitatively similar to those for nominal exchange rates. As we have pointed out in Section 4.1, the beta coefficients indicate that the impact of nominal exchange rates dominates that of the relative CPI between China and a trade partner. Thus the impacts of nominal and real exchange rates are qualitatively similar, and the relative CPI has a limited effect.

**Sectoral/Product Differences**

The responses of the EM of exports to tariffs and nominal exchange rates might be different across sectors/products. In this section, we firstly examine the responses by China's top 10 export sectors at the HS2 level, which account for 66 percent of China's exports. These sectors are Electrical equipment (21.9 percent), Mechanical appliances (18.1 percent), Apparel, not knitted or crocheted (5.4 percent), Apparel, knitted or crocheted (4.5 percent), Optical instruments (3.1 percent), Furniture (3 percent), Toys and sports requisites (2.8 percent), Mineral products (2.5 percent), Footwear (2.5 percent), and Iron or steel (2.4 percent). The numbers in parentheses are ratios of exports in each sector relative to all exports from China from 2000 to 2006. Table 7 shows that the responses are different across sectors. The coeffi-

[14] Naknoi (2015) investigates the EM of exports using the quarterly U.S. bilateral trade data.

cient of exporter numbers on tariffs is significant in 7 sectors and that on exchange rates is also significant in 7 sectors.

Second, we test whether the responses of the EM of exports to tariffs and nominal exchange rates would be larger or smaller for differentiated products. The results in Table 8 show that the responses are larger for the differentiated products. First, following the classification from Rauch (1999), we divide products into two groups: homogeneous and differentiated products. Rauch (1999) defines the product at the SITC4 level, and we convert all products to HS6 using the concordance between HS1996 and SITC4. The columns 1 and 2 of Table 8 present the results. We find that the coefficients on tariffs and nominal exchange rates are larger for the differentiated products. Second, following Broda and Weinstein (2006) and Broda et al. (2008), we use the elasticity of product to measure the differentiation. We get the export elasticity of product at the HS4 level for China from Broda et al. (2008).[15] The elasticity is higher, the differentiation level is lower. The columns 3 and 4 of Table 8 present the results. Again, the coefficients on tariffs and nominal exchange rates are larger for the lower elasticity products, that is, the more differentiated products. These results are in line with some other empirical findings. Yi and Biesebroeck (2012) show, using data for China's imports from 129 countries during the period 2001–2006, that the response to tariffs of the EM of exports to China is higher for differentiated goods than for homogeneous goods. Colacelli (2010) find, using 136 countries' bilateral export data during the period 1981–1997, that the response to exchange rates, though real, of the EM of exports is higher for differentiated goods.

Our results are consistent with the Besedeš and Cole (2017) model. They introduce ad valorem tariffs and a government to the Chaney (2008) model, which is the asymmetric-country version of the Melitz (2003) model. Then their model shows that the effect of a decrease in ad valorem tariffs on exporter numbers is larger in an industry with the lower elasticity of substitution between varieties, that is, in the more differentiated industry. Analogously, the model implies that the effect of an increase in nominal exchange rates—depreciation—on exporter numbers is larger in the more differentiated industry. The reason is the following. When tariffs decrease, the cutoff productivity for exports decreases and thus low productivity firms enter the export market. If the elasticity of substitution is lower, each firm is more

[15] Broda et al. (2008) use HS6 import data from the COMTRADE database from 1994-2003 to estimate 4-digit import and export elasticities for 15 non-WTO countries including China.

sheltered from competition. Thus a tariff reduction enables more low productivity firms to enter the export market, decreasing the cutoff productivity more.[16]

### 4.5 An Explanation for Our Results: Financial Constraints

Our product-level results have shown that the number of China's exporters—the EM of China's exports—responded significantly to not only reductions in tariffs but also changes in nominal exchange rates. One possible factor that might be able to explain the significant impact of exchange rates on China's exporters is the nature of changes in Yuan. Ruhl (2008) argues that firms do not change their exporting status in response to temporary shocks while some firms do change it in response to permanent shocks. If changes of Yuan are "non-temporary", then China's exporters would respond to the nominal exchange rates. The volatilities of Yuan, USD, Euro and Japanese Yen against currencies of China's main trade partners are presented in Figure 5. Before July 2005, Chinese Yuan was fixed to USD. Thus, the volatility of Yuan was almost the same as that of USD in most years. Figure 5 shows that the volatility of Yuan against some currencies of high income countries (South Korea, UK, and Australia) was similar to that of Euro and Yen, while the volatility of Yuan against some currencies of low income countries (Malaysia, India, and Thailand) was smaller than that of Euro and Yen. Thus, Yuan is less volatile than Euro and Yen against currencies of low income countries. One possible reason for it is that many low income countries used USD as an anchor currency as China did. According to Ilzetzki et al. (2019), 112 countries use USD as an anchor in 2006 while only 55 countries use Euro as an anchor. The above observations are consistent with our result that the effect of nominal exchange rates on the EM of China's exports is larger for low income destinations. Thus this low volatility of Yuan relative to Euro and Yen for low income destinations might be a possible factor causing the significant effect of exchange rates for China. This is, however, a relative argument between Yuan and Euro/Yen, so we may argue that changes of Yuan are "less temporary" than those of Euro and Yen for low income destinations, but may not argue that changes of Yuan are "non-

[16] While the elasticity of substitution does not affect the elasticity of the export cutoff productivity with respect to iceberg transport costs in the Chaney (2008) model, it does affect the elasticity of the export cutoff productivity with respect to ad valorem tariffs in the Besedeš and Cole (2017) model. This is because tariff revenue is completely captured by the domestic government while firms can recoup a portion of their losses in transport through their monopolistic power.

temporary". Thus Ruhl's (2008) argument seems not to provide a satisfactory explanation for our findings.

Therefore, in order to rationalize our findings, motivated by the hypothesis (b) in Section 2 we now suggest the FCs of exporters as a more plausible factor that might enlarge the impact of exchange rates on China's exporters at the product level. Since China is a developing country and has weaker financial institutions than developed countries, the FCs of exporters is a factor that could not be neglected. Specifically, we examine whether the responses of China's exporters to tariffs and nominal exchange rates are dependent on the product-level FCs. The regression specification and data have been described in Section 3. After matching the custom data and FC data, we have one-third firms left which accounted for 53.33 percent of total export values from 2000 to 2006. Table 9 presents the coefficients of equation (3.4). Columns 1, 3 and 5 show the results of matched data are similar to the results of full sample in Table 2. Thus, there is no selection concern in the matched sample. Columns 2, 4 and 6 show that the interaction terms between the nominal exchange rates and the FC index are positive and significant, while the interaction terms between the tariffs and the FC index are negative but insignificant. This confirms our hypothesis: FCs enlarge the impact of nominal exchange rates on exporters at the product level.

# 5 Discussion: The Trade Elasticity

In Section 4, we have demonstrated that China's exports significantly respond to both tariffs and exchange rates. This is essentially a problem of the so-called "elasticity of trade".

First, we obtain the product-level elasticity of exports by summing the coefficient of exporter numbers and that of export value per exporter, at the HS6 level. According to the results in the column 1 of Table 2, the product-level elasticity of exports with respect to trade costs is 4.49 (1.031+3.456) and that with respect to nominal exchange rates is 1.14 (0.113+1.022). According to the results in the columns 1 and 2 of Table 6, the product-level elasticity of exports with respect to real exchange rates is 1.26 (0.112+1.145).

It should be, however, noted that our main interest has been particularly in the response of the EM of exports, not the response of exports overall. Thus, it is important to compare our results with the responses of the EM of exports to tariffs and exchange rates in the literature, although there are not many studies that estimated the elasticity of the EM of exports with respect to trade costs or exchange rates. We summarize the elasticities in our paper and other studies in Table 10.

We obtain the elasticity of the EM of exports by looking at the coefficient of exporter numbers or export variety numbers. Let us first focus on exporter numbers as a measurement of the EM of exports. According to the results in the column 1 of Table 2, the elasticity of exporter numbers with respect to trade costs is 1.031, and that with respect to nominal exchange rates is 0.113. According to the results in the column 1 of Table 6, the elasticity of exporter numbers with respect to real exchange rates is 0.112. On the other hand, the estimated elasticity of exporter numbers with respect to trade costs by Bas et al. (2017) is 3.83, which is much larger than ours. That with respect to real exchange rates by Tang and Zhang (2012) is 0.17, which is similar to ours in that both are less than 1. Note that while exporter numbers in our paper are at the product-destination-year level; those in Bas et al. (2017) are at the product-destination level focusing on the year 2000; and those in Tang and Zhang (2012) are at the destination-year level.

Let us next consider export variety numbers as a measurement of the EM of exports. According to the results in the column 1 of Table 4, the elasticity of export variety numbers with respect to trade costs is 0.336 and that with respect to nominal exchange rates is 0.0873. According to the results in Table 6, that with respect to real exchange rates is 0.107. According to the literature, on the other hand, the coefficient of export variety on tariffs by Feenstra and Kee (2007) is about 2, which is much larger than ours. That on real exchange rates by Colacelli (2010) is 0.045, which is similar to ours in that both are less than 1. Note that while export variety in our paper is at the product-destination-year level, that in Feenstra and Kee (2007) and Colacelli (2010) is at the destination-year level. Note also that our export variety numbers of a product directly measures the number of exported HS6 products within a HS4 product from China to a destination country while their measurements build on Feenstra's (1994) product variety.

In sum, our trade cost elasticities are smaller than and our real exchange rate elasticities are similar to estimates by other studies. To our knowledge, no past studies have estimated the elasticity of exporter numbers or export variety numbers with respect to nominal exchange rates.

# 6 Conclusion

Using China's firm-product data from 2000 to 2006 with 138 trade partners, we have tested whether the EM of China's exports respond to both trade liberalization and nominal exchange rates. Based on regressions, we have three main empirical findings. First, overall, changes in tariffs (charged by trade partners) and nominal exchange rates have comparable effects on exporter numbers—the EM of exports—at the product level. Second, the effects are larger for processing trade, low income destinations, and differentiated products. Finally, our results suggest FCs as a factor that can enlarge the impact of nominal exchange rates on China's exporter numbers at the product level.

The results presented in this paper are valuable, particularly for empirical studies on trade liberalization and the EM of trade. First, Kehoe and Ruhl (2013), for example, focused on increases in the EM of trade after trade liberalization or structural changes. Our results, however, indicate that the observed increases in the EM of trade could be caused by not only changes in tariffs but also changes in nominal exchange rates. Thus, future studies, in particular, on China's EM need to place more importance on exchange rates when investigating the changes in the EM of trade using firm data. Second, our results provide an important policy implication. China was a centrally-planned economy and adopted a U.S. dollar pegged exchange rate policy for a long period. Previous studies paid little attention to the effect of exchange rates on the EM of exports using Chinese data. China, however, allowed a managed float of its currency in July 2005 and became the largest trader in the world in 2012. It is thus important to examine the effect of exchange rates. In fact, our results indicate that foreign currency policy could be an effective tool if Chinese government would like to boost exports.

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Table 1: Data Summary

| Variables | Year 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| **Exporter, Product, and Destination** | | | | | | | |
| Exporter Numbers | 51,578 | 57,472 | 66,464 | 81,733 | 104,161 | 126,775 | 153,014 |
| Product Numbers | 4,526 | 4,566 | 4,555 | 4,593 | 4,573 | 4,567 | 4,596 |
| Destination Numbers | 93 | 117 | 124 | 117 | 111 | 116 | 126 |
| **Direct Trade Share** | 67% | 69% | 72% | 75% | 78% | 81% | 79% |
| **Tariffs Charged by Destinations (%)** | | | | | | | |
| —All Destinations | | | | | | | |
| (simple mean) | 9.47 | 9.48 | 9.16 | 8.56 | 8.23 | 8.18 | 7.96 |
| (standard deviation) | 12.75 | 11.73 | 11.42 | 10.82 | 11.45 | 10.15 | 10.05 |
| —High Income Destinations | | | | | | | |
| (simple mean) | 5.11 | 5.23 | 4.96 | 4.81 | 4.53 | 4.42 | 4.43 |
| (standard deviation) | 12.96 | 11.76 | 12 | 11.26 | 12.66 | 10.6 | 10.67 |
| —Low Income Destinations | | | | | | | |
| (simple mean) | 14.45 | 13.78 | 13.23 | 12.12 | 11.60 | 11.31 | 10.58 |
| (standard deviation) | 12.75 | 11.73 | 11.41 | 10.82 | 11.45 | 10.15 | 10.05 |
| **Tariffs Charged by Trade Modes (%)** | | | | | | | |
| —Processing Trade | | | | | | | |
| (weighted mean) | 4.27 | 4.45 | 4.01 | 3.26 | 3.02 | 2.83 | 2.81 |
| —Ordinary Trade | | | | | | | |
| (weighted mean) | 10.66 | 9.44 | 10.63 | 10.43 | 7.41 | 8.37 | 7.34 |
| **China's Nominal Effective Exchange Rate** | 93.18 | 98.35 | 97.92 | 91.88 | 87.68 | 87.26 | 89.23 |

Note: (a) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (b) China's nominal effective exchange rate index for 2010 is 100.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

## Table 2: Nominal Exchange Rates, Tariffs, and Exports

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Full Sample | Betas | Ordinary | Processing | High Income | Low Income |
| | ln(Exporter Numbers +1) | | | | | |
| ln(1+Tariff) | -1.031*** | -0.0708*** | -0.978*** | -1.107*** | -0.214 | -0.333*** |
| | (0.0814) | (0.00559) | (0.0915) | (0.0742) | (0.130) | (0.0640) |
| ln(NER) | 0.113** | 0.249** | 0.0940 | 0.171*** | 0.0512 | 0.133* |
| | (0.0547) | (0.120) | (0.0713) | (0.0513) | (0.0754) | (0.0766) |
| ln(Relative CPI) | 0.108* | 0.0109* | 0.0431 | 0.139** | 0.588*** | 0.133* |
| | (0.0612) | (0.00616) | (0.0830) | (0.0552) | (0.156) | (0.0757) |
| Processing Trade | -0.877*** | -0.335*** | | | -0.922*** | -0.883*** |
| | (0.0147) | (0.00561) | | | (0.0204) | (0.0208) |
| ln(GDP) | -0.216 | -0.354 | -0.351* | -0.613*** | -0.224 | 0.0706 |
| | (0.156) | (0.256) | (0.185) | (0.153) | (0.202) | (0.214) |
| ln(GDP per capita) | 0.420** | 0.517** | 0.556*** | 0.716*** | 0.247 | 0.154 |
| | (0.169) | (0.209) | (0.199) | (0.165) | (0.225) | (0.194) |
| ln(Trade) | 0.133*** | 0.0943*** | 0.139*** | 0.0372 | -0.101* | 0.225*** |
| | (0.0385) | (0.0273) | (0.0495) | (0.0324) | (0.0605) | (0.0406) |
| Direct Trade | 1.117*** | 0.220*** | 0.175*** | 0.437*** | 1.174*** | 0.790*** |
| | (0.0537) | (0.0106) | (0.0464) | (0.0539) | (0.0726) | (0.0508) |
| Direct Trade$^2$ | -1.138*** | -0.284*** | -0.170*** | -0.360*** | -1.176*** | -0.872*** |
| | (0.0449) | (0.0112) | (0.0434) | (0.0459) | (0.0614) | (0.0407) |
| Constant | -0.321 | 0.0109** | 0.0523 | 1.699*** | 2.255*** | -1.478 |
| | (0.681) | (0.00542) | (0.836) | (0.638) | (0.721) | (1.128) |
| Observations | 1,857,667 | 1,857,667 | 1,276,262 | 581,235 | 914,499 | 943,089 |
| R-squared | 0.574 | 0.574 | 0.644 | 0.565 | 0.666 | 0.523 |
| | ln(Export Value per Exporter + 1) | | | | | |
| ln(1+Tariff) | -3.456*** | -0.0503*** | -2.720*** | -4.167*** | -2.279*** | -1.484*** |
| | (0.299) | (0.00435) | (0.317) | (0.346) | (0.479) | (0.282) |
| ln(NER) | 1.022*** | 0.478*** | 0.970*** | 1.030** | 2.251*** | 1.271*** |
| | (0.321) | (0.150) | (0.311) | (0.403) | (0.556) | (0.386) |
| ln(Relative CPI) | 1.806*** | 0.0386*** | 1.764*** | 1.643*** | 2.674* | 1.700*** |
| | (0.385) | (0.00822) | (0.426) | (0.413) | (1.387) | (0.438) |
| Processing Trade | -1.813*** | -0.147*** | | | -1.322*** | -2.602*** |
| | (0.0513) | (0.00416) | | | (0.0643) | (0.0422) |
| ln(GDP) | -0.483 | -0.168 | -0.414 | -1.434 | 3.523** | -1.989 |
| | (1.075) | (0.374) | (1.099) | (1.239) | (1.479) | (1.368) |
| ln(GDP per capita) | 2.068* | 0.541* | 1.813 | 3.397** | -2.680 | 3.157** |
| | (1.162) | (0.304) | (1.158) | (1.387) | (1.737) | (1.289) |
| ln(Trade) | 1.659*** | 0.249*** | 1.651*** | 1.504*** | 1.222*** | 1.718*** |
| | (0.216) | (0.0325) | (0.233) | (0.220) | (0.429) | (0.230) |
| Direct Trade | 5.711*** | 0.238*** | 2.036*** | 5.624*** | 6.227*** | 4.222*** |
| | (0.217) | (0.00904) | (0.178) | (0.300) | (0.257) | (0.264) |
| Direct Trade$^2$ | -5.439*** | -0.289*** | -1.712*** | -4.471*** | -5.732*** | -4.358*** |
| | (0.173) | (0.00920) | (0.164) | (0.240) | (0.206) | (0.214) |
| Constant | -11.38*** | 0.00638 | -9.598** | -12.84*** | -17.43*** | -0.154 |
| | (4.107) | (0.00776) | (4.308) | (4.562) | (4.113) | (6.678) |
| Observations | 1,857,667 | 1,857,667 | 1,276,262 | 581,235 | 914,499 | 943,089 |
| R-squared | 0.283 | 0.283 | 0.339 | 0.316 | 0.336 | 0.270 |
| | ln(Export Quantity per Exporter + 1) | | | | | |
| ln(1+Tariff) | -2.478*** | -0.0456*** | -1.785*** | -3.527*** | -1.876*** | -0.982*** |
| | (0.227) | (0.00417) | (0.232) | (0.276) | (0.441) | (0.205) |
| ln(NER) | 0.699*** | 0.412*** | 0.624*** | 0.782*** | 1.563*** | 0.927*** |
| | (0.246) | (0.145) | (0.240) | (0.300) | (0.452) | (0.288) |
| ln(Relative CPI) | 1.324*** | 0.0357*** | 1.246*** | 1.291*** | 2.418** | 1.202*** |
| | (0.287) | (0.00773) | (0.307) | (0.318) | (0.975) | (0.317) |
| Processing Trade | -1.230*** | -0.126*** | | | -0.833*** | -1.851*** |
| | (0.0396) | (0.00405) | | | (0.0479) | (0.0322) |
| ln(GDP) | -0.202 | -0.0887 | -0.108 | -1.146 | 2.463** | -1.276 |
| | (0.790) | (0.347) | (0.787) | (0.941) | (1.077) | (0.996) |
| ln(GDP per capita) | 1.287 | 0.425 | 1.061 | 2.485** | -2.004 | 2.039** |
| | (0.865) | (0.286) | (0.844) | (1.057) | (1.279) | (0.956) |
| ln(Trade) | 1.115*** | 0.212*** | 1.104*** | 0.978*** | 0.744** | 1.153*** |
| | (0.156) | (0.0295) | (0.164) | (0.166) | (0.323) | (0.162) |
| Direct Trade | 3.870*** | 0.204*** | 1.261*** | 3.585*** | 4.396*** | 2.610*** |
| | (0.175) | (0.00922) | (0.128) | (0.224) | (0.211) | (0.200) |
| Direct Trade$^2$ | -3.866*** | -0.259*** | -1.051*** | -2.902*** | -4.184*** | -2.958*** |
| | (0.138) | (0.00925) | (0.117) | (0.181) | (0.167) | (0.160) |
| Constant | -7.793*** | 0.419*** | -6.732** | -7.627** | -10.26*** | 0.441 |
| | (2.920) | (0.0168) | (2.970) | (3.385) | (2.951) | (4.699) |
| Observations | 1,857,667 | 1,857,667 | 1,276,262 | 581,235 | 914,499 | 943,089 |
| R-squared | 0.354 | 0.354 | 0.427 | 0.356 | 0.403 | 0.344 |
| Product FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes | Yes |

Note: (a) The column 2 reports standardized beta coefficients from the column 1. (b) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (c) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 3: Nominal Exchange Rates, Tariffs, and Exporter Dynamics

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Full Sample | Betas | Ordinary | Processing | High Income | Low Income |
| | ln(Normalized New Exporter Numbers + 1) | | | | | |
| ln(1+Tariff) | -0.0795*** | -0.0222*** | -0.0774*** | -0.0636*** | -0.0305* | -0.0297** |
| | (0.0111) | (0.00310) | (0.0122) | (0.0125) | (0.0160) | (0.0124) |
| ln(NER) | 0.0321* | 0.293* | 0.0398* | 0.00926 | 0.0525* | 0.0719*** |
| | (0.0190) | (0.174) | (0.0208) | (0.0210) | (0.0317) | (0.0257) |
| ln(Relative CPI) | 0.108*** | 0.0368*** | 0.109*** | 0.0877*** | 0.0915 | 0.130*** |
| | (0.0262) | (0.00891) | (0.0323) | (0.0222) | (0.107) | (0.0339) |
| Processing Trade | -0.178*** | -0.279*** | | | -0.167*** | -0.198*** |
| | (0.00176) | (0.00276) | | | (0.00209) | (0.00228) |
| ln(GDP) | 0.0583 | 0.395 | 0.0737 | -0.0737 | 0.190* | -0.0842 |
| | (0.0659) | (0.446) | (0.0709) | (0.0663) | (0.101) | (0.0885) |
| ln(GDP per capita) | 0.0236 | 0.120 | 0.00132 | 0.172** | -0.125 | 0.125 |
| | (0.0690) | (0.353) | (0.0733) | (0.0743) | (0.117) | (0.0803) |
| ln(Trade) | 0.0719*** | 0.209*** | 0.0721*** | 0.0660*** | -0.00546 | 0.0931*** |
| | (0.0159) | (0.0463) | (0.0180) | (0.0136) | (0.0278) | (0.0184) |
| Direct Trade | 0.278*** | 0.220*** | 0.178*** | 0.250*** | 0.288*** | 0.237*** |
| | (0.00849) | (0.00671) | (0.0109) | (0.0155) | (0.0116) | (0.0120) |
| Direct Trade$^2$ | -0.264*** | -0.268*** | -0.163*** | -0.201*** | -0.268*** | -0.235*** |
| | (0.00689) | (0.00701) | (0.0103) | (0.0120) | (0.00960) | (0.00967) |
| Constant | -0.824*** | -0.00555 | -0.789*** | -0.730*** | -0.854*** | 0.0368 |
| | (0.275) | (0.00982) | (0.299) | (0.250) | (0.300) | (0.463) |
| Observations | 1,636,514 | 1,636,514 | 1,129,507 | 506,836 | 791,611 | 844,812 |
| R-squared | 0.182 | 0.182 | 0.179 | 0.105 | 0.202 | 0.188 |
| | ln(Normalized Exit Exporter Numbers + 1) | | | | | |
| ln(1+Tariff) | -0.0730*** | -0.0202*** | -0.0736*** | -0.0453*** | -0.0239* | -0.0235* |
| | (0.0110) | (0.00304) | (0.0124) | (0.0131) | (0.0132) | (0.0121) |
| ln(NER) | 0.0169 | 0.156 | 0.0264 | -0.00689 | 0.0475 | 0.0576* |
| | (0.0224) | (0.208) | (0.0227) | (0.0283) | (0.0291) | (0.0346) |
| ln(Relative CPI) | 0.00641 | 0.00202 | 0.00936 | -0.0187 | 0.0335 | 0.0107 |
| | (0.0273) | (0.00859) | (0.0279) | (0.0326) | (0.0898) | (0.0368) |
| Processing Trade | -0.168*** | -0.271*** | | | -0.159*** | -0.187*** |
| | (0.00190) | (0.00306) | | | (0.00224) | (0.00278) |
| ln(GDP) | 0.00960 | 0.0659 | 0.0294 | -0.0991 | 0.150 | -0.143 |
| | (0.0650) | (0.447) | (0.0674) | (0.0758) | (0.101) | (0.0909) |
| ln(GDP per capita) | 0.0316 | 0.164 | 0.00804 | 0.148 | -0.0946 | 0.127 |
| | (0.0751) | (0.389) | (0.0754) | (0.0928) | (0.115) | (0.0846) |
| ln(Trade) | 0.0114 | 0.0339 | 0.00880 | 0.0140 | 0.00922 | 0.00709 |
| | (0.0137) | (0.0408) | (0.0150) | (0.0148) | (0.0234) | (0.0168) |
| Direct Trade | 0.190*** | 0.153*** | 0.0703*** | -0.0211 | 0.182*** | 0.174*** |
| | (0.00950) | (0.00764) | (0.0123) | (0.0163) | (0.0116) | (0.0146) |
| Direct Trade$^2$ | -0.197*** | -0.205*** | -0.0733*** | 0.0103 | -0.186*** | -0.190*** |
| | (0.00756) | (0.00784) | (0.0112) | (0.0129) | (0.00937) | (0.0114) |
| Constant | -0.103 | 0.00220 | -0.102 | 0.0324 | -0.723** | 0.978** |
| | (0.251) | (0.0136) | (0.260) | (0.270) | (0.331) | (0.495) |
| Observations | 1,407,021 | 1,407,021 | 947,082 | 459,827 | 738,673 | 668,238 |
| R-squared | 0.188 | 0.188 | 0.182 | 0.116 | 0.208 | 0.191 |
| Product FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes | Yes |

Note: (a) The normalized number of new (exit) exporters is defined as the ratio of new (exit) exporter numbers to total exporter numbers. (b) The column 2 reports standardized beta coefficients from the column 1. (c) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (d) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 4: Nominal Exchange Rates, Tariffs, and Export Variety Numbers

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Full Sample | Betas | Ordinary | Processing | High Income | Low Income |
| | ln(Export Variety Numbers+ 1) | | | | | |
| ln(1+Tariff) | -0.336*** | -0.0429*** | -0.235*** | -0.432*** | -0.177*** | -0.191*** |
| | (0.0322) | (0.00411) | (0.0353) | (0.0378) | (0.0483) | (0.0314) |
| ln(NER) | 0.0873*** | 0.351*** | 0.0917*** | 0.0688** | 0.168*** | 0.163*** |
| | (0.0328) | (0.132) | (0.0351) | (0.0332) | (0.0553) | (0.0377) |
| ln(Relative CPI) | 0.192*** | 0.0378*** | 0.197*** | 0.149*** | 0.293* | 0.192*** |
| | (0.0370) | (0.00726) | (0.0410) | (0.0350) | (0.154) | (0.0409) |
| Processing Trade | -0.432*** | -0.309*** | | | -0.353*** | -0.513*** |
| | (0.00559) | (0.00400) | | | (0.00582) | (0.00628) |
| ln(GDP) | 0.0749 | 0.230 | 0.120 | -0.145 | 0.535*** | -0.230* |
| | (0.108) | (0.331) | (0.118) | (0.106) | (0.137) | (0.129) |
| ln(GDP per capita) | 0.0970 | 0.224 | 0.0403 | 0.330*** | -0.409** | 0.319** |
| | (0.116) | (0.268) | (0.125) | (0.116) | (0.163) | (0.124) |
| ln(Trade) | 0.176*** | 0.228*** | 0.179*** | 0.156*** | 0.136*** | 0.174*** |
| | (0.0233) | (0.0303) | (0.0267) | (0.0189) | (0.0448) | (0.0253) |
| Direct Trade | 0.608*** | 0.197*** | -0.0456 | 0.245*** | 0.700*** | 0.412*** |
| | (0.0305) | (0.00987) | (0.0278) | (0.0403) | (0.0313) | (0.0398) |
| Direct Trade$^2$ | -0.602*** | -0.257*** | 0.0573** | -0.211*** | -0.651*** | -0.474*** |
| | (0.0231) | (0.00989) | (0.0247) | (0.0312) | (0.0243) | (0.0303) |
| Constant | -1.459*** | 0.00273 | -1.424*** | -1.141*** | -2.423*** | 0.497 |
| | (0.418) | (0.00717) | (0.459) | (0.399) | (0.425) | (0.584) |
| Observations | 712,835 | 712,835 | 462,519 | 250,293 | 317,974 | 394,854 |
| R-squared | 0.568 | 0.568 | 0.638 | 0.546 | 0.642 | 0.539 |
| Product FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes | Yes |

Note: (a) The column 2 reports standardized beta coefficients from the column 1. (b) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (c) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 5: Nominal Exchange Rates, Tariffs, and Exports: Robustness Checks

| | (1) Main Trade Partners | (2) Only Positive Trade Flows | (3) Quarterly stacked |
|---|---|---|---|
| | ln(Exporter Numbers + 1) | | |
| ln(1+Tariff) | -1.078*** | -0.828*** | -0.735*** |
| | (0.121) | (0.112) | (0.0738) |
| ln(NER) | 0.183** | 0.00108 | 0.1318*** |
| | (0.0926) | (0.0912) | (8.05) |
| ln(Relative CPI) | 0.221** | -0.00989 | 0.1578*** |
| | (0.0945) | (0.0977) | (8.89) |
| Processing Trade | -0.976*** | -0.946*** | -0.553*** |
| | (0.0162) | (0.0185) | (0.0126) |
| ln(GDP) | 0.213 | 0.727** | -0.203 |
| | (0.299) | (0.306) | (0.144) |
| ln(GDP per capita) | -0.148 | -0.399 | 0.225 |
| | (0.349) | (0.345) | (0.151) |
| ln(Trade) | 0.0247 | 0.0955 | 0.00316 |
| | (0.0581) | (0.0630) | (0.0343) |
| Direct Trade | 1.131*** | 1.373*** | 0.675*** |
| | (0.0587) | (0.0924) | (0.0620) |
| Direct Trade$^2$ | -1.150*** | -1.383*** | -0.740*** |
| | (0.0490) | (0.0716) | (0.0497) |
| Constant | 0.176 | -3.505*** | 2.123*** |
| | (1.110) | (1.253) | (0.633) |
| Observations | 1,310,859 | 543,649 | 3,584,574 |
| R-squared | 0.618 | 0.629 | 0.525 |
| | ln(Export Value per Exporter + 1) | | |
| ln(1+Tariff) | -3.803*** | -0.318*** | -0.411*** |
| | (0.425) | (0.113) | (0.0890) |
| ln(NER) | 2.187*** | 0.106 | 0.0338 |
| | (0.530) | (0.113) | (0.55) |
| ln(Relative CPI) | 2.369*** | 0.0852 | 0.0498 |
| | (0.511) | (0.134) | (0.58) |
| Processing Trade | -1.674*** | 0.765*** | 0.478*** |
| | (0.0596) | (0.0291) | (0.0225) |
| ln(GDP) | 2.042 | -0.0701 | -0.0917 |
| | (1.658) | (0.288) | (0.234) |
| ln(GDP per capita) | -1.844 | 0.355 | 0.288 |
| | (1.919) | (0.317) | (0.233) |
| ln(Trade) | 1.166*** | 0.262*** | 0.163*** |
| | (0.272) | (0.0744) | (0.0493) |
| Direct Trade | 6.362*** | -2.114*** | -1.484*** |
| | (0.222) | (0.180) | (0.126) |
| Direct Trade$^2$ | -5.885*** | 1.834*** | 1.222*** |
| | (0.177) | (0.131) | (0.0928) |
| Constant | -5.331 | 9.183*** | 9.631*** |
| | (5.720) | (1.378) | (1.007) |
| Observations | 1,310,859 | 543,649 | 3,584,574 |
| R-squared | 0.283 | 0.473 | 0.331 |
| | ln(Export Quantity per Exporter + 1) | | |
| ln(1+Tariff) | -2.659*** | -0.263** | -0.279*** |
| | (0.324) | (0.131) | (0.102) |
| ln(NER) | 1.644*** | 0.222 | 0.0629 |
| | (0.404) | (0.146) | (1.63) |
| ln(Relative CPI) | 1.845*** | 0.347** | 0.0712 |
| | (0.406) | (0.171) | (1.06) |
| Processing Trade | -1.118*** | 0.760*** | 0.473*** |
| | (0.0459) | (0.0265) | (0.0203) |
| ln(GDP) | 2.135* | 0.549 | -0.0185 |
| | (1.204) | (0.342) | (0.255) |
| ln(GDP per capita) | -2.106 | -0.346 | 0.110 |
| | (1.401) | (0.371) | (0.249) |
| ln(Trade) | 0.834*** | 0.371*** | 0.103 |
| | (0.200) | (0.0968) | (0.0672) |
| Direct Trade | 4.363*** | -1.311*** | -0.899*** |
| | (0.181) | (0.174) | (0.118) |
| Direct Trade$^2$ | -4.193*** | 0.938*** | 0.502*** |
| | (0.143) | (0.128) | (0.0877) |
| Constant | -5.082 | 4.067** | 7.182*** |
| | (4.166) | (1.691) | (1.189) |
| Observations | 1,310,859 | 543,649 | 3,584,574 |
| R-squared | 0.366 | 0.666 | 0.596 |
| Product FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes |

Note: (a) The export value of the top 50 partners is about 97.6 percent of China's total export value from 2000 to 2006. (b) The stacked regression in the column 3 measures the responses to exchange rate fluctuations over the current and last three quarters. (c) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 6: Real Exchange Rates, Tariffs, and Exports

| | (1) | (2) | (3) |
|---|---|---|---|
| | ln(Exporter Numbers + 1) | ln(Export Value per Exporter + 1) | ln(Export Quantity per Exporter + 1) |
| ln(1+Tariff) | -1.031*** | -3.490*** | -2.505*** |
| | (0.0814) | (0.298) | (0.226) |
| ln(RER) | 0.112** | 1.145*** | 0.797*** |
| | (0.0541) | (0.339) | (0.261) |
| Processing Trade | -0.877*** | -1.813*** | -1.230*** |
| | (0.0147) | (0.0513) | (0.0396) |
| Constant | -0.309 | -13.31*** | -9.328*** |
| | (0.697) | (4.471) | (3.177) |
| Observations | 1,857,667 | 1,857,667 | 1,857,667 |
| R-squared | 0.574 | 0.283 | 0.353 |
| Product FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes |

| | (1) | (2) |
|---|---|---|
| | ln(Normalized New Exporter Numbers + 1) | ln(Normalized Exit Exporter Numbers + 1) |
| ln(1+Tariff) | -0.0821*** | -0.0726*** |
| | (0.0110) | (0.0224) |
| ln(RER) | 0.0378* | 0.0169 |
| | (0.0208) | (0.0224) |
| Processing Trade | -0.178*** | -0.168*** |
| | (0.00176) | (0.00190) |
| Constant | -1.064*** | -0.0820 |
| | (0.320) | (0.256) |
| Observations | 1,636,514 | 1,407,021 |
| R-squared | 0.182 | 0.188 |
| Product FE | Yes | Yes |
| Country FE | Yes | Yes |
| Industry-time FE | Yes | Yes |
| Cluster by Country-time | Yes | Yes |

| | ln(Export Variety Numbers+ 1) |
|---|---|
| ln(1+Tariff) | -0.340*** |
| | (0.0320) |
| ln(RER) | 0.107*** |
| | (0.0358) |
| Processing Trade | -0.432*** |
| | (0.00559) |
| Constant | -1.585*** |
| | (0.455) |
| Observations | 712,835 |
| R-squared | 0.567 |
| Product FE | Yes |
| Country FE | Yes |
| Industry-time FE | Yes |
| Cluster by Country-time | Yes |

Note: (a) The normalized number of new (exit) exporters is defined as the ratio of new (exit) exporter numbers to total exporter numbers. (b) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 7: Nominal Exchange Rates, Tariffs, and Exports by Sectors

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| | | Numbers | Value | Quantity |
| Electrical equipment | Tariff | -0.896*** | -3.290*** | -2.529*** |
| | | (0.0779) | (0.393) | (0.291) |
| | NER | 0.114* | 0.759 | 0.500 |
| | | (0.0633) | (0.488) | (0.356) |
| Mechanical appliances | Tariff | -0.618*** | -2.367*** | -0.874*** |
| | | (0.0787) | (0.426) | (0.267) |
| | NER | 0.123* | 1.498*** | 0.825*** |
| | | (0.0675) | (0.448) | (0.244) |
| Apparel, not knitted or crocheted | Tariff | 0.648*** | 2.100** | 1.453** |
| | | (0.159) | (0.937) | (0.662) |
| | NER | 0.478*** | 0.669 | 0.649 |
| | | (0.155) | (0.667) | (0.501) |
| Electrical equipment | Tariff | -0.227 | -0.560 | -0.306 |
| | | (0.193) | (0.816) | (0.625) |
| | NER | 0.398** | 0.958 | 0.901 |
| | | (0.188) | (0.734) | (0.602) |
| Optical instruments | Tariff | -0.481*** | -1.925*** | -1.487*** |
| | | (0.131) | (0.631) | (0.431) |
| | NER | 0.519*** | 2.352*** | 1.646*** |
| | | (0.106) | (0.570) | (0.386) |
| Furniture | Tariff | 0.0439 | 0.453 | 0.382 |
| | | (0.134) | (0.636) | (0.516) |
| | NER | 0.274*** | 1.262** | 0.916** |
| | | (0.0930) | (0.569) | (0.447) |
| Toys and sports requisites | Tariff | -0.123 | -1.322* | -1.213** |
| | | (0.197) | (0.722) | (0.561) |
| | NER | 0.225** | 0.749 | 0.449 |
| | | (0.107) | (0.644) | (0.485) |
| Mineral products | Tariff | -0.713*** | -1.738*** | -1.301*** |
| | | (0.107) | (0.539) | (0.455) |
| | NER | 0.114 | 0.902** | 0.583 |
| | | (0.0748) | (0.454) | (0.365) |
| Footwear | Tariff | -0.370*** | -1.298** | -0.385 |
| | | (0.0991) | (0.577) | (0.386) |
| | NER | 0.0276 | 0.107 | -0.113 |
| | | (0.0525) | (0.435) | (0.274) |
| Iron or steel | Tariff | -1.770*** | -5.128*** | -4.382*** |
| | | (0.178) | (0.811) | (0.652) |
| | NER | 0.0633 | 1.108** | 0.697* |
| | | (0.0774) | (0.498) | (0.393) |

Note: (a) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 8: Exchange Rates, Tariffs, and Differentiated Products

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Rauch | | Broda et al. | |
| | ln(Exporter Numbers + 1) | | | |
| ln(1+Tariff) | -1.098*** | -0.114 | -1.045*** | -1.051*** |
| | (0.0834) | (0.0839) | (0.0813) | (0.0811) |
| ln(NER) | 0.117** | 0.0783 | 0.114** | 0.114** |
| | (0.0557) | (0.0554) | (0.0549) | (0.0550) |
| ln(1+Tariff)× Diff Dummy | | -1.090*** | | |
| | | (0.0999) | | |
| ln(NER)×Diff Dummy | | 0.0473*** | | |
| | | (0.00366) | | |
| ln(1+Tariff)×Elas | | | | 0.00335** |
| | | | | (0.00139) |
| ln(NER)×Elas | | | | -0.000211*** |
| | | | | (4.47e-05) |
| Constant | -0.101 | -0.249 | -0.218 | -0.221 |
| | (0.691) | (0.684) | (0.686) | (0.686) |
| Observations | 1,742,118 | 1,742,118 | 1,814,785 | 1,814,785 |
| R-squared | 0.574 | 0.577 | 0.575 | 0.575 |
| | ln(Export Value per Exporter + 1) | | | |
| ln(1+Tariff) | -3.678*** | -1.430*** | -3.491*** | -3.520*** |
| | (0.304) | (0.354) | (0.297) | (0.294) |
| ln(NER) | 1.038*** | 0.860*** | 1.040*** | 1.041*** |
| | (0.324) | (0.325) | (0.321) | (0.322) |
| ln(1+Tariff)× Diff Dummy | | -2.322*** | | |
| | | (0.387) | | |
| ln(NER)×Diff Dummy | | 0.213*** | | |
| | | (0.0121) | | |
| ln(1+Tariff)×Elas | | | | 0.0171** |
| | | | | (0.00726) |
| ln(NER)×Elas | | | | -0.00131*** |
| | | | | (0.000209) |
| Constant | -10.27** | -10.64** | -10.81*** | -10.82*** |
| | (4.157) | (4.125) | (4.101) | (4.101) |
| Observations | 1,742,118 | 1,742,118 | 1,814,785 | 1,814,785 |
| R-squared | 0.283 | 0.285 | 0.283 | 0.283 |
| | ln(Export Quantity per Exporter + 1) | | | |
| ln(1+Tariff) | -2.627*** | -0.971*** | -2.507*** | -2.529*** |
| | (0.227) | (0.301) | (0.225) | (0.222) |
| ln(NER) | 0.727*** | 0.560** | 0.714*** | 0.715*** |
| | (0.249) | (0.249) | (0.247) | (0.247) |
| ln(1+Tariff)× Diff Dummy | | -1.665*** | | |
| | | (0.322) | | |
| ln(NER)×Diff Dummy | | 0.197*** | | |
| | | (0.0105) | | |
| ln(1+Tariff)×Elas | | | | 0.0128* |
| | | | | (0.00672) |
| ln(NER)×Elas | | | | -0.00151*** |
| | | | | (0.000201) |
| Constant | -6.775** | -6.299** | -7.334** | -7.337** |
| | (2.953) | (2.935) | (2.920) | (2.919) |
| Observations | 1,742,118 | 1,742,118 | 1,814,785 | 1,814,785 |
| R-squared | 0.356 | 0.357 | 0.354 | 0.355 |
| Product FE | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes |

Note: (a) Diff Dummy is 1 if the product is a differentiated product according to the classification from Rauch (1999); otherwise, it is 0. (b) The elasticity is calculated by Broda et al. (2008), which is at the HS4 level. (c) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Table 9: Exchange Rates, Tariffs, and Financial Constraints

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Numbers | | Value | | Quantity | |
| ln(1+Tariff) | -0.840*** | -0.754*** | -2.998*** | -2.468*** | -2.042*** | -1.736*** |
| | (0.0628) | (0.103) | (0.269) | (0.450) | (0.206) | (0.342) |
| ln(NER) | 0.0766 | 0.0636 | 0.872** | 0.805** | 0.580** | 0.514** |
| | (0.0536) | (0.0538) | (0.352) | (0.353) | (0.262) | (0.262) |
| ln(1+Tariff) × FC | | -0.508 | | -3.137 | | -1.848 |
| | | (0.422) | | (1.921) | | (1.497) |
| ln(NER) × FC | | 0.0765*** | | 0.394*** | | 0.383*** |
| | | (0.0111) | | (0.0581) | | (0.0439) |
| ln(Relative CPI) | 0.0981* | 0.0984* | 1.742*** | 1.743*** | 1.252*** | 1.253*** |
| | (0.0544) | (0.0544) | (0.448) | (0.448) | (0.317) | (0.317) |
| Processing Trade | -0.644*** | -0.644*** | -1.080*** | -1.080*** | -0.562*** | -0.562*** |
| | (0.0150) | (0.0150) | (0.0539) | (0.0539) | (0.0416) | (0.0416) |
| ln(GDP) | -0.302** | -0.301** | -0.444 | -0.436 | -0.550 | -0.543 |
| | (0.143) | (0.144) | (1.106) | (1.106) | (0.792) | (0.793) |
| ln(GDP per capita) | 0.552*** | 0.550*** | 2.395** | 2.386** | 1.839** | 1.832** |
| | (0.157) | (0.157) | (1.207) | (1.207) | (0.879) | (0.879) |
| ln(Trade) | 0.180*** | 0.181*** | 1.894*** | 1.896*** | 1.259*** | 1.261*** |
| | (0.0350) | (0.0350) | (0.231) | (0.230) | (0.158) | (0.158) |
| Direct Trade | 1.438*** | 1.439*** | 6.980*** | 6.986*** | 4.550*** | 4.556*** |
| | (0.0440) | (0.0440) | (0.207) | (0.207) | (0.160) | (0.161) |
| Direct Trade$^2$ | -1.406*** | -1.408*** | -6.501*** | -6.506*** | -4.493*** | -4.499*** |
| | (0.0374) | (0.0374) | (0.170) | (0.171) | (0.132) | (0.132) |
| Constant | -0.863 | -0.870 | -16.21*** | -16.24*** | -9.748*** | -9.778*** |
| | (0.640) | (0.640) | (4.328) | (4.329) | (2.975) | (2.976) |
| Observations | 719,928 | 719,928 | 719,928 | 719,928 | 719,928 | 719,928 |
| R-squared | 0.557 | 0.557 | 0.283 | 0.284 | 0.369 | 0.369 |
| Product FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes | Yes |

Note: (a) FC is defined as the inventory to sales ratio. (b) *** p < 0.01, ** p < 0.05, * p < 0.1.

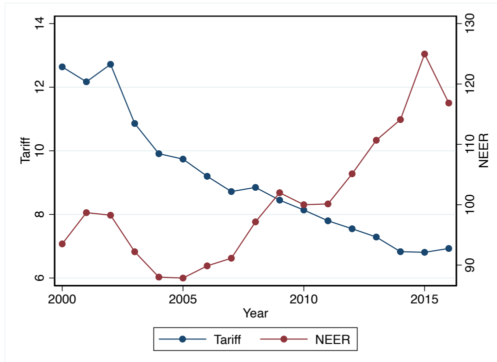
Source: Chinese Customs Export and Import Database, IMF, TRAINS and U.S. Compustat dataset.

Table 10: Elasticities in Selected Studies

| Paper | Country | Trade cost elasticity | Exchange rate elasticity | |
|---|---|---|---|---|
| | | | NER | RER |
| **Exporter numbers** | | | | |
| Ours | China | 1.031 | 0.113 | 0.112 |
| Bas et al. (2017) | China & France | 3.83 | | |
| Tang and Zhang (2012) | China | | | 0.17 |
| **Export variety** | | | | |
| Ours | China | 0.336 | 0.0873 | 0.107 |
| Feenstra and Kee (2007) | Mexico | 2.049 | | |
| Colacelli (2010) | 136 countries | | | 0.045 |

Note: (a) For exporter numbers, our paper is at the product-destination-year level; Bas et al. (2017) are at the product-destination level focusing on the year 2000; and Tang and Zhang (2012) are at the destination-year level. (b) For export variety, our paper is at the product-destination-year level, and Feenstra and Kee (2007) and Colacelli (2010) are at the destination-year level.

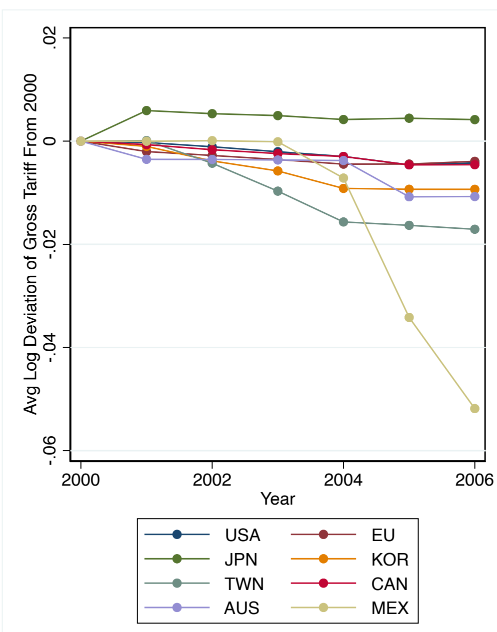
Figure 1: Average Tariffs Charged by Trade Partners and China's Nominal Effective Exchange Rates



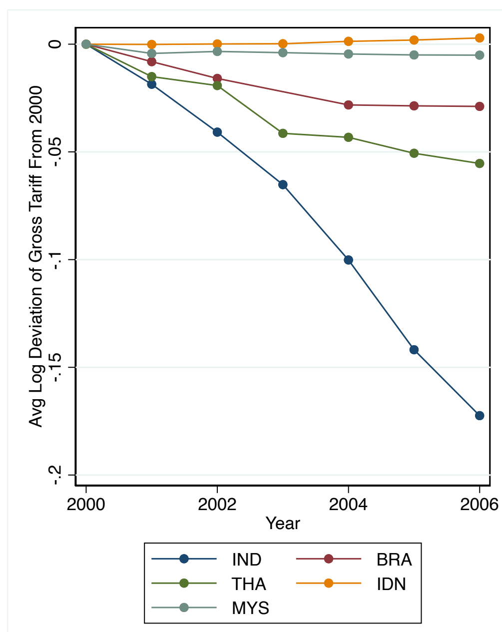

Note: An increase (decrease) in nominal effective exchange rates means China's yuan appreciation (depreciation).

Source: IMF and TRAINS.

Figure 2: Average Evolution of Tariffs Charged by Selected Trade Partners




(a) High Income

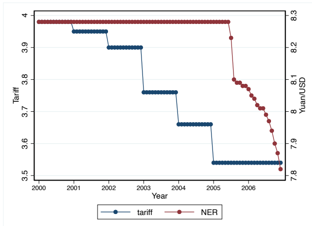



(b) Low Income

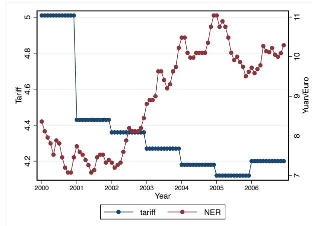
Note: (a) This figure shows coefficients on year dummies in country-by-country regression of ln(1+Tariff) on HS6 fixed effects and year dummies. (b) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars.

Source: TRAINS.

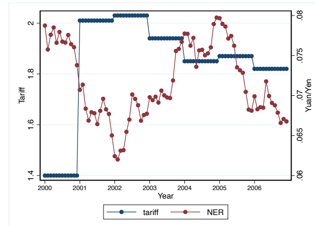
Figure 3: Tariffs Charged to China and Nominal Exchange Rates for Selected Trade Partners



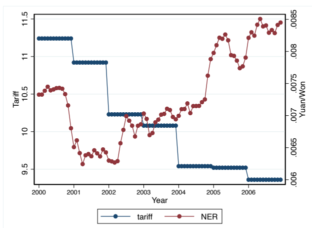
(a) USA



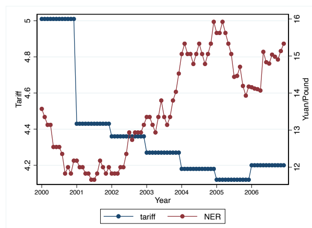
(b) Euro Area



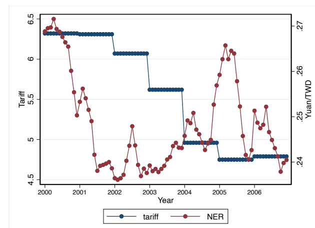
(c) Japan



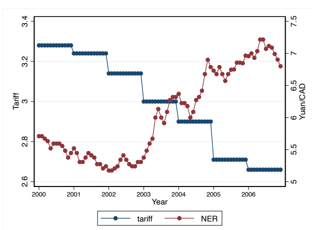
(d) South Korea



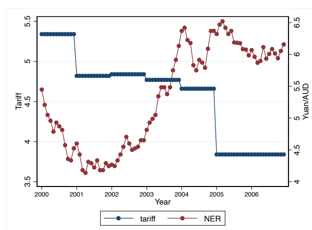
(e) UK



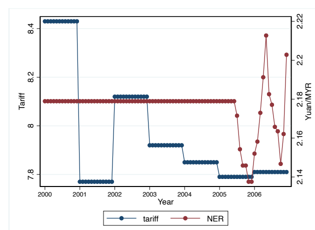
(f) Taiwan



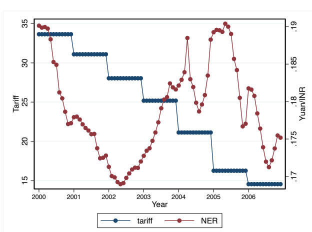
(g) Canada



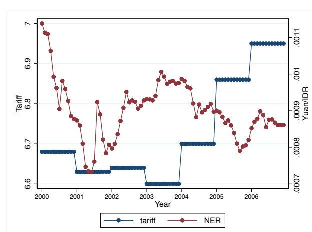
(h) Australia



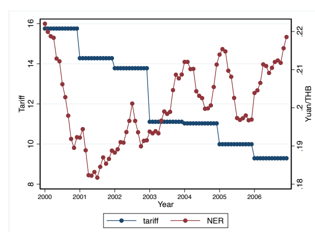
(i) Malaysia



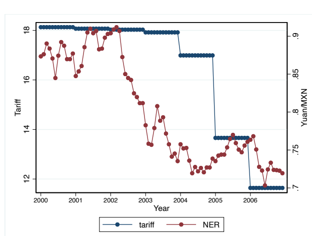
(j) India



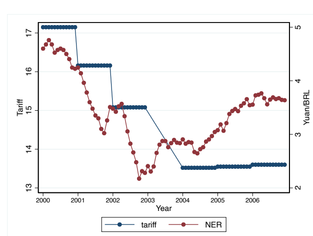
(k) Indonesia



(l) Thailand



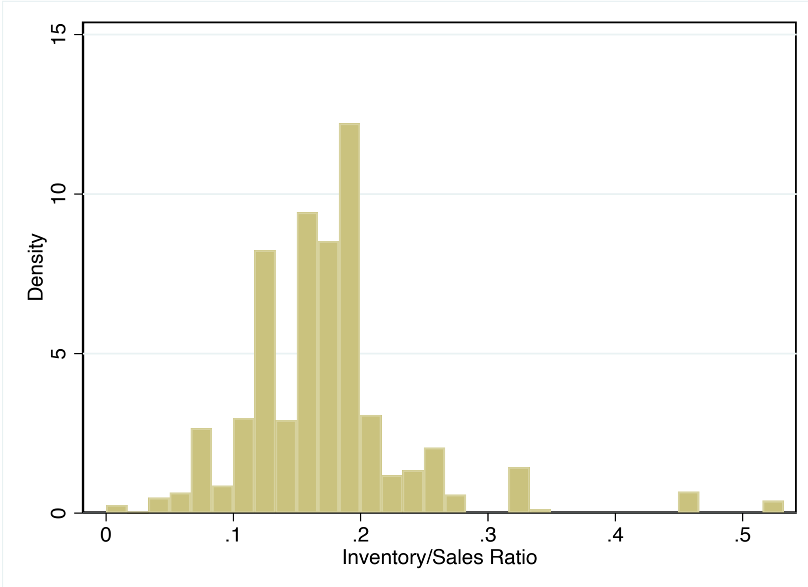
(m) Mexico



(n) Brazil

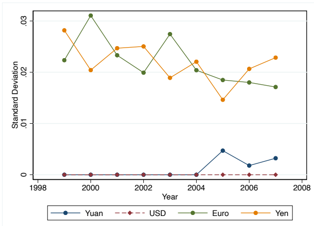
Note: A decrease (increase) in nominal exchange rates means China's yuan appreciation (depreciation).
Source: IMF and TRAINS.

Figure 4: The Distribution of Inventory/Sales Ratio

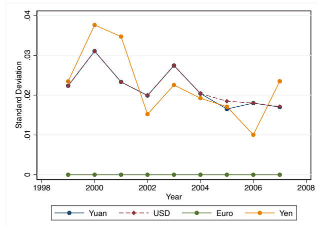



Source: U.S. Compustat dataset.

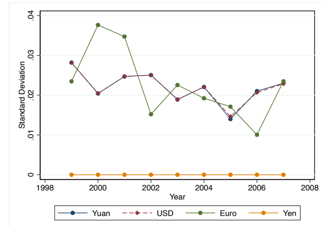
Figure 5: Volatilities of Nominal Exchange Rates



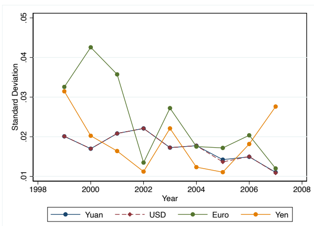

(a) USA



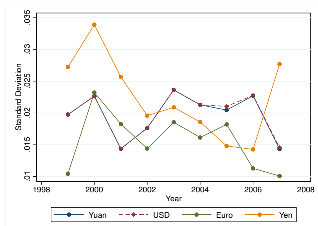

(b) Euro Area



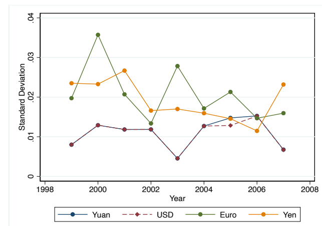

(c) Japan



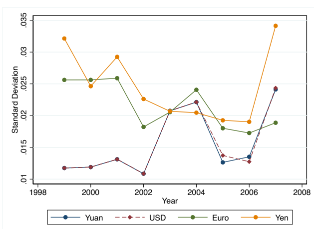

(d) South Korea



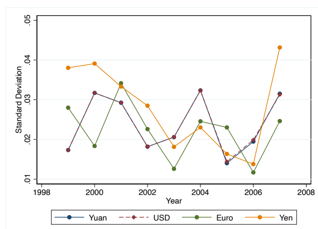

(e) UK



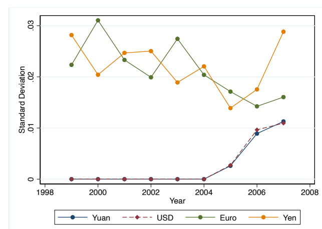

(f) Taiwan



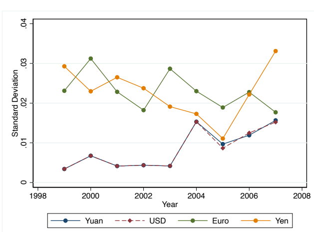

(g) Canada



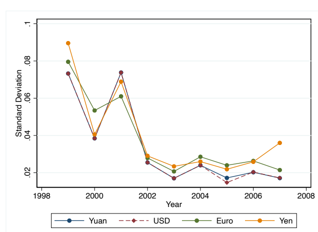

(h) Australia



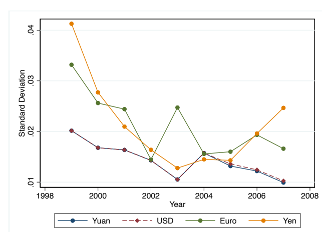

(i) Malaysia



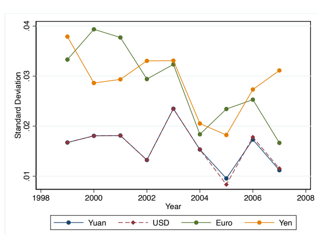

(j) India



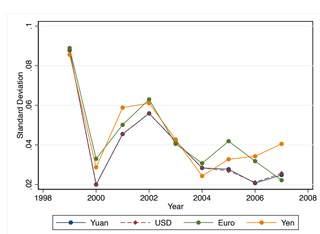

(k) Indonesia




(l) Thailand




(m) Mexico




(n) Brazil

Source: IMF

# A Appendix

## A.1 Nominal and Real Exchange Rates

Figure A1 demonstrates the relationship between nominal and real exchange rates for China's selected trade partners from 2000/01 to 2006/12. Notably, due to data constraints, to calculate the real exchange rates for the euro area we use producer prices for the euro area's CPI.

## A.2 Poisson Estimation for Exporter Numbers

As the number of exporters is count data, following Silva and Tenreyro (2006), we also run the Pseudo Poisson maximum likelihood (PPML) estimation. As shown in Table A1, the results of PPML estimation indicate that tariffs have a significant negative effect on exporter numbers except for high income destinations, while nominal exchange rates have a significant positive effect only for low income destinations. Surprisingly, the effects of tariffs and nominal exchange rates for high income destinations seem to contradict the implications from the theory. We guess that one possible reason is product quality. Past studies (e.g., Manova and Zhang, 2012) have shown that exporters from China export high quality products to high income destinations. As the product quality improved over the years, more Chinese exporters could break into high income destinations although the changes of tariffs and exchange rates were bad for them. Manova and Zhang (2012) use the export price to proxy the product quality. We cannot observe the export price when the trade flow is zero. Thus, this method does not work for us. We have to admit that without controlling for the product quality, our results for high income destinations may be biased.

## A.3 Other Unobservable Shocks

In our regression specification, we use the country, product, and industry-year fixed effects to control for many unobservable shocks. There, however, might be some unobservable shocks at the destination-year level. For example, unobservable political shocks may influence tariff and nominal exchange rate variation simultaneously, which leads to reversal causality in the estimation. Unfortunately, we cannot use the destination-year fixed effects since the nominal exchange rates are also at the destination-year level. Controlling for destination-year fixed effects would absorb the main variable—exchange rates. Due to China's special situation, however, we think that this concern might not be a serious problem. First, China is a latecomer in international trade. China became a WTO member in 2001 while most tariffs charged by its trade partners were decided before China's entry. The first and only free trade agreement between China and its trade partners during 2000-2006 was implemented in 2004, which covers ten countries in Association of Southeast Asian Nations (ASEAN). Thus, we think that the political shocks had a limited effect on the tariffs. Second, Chinese yuan was fixed with U.S. dollar from 2000 to June 2005. Since July 2005, Chinese yuan began to appreciate against U.S. dollar. Thus, we think that the nominal exchange rates were also not affected by the political shocks. As a robustness check, we drop observations from ASEAN countries from 2004 to 2006, and the countries using U.S. dollar as currencies from 2005 to 2006. The results for the subsample remain robust, which are presented in Table A2.

Table A1: Poisson Estimation for Exporter Numbers

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Full Sample | Ordinary | Processing | High Income | Low Income |
| | Exporter Numbers | | | | |
| ln(1+Tariff) | -1.106*** | -1.055*** | -1.638*** | 0.259 | -0.291* |
| | (0.190) | (0.200) | (0.282) | (0.194) | (0.169) |
| ln(NER) | 0.0211 | 0.0277 | -0.0295 | -0.245* | 0.356** |
| | (0.107) | (0.119) | (0.159) | (0.135) | (0.149) |
| ln(Relative CPI) | 0.100 | 0.0384 | 0.175 | 0.997*** | 0.242* |
| | (0.118) | (0.136) | (0.176) | (0.239) | (0.135) |
| Processing Trade | -1.388*** | | | -1.323*** | -1.707*** |
| | (0.0290) | | | (0.0309) | (0.0306) |
| ln(GDP) | 0.625 | 0.514 | -1.289*** | -0.340 | 0.421 |
| | (0.383) | (0.396) | (0.487) | (0.450) | (0.592) |
| ln(GDP per capita) | -0.209 | -0.134 | 1.697*** | 0.591 | -0.0932 |
| | (0.410) | (0.423) | (0.554) | (0.520) | (0.543) |
| ln(Trade) | -0.0415 | -0.0595 | -0.103 | -0.546*** | 0.460*** |
| | (0.0858) | (0.0931) | (0.0902) | (0.105) | (0.0734) |
| Direct Trade | 2.076*** | 0.428*** | 1.384*** | 2.228*** | 0.943*** |
| | (0.207) | (0.134) | (0.140) | (0.234) | (0.115) |
| Direct Trade$^2$ | -2.039*** | -0.502*** | -1.080*** | -2.085*** | -1.262*** |
| | (0.151) | (0.120) | (0.107) | (0.169) | (0.0875) |
| Constant | -2.719 | -1.482 | 3.931** | 4.636*** | -2.740 |
| | (1.745) | (1.813) | (1.911) | (1.450) | (3.136) |
| Observations | 1,857,623 | 1,276,221 | 581,191 | 914,418 | 942,879 |
| Product FE | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes |

Note: (a) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (b) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

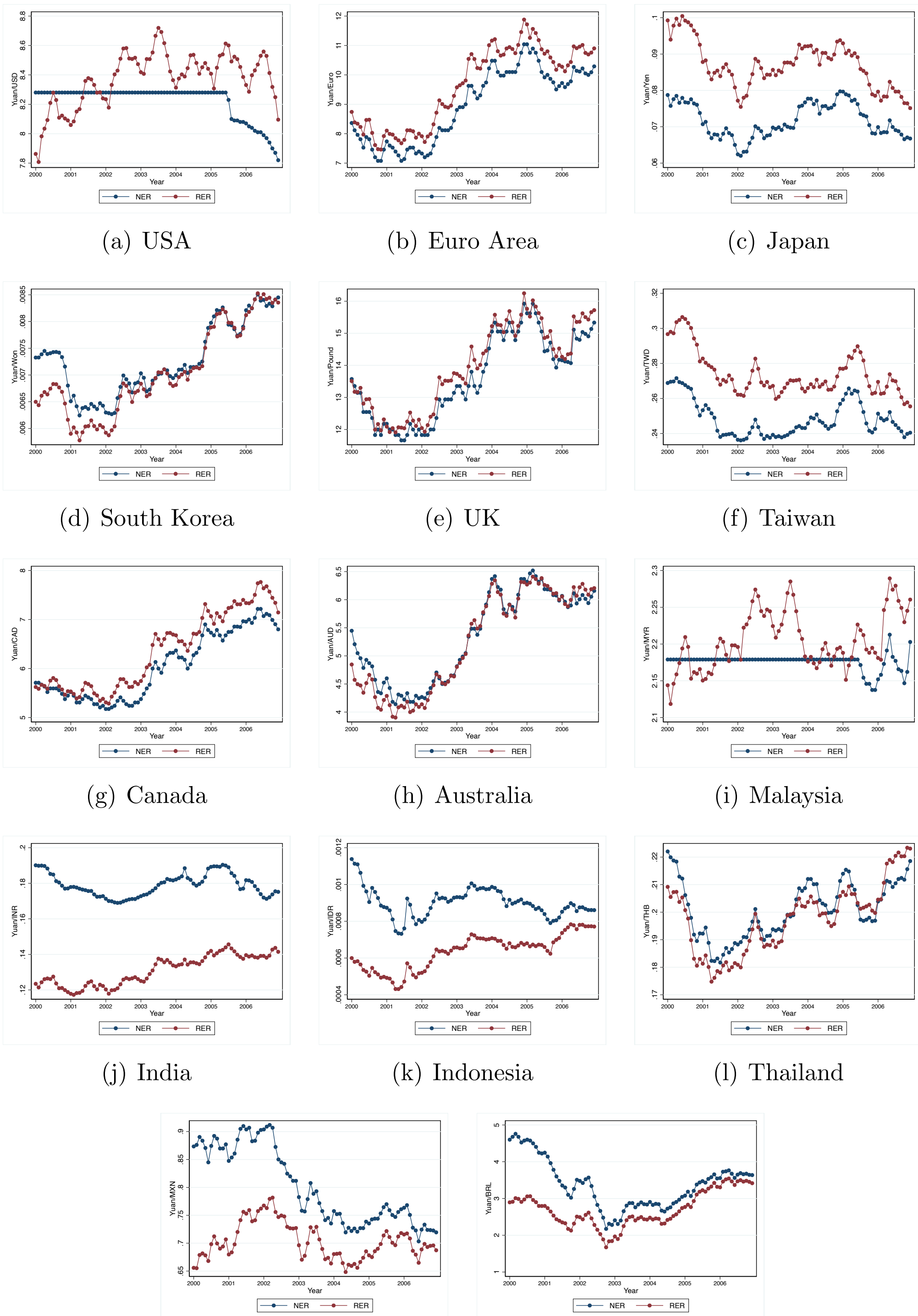
Table A2: Nominal Exchange Rates, Tariffs, and Exports

| | (1) | (2) | (3) | (4) | (5)) |
|---|---|---|---|---|---|
| | Full Sample | Ordinary | Processing | High Income | Low Income |
| | ln(Exporter Numbers +1) | | | | |
| ln(1+Tariff) | -0.979*** | -0.934*** | -1.078*** | -0.220 | -0.262*** |
| | (0.0804) | (0.0910) | (0.0751) | (0.134) | (0.0626) |
| ln(NER) | 0.114* | 0.103 | 0.178*** | 0.0290 | 0.165* |
| | (0.0602) | (0.0775) | (0.0580) | (0.0811) | (0.0852) |
| ln(Relative CPI) | 0.140** | 0.0822 | 0.176*** | 0.424** | 0.179** |
| | (0.0639) | (0.0865) | (0.0601) | (0.168) | (0.0867) |
| Processing Trade | -0.852*** | | | -0.914*** | -0.829*** |
| | (0.0144) | | | (0.0196) | (0.0193) |
| ln(GDP) | -0.235 | -0.380** | -0.628*** | -0.231 | 0.0341 |
| | (0.156) | (0.185) | (0.154) | (0.206) | (0.227) |
| ln(GDP per capita) | 0.425** | 0.562*** | 0.730*** | 0.293 | 0.149 |
| | (0.172) | (0.202) | (0.169) | (0.232) | (0.202) |
| ln(Trade) | 0.0781* | 0.0732 | 0.0146 | -0.129** | 0.184*** |
| | (0.0398) | (0.0507) | (0.0356) | (0.0622) | (0.0465) |
| Direct Trade | 1.048*** | 0.192*** | 0.442*** | 1.142*** | 0.666*** |
| | (0.0547) | (0.0466) | (0.0549) | (0.0718) | (0.0479) |
| Direct Trade$^2$ | -1.082*** | -0.186*** | -0.363*** | -1.150*** | -0.777*** |
| | (0.0459) | (0.0437) | (0.0466) | (0.0608) | (0.0389) |
| Constant | 0.0331 | 0.529 | 1.762*** | 1.993*** | -0.892 |
| | (0.660) | (0.821) | (0.615) | (0.702) | (1.204) |
| Observations | 1,748,760 | 1,203,922 | 544,669 | 896,962 | 851,714 |
| R-squared | 0.571 | 0.640 | 0.565 | 0.662 | 0.506 |
| | ln(Export Value per Exporter + 1) | | | | |
| ln(1+Tariff) | -3.186*** | -2.420*** | -3.891*** | -2.199*** | -1.117*** |
| | (0.297) | (0.308) | (0.359) | (0.481) | (0.280) |
| ln(NER) | 0.787** | 0.689** | 0.930** | 2.196*** | 0.985** |
| | (0.359) | (0.346) | (0.447) | (0.598) | (0.427) |
| ln(Relative CPI) | 1.730*** | 1.625*** | 1.712*** | 3.461** | 1.339*** |
| | (0.435) | (0.471) | (0.476) | (1.555) | (0.495) |
| Processing Trade | -1.803*** | | | -1.345*** | -2.601*** |
| | (0.0522) | | | (0.0641) | (0.0455) |
| ln(GDP) | -0.775 | -0.734 | -1.664 | 3.494** | -2.139 |
| | (1.069) | (1.088) | (1.244) | (1.494) | (1.400) |
| ln(GDP per capita) | 2.405** | 2.176* | 3.655*** | -2.793 | 3.318*** |
| | (1.147) | (1.137) | (1.395) | (1.776) | (1.271) |
| ln(Trade) | 1.312*** | 1.239*** | 1.334*** | 1.293*** | 1.130*** |
| | (0.237) | (0.249) | (0.246) | (0.463) | (0.251) |
| Direct Trade | 5.618*** | 1.898*** | 5.633*** | 6.212*** | 4.192*** |
| | (0.222) | (0.183) | (0.317) | (0.260) | (0.281) |
| Direct Trade$^2$ | -5.396*** | -1.584*** | -4.469*** | -5.719*** | -4.409*** |
| | (0.178) | (0.169) | (0.252) | (0.209) | (0.227) |
| Constant | -9.855** | -7.732* | -12.15** | -16.03*** | 1.734 |
| | (4.258) | (4.385) | (4.775) | (3.956) | (7.134) |
| Observations | 1,748,760 | 1,203,922 | 544,669 | 896,962 | 851,714 |
| R-squared | 0.283 | 0.339 | 0.319 | 0.333 | 0.266 |
| | ln(Export Quantity per Exporter + 1) | | | | |
| ln(1+Tariff) | -2.287*** | -1.591*** | -3.341*** | -1.838*** | -0.681*** |
| | (0.227) | (0.230) | (0.285) | (0.447) | (0.203) |
| ln(NER) | 0.551** | 0.454* | 0.694** | 1.598*** | 0.706** |
| | (0.279) | (0.272) | (0.333) | (0.484) | (0.322) |
| ln(Relative CPI) | 1.275*** | 1.160*** | 1.316*** | 2.954*** | 0.904** |
| | (0.329) | (0.347) | (0.367) | (1.094) | (0.359) |
| Processing Trade | -1.218*** | | | -0.848*** | -1.844*** |
| | (0.0402) | | | (0.0479) | (0.0345) |
| ln(GDP) | -0.362 | -0.283 | -1.280 | 2.540** | -1.279 |
| | (0.789) | (0.783) | (0.945) | (1.092) | (1.026) |
| ln(GDP per capita) | 1.469* | 1.252 | 2.651** | -2.192* | 2.049** |
| | (0.859) | (0.835) | (1.063) | (1.311) | (0.949) |
| ln(Trade) | 0.882*** | 0.837*** | 0.837*** | 0.828** | 0.725*** |
| | (0.175) | (0.182) | (0.186) | (0.347) | (0.177) |
| Direct Trade | 3.810*** | 1.192*** | 3.596*** | 4.392*** | 2.582*** |
| | (0.179) | (0.132) | (0.236) | (0.213) | (0.212) |
| Direct Trade$^2$ | -3.845*** | -0.994*** | -2.902*** | -4.182*** | -3.002*** |
| | (0.142) | (0.121) | (0.189) | (0.169) | (0.170) |
| Constant | -6.794** | -5.500* | -7.256** | -9.634*** | 1.500 |
| | (3.054) | (3.069) | (3.540) | (2.893) | (5.081) |
| Observations | 1,748,760 | 1,203,922 | 544,669 | 896,962 | 851,714 |
| R-squared | 0.352 | 0.424 | 0.357 | 0.401 | 0.337 |
| Product FE | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes |
| Industry-time FE | Yes | Yes | Yes | Yes | Yes |
| Cluster by Country-time | Yes | Yes | Yes | Yes | Yes |

Note: (a) The high income destinations are defined as countries whose average GDP per capita during 2000-2006 is above 10,000 U.S. dollars. (b) *** p < 0.01, ** p < 0.05, * p < 0.1.

Source: Chinese Customs Export and Import Database, IMF and TRAINS.

Figure A1: Nominal and Real Exchange Rates for Selected Trade Partners




(a) USA (b) Euro Area (c) Japan

(d) South Korea (e) UK (f) Taiwan

(g) Canada (h) Australia (i) Malaysia

(j) India (k) Indonesia (l) Thailand

(m) Mexico (n) Brazil

Note: A decrease (increase) in nominal/real exchange rates means China's appreciation (depreciation). Source: IMF.