

Exchange rate pass-through and firms in processing trade

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Abstract

This study investigates the exchange rate pass-through in import prices and its relationship with trade mode choices of assembly firms in China. We first explore factors that may affect the exchange rate pass-through. We find that the ownership of assembly firms matters. Chinese-owned assembly firms bear higher exchange rate pass-through than joint-owned and foreign-owned assembly firms. This pattern persists even if we exclude trade intermediaries and control the quality of imported materials. Moreover, assembly firms that import materials from developed countries bear higher exchange rate pass-through, as do assembly firms with higher market shares, higher value-added, and those located in financially developed prefectures.

JEL classification: F14, F23, F31

Keywords: exchange rate, trade mode, processing trade, financial constraint

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1 Introduction

As economic globalization has processed, an increasing number of production processes have been transferred from developed countries to developing countries for lower labor costs. By participating in the processing trade, developing countries have become one part of the global production chain. Owing to its success in the processing trade in particular, China has become the world's largest trading country. The processing trade in China accounts for about one-third of its total trade and three-quarters of its trade surplus.¹ Since assembly firms in the processing trade import a large amount of inputs, they are more vulnerable to exchange rate fluctuations than are ordinary firms. Moreover, the financial condition of assembly firms is usually worse than that of ordinary firms (Manova and Yu, 2016), and thus, exchange rate fluctuations place greater liquidity pressure on assembly firms.

Thus, it is worth investigating how assembly firms are exposed to exchange rate risk and its consequence. If firms are risk neutral, then firms that bear greater exchange rate pass-through would take more exchange rate risks. In this study, we investigate the exchange rate pass-through in import prices in China's processing trade. In particular, we explore those factors that could affect the exchange rate pass-through, such as ownership, source of origin country, market share, value-added, and local financial development.

First, we find that exchange rate pass-through depends on the ownership of assembly firms in China. Chinese-owned assembly firms bear higher exchange rate pass-through than do foreign outsourcing firms. On the contrary, joint-owned and foreign-owned assembly firms bear less exchange rate pass-through than do foreign outsourcing firms. This pattern persists even if we exclude intermediary companies and control the quality of imported materials. We believe that joint-owned and foreign-owned assembly firms may have good knowledge of the international market and thus, they bear lower exchange rate pass-through. On the contrary, Chinese-owned assembly firms cannot efficiently use the international market and thus, they bear greater exchange rate pass-through. In this sense, Chinese-owned assembly firms face higher exchange rate risk than joint-owned and foreign-owned assembly firms. In addition, we find that the exchange rate pass-through for assembly firms becomes lower over time, regardless of firm ownership. This finding implies that assembly firms in China become more competitive than before when importing materials from the international market and thereby have lower exchange rate risk.

¹According to the China General Administration of Customs report, in 2017, the value of the processing trade was 1,190 billion U.S. dollars, which accounts for 29% of China's total trade value. The trade surplus of the processing trade was 327 billion U.S. dollars, which accounts for 77% of China's total trade surplus.

Second, we find that the exchange rate pass-through is greater when assembly firms import materials from developed countries. When they import materials from developing countries, assembly firms are almost free of exchange rate pass-through. We posit that assembly firms are in a weak position when they import materials from developed countries, and thus, they have to bear more exchange rate pass-through. When assembly firms import materials from developing countries, the disadvantage disappears and thus the exchange rate pass-through is not significant.

Third, we find that assembly firms can bear higher exchange rate pass-through if they have higher market shares. Usually a higher market share implies higher market power and thus, these firms will bear less exchange rate pass-through (Amiti, Itskhoki, and Konings, 2014). However, our finding is contrary to this prediction. Goldberg and Tille (2013) present a bargain model between importers and exporters and argue that higher bargaining power implies lower import prices but greater exchange rate risk. Our result verifies this prediction. When the market share is higher, the import price is lower but the exchange rate pass-through is higher.

Fourth, we find that the value-added of assembly firms also affects the exchange rate pass-through. By processing imported raw materials, assembly firms add value to the exported products. When the value-added is higher, assembly firms bear higher exchange rate pass-through. We believe that assembly firms have higher ability to absorb exchange rate shocks when value-added is high, and thus, can bear higher exchange rate pass-through.

Finally, we find that a high level of financial development is helpful for assembly firms to bear higher exchange rate pass-through. Two benefits arise from assembly firms being located in financially developed prefectures. First, they have access to more financial tools to hedge against exchange rate fluctuations. Financial hedging is a substitute strategy with direct pass-through. Second, a developed financial sector is helpful for decreasing the borrowing costs of assembly firms and lowering their financial constraints. Thus, unconstrained assembly firms can bear greater exchange rate pass-through. These two benefits can explain the positive correlation between local financial development and exchange rate pass-through.

In the processing trade, assembly firms in China first obtain production orders from foreign outsourcing firms, then import raw materials from abroad, process them, and finally export the finished goods back to foreign outsourcing firms. The raw materials can be imported either by foreign outsourcing firms or by assembly firms in China. When materials are imported by foreign outsourcing firms, it is called "pure assembly" (PA). When materials are imported by assembly firms in China, it is called "import and assem-

bly" (IA). In the PA trade mode, assembly firms in China are not responsible for importing materials and earn only processing service fees. Thus, the profit in this trade mode is low. In the IA trade mode, assembly firms in China own the imported materials and thus, can claim more profit from the production process. Although the profits in the IA trade mode are higher, a large number of assembly firms in China is still engaged in the PA trade mode, especially Chinese-owned assembly firms.

Existing studies use either the property right theory or financial constraint of the firm to explain this phenomenon. In this study, we introduce the inability to bear exchange rate risks as another potential explanation. When assembly firms choose the PA trade mode, they earn less profit. However, in this case, foreign outsourcing firms bear exchange rate risks. When assembly firms choose the IA trade mode, they can earn more profit. However, the disadvantage is that they take on exchange rate risks by themselves. Thus, the ability to take on exchange rate risks may affect the choice of processing trade modes. Chinese-owned assembly firms bear higher exchange rate pass-through than do foreign outsourcing firms, while joint-owned and foreign-owned assembly firms bear less, and these differences in exchange rate risks might explain why Chinese-owned assembly firms tend to be engaged in the PA trade mode while joint-owned and foreign-owned assembly firms prefer the IA trade mode.

To the best of our knowledge, this is the first study to directly compare the exchange rate pass-through differences between assembly firms in developing countries and foreign outsourcing firms. The heterogeneous responses of assembly firms and foreign outsourcing firms are critical when we estimate the aggregate effect of exchange rate fluctuation. The other contribution of our study is its investigation of how assembly firms react to exchange rate fluctuations from the perspective of local financial development. Unlike the previous literature, which uses aggregate data or surveys, our study uses detailed firm-product level trade data to show that local financial development is helpful for assembly firms to bear greater exchange rate pass-through.

The rest of the paper is organized as follows. Section 2 reviews related studies. Section 3 introduces the background of China's processing trade. Section 4 describes the data. Section 5 studies the exchange rate pass-through in import prices. Section 6 investigates the impacts of market share, value-added, and financial development on exchange rate pass-through. Finally, the last section concludes.

2 Literature Review

Four strands of literature are related to our study. The first strand addresses the choice of processing trade modes. Some literature analyzes these choices from the perspective of outsourcing firms. These studies use the property right theory of the firm (Feenstra and Hanson, 2005; Fernandes and Tang, 2012) to explain outsourcing firms' decisions on controlling material purchases. These studies argue that firms prefer internalization because ownership of materials is a source of power when contracts are incomplete. Other studies use the financial constraint (Manova and Yu, 2016) to explain the choice of processing trade modes from the perspective of assembly firms. These works find that limited access to capital prevents assembly firms upgrading from the PA trade mode to the IA trade mode. In this study, we present a third possible mechanism to explain the outsourcing decisions of firms from the perspective of exchange rate risks. When assembly firms (especially Chinese-owned) import materials, they have to pay higher import prices and bear greater exchange rate pass-through than do foreign outsourcing firms. The ineffective use of the international market might prevent local assembly firms from choosing the IA trade mode.

The second strand of literature is related to market power and exchange rate pass-through. Amiti et al. (2014) find that importers bear lower exchange rate pass-through if they have higher market shares. On the contrary, Goldberg and Tille (2013) show that a party has a higher effective bargaining weight when it is large or more risk tolerant. A higher effective bargaining weight of importers relative to exporters in turn translates into lower import prices and greater exchange rate pass-through. In our study, we indeed find that a higher bargaining weight (larger market share, higher value-added, or location in a financially developed prefecture) helps assembly firms to bear greater exchange rate pass-through, which verifies the prediction in Goldberg and Tille (2013).

The third strand of literature studies how financial constraints affect firms' responses to exchange rate fluctuations. Strasser (2013) finds that the exchange rate pass-through of financially constrained firms is almost twice that of unconstrained firms. Héricourt and Poncet (2013) find that a firm's exported value decreases for destinations with higher exchange rate volatility and this effect is magnified for financially vulnerable firms. As Manova and Yu (2016) show, assembly firms in the PA trade mode are more likely to be financially constrained. Thus, they cannot bear much exchange rate pass-through and have to choose the PA trade mode.

The last strand of literature studies how firms mitigate the impact of exchange rate fluctuations. Firms can employ three kinds of tools: operation hedging strategies, finan-

cial hedging strategies, and direct pass-through to customers. Allayannis, Ihrig, and Weston (2001) point out that operation-hedging strategies benefit shareholders only when used in combination with financial hedging strategies. Bartram, Brown, and Minton (2010) find that firms pass through part of currency changes to customers and utilize both operational and financial hedges. Pass-through and operational hedging both reduce exchange rate exposure by 10 – 15% while financial hedging decreases exposure by about 40%. Döhring (2008) and Takatoshi, Satoshi, Kiyotaka, and Junko (2013) investigate the exchange rate risk management of European firms and Japanese firms respectively. They find that firms with higher sales and greater dependency on foreign markets engage more actively in currency hedging. In addition, domestic-currency invoicing and hedging are, under certain circumstances, complementary strategies. In this study, we also find that financial hedging is a substitute strategy with direct pass-through. When assembly firms can obtain more financial support, they can bear greater exchange rate pass-through.

3 Background

In the processing trade, assembly firms in China obtain raw materials from abroad, process them locally, and then export the value-added goods. Most assembly firms that are engaged in China’s processing trade do not have their own brands or responsibility for marketing in foreign countries. Thus, these assembly firms are in charge of the production process only.

There are two processing trade modes in China: PA and IA. The distinction is that in the PA trade mode, the assembly firm does not take ownership of either the imported materials or the value-added goods, and hence, plays a fairly passive role. The value-added the firm creates is only the processing service fee. By comparison, in the IA trade mode, the assembly firm plays a more active role, because it controls the imported materials process and owns the imported materials and value-added goods.

Figure 1 shows the production chains for the PA and IA trade modes. First, the assembly firm in China signs a production contract with a foreign outsourcing firm. Then, these firms decide which among them is in charge of the imported materials. In the PA trade mode, the foreign outsourcing firm buys the materials and then transfers them to the assembly firm in China for free. Although the materials are free, the foreign outsourcing firm still needs to report the values of these materials to Chinese Customs. This is the “import price” observed in the customs data. In the IA trade mode, an assembly firm in China buys materials by itself. After processing these materials, the assembly firm either returns or sells the value-added goods to the foreign outsourcing firm. This is the “export

price" observed in the customs data. Thus, in the PA trade mode, the foreign outsourcing firm outsources only the assembly process but controls the purchase of materials. Meanwhile, in the IA trade mode, the foreign outsourcing firm outsources both the assembly process and the purchase of materials.

In Chinese Customs data, we can observe the prices between foreign outsourcing firms and assembly firms in the PA trade mode and the prices between foreign materials suppliers and assembly firms in the IA trade mode. Unfortunately, we cannot directly observe the prices between foreign material suppliers and foreign outsourcing firms. However, it is reasonable to assume that foreign outsourcing firms do not have incentive to misreport the costs of materials to Chinese Customs. First, in the PA trade mode, the materials belong to foreign outsourcing firms. Hence, it is not necessary for them to hide the price information from assembly firms. In some legal disputes, the outsourcing firms might have incentive to inflate the prices to obtain more compensation. However, if the inflation is not related to the exchange rate fluctuations, then there is no concern about exchange rate pass-through. Second, imports and exports are tariff free for the processing trade in China. Foreign outsourcing firms cannot obtain tariff benefits from misreporting to Chinese Customs. Third, assembly firms charge only processing service fees in the PA trade mode. Foreign outsourcing firms cannot evade corporate tax by misreporting import or export prices. However, if the foreign material supplier and foreign outsourcing firm belong to the same multinational firm, then the foreign outsourcing firm has incentive to misreport the import or export prices for tax benefits. Owing to data limitations, we cannot discuss intra-firm trade concerns in this study. Hereafter, we assume that the price between foreign materials suppliers and foreign outsourcing firms is the same as the transfer price between foreign outsourcing firms and assembly firms in China. Thus, in both the PA and IA trade modes, the import prices measure the costs of importing materials. This enables us to investigate how assembly firms in China and foreign outsourcing firms react to the exchange rate fluctuation.

In the PA trade mode, foreign outsourcing firms own value-added goods. Thus, they do not care about the exchange rate pass-through in export prices. However, since foreign outsourcing firms need to import raw materials from other suppliers, they indeed care about the exchange rate pass-through in import prices. In the IA trade mode, assembly firms in China import raw materials and sell value-added goods back to foreign outsourcing firms. Thus, assembly firms care about the exchange rate pass-through in both import and export prices. Usually the export price is decided when the contract is signed, after which the raw materials are imported. Thus, when both foreign outsourcing firms and assembly firms import materials, they regard the export price as given. Thus,

the exchange rate pass-through in export prices would not affect the exchange rate pass-through in import prices and both kinds of firms seek low exchange rate pass-through in import prices.

4 Data

4.1 Customs Data

This study uses the “Chinese Customs Export and Import Database” from 2000 to 2006, which is reported on a monthly basis and collected by Chinese Customs. This database includes all transaction information on export and import values and quantities for each eight-digit harmonized system (HS) product, the exporting country, the importing country, firm ownership (Chinese-owned, joint-owned and foreign-owned),² and trade modes (ordinary, PA and IA). This database does not directly provide any price information. However, we can divide the value of the good by the quantity to obtain the unit value price. In this study, we use the unit value price at the HS8 level. Some imported goods are sold in the domestic market and others are used as intermediate inputs. Thus, it is necessary to distinguish the usage of imported goods. In the Chinese processing trade, imported goods must be used as inputs to produce value-added goods for exporting. Thus, we do not mix the exchange rate pass-through of these two kinds of imported goods.

4.2 Exchange Rate Data

The nominal exchange rate data and consumer price index (CPI) are collected from the International Financial Statistics (IFS), which are on monthly basis.³ The real exchange rate (RER_{jt}) between country j and China at time t is defined as the foreign currency price per Chinese yuan (NER_{jt}) times Chinese CPI divided by foreign CPI, which is as follows:

$$RER_{jt} = NER_{jt} \times CPI_{China,t} / CPI_{jt}$$

Therefore, an increase in the real exchange rate (RER_{jt}) implies an appreciation of the yuan.

²The joint-owned and foreign-owned firms include those with investors from Hong Kong, Taiwan, and Macao.

³The CPI data of Australia and New Zealand are on quarterly basis. The CPI and nominal exchange rate data of Taiwan are collected from National Statistics, Taiwan.

4.3 Financial Data

In practice, it is difficult to measure financial development given its complexity and multi-dimensionality. This study uses the ratio between loans and gross domestic product (GDP) to measure financial development at the prefecture level. Loans include both enterprise and resident loans. The financial data are collected from the “China City Statistical Yearbook,” and include 287 prefectures covering the period 2003 to 2006.

4.4 Data Summary

The customs data include all import transactions of China’s processing trade from 2000 to 2006. There are more than 27 million transactions, which cover 208 countries and regions and 6,973 kinds of goods at the HS8 level. In 2000, there were 33,285 firms engaged in the processing trade and these firms imported goods worth 767 billion yuan. In 2006, the firm number increased to 48,493 and the value of imported goods increased to 2,542 billion yuan.

Table 1 shows the firm numbers and import values by trade modes. About 15% – 18% of firms are engaged only in the PA trade mode and more than 70% of firms are engaged only in the IA trade mode. About 12% of firms participate in both processing trade modes. In terms of firm number, the shares of firms in different trade modes remain stable. However, in terms of import value, the share of firms engaged in both trade modes decreases over time and the share of firms engaged only in the IA trade mode increases over time. This finding implies that assembly firms in China are updating from the PA trade mode to the IA trade mode in order to earn more profits. Table 2 shows that most Chinese-owned assembly firms are engaged in the PA trade mode. Most joint-owned and foreign-owned firms are engaged in the IA trade mode.

Panel A of Table 3 shows the top six sources of origin and Panel B shows the assembly firms’ locations. Most processing trades occur between China and East Asian economies.⁴ China is like a processing transfer station that imports intermediate goods from other East Asian economies, assembles them locally, then exports the value-added goods to developed countries. We find that more than 94% of assembly firms are located in 8 coastal provinces (there are 31 provinces⁵ in Mainland China). In particular, assembly firms in Guangdong account for almost half of the processing trade. In Panel C of Table 3, we investigate the differences of product varieties between the two processing trade modes.

⁴When an assembly firm imports materials from a bonded area in China, the source of origin is recorded as Mainland China.

⁵The customs data do not include assembly firms from Tibet.

The product varieties are at the HS2 level, which includes 98 kinds of product categories. We find that both trade modes import similar products. Chapter 85⁶ is the primary imported material, and accounts for 31.89% of all imports in the PA trade mode and 45.46% of all imports in the IA trade mode. Figure 2 shows the distribution of imported product varieties within this category. In this category, there are 295 kinds of products at the HS6 level. The x-axis is the product variety and the y-axis is the import value share of the product. We find that the bar graphs are similar between the two processing trade modes and the correlation of these shares is 0.97.

Thus, we conclude that by location, source of origin and product categories, there are no significant differences between the two processing trade modes. The only significant difference between them is ownership.

5 Exchange Rate Pass-Through in Import Prices

In this section, we examine the exchange rate pass-through in import prices. In the PA trade mode assembly firms in China import materials, while in the IA trade mode, foreign outsourcing firms import materials. Thus, it is necessary to distinguish between the two trade modes and to examine the differences between them.

5.1 Benchmark Regression at the Firm-Product-Country Level

We examine the exchange rate pass-through at the firm-product-country level. First, we aggregate all import transactions to the HS6 level by firm-country-mode pair for each month. Then we calculate the average price of each firm-product-country-mode pair for each month. The benchmark regression is as follows:

$$\begin{aligned} \Delta \ln(P_{ijkt}) = & \alpha_0 + \sum_{h=0}^3 \alpha_{1h} \Delta \ln(RER_{jt-h}) + \sum_{h=0}^3 \alpha_{2h} \Delta \ln(RER_{jt-h}) \times Mode_{ijkt} + \alpha_3 Mode_{ijkt} \\ & + \mu_{ij} + \eta_k + \lambda_t + \epsilon_{ijkt} \end{aligned} \quad (1)$$

Here, P_{ijkt} is the import price (yuan) of product i from country j for firm k at time t . RER_{jt} is the real exchange rate between country j and China at time t . $Mode_{ijkt}$ is a dummy for the trade mode. The same product can be traded under both trade modes;

⁶Chapter 85 is “electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles.”

if the product is traded under the PA trade mode, then $Mode_{ijt}$ is 0, and otherwise 1. μ_{ij} measures the product-country fixed effect, η_k measures the firm fixed effect and λ_t measures the time fixed effect. We take both import prices and real exchange rate in the first difference forms. In Chinese Customs data, we observe only the arrival month of imported products at the ports. One concern is that there is a time lag between the signing of import contracts and the arrival of those products. If the time lag is greater than 1 month, then we should examine the effect of the exchange rate in the last months instead of in the current month. To check this problem, we include twelve exchange rate lags to examine the total exchange rate pass-through. We also add three lags of real exchange rates to measure the long-term effect. The coefficient α_{10} measures the short-term exchange rate pass-through for the PA trade mode while $\sum_{1h}^3 \alpha_{1h}$ measures the long-term exchange rate pass-through for the PA trade mode. When the yuan appreciates, the import price (yuan) is supposed to decrease. Thus, α_{10} and $\sum_{1h}^3 \alpha_{1h}$ should be negative. The coefficient α_{20} measures the short-term exchange rate pass-through differences between the two trade modes—PA and IA, while $\sum_{h=0}^3 \alpha_{2h}$ measures the long-term exchange rate pass-through differences. When α_{20} or $\sum_{h=0}^3 \alpha_{2h}$ is negative, it means that the exchange rate pass-through is larger in the IA trade mode. When α_{20} or $\sum_{h=0}^3 \alpha_{2h}$ is positive, it means that the exchange rate pass-through is larger in the PA trade mode. The coefficient α_3 measures the price differences between the two trade modes.

The result is presented in Table 4. In the first two columns, we present the short-term results, that is, the responses of price change to the exchange rate change at the current month. In the last two columns, we present the long-term results, that is, the responses of price change to the exchange rate change at the last three months. In the short-term, the price is sticky, which does not response to the exchange rate change. While in the long-term, the response of price change is significant. Column 3 shows that the exchange rate pass-through is 0.2227. On average, when the yuan appreciates by 10%, the import price (yuan) decreases by 2.227%. In column 4, we additionally control the trade mode effect and the interaction term between the real exchange rate and the trade mode. The result shows that the exchange rate pass-through in the PA trade mode is 0.2629. When the yuan appreciates by 10%, the import prices (yuan) decreases by 2.629%. In the IA trade mode, the exchange rate pass through is lower, at 0.1948. When the yuan appreciates by 10%, the import price (yuan) decreases by 1.948%. In summary, the result in Table 4 shows that when assembly firms in China import materials themselves, they bear lower exchange rate pass-through. In this sense, assembly firms in China have comparative advantage in obtaining materials from the international market against foreign outsourcing firms.

5.1.1 Ownership

Table 5 shows that most Chinese-owned firms are engaged in the PA trade mode. Table 5 shows the exchange rate pass-through in import prices by ownership. For state-owned assembly firms, the exchange rate pass-through is higher in the IA trade mode. For private-owned assembly firms, the exchange rate pass-through is also higher in the IA trade mode but insignificant. For joint-owned or foreign-owned assembly firms, the exchange rate pass-through are both lower in the PA trade mode.

5.1.2 Excluding the U.S. dollar pegging Countries

Until 2005, the yuan was pegged to the U.S. dollar. Thus, the exchange rate between China and the United States was fixed. The real exchange rate fluctuation between them reflected only the CPI fluctuation. Among the top 10 sources of origin, Hong Kong also pegged its currency to the U.S. dollar. In Table 6, we exclude the US dollar pegging countries. The result is very similar to that in the full sample.

5.1.3 Intermediary Company

In the processing trade, some firms are pure import-export companies that do not produce any products. These firms provide only intermediary services between domestic producers and foreign buyers. Thus, it is necessary to distinguish these firms from other ordinary assembly firms. Following Manova and Yu (2016), we use the keywords in firms' names to identify import-export companies.⁷ The summary is presented in Table 7. Panel A shows that the number of intermediary companies remains stable from 2000 to 2006. In 2000, the share of intermediary companies was 7.8%, but this decreased to 7.26% in 2006. However, the total values imported by intermediary companies decreased significantly. In 2000, intermediary companies imported around 20% of total goods but in 2006, these firms imported only 8.4% of total goods. This finding implies that the role of intermediary companies is in decline. Some assembly firms no longer need intermediary services and can directly establish connections with foreign outsourcing firms. Panels B and C show that intermediary companies differ from non-intermediary companies in processing trade modes. Around 82% of non-intermediary companies were engaged in the IA trade mode in 2006 and the import value was more than 77%. Only 73% of intermediary companies were engaged in the IA trade mode and the total value was less than 25%. This finding implies that firms that cooperate with intermediary companies prefer to participate in the

⁷The keywords that we use are "jingmao," "jinchukou," "maoyi," "kemaoyi," "waimao," "jiagongzhuang-peifuwugongsi," "waijingfazhan," and "duiwaijingjifazhan."

PA trade mode. Some small firms cannot directly receive orders from foreign outsourcing firms, and intermediary companies can supply such matching services. At the same time, these small firms do not have international market networks or cannot bear the exchange rate risks, and thus, they are engaged only in the PA trade mode.

Several mechanisms may explain this result. First, assembly firms in China might have weak international market networks, thereby incurring higher prices and bearing more exchange rate risk. Second, the quantity per transaction can affect the import price. The more products are imported, the lower is the unit price that a firm might pay. To investigate this channel, we first calculate the average quantity of transactions for each product-country-mode pair. Then, we examine whether the average quantity is significantly different across trade modes. Table 5 shows that the average quantity is higher in the IA trade mode. Therefore, if the quantity channel works, the import price should be lower in the IA trade mode. Thus, the quantity per transaction cannot explain our result.

Third, the significant price differences between these two trade modes could be the result of differences in the quality of the product. In Panel C of Table 3 and Figure 2, we show that there are no significant differences between imported goods under the two processing trade modes. However, this result does not mean that the quality of the product is the same under the two processing trade modes. Even within the HS8 level, the products are still very different. At the product-country level, we cannot discuss this issue.

Fourth, foreign outsourcing firms might not buy materials from other firms, and they actually transfer materials within the firm boundary. In the PA trade mode, the imported materials are owned by foreign outsourcing firms and thus, the import prices are not necessarily the real international market prices. This mechanism can explain how the price is lower in the PA trade mode. As we discussed in section 3, foreign outsourcing firms cannot obtain tax benefits from misreporting, and thus, this concern might not be a serious problem. In addition, even if the import prices are misreported, they are not necessarily related to exchange rate fluctuations.

Finally, the invoice of currency can affect the exchange rate pass-through (Devereux, Dong, and Tomlin, 2017). Suppose the import price is fixed and the transaction is invoiced in yuan; then, the exchange rate pass-through should be close to 0. On the contrary, suppose the transaction is invoiced in foreign currency; then, the exchange rate pass-through should be close to 1. If the invoices of currency are significantly different between these two trade modes, the exchange rate pass-through will be different. Owing to data limitations, we cannot discuss this issue in this study.

5.1.4 Source of Origin

Existing studies argue that the quality of product is different across countries and the bargaining position of assembly firms also may vary across countries. Thus, we divide sources of origin into two groups: developed and developing countries.⁸ Then, we investigate the exchange rate pass-through for these two groups. Table 11 shows that the result is robust for developed countries. However, the exchange rate pass-through in the two trade modes is not significant for developing countries. This means that the exchange rate risk is almost zero for assembly firms in China and there is no significant difference between the two trade modes. One possibility is that assembly firms in China have a strong bargaining position when they import materials from developing countries.

5.1.5 Changes over Time

When assembly firms in China become familiar with the international market, the exchange rate pass-through is expected to change over time. We use rolling regression and 24 months as the window to investigate this issue. The result is shown in Figure 6. After 2002, the exchange rate pass-through for all kinds of assembly firms becomes lower relative to that of foreign outsourcing firms. This means that assembly firms in China bear less exchange rate risks than before.

6 Market Share, Financial Development and Exchange Rate Pass-Through

In this section, we investigate other factors that can affect the exchange rate pass-through, such as market share, value-added and financial development. In the PA trade mode, the imported materials within the same assembly firm can be supplied by different foreign outsourcing firms. Since we cannot identify which foreign outsourcing firm operates these transactions, we cannot obtain the market share and value-added of each foreign outsourcing firm. On the contrary, in the IA trade mode, the imported materials are traded by the assembly firms themselves. Thus, we can obtain the market share and value-added of each assembly firm under the IA trade mode. In this section, our sample

⁸We exclude Hong Kong and the United States from our sample owing to China's dollar peg policy. The developed countries (regions) include OECD countries plus Singapore and Taiwan.

is narrowed to assembly firms under the IA trade mode. The regression is as follows:

$$\begin{aligned} \ln(P_{ijft}) = & \gamma_0 + \gamma_1 \ln(RER_{jt}) + \gamma_2 \ln(RER_{jt}) \times C_{ijft} + \gamma_3 C_{ijft} \\ & + \text{other controls} + \mu_{ij} + \lambda_t + \epsilon_{ijft} \end{aligned} \quad (2)$$

Here, P_{ijft} is the import price (yuan) of product i from country j at time t for assembly firm f . RER_{jt} is the real exchange rate between country j and China at time t . C_{ijft} is assembly firm f ' characteristics, either market share or value-added. Other controls are the same as those of benchmark regression. The coefficient we are interested in is γ_2 , which measures the impact of market share or value-added on the exchange rate pass-through.

6.1 Market Share

We define the market share of assembly firm f on product i in country j at time t as

$$\text{Market Share}_{ijft} = \frac{\text{Import Quantity}_{ijft}}{\sum_{f \in F} \text{Import Quantity}_{ijft}}$$

Here, $\text{Import Quantity}_{ijft}$ is the import quantity of product i from country j at time t for assembly firm f . F is the set of all assembly firms that imported product i from country j at time t .

The result is shown in Table 13. For Chinese-owned assembly firms, the effect of market share is not significant. For joint-owned and foreign-owned assembly firms, higher market share implies higher exchange rate pass-through. This result is contrary to those of previous studies. Usually a higher market share implies a better bargaining position and thus, these firms bear less exchange rate pass-through (Amiti et al., 2014). However, Goldberg and Tille (2013) present a bargain model between importers and exporters and argue that higher bargaining power implies lower import price but more exchange rate risks. Our result verifies this prediction.

Another possible explanation is related to Baldwin and Krugman (1989) and Froot and Klemperer (1989). In this study, we consider only the static decisions of firms. Actually, a firm's pricing strategy is dynamic. Froot and Klemperer (1989) argue that firms' current market shares matter for their future profit. Thus, a firm would like to bear more exchange rate pass-through if the exchange rate shock is permanent. This mechanism also can explain why large firms bear higher exchange rate pass-through because they wish to maintain market share by changing prices.

6.2 Local Financial Development

In this subsection, we examine the impact of local financial development on the exchange rate pass-through. When firms are located in financially developed prefectures, they receive two benefits. First, they can access more financial tools to hedge against exchange rate fluctuations. Financial hedging is a substitute strategy with direct exchange rate pass-through. When firms hedge the exchange rate risks, they bear greater exchange rate pass-through. Second, the developed financial sector is helpful for decreasing the borrowing costs of firms. Thus, these firms have less financial constraints. Unconstrained importing firms can bear greater exchange rate pass-through. Based on these two channels, the higher is local financial development, the higher is the exchange rate pass-through.

We measure local financial development at the prefecture-year level. We use loans/GDP to measure financial development; Figure 7 shows the distribution of loans/GDP for each year. It shows that the distribution of loans/GDP remains stable over time. According to the median value of loans/GDP for each year, we divide the prefectures into two groups: financially developed and undeveloped prefectures. $FinD_f$ is a dummy for firm f . If firm f is located in a financially developed prefecture, then $FinD_f$ is 1, and otherwise 0. Unfortunately, we can identify only the locations of assembly firms in China but not the origins of foreign outsourcing firms. Thus, we have to assume that all foreign outsourcing firms are identical. After including $FinD_f$ and all interaction terms, the regression is as follows:

$$\begin{aligned}
 \ln(P_{ijft}) = & \theta_0 + \theta_1 \ln(RER_{jt}) + \theta_2 Mode_{ijft} + \theta_3 FinD_{ft} \\
 & + \theta_4 \ln(RER_{jt}) \times Mode_{ijft} + \theta_5 \ln(RER_{jt}) \times FinD_{ft} \\
 & + \theta_6 Mode_{ijft} \times FinD_{ft} + \theta_7 \ln(RER_{jt}) \times Mode_{ijft} \times FinD_{ft} \\
 & + Z_{ft} + \mu_{ij} + \lambda_t + \epsilon_{ijft}
 \end{aligned} \tag{3}$$

Here, i is the product, j is the source of origin, f is the firm, and t is time. In Z_{ft} , we control other characteristics at the firm and prefecture level: the average quality of exporting product at the firm level, GDP per capita, and population at the prefecture level. The coefficient θ_4 measures the exchange rate pass-through differences between the two trade modes in financially undeveloped prefectures. The coefficient $\theta_4 + \theta_7$ measures the exchange rate pass-through differences in financially developed prefectures. The coefficient we are interested in is θ_7 , which should be negative.

The results are shown in Table 14. θ_4 is positive, which means that the exchange rate pass-through is lower for assembly firms in financially undeveloped prefectures. θ_7 is negative and significant. Thus, assembly firms in financially developed prefectures in-

deed bear greater exchange rate pass-through. In particular, Chinese-owned assembly firms benefit mostly from local financial development.

7 Conclusion

In this study, we discuss the exchange rate pass-through in the processing trade and find some interesting patterns. First, we find that exchange rate pass-through depends on the ownership of assembly firms in China. Chinese-owned assembly firms have to bear higher exchange rate pass-through than do foreign outsourcing firms. However, joint-owned and foreign-owned assembly firms bear less exchange rate pass-through. This pattern persists even if we exclude the effect of intermediary companies and control the quality of imported materials. Then, we argue that the differences in exchange rate pass-through may be used to explain that Chinese-owned assembly firms are more engaged in the PA trade mode while joint-owned and foreign-owned assembly firms prefer the IA trade mode. This finding has the following policy implications. For the Chinese government to help assembly firms to deal with exchange rate risks, it would be helpful for assembly firms to upgrade their trade mode. It is noteworthy that, the exchange rate pass-through for assembly firms becomes lower over time. This implies that assembly firms in China have become more competitive than before, which may also explain why the IA trade mode has become more popular among assembly firms than previously.

Second, we find that the exchange rate pass-through is greater when assembly firms import materials from developed countries and have higher market share or value-added. Thus, when we estimate the aggregate impact of exchange rate shocks, it is necessary to consider the heterogeneous effects across firms and sources of origin.

Third, we find that assembly firms, which are located in financially developed prefectures, can bear higher exchange rate pass-through. For those firms in developing countries, hedging exchange rate fluctuations is critical for their profits. Thus, local governments should support the development of the financial sector so that local assembly firms can mitigate the impact of exchange rate fluctuations better.

This study has some shortcomings arising from to data limitations. For example, we cannot distinguish intra-firm transactions from inter-firm transactions. Thus, the price differences between the two trade modes in this study might be inaccurate. However, if the price of intra-firm transactions is unrelated to exchange rate fluctuations, then it will not affect the conclusion about exchange rate pass-through.

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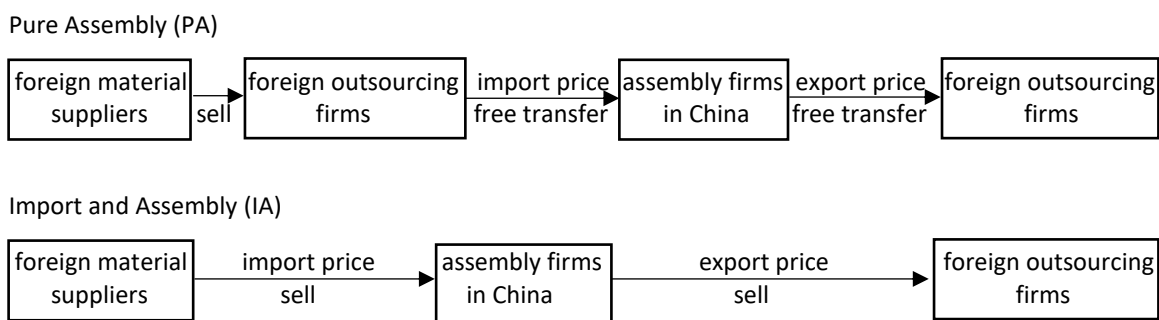


Figure 1: The Production Chains for the PA and IA trade modes

Notes: This figure shows the production chains for the PA and IA trade modes. First, the assembly firm in China signs a production contract with a foreign outsourcing firm. Then, these firms decide which among them is in the charge of the imported materials. In the PA trade mode, the foreign outsourcing firm buys the materials and then transfers them to the assembly firm for free. Although the materials are free, the foreign outsourcing firm still needs to report the values of these materials to Chinese Customs. This is the “import price” observed in the customs data. In the IA trade mode, an assembly firm in China buys materials by itself. After processing these materials, the assembly firm either returns or sells the value-added good to the foreign outsourcing firm. This is the “export price” observed in the customs data.

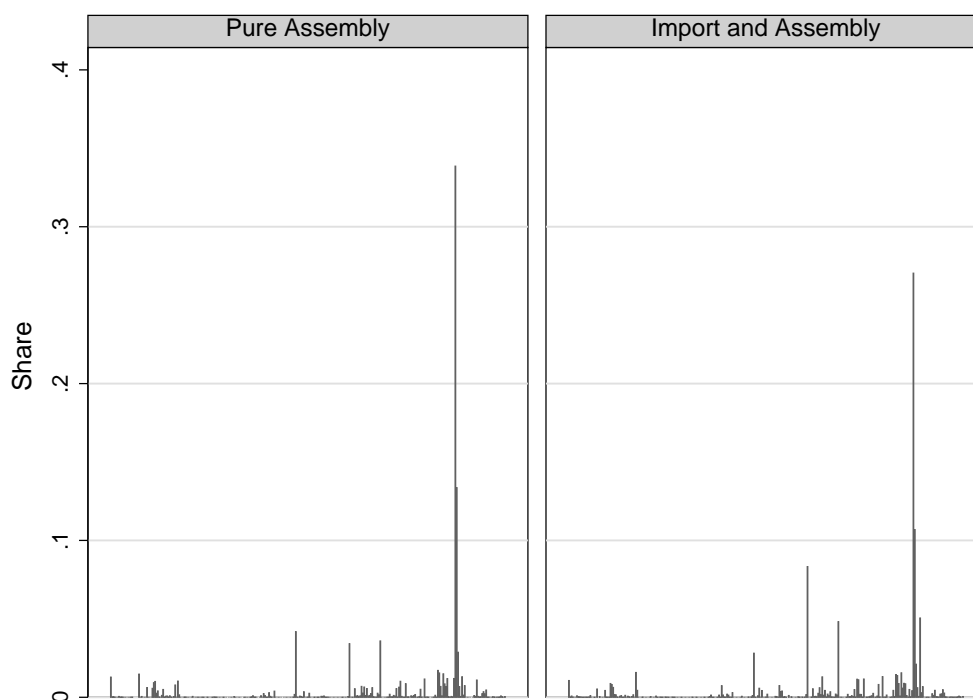


Figure 2: The Distribution Across Imported Product Varieties

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This figure shows the distribution of imported product varieties within the “electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles” category (Chapter 85). Within this category, there are 295 kinds of products at the HS6 level. The x-axis is the product variety and the y-axis is the import value share of the product. The correlation of these shares between two trade modes is 0.97.

Table 1: Firm Number and Import Value by Trade Modes

Year	Trade Mode	Firm Number	Share ¹	Import Value ²	Share ³
2000	Only PA	4,850	14.57%	97	12.65%
	Only IA	24,265	72.9%	458	59.71%
	Both PA and IA	4,170	12.53%	212	27.64%
	Either PA or IA	33,285	100%	767	100%
2001	Only PA	5,552	15.95%	105	12.38%
	Only IA	24,637	70.89%	507	59.79%
	Both PA and IA	4,563	13.13%	236	27.83%
	Either PA or IA	34,752	100%	848	100%
2002	Only PA	6,267	17.13%	95	9.88%
	Only IA	25,801	70.55%	610	63.4%
	Both PA and IA	4,507	12.32%	257	26.72%
	Either PA or IA	36,575	100%	962	100%
2003	Only PA	6,950	17.38%	180	13.35%
	Only IA	28,288	70.77%	927	68.77%
	Both PA and IA	4,732	11.84%	241	17.88%
	Either PA or IA	39,970	100%	1,348	100%
2004	Only PA	7,829	17.11%	245	13.35%
	Only IA	31,030	70.18%	1260	68.66%
	Both PA and IA	5,353	12.11%	330	17.98%
	Either PA or IA	44,212	100%	1,835	100%
2005	Only PA	8,689	18.27%	289	12.90%
	Only IA	33,382	70.18%	1,540	68.72%
	Both PA and IA	5,492	11.55%	412	18.38%
	Either PA or IA	47,563	100%	2,241	100%
2006	Only PA	8,916	18.38%	449	17.66%
	Only IA	34,220	70.56%	1,760	69.24%
	Both PA and IA	5,357	11.06%	333	13.10%
	Either PA or IA	48,493	100%	2,542	100%

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the firm numbers and import values by the trade modes.

1. The share is measured by the firm number ratio between the sub-sample (only PA, only IA, both PA and IA, either PA or IA) and the full sample.

2. The import value is the total import value of firms in the sub-sample and the unit is in billion yuan.

3. The share is measured by the value ratio between the sub-sample (only PA, only IA, both PA and IA, either PA or IA) and the full sample.

Table 2: Ownership and Trade Mode

Ownership	PA		IA	
	Value ¹	Share	Value ¹	Share
Chinese-Owned	1,370	71.50%	547	28.50%
Joint-Owned	319	13.05%	2,120	86.95%
Foreign-Owned	959	15.63%	5,180	84.37%

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the values by ownership and trade modes.

1. The unit is in billion yuan.

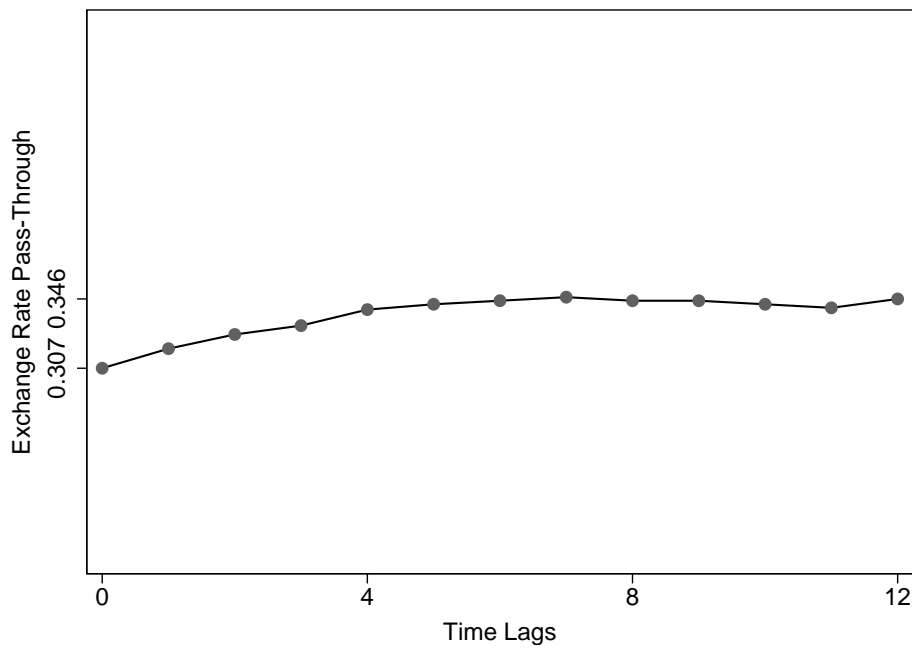


Figure 3: The Exchange Rate Pass-Through over Times

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This figure shows the exchange rate pass-through over times. The x-axis is time and the y-axis is exchange rate pass-through. When the time lags increases from 0 to 12, the exchange rate pass-through rises from 0.307 to 0.346.

Table 3: Source of Origin, Firm Location and Product by Trade Mode

PA		IA	
<i>Panel A: Source of Origin Share</i>			
Taiwan	21.51%	Japan	18.59%
Japan	16.96%	Taiwan	18.43%
South Korea	16.16%	South Korea	13.53%
Mainland China	11.10%	Mainland China	12.96%
Hong Kong	5.68%	Untied States	5.17%
Untied States	4.92%	Hong Kong	4.72%
Others	23.67%	Others	26.6%
<i>Panel B: Firm Location Share¹</i>			
Guangdong	52.79%	Guangdong	44.95%
Jiangsu	21.93%	Jiangsu	16.60%
Shanghai	7.74%	Shanghai	13.35%
Shandong	6.48%	Tianjin	4.63%
Liaoning	2.76%	Shandong	4.55%
Zhejiang	2.19%	Fujian	3.83%
Fujian	2.13%	Liaoning	3.52%
Tianjin	1.42%	Zhejiang	3.00%
Others	2.56%	Others	5.57%
<i>Panel C: Imported Product Share²</i>			
Electrical machinery and equipment (chapter 85)	31.89%	Electrical machinery and equipment (chapter 85)	45.46%
Optical, photographic, cinematographic (chapter 90)	10.43%	Nuclear reactors, boilers, machinery and mechanical appliances (chapter 84)	9.72%
Plastics (chapter 39)	9.11%	Optical, photographic, cinematographic (chapter 90)	8.33%
Nuclear reactors, boilers, machinery and mechanical appliances (chapter 84)	3.88%	Plastics (chapter 39)	6.95%
Others	44.69%	Others	29.54%

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the source of origin, firm locations and product categories by the trade modes.

1. The location is at the province level, which include 31 provinces in Mainland China except Tibet.

2. The product is at the HS2 level, which include 98 kinds of product categories.

3. The share is measured by the value ratio between the sub-sample and the full sample.

Table 4: Exchange Rate Pass-Through and Trade Mode

	Dependent Variable: $\Delta \ln(\text{Price})$			
	(1)	(2)	(3)	(4)
	Short-term		Long-term	
$\Delta \ln(\text{Exchange Rate})$	-0.0145 (-1.073)	-0.0302 (-1.575)	-0.2227*** (88.87)	-0.2629*** (61.34)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		0.0261 (1.247)		0.0681** (4.68)
Trade Mode	0.00155* (1.944)	0.00153* (1.911)	0.0015* (1.899)	0.0015* (1.833)
Observations	12,808,500	12,808,500	12,808,500	12,808,500
R-squared	0.005	0.005	0.005	0.005
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

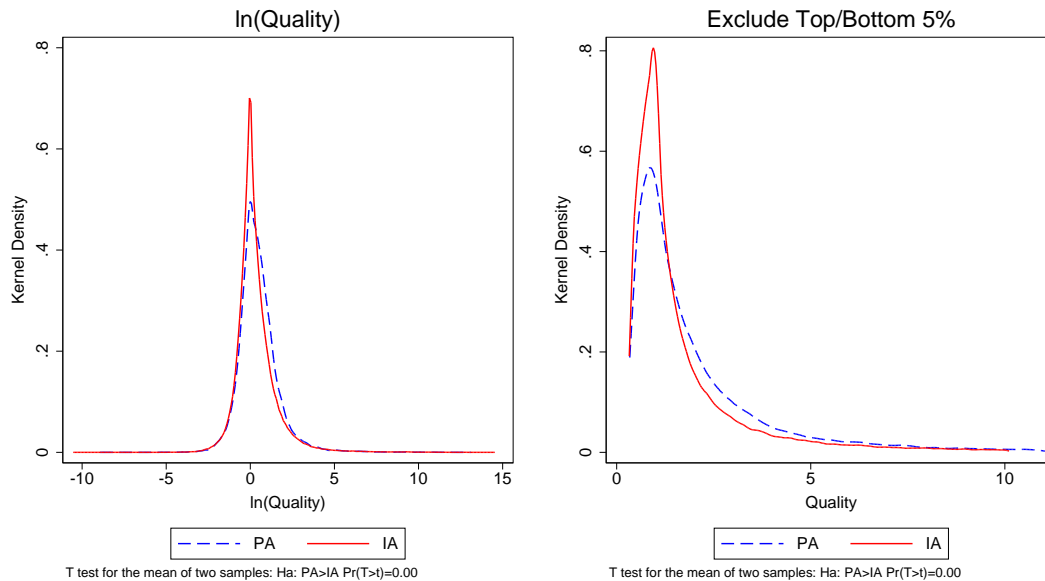


Figure 4: The Distribution of Quality

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This figure shows the distribution of product quality at the firm level. The x-axis is the quality index and the y-axis is the kernel density. To exclude the effect of outliers, we use the logarithm of the quality index in the left graph and exclude the top and bottom 5% observations in the right graph.

Table 5: Exchange Rate Pass-Through and Trade Mode By Ownership

	Dependent Variable: $\Delta \ln(\text{Price})$			
	(1)	(2)	(3)	(4)
	Short-term		Long-term	
Panel A: State-Owned				
$\Delta \ln(\text{Exchange Rate})$	0.0121 (0.404)	0.0149 (0.512)	-0.1262*** (7.45)	-0.0927** (4.43)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		-0.0191 (-0.219)		-0.2268* (3.13)
Trade Mode	0.00203 (1.102)	0.00205 (1.117)	0.00202 (1.097)	0.00216 (1.177)
Observations	2,536,094	2,536,094	2,536,094	2,536,094
R-squared	0.007	0.007	0.007	0.007
Panel B: Private-Owned				
$\Delta \ln(\text{Exchange Rate})$	-0.0713 (-0.806)	-0.121 (-1.228)	-0.3339** (6.42)	-0.2907** (4.17)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		0.217 (1.382)		-0.2072 (0.56)
Trade Mode	-0.00686 (-1.440)	-0.00721 (-1.509)	-0.00683 (-1.434)	-0.00688 (-1.435)
Observations	411,180	411,180	411,180	411,180
R-squared	0.023	0.023	0.023	0.023
Panel C: Joint-Owned				
$\Delta \ln(\text{Exchange Rate})$	0.0198 (0.752)	-0.0361 (-0.767)	-0.2978*** (50.36)	-0.5195*** (50.58)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		0.0792 (1.643)		0.3159*** (19.7)
Trade Mode	-0.000109 (-0.0613)	-0.000254 (-0.144)	-0.000204 (-0.114)	-0.000701 (-0.395)
Observations	3,015,715	3,015,715	3,015,715	3,015,715
R-squared	0.007	0.007	0.007	0.007
Panel D: Foreign-Owned				
$\Delta \ln(\text{Exchange Rate})$	-0.0418** (-2.148)	-0.0803** (-2.157)	-0.2216*** (56.41)	-0.3165*** (37.87)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		0.0495 (1.326)		0.1258* (5.91)
Trade Mode	0.00294** (2.505)	0.00293** (2.498)	0.00292** (2.481)	0.00294** (2.499)
Observations	6,835,528	6,835,528	6,835,528	6,835,528
R-squared	0.005	0.005	0.005	0.005
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.

2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.

3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

Table 6: Exchange Rate Pass-Through and Trade Mode Exclude U.S. Dollar Pegging Countries

	Dependent Variable: $\Delta \ln(\text{Price})$			
	(1)	(2)	(3)	(4)
	Stated-Owned	Private-Owned	Joint-Owned	Foreign-Owned
$\Delta \ln(\text{Exchange Rate})$	-0.0990*	-0.3424**	-0.5056***	-0.3110***
	(3.75)	(4.03)	(40.99)	(32.58)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$	-0.2773**	-0.2800	0.3207***	0.1303**
	(4.43)	(0.94)	(19.78)	(6.11)
Trade Mode	0.00253	-0.00885	0.000895	0.00366***
	(1.123)	(-1.454)	(0.444)	(2.828)
Observations	1,779,978	318,469	2,345,108	5,493,238
R-squared	0.009	0.024	0.008	0.005
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

Table 7: Exchange Rate Pass-Through and Trade Mode Exclude Intermediary

	Dependent Variable: $\Delta \ln(\text{Price})$			
	(1)	(2)	(3)	(4)
	Stated-Owned	Private-Owned	Joint-Owned	Foreign-Owned
$\Delta \ln(\text{Exchange Rate})$	-0.1516 (1.52)	-0.3890* (2.74)	-0.5248*** (51.55)	-0.3169*** (37.88)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$	0.1536 (0.48)	-0.1518 (0.2)	0.3203*** (20.22)	0.1260** (5.91)
Trade Mode	0.00416 (1.115)	-0.00847 (-0.750)	-0.000714 (-0.404)	0.00295** (2.506)
Observations	519,781	168,655	3,014,603	6,832,520
R-squared	0.018	0.034	0.007	0.005
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

Table 8: Exchange Rate Pass-Through and Trade Mode: Ordinary and Processing

	Dependent Variable: $\Delta \ln(\text{Price})$					
	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample	Stated-Owned	Private-Owned	Joint-Owned	Foreign-Owned	
$\Delta \ln(\text{Exchange Rate})$	-0.2579*** (153.6)	-0.3973*** (164.22)	-0.2725*** (28.5)	-0.2463*** (8.00)	-0.4009*** (39.09)	-0.5740*** (75.31)
$\Delta \ln(\text{Exchange Rate}) \times \text{Trade Mode}$		0.2250*** (48.11)	0.2166*** (14.29)	0.0850 (0.5)	0.1260* (3.55)	0.3789*** (34.18)
Trade Mode		-0.00215*** (-3.131)	-0.00963*** (-5.900)	-0.00466 (-1.095)	-0.000572 (-0.465)	-0.000139 (-0.142)
Observations	18,479,253	18,479,253	4,522,166	1,287,701	4,240,697	8,407,618
R-squared	0.006	0.006	0.008	0.023	0.009	0.007
Product-Country FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the processing trade mode, then it is 0, and otherwise 1.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

Table 9: Exchange Rate Pass-Through and Trade Mode: Decomposition

	Dependent Variable: $\Delta \ln(\text{Price})$	
	(1)	(2)
$\Delta \ln(\text{Exchange Rate})$	-0.2908*** (220.77)	
$\Delta \ln(\text{US Exchange Rate})$	0.0193 (-4.391)	
$\Delta \ln(\text{Nominal Exchange Rate})$		-0.2290*** (92.06)
$\Delta \ln(\text{CPI})$		0.0911 (1.7)
Trade Mode	0.00147* (0.08)	0.0015* (1.89)
Observations	12,808,500	12,808,500
R-squared	0.005	0.005
Product-Country FE	✓	✓
Firm FE	✓	✓
Time FE	✓	✓
Cluster By Product-Country	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices.

1. The product is at the HS6 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.

2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.

3. Robust t-statistics or F-statistics in parentheses. **Significant at 5%; ***significant at 1%.

Table 10: Quantity and Trade Mode

	Dependent Variable: ln(Average Quantity)				
	(1)	(2)	(3)	(4)	(5)
	Full Sample	State-Owned	Private-Owned	Joint-Owned	Foreign-Owned
Trade Mode	0.059*** (0.010)	0.098*** (0.020)	0.039 (0.024)	0.040*** (0.013)	0.026** (0.010)
Observations	21,089,302	4,271,495	792,896	5,041,485	10,960,662
R-squared	0.661	0.653	0.754	0.703	0.669
Product-Country FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the import quantity differences between two trade modes.

1. The product is at the HS8 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.
2. Standard errors in parentheses. **Significant at 5%; ***significant at 1%.

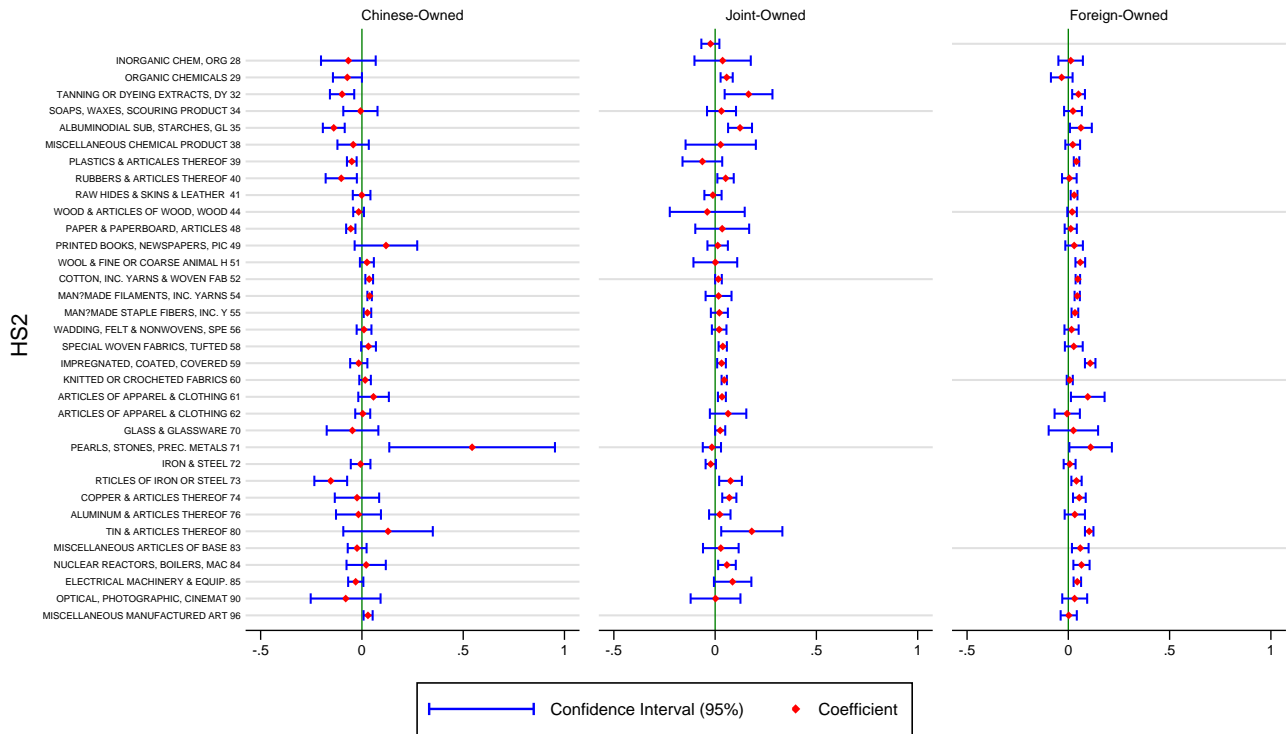


Figure 5: The Exchange Rate Pass-Through Differences Across Industries

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This figure shows the exchange rate pass-through differences across industries. We exclude those industries with less than 50,000 observations. The x-axis is the exchange rate pass-through differences and the y-axis is the industries name at the HS2 level.

Table 11: Summary of Intermediary and Non-intermediary Companies

Year	Share of Firm Number		Value ¹	
	Non-Intermediary	Intermediary	Non-Intermediary	Intermediary
<i>Panel A: Full Sample</i>				
2000	92.21%	7.79%	612	154
2001	92.33%	7.67%	679	163
2002	92.88%	7.12%	791	168
2003	93.08%	6.92%	1,160	183
2004	93.01%	6.99%	1,610	210
2005	94.21%	5.79%	2,010	209
2006	92.74%	7.26%	2,330	214
<i>Panel B: Non-Intermediary</i>				
Year	PA	IA	PA	IA
2000	24.56%	85.79%	162	556
2001	26.75%	84.30%	181	618
2002	27.31%	83.03%	189	720
2003	27.12%	83.06%	240	1,060
2004	27.82%	82.71%	369	1,500
2005	28.33%	81.93%	494	1,860
2006	27.49%	82.24%	582	2,030
<i>Panel C: Intermediary</i>				
Year	PA	IA	PA	IA
2000	57.15%	81.06%	146	114
2001	57.38%	80.74%	155	122
2002	57.45%	80.68%	160	145
2003	57.32%	76.70%	173	103
2004	56.20%	76.92%	195	81.4
2005	55.13%	76.17%	196	77.3
2006	54.37%	73.42%	201	66.3

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the summary of intermediary companies.

1. The unit is in billion yuan.

2. Since an assembly firm in China can be engaged in both trade modes, the sum of shares of the PA and IA modes is larger than 1.

Table 12: Companies and Ownership

Year	Non-intermediaries			Intermediaries		
	Chinese-owned	Joint-owned	Foreign-owned	Chinese-owned	Joint-owned	Foreign-owned
2000	7.10%	39.45%	53.45%	99.80%	0.14%	0.06%
2001	7.28%	37.28%	55.44%	99.77%	0.15%	0.08%
2002	6.84%	32.59%	60.57%	99.82%	0.09%	0.09%
2003	6.33%	28.23%	65.44%	99.83%	0.04%	0.13%
2004	6.39%	25.80%	67.81%	99.85%	0.03%	0.12%
2005	6.88%	22.82%	70.30%	99.78%	0.02%	0.20%
2006	6.71%	21.14%	72.15%	99.74%	0.01%	0.25%

Data Sources: The “Chinese Customs Export and Import Database”.

Notes: This table shows the import value share of ownership for both non-intermediary and intermediary companies.

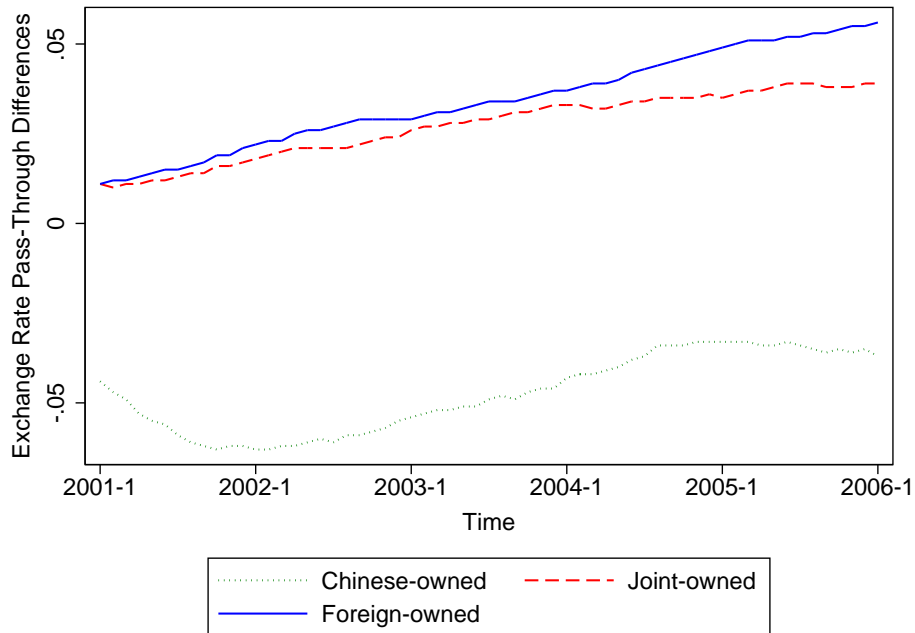


Figure 6: The Exchange Rate Pass-Through Differences Over Times

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This figure shows the exchange rate pass-through differences over times. The x-axis is time and the y-axis is exchange rate pass-through differences. We use the rolling regressions to get the exchange rate pass-through and the window is 24 months.

Table 13: Exchange Rate Pass-Through and Trade Mode By Source of Origin

	Dependent Variable: $\Delta \ln(\text{Price})$			
<i>Panel A: OECD</i>				
ln(Exchange Rate)	-0.1030** (4.22)	-0.1865 (1.22)	-0.5298*** (47.33)	-0.3562*** (43.80)
ln(Exchange Rate) \times Trade Mode	-0.2440* (3.30)	-0.3023 (0.97)	0.2964*** (16.43)	0.1210** (5.10)
Trade Mode	0.00214 (1.131)	-0.00685 (-1.305)	-0.000459 (-0.252)	0.00319*** (2.655)
Observations	2,267,595	360,266	2,752,931	6,172,677
R-squared	0.007	0.024	0.007	0.005
<i>Panel B: non-OECD</i>				
ln(Exchange Rate)	-0.1259 (1.32)	-0.8178*** (8.06)	-0.5087 (2.51)	0.0470 (0.06)
ln(Exchange Rate) \times Trade Mode	0.2415 (1.06)	0.6914 (2.64)	0.4237 (1.81)	-0.0730 (0.13)
Trade Mode	-0.00958 (-1.274)	-0.00730 (-1.054)	-0.00893 (-1.083)	0.00147 (0.234)
Observations	268,086	50,643	261,874	661,275
R-squared	0.012	0.024	0.014	0.009
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the exchange rate pass-through in import prices by source of origin.

1. The product is at the HS8 level. The trade mode is a dummy. If the product is traded under the PA trade mode, then it is 0, and otherwise 1.

2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.

3. The developed countries (regions) include OECD countries plus Singapore and Taiwan. We exclude Hong Kong and the United States from the sample.

4. Standard errors in parentheses. **Significant at 5%; ***significant at 1%.

Table 14: Exchange Rate Pass-Through and Market Share

	Dependent Variable: $\Delta \ln(\text{Price})$					
	Full Sample	State-owned	Private-owned	Joint-owned	Foreign-owned	
$\Delta \ln(\text{Exchange Rate})$	-0.1475*** (32.91)	-0.1616*** (32.80)	-0.0547 (0.03)	-0.5555 (1.99)	-0.1750*** (15.16)	-0.1562*** (20.73)
$\Delta \ln(\text{Exchange Rate}) \times \text{Market Share}$		0.1129 (1.739)	1.9490** (4.84)	2.1423** (4.32)	-0.0087 (0.01)	0.0986 (1.13)
Market Share	0.00273** (2.026)	0.00276** (2.045)	0.0408 (1.580)	0.0189 (0.516)	0.000181 (0.0665)	0.00355** (2.124)
Observations	7,867,522	7,867,522	156,630	59,310	2,221,978	5,423,042
R-squared	0.007	0.007	0.031	0.069	0.010	0.006
Product-Country FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the impact of market share at the exchange rate pass-through within the IA trade mode.

1. The product is at the HS6 level.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
- 3 The market share is defined as the value ratio between firm f and all firms at the product-country-month level.
4. We exclude intermediary companies from the sample.
5. Standard errors in parentheses. **Significant at 5%; ***significant at 1%.

Table 15: Exchange Rate Pass-Through and Industry

	Dependent Variable: $\Delta \ln(\text{Price})$			
	State-owned	Private-owned	Joint-owned	Foreign-owned
$\Delta \ln(\text{Exchange Rate}) \times \text{Homogeneous}$	-0.0281 (0.18)	0.0474 (0.05)	-0.2619* (3.25)	-0.2290** (6.48)
$\Delta \ln(\text{Exchange Rate}) \times \text{Homogeneous} \times \text{Trade Mode}$	-0.0114 (0.00)	-0.0709 (0.04)	0.0242 (0.02)	0.0911 (1.00)
$\Delta \ln(\text{Exchange Rate}) \times \text{Differentiated}$	-0.1208** (5.77)	-0.3240** (4.17)	-0.5391*** (47.31)	-0.3318*** (33.23)
$\Delta \ln(\text{Exchange Rate}) \times \text{Differentiated} \times \text{Trade Mode}$	-0.2581* (3.20)	-0.3388 (1.02)	0.3476*** (19.92)	0.1271** (4.54)
Trade Mode	0.002292 (1.24)	-0.007633 (-1.56)	-0.00076 (-0.43)	0.003248*** (2.74)
Observations	2,461,373	398,176	2,925,637	6,623,303
R-squared	0.007	0.023	0.007	0.005
Product-Country FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
Cluster By Product-Country	✓	✓	✓	✓

Data Sources: The “Chinese Customs Export and Import Database” and IFS.

Notes: This table shows the impact of market share at the exchange rate pass-through within the IA trade mode.

1. The product is at the HS6 level.
2. The price is in the yuan and the exchange rate is the real exchange rate between the source of origin and China. An increase in the real exchange rate implies an appreciation of the yuan.
- 3 The market share is defined as the value ratio between firm f and all firms at the product-country-month level.
4. We exclude intermediary companies from the sample.
5. Standard errors in parentheses. **Significant at 5%; ***significant at 1%.

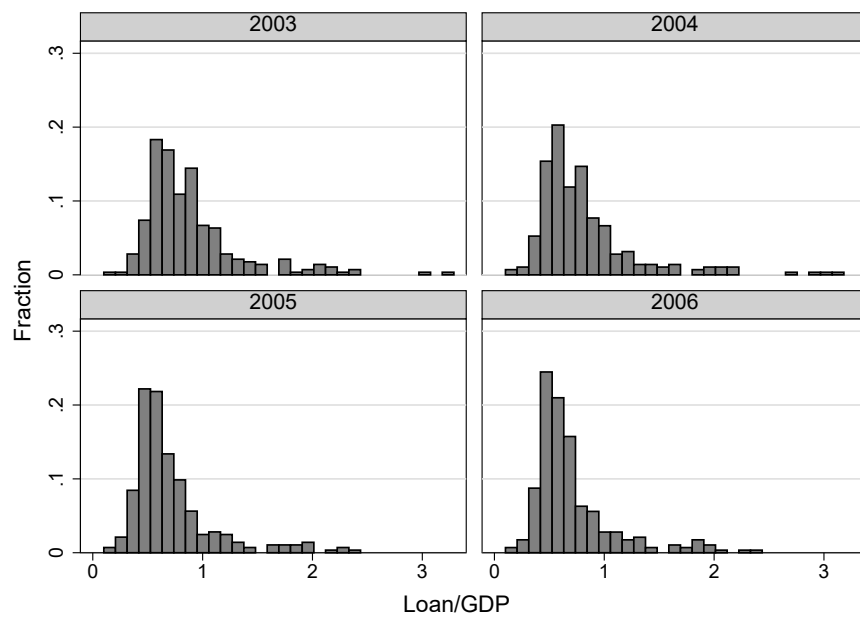


Figure 7: The Distribution of Loan/GDP

Data Sources: The "China City Statistical Yearbook".

Notes: This figure shows the distribution of loans/GDP. The x-axis is the loans/GDP and the y-axis is the density.

Exchange rate pass-through and firms in processing trade

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