Exchange Rate Pass-Through and Importers' Credit Constraints: Evidence From China

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Outline

Motivations

- Exchange rate shock is a key factor affecting international trade price fluctuations.
- The impact of exchange rate changes on prices denominated in buyers' and sellers' currencies may be different, which leads to the studies on exchange rate pass-through.
- Exchange rate pass-through (ERPT) is defined as **the elasticity of local price changes to exchange rate changes**. ▸ Example
- Understanding the pattern of ERPT has important implications for formulating macro policies, including monetary policy, inflation targeting, and the balance of payments.

Motivations

- Import sourcing is crucial for firm performance and aggregate welfare, while less is known about import-side (or buyer-side) ERPT with firm-level evidence.
- The credit constraints could be an important factor for significant firm heterogeneity in ERPT.
- It remains an open question whether **importers under financial constraints will behave differently** in price setting during exchange rate fluctuations compared to those less constrained.

Research Questions

1. What is the degree of ERPT among importers in China?
2. How do credit constraints affect the importers' ERPT?
3. What could be the theoretical rationales?

What We Find

Using Chinese customs transaction records and firm-level data:

1. The baseline import ERPT in China is around 73%.
2. Importers with tighter financial constraints have more complete ERPT.
3. Theory: Tighter financial constraints $\rightarrow$ Higher demand elasticity $\rightarrow$ Great changes in bargaining position $\rightarrow$ Higher ERPT.

Contribution: Incomplete Exchange Rate Pass-Through

- We contribute to the literature of exchange rate disconnect, particularly on firm-level evidence of **incomplete ERPT**.
- Related literature:
  - Berman, Martin and Mayer (2012) (BMM): micro-level evidence of firm heterogeneity in response to real exchange rate shocks.
  - Amiti, Itskhoki and Konings (2014) (AIK): firms with higher import intensity and larger market share have lower ERPT.
  - More works: Li, Ma and Xu (2015), Chen and Juvenal (2016), Garetto (2016), Auer and Schoenle (2016), Devereux, Dong and Tomlin (2017), etc.
- Our contribution is to examine how **import** ERPT is affected by **credit constraints** using highly disaggregated data, particularly important for emerging markets with immature financial markets.

Contribution: Credit Constraints and Trade

- This paper adds to the literature related to **the effects of credit constraints on firms' trade behaviors**.
- E.g.: Manova (2013), Chaney (2016), Manova, Wei and Zhang (2015), Fan, Lai and Li (2015).
- A few studies discuss how credit constraints affect firms' **export** responses to exchange rate fluctuations.
  - Strasser (2013) shows that financially constrained firms tend to pass more exchange rate shocks to export prices.
  - Dai et al. (2021) and Xu and Guo (2021) explore the export response to exchange rate shock under credit constraints.
- We contribute by uncovering the role of credit constraints in affecting **import EPRT** and showing how sourcing capacity (diversity) helps alleviate such impacts.

Outline

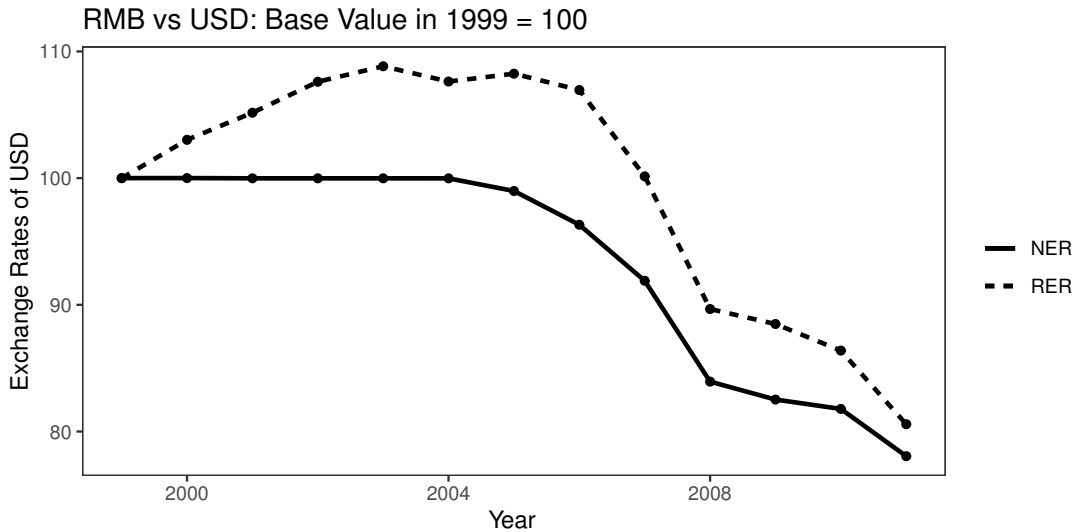
Data: Exchange Rates and Macro Variables

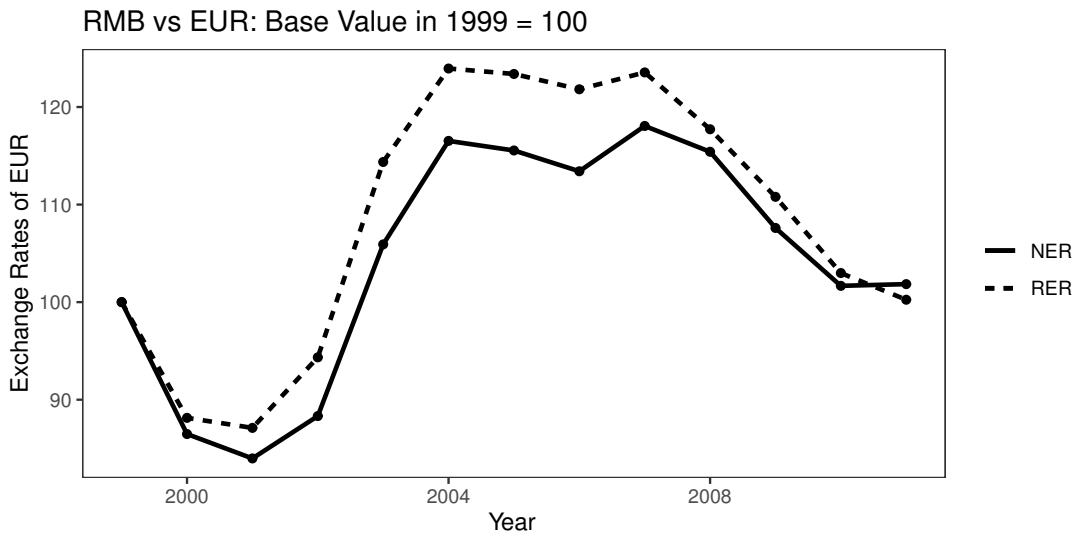
- The bilateral nominal exchange rate is defined as the number of home currency units that can purchase a unit of foreign currency.
- The CPI-based real exchange rate (RER_{ct}) is defined as:

$$RER_{ct} = NER_{ct} \cdot \frac{CPI_{ct}}{CPI_{CHN,t}}.$$

- An increase in RER_{ct} means a real depreciation of the Chinese RMB against the foreign country's c currency.
- We use the real GDP of trading partners computed with national accounts growth, $RGDP_{ct}$, as the control variable of foreign supplies.

Data: Exchange Rates Fluctuations





Data: Firm-level and Customs data

- Annual surveys of industrial enterprises from the National Bureau of Statistics of China
  - Sample: all state-owned enterprises and above-scale firms (sales >5 million RMB), 1999 to 2007
  - Information: balance sheet variables, sales, employment, etc.
- China Customs Records (from the General Administration of Customs of China)
  - Sample: all exporting firms (except whole-sellers) in 2000-2011; matched manufacturing firms in 2000-2007 (baseline).
  - Information: import and export values, quantities, product names and codes, source and destination countries, and firm types

Data: Summary Statistics

Table 1: Summary statistics for customs and firm data

	Mean	Median	Std. Dev	P10	P90	#observations
Panel A: Firm information						
Sales Income (in 1000 RMB)	81492	18164	737089	5465	114840	1,619,194
Employment (persons)	256	106	939	30	491	1,619,194
Fixed Asset (in 1000 RMB)	27398	4025	311063	572	36586	1,619,194
Operation Input (in 1000 RMB)	63645	14318	580861	4143	90624	1,619,194
Current wage payable (in 1000 RMB)	3802	1144	29502	278	6404	1,619,194
Panel B: Matched sample with customs data						
Annual Import Price Change	-0.0851	-0.0018	1.4129	-1.3406	1.1411	1,478,176
Value per Transaction (in 1000 USD)	1140.97	14.81	18807.06	0.34	689.87	1,478,176
# Sources per Firm-product	2.07	1	2.27	1	4	1,478,176
Annual Export Price Change	0.0248	0.0056	0.7101	-0.5251	0.5940	1,724,591
Value per Transaction (in 1000 USD)	786.32	44.08	17472.43	1.92	850.69	1,724,591
# Destinations per Firm-product	9.56	5	10.94	1	24	1,724,591

Notes: This table shows the summary statistics of some important variables in our major datasets. Panel A describes sales and costs information of Chinese manufacturing firms during 2000-2007. The observations in panel A are at the firm-year level. The money values in panel A are in thousands of RMB. Panel B describes the price change, the value per transaction, and the number of sources (destinations) from (to) which each firm imports (exports) a certain HS6 product for the matched sample. The observations in panel B are at the firm-product-country-year level. The money values in panel B are in thousands of USD.

Measures of Credit Constraints

- Following Manova, Wei and Zhang (2015) and Fan, Lai and Li (2015), we use sector-level financial vulnerability measures.
  1. **External Finance Dependence ($ExtFin_s$)**: the share of capital expenditures not financed by operational cash flows.
  2. **Asset Tangibility ($Tang_s$)**: the share of the net value of tangible assets that firms can pledge as collateral in its total book value.
  3. **Inventory-to-sales Ratio ($Invent_s$)**: the production cycle duration in which firms need necessary working capital to maintain inventories.

- We construct the **first principal component** FPC_s of external finance dependence and asset tangibility as an aggregate measure.

Outline

Baseline Estimation Equation

- The first step goal is to estimate exchange rate pass-through as the elasticity of unit values changes to exchange rate changes.

$$\Delta \ln P_{ijct} = \alpha + \beta \Delta \ln RER_{ct} + \gamma \Delta \ln RGDP_{ct} + \xi_{ijc} + \tau_t + \varepsilon_{ijct}, \quad (1)$$

  where
  - P_{ijct}: the price of the product i bought by firm j from country c in year t.
  - ξ_{ijc}: the firm-product-country level fixed effects
  - τ_t: the year dummies, control for common macro-shocks across firms.

- β measures the completeness of importers' ERPT.
  - A higher β means that Chinese importers face more volatile import RMB prices during exchange rate shocks.
  - A lower β corresponds to greater price stability for Chinese firms.

Unit Value as Price

- The customs records contain trade values (originally denominated by US dollars) and quantities V_{ijct}, and Q_{ijct} for each HS6 product i, each firm j, from each country c, in each year t.
- The prices for import P_{ijct} are computed as unit values, both denominated by the Chinese RMB:

$$P_{ijct} = \frac{V_{ijct} \times NER_{US,t}}{Q_{ijct}}$$

- Because product categories are highly subdivided (HS6), we believe that the unit value is an ideal proxy for the transaction price.

Results: Incomplete Pass-through into Import Prices

Table 3: Exchange rate pass-through to import prices and credit constraints

	(1)	(2)	(3)	(4)	(5)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$				
	Baseline	FPC	External Finance	Tangibility	Inventory
$\Delta \ln RER_{ct}$	0.732***	0.351***	0.493***	1.986***	-0.930**
	(0.075)	(0.064)	(0.065)	(0.258)	(0.420)
$\Delta \ln RGDP_{ct}$	0.117	0.170	0.115	0.141	0.156
	(0.182)	(0.183)	(0.182)	(0.183)	(0.183)
$\Delta \ln RER_{ct} \times FPC_s$		0.573***			
		(0.089)			
$\Delta \ln RER_{ct} \times ExtFin_s$			1.749***		
			(0.266)		
$\Delta \ln RER_{ct} \times Tang_s$				-5.111***	
				(0.960)	
$\Delta \ln RER_{ct} \times Invent_s$					9.536***
					(2.460)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (2)-(5) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Export-Credit

Finding 1: Incomplete Pass-through into Import Prices

Finding 1

- The average exchange rate pass-through into import prices in China is incomplete, at around 73%.

- The average import prices denominated in RMB will increase by approximately 7.3% during a 10% real depreciation of RMB against the currency in the source country.
- For manufacturing exporters highly dependent on imported inputs, the disadvantages of sourcing cost increases caused by depreciation may offset the benefit from the competitiveness of export prices.

Estimations with Credit Constraints

- We study the credit constraint effects on exchange rate pass-through by including an interaction term of sectors' financial vulnerability:

$$\begin{aligned}\Delta \ln P_{ijct} =& \alpha + \beta_1 \Delta \ln RER_{ct} + \beta_2 \Delta \ln RER_{ct} \cdot FC_s \\ &+ \gamma \Delta \ln RGDP_{ct} + \xi_{ijc} + \tau_t + \varepsilon_{ijct}\end{aligned} \tag{2}$$

  - FC_s: financial constraint of the sector to which the firm j belongs.
  - β_2: effect of credit constraints on exchange rate pass-through.
- The overall ERPT for an importer j is given by $\beta_1 + \beta_2 FC_s$.

Results: Credit Constraints and Import ERPT

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		(0.089)			
$\Delta \ln RER_{ct} \times ExtFin_s$			1.749***		
			(0.266)		
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Observations	1449210	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (2)-(5) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Export-Credit

Finding 2: Credit Constraints and Import ERPT

Finding 2

- Importers (buyers) with tighter financial constraints will have a more complete exchange rate pass-through.

- Exchange rate fluctuations are more likely reflected in unstable import costs for importers in financially constrained industries because they have weak bargaining power in global sourcing.
- Inadequate credit results in limited financial flexibility for these importers so they might be unable to negotiate better deals or absorb unexpected costs.
- *Credit constraints expose Chinese manufacturing firms to greater exchange rate risk (more volatile prices) in global sourcing.*

Estimations with Additional Factors

- We introduce a vector $\mathbb{Z}_{jt}$ (or its lagged form $\mathbb{Z}_{jt-1}$) to include additional factors that may affect ERPT.
- Estimation equations with additional factors $\mathbb{Z}_{jt}$:

$$\begin{aligned}\Delta \ln P_{ijct} =& \alpha + [\beta_1 + \beta_2 \cdot FC_s + \beta_3 \cdot \mathbb{Z}_{jt}']\Delta \ln RER_{ct} \\ &+ \gamma \Delta \ln RGDP_{ct} + \mathbb{Z}_{jt}'\eta + \xi_{ijc} + \tau_t + \varepsilon_{ijct}.\end{aligned} \tag{3}$$

$$\begin{aligned}\Delta \ln P_{ijct} =& \alpha + [\beta_1 + \beta_2 \cdot FC_s + \beta_3 \cdot \mathbb{Z}_{jt}' + \beta_4 \cdot FC_s \cdot \mathbb{Z}_{jt}']\Delta \ln RER_{ct} \\ &+ \gamma \Delta \ln RGDP_{ct} + \mathbb{Z}_{jt}'\eta + \xi_{ijc} + \tau_t + \varepsilon_{ijct}.\end{aligned} \tag{4}$$

- Now we focus on how **sourcing diversity** affects exchange rate pass-through for firms subject to different levels of credit constraints.
- **Sourcing diversity** is defined as the number of source countries from which an importer j imports a certain HS6 product type i.

Results: Sourcing Diversity, Credit Constraints, and ERPT

Table 4: Import sources, credit constraints, and exchange rate pass-through

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
	Current Sources				Initial Sources			
	#Sources	#Sources+ FPC	#Sources+ External Finance	#Sources+ Tangibility	#Sources	#Sources+ FPC	#Sources+ External Finance	#Sources+ Tangibility
$\Delta \ln RER_{ct}$	0.950***	0.550***	0.696***	2.375***	0.930***	0.548***	0.683***	2.282***
	(0.055)	(0.058)	(0.054)	(0.146)	(0.054)	(0.059)	(0.054)	(0.147)
$\Delta \ln RGDR_{ct}$	0.143	0.080	0.080	0.108	0.143	0.082	0.082	0.109
	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)	(0.126)
$\Delta \ln RER_{ct} \times \#Source_{ijt}$	-0.059***	-0.059***	-0.057***	-0.081***	-0.066***	-0.071***	-0.065***	-0.076***
	(0.009)	(0.010)	(0.009)	(0.024)	(0.010)	(0.012)	(0.010)	(0.028)
$\Delta \ln RER_{ct} \times FPC_s \times \#Source_{ijt}$		-0.015**				-0.011		
		(0.007)				(0.009)		
$\Delta \ln RER_{ct} \times FPC_s$		0.670***				0.637***		
		(0.046)				(0.047)		
$\Delta \ln RER_{ct} \times ExtFin_s \times \#Source_{ijt}$			-0.064***				-0.058**	
			(0.020)				(0.025)	
$\Delta \ln RER_{ct} \times ExtFin_s$			2.113***				2.024***	
			(0.137)				(0.140)	
$\Delta \ln RER_{ct} \times Tang_s \times \#Source_{ijt}$				0.049				-0.005
				(0.098)				(0.116)
$\Delta \ln RER_{ct} \times Tang_s$				-5.665***				-5.374***
				(0.537)				(0.552)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm-product level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (1)-(4) use the number of source countries in the current year, while columns (5)-(8) use the number of source countries in the initial year. All regressions include firm-product-country fixed effects and year fixed effects.

▶ Geographical Distance

Finding 3: Sourcing Diversity, Credit Constraints, and ERPT

Finding 3

- Importers with a larger sourcing base (who import a certain product from more sources) have a less complete ERPT and are less affected by credit constraints.

- If a firm can import the same product from more sources, it has more flexibility to escape the unfavorable exchange rate risk.
- The result is similar if we replace the number of sources with the average sourcing distance.
- A more diverse importer can either switch from one source to another to reduce costs (trade diversion effect) or make a more credible threat to negotiate a more stable price.

Outline

Robustness Checks

- Robustness 1: alternative measures of credit constraints from Chinese data
- Robustness 2: alternative transaction samples excluding countries using USD or USD-pegged currencies
- Robustness 3: controls of trade type (1) two-way traders vs pure importers and (2) ordinary trade vs processing trade ▸ Trade type
- Robustness 4: controls of firm ownership ▸ Ownership
- Robustness 5: controls of firm-specific markup levels ▸ Markup
- Robustness 6: different estimation methods (1) alternative fixed effects ▸ Alternative FEs and (2) cross-sectional estimation ▸ Cross-sectional

Robustness 1: Alternative Measures of Credit Constraints

Table 5: Robustness check: alternative credit constraints measures from Chinese data

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$			
	Measures of Credit Constraints from Chinese Data			
	External Finance	Tangibility	Inventory	R&D Intensity
$\Delta \ln RER_{ct}$	0.943***	3.427***	-0.966***	0.215*
	(0.113)	(0.395)	(0.267)	(0.110)
$\Delta \ln RGDP_{ct}$	0.154	0.142	0.168	0.160
	(0.183)	(0.182)	(0.183)	(0.183)
$\Delta \ln RER_{ct} \times ExtFin_s$	0.327**			
	(0.134)			
$\Delta \ln RER_{ct} \times Tang_s$		-9.321***		
		(1.286)		
$\Delta \ln RER_{ct} \times Invent_s$			14.919***	
			(2.433)	
$\Delta \ln RER_{ct} \times R\&D_s$				26.607***
				(5.291)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. The dependent variable is the price change $\Delta \ln P_{ijct}$. Columns (1)-(4) use different measures of credit constraints calculated using Chinese data. All regressions include firm-product-country fixed effects and year fixed effects.

Robustness 2: Alternative Transaction Samples

Table 6: Robustness check: alternative samples excluding countries using USD or USD-pegged currencies

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$ Excluding US Dollar Peg			
	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.849***	0.511***	0.642***	2.021***
	(0.086)	(0.086)	(0.081)	(0.266)
$\Delta \ln RGDP_{ct}$	0.770***	0.678***	0.686***	0.710***
	(0.252)	(0.247)	(0.247)	(0.249)
$\Delta \ln RER_{ct} \times FPC_s$		0.526***		
		(0.086)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.590***	
			(0.255)	
$\Delta \ln RER_{ct} \times Tang_s$				-4.753***
				(0.933)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Observations	1147027	1147027	1147027	1147027

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and, 1% levels. We exclude countries that use the U.S. dollar or currencies pegged to the U.S. dollar. Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Outline

Discussion: Import Market Share

- How does an importer's market share in the market of a specific product affect its exchange rate pass-through?
- The "import market share" is defined as the fraction of a firm j's import value to the total value imported by all Chinese importers from the same source c, within a given HS6 product i in year t:

$$S_{ijct} \equiv \frac{v_{ijct}}{\sum_{j' \in J_{ict}} v_{ij'ct}}$$

- Can firm heterogeneity in market shares explain the effects of credit constraints on pass-through? How about the impact of credit constraints after we consider market share?

Import Market Share

Table 7: Heterogeneous Market Share, Credit Constraints, and Exchange Rate Pass-through

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$			
	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.832***	0.438***	0.579***	2.003***
	(0.070)	(0.079)	(0.069)	(0.258)
$\Delta \ln RGDP_{ct}$	0.149	0.106	0.103	0.129
	(0.182)	(0.181)	(0.181)	(0.181)
$\Delta \ln RER_{ct} \times MS_{ijct}$	-0.975***	-0.728***	-0.791***	-0.782***
	(0.130)	(0.123)	(0.126)	(0.122)
$\Delta \ln RER_{ct} \times FPC_s$		0.555***		
		(0.088)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.705***	
			(0.264)	
$\Delta \ln RER_{ct} \times Tang_s$				-4.859***
				(0.960)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Market Share Control	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1%. Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Outline

A Bargaining Model with Financial Constraints

- We develop a simple PE model of price determination in firms' import sourcing choices, built upon Alviarez et al. (2023).
- In the model, the import price p_{ij} are determined by bilateral negotiation between the domestic importer i and the foreign supplier j.
- **Financial Constraints**: the importer is required to prepay a fixed fraction of the ordered import value before receiving the inputs from foreign suppliers. We assume that the importer must borrow from banks to make the required prepayment.
- **Sourcing Diversity**: the importer buys products from several foreign exporters.

Pass-Through

The import price pass-through elasticity to a change in RER (φ_i) can be derived as:

$$\Phi_{ij} \equiv \frac{d \ln p_{ij}}{d \ln \varphi_i} = \frac{1}{1 + \Gamma^s_{ij}(\rho - 1)(1 - s_{ij}) + \Gamma^x_{ij}\varepsilon_{ij}(1 - x_{ij}) + \frac{1-\theta}{\theta} x_{ij}\varepsilon_{ij}} \quad (5)$$
$$\simeq \Phi_{SC} \times \Phi_{SS} \times \Phi_{TT} \leq 1.$$

The pass-through degree is decomposed into three components.

- $\Phi_{SC} \leq 1$ captures how the oligopoly markup of the supplier responds to exchange rate shocks.
- $\Phi_{SS} \geq 1$ reflects how the oligopsony markdown of the importer is influenced by exchange rate shocks.
- $\Phi_{TT} \leq 1$ captures the endogenous changes in the supplier's marginal cost to the initial impact of the shock.

Pass-Through

The import price pass-through elasticity to a change in RER (φ_i) can be derived as:

$$\Phi_{ij} \equiv \frac{d \ln p_{ij}}{d \ln \varphi_i} = \frac{1}{1 + \Gamma^s_{ij}(\rho - 1)(1 - s_{ij}) + \Gamma^x_{ij}\varepsilon_{ij}(1 - x_{ij}) + \frac{1-\theta}{\theta} x_{ij}\varepsilon_{ij}} \quad (6)$$
$$\simeq \Phi_{SC} \times \Phi_{SS} \times \Phi_{TT} \leq 1.$$

The pass-through degree is decomposed into three components.

- $\Phi_{SC} \leq 1$ captures how the oligopoly markup of the supplier responds to exchange rate shocks.
- $\Phi_{SS} \geq 1$ reflects how the oligopsony markdown of the importer is influenced by exchange rate shocks.
- $\Phi_{TT} \leq 1$ captures the endogenous changes in the exporter's marginal cost to the initial impact of the shock.

Financial Constraints and Sourcing Diversity

A depreciation in RMB raises a foreign supplier's price ⇒ Lower demand.

Financial Constraints:

- To the importer, this reduced demand limits the importer's role within this buyer-seller relationship ⇒ Higher price.
- Financial constraint amplifies this effect by making the importer more sensitive to price changes.
- Tighter financial constraints ⇒ higher demand reduction ⇒ Higher ERPT.

Sourcing Diversity:

- To the supplier, when its production technology exhibits decreasing returns to scale, reduced demand ⇒ lowers marginal cost for the supplier.
- This reduction in marginal cost provides the supplier with greater flexibility to stabilize the price by lowering its markup in response to positive cost shocks.
- Higher sourcing diversity ⇒ larger the importer's demand elasticity.
- Therefore, higher sourcing diversity amplifies the endogenous adjustments ⇒ Lower ERPT.

Outline

Conclusion

- This paper provides disaggregated level evidence for the incomplete exchange rate pass-through (ERPT) into import prices in China and reveals how importers' financial constraints affect the pass-through.
- We find that:
  1. The average exchange rate pass-through to import prices in China is incomplete (73%).
  2. Exchange rate pass-through into import prices is more complete for firms in industries with tighter credit constraints.
  3. Import source diversity can effectively reduce ERPT into import prices and offset the effects of credit constraints.
- We offer theoretical mechanisms potentially at play and leave quantitative calibration to the next paper.

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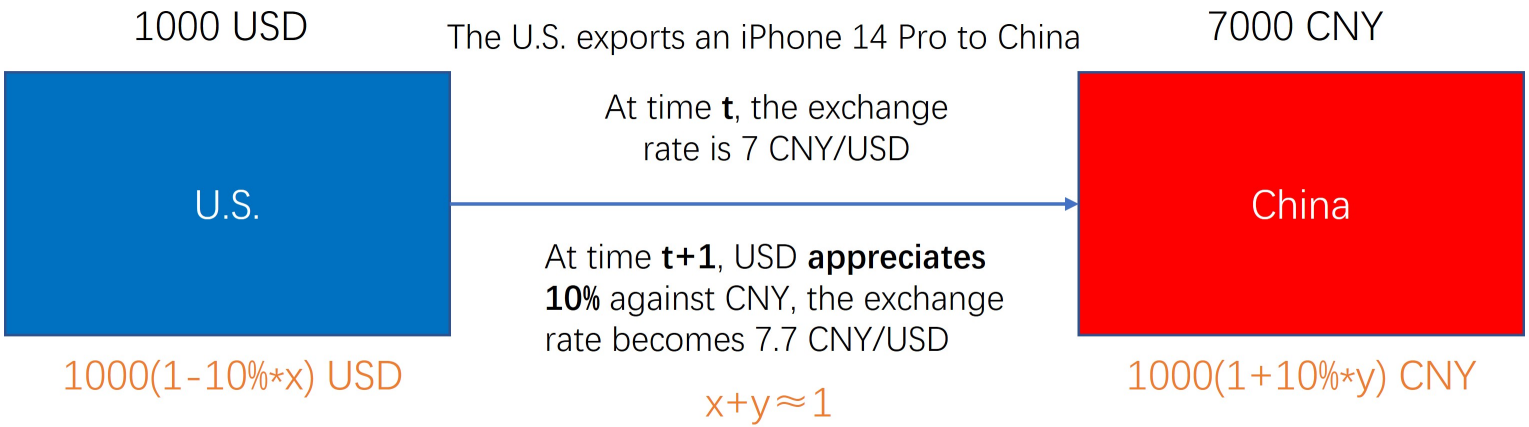
Illustrative Example of ERPT

- ERPT measures how exchange rate shock is shared between buyers and sellers of trade.



- In this example, we call y as ERPT into China's import price.

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Measures of Credit Constraints

Table A.1: Summary statistics of measures of credit constraints

	Mean	Median	Std. dev	P10	P90	# Observations
Panel A: US Measures						
FPC_s	0	0.030	1.000	-0.898	1.426	414
$ExtFin_s$	-0.019	-0.040	0.317	-0.22	0.37	414
$Tang_s$	0.295	0.275	0.093	0.180	0.427	414
$Invent_s$	0.164	0.17	0.032	0.100	0.196	414
Panel B: Chinese Measures						
FPC_s	-0.099	-0.077	1.000	-1.741	1.139	414
$ExtFin_s$	-0.643	-0.440	0.664	-1.340	-0.100	414
$Tang_s$	0.323	0.294	0.068	0.235	0.432	414
$Invent_s$	0.121	0.117	0.033	0.083	0.174	414
$R\&D_s$	0.017	0.014	0.013	0.007	0.028	414

Notes: This table shows the summary statistics of credit constraint measures. Panel A describes the measures calculated using US data, while panel B shows the alternative measures from Chinese data. FPC_s denotes the first principal components of external finance dependence and asset tangibility. $ExtFin_s$ denotes external finance dependence, $Tang_s$ denotes asset tangibility, $Invent_s$ denotes inventory ratio, and $R\&D_s$ denotes R&D intensity.

Alternative Samples of Importers

Table A.2: Alternative samples of importers

	(1)	(2)	(3)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$		
	Whole	Top 50	Top 20
$\Delta \ln RER_{ct}$	0.426***	0.723***	0.658***
	(0.024)	(0.064)	(0.066)
$\Delta \ln RGDP_{ct}$	-0.310***	0.190	0.082
	(0.083)	(0.186)	(0.207)
Year FE	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes
Observations	3886845	1439301	1343150

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Column (1) uses the whole customs data from 2000 to 2007. Columns (2) and (3) use sub-samples with only China's top 50 and top 20 partners ranked by total trade value. All regressions include firm-product-country fixed effects and year fixed effects.

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Results: Credit Constraints and Export ERPT

- A higher β means exporters pass less exchange rate change to the local currency and have more volatile prices in the producer currency.

Table A.3: Exchange rate pass-through to export prices and credit constraints

	(1)	(2)	(3)	(4)	(5)
Dependent Var:	Export Prices $\Delta \ln P_{ijct}$				
	Baseline	FPC	External Finance	Tangibility	Inventory
$\Delta \ln RER_{ct}$	0.060***	0.074***	0.066***	-0.034	0.162**
	(0.012)	(0.013)	(0.013)	(0.036)	(0.071)
$\Delta \ln RGDP_{ct}$	-0.085*	-0.086*	-0.086*	-0.086*	-0.085*
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
$\Delta \ln RER_{ct} \times FPC_s$		-0.031***			
		(0.010)			
$\Delta \ln RER_{ct} \times ExtFin_s$			-0.090***		
			(0.033)		
$\Delta \ln RER_{ct} \times Tang_s$				0.354***	
				(0.127)	
$\Delta \ln RER_{ct} \times Invent_s$					-0.593
					(0.407)
Year FE	Yes	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes	Yes
Observations	1690715	1690715	1690715	1690715	1690715

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (2)-(5) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

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Results: Geographical Distance

Table A.4: Import Sources, Credit Constraints, and Exchange Rate Pass-Through: Geographical Distance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
	Simple Distance				Population-weighted Distance			
	Distance	FPC	External Finance	Tangibility	Distance	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	1.099***	0.494***	0.688***	2.652***	1.099***	0.477***	0.675***	2.680***
	(0.107)	(0.117)	(0.101)	(0.417)	(0.112)	(0.120)	(0.104)	(0.432)
$\Delta \ln RGDR_{ct}$	0.039	0.006	-0.007	0.030	0.051	0.017	0.003	0.041
	(0.189)	(0.188)	(0.188)	(0.189)	(0.189)	(0.188)	(0.188)	(0.189)
$\Delta \ln RER_{ct} \times Distance_{ijt}$	-0.090***	-0.039**	-0.055***	-0.188***	-0.090***	-0.036**	-0.052***	-0.194***
	(0.018)	(0.015)	(0.015)	(0.062)	(0.019)	(0.016)	(0.016)	(0.067)
$\Delta \ln RER_{ct} \times FPC_s \times Distance_{ijt}$		-0.063***				-0.068***		
		(0.020)				(0.022)		
$\Delta \ln RER_{ct} \times FPC_s$		0.805***				0.827***		
		(0.141)				(0.146)		
$\Delta \ln RER_{ct} * ExtFin_s \times Distance_{ijt}$			-0.222***				-0.242***	
			(0.057)				(0.061)	
$\Delta \ln RER_{ct} \times ExtFin_s$			2.653***				2.738***	
			(0.418)				(0.433)	
$\Delta \ln RER_{ct} \times Tang_s \times Distance_{ijt}$				0.441**				0.465**
				(0.206)				(0.221)
$\Delta \ln RER_{ct} \times Tang_s$				-6.572***				-6.697***
				(1.543)				(1.590)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210	1449210	1449210	1449210	1449210

Notes:Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (1)-(4) use the simple distance between the most populated cities of the two countries while columns (5)-(8) use the population-weighted harmonic mean distance between the two countries. All regressions include firm-product-country fixed effects and year fixed effects.

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Robustness: Trade Type Controls

Table A.5: Robustness check: trade type controls for two-way traders or processing trade

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
		Two-way Traders Controls				Processing Trade Controls		
	Baseline	FPC	External Finance	Tangibility	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.732***	0.352***	0.493***	1.986***	0.736***	0.355***	0.496***	2.000***
	(0.064)	(0.075)	(0.065)	(0.258)	(0.064)	(0.075)	(0.065)	(0.256)
$\Delta \ln RGDP_{ct}$	0.170	0.117	0.116	0.141	0.149	0.096	0.096	0.120
	(0.184)	(0.182)	(0.182)	(0.183)	(0.183)	(0.182)	(0.182)	(0.183)
$\Delta \ln RER_{ct} \times FPC_s$		0.573***				0.574***		
		(0.088)				(0.088)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.749***				1.746***	
			(0.266)				(0.264)	
$\Delta \ln RER_{ct} \times Tang_s$				-5.111***				-5.151***
				(0.959)				(0.952)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Two-way trade control	Yes	Yes	Yes	Yes	No	No	No	No
Processing trade controls	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1449210	1449210	1449210	1449210	1449210	1449210	1449210	1449210

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. The dependent variable is the price change $\Delta \ln P_{ijct}$. We only include those firms that simultaneously import and export during the same year. Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

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Robustness: Ownership Controls

Table A.6: Robustness check: ownership controls for registration type and affiliation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
	Ownership registration controls				Affiliation controls			
	Baseline	FPC	External Finance	Tangibility	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.879***	0.617***	0.696***	1.629***	0.879***	0.616***	0.696***	1.633***
	((0.035)	(0.044)	(0.037)	(0.154)	(0.035)	(0.044)	(0.037)	(0.154)
$\Delta \ln RGDP_{ct}$	0.593***	0.564***	0.554***	0.583***	0.596***	0.567***	0.558***	0.586***
	(0.102)	(0.102)	(0.101)	(0.102)	(0.103)	(0.102)	(0.102)	(0.102)
$\Delta \ln RER_{ct} \times FPC_s$		0.403***				0.405***		
		(0.053)				(0.053)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.356***				1.362***	
			(0.155)				(0.155)	
$\Delta \ln RER_{ct} \times Tang_s$				-3.039***				-3.057***
				(0.581)				(0.581)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sales income control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership registration control	Yes	Yes	Yes	Yes	No	No	No	No
Affiliation control	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1449168	1449168	1449168	1449168	1449168	1449168	1449168	1449168

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (1)-(4) include controls of registration type while columns (5)-(8) include controls of affiliation. All regressions include firm-product-country fixed effects and year fixed effects.

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Robustness: Markup Controls

Table A.7: Robustness check: markup controls

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$			
	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.763**	0.543*	0.725**	2.121***
	(0.331)	(0.322)	(0.322)	(0.426)
$\Delta \ln RGDP_{ct}$	0.260*	0.203	0.201	0.230*
	(0.137)	(0.137)	(0.137)	(0.137)
$\Delta \ln RER_{ct} \times FPC_s$		0.589***		
		(0.094)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.786***	
			(0.284)	
$\Delta \ln RER_{ct} \times Tang_s$				-5.272***
				(1.015)
$\Delta \ln RER_{ct} \times Markup_{jt}$	-0.030	-0.161	-0.186	-0.080
	(0.240)	(0.236)	(0.238)	(0.237)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Markup Control	Yes	Yes	Yes	Yes
Observations	1343563	1343563	1343563	1343563

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5% and 1%. All columns include firm-level markup levels and their interactions with $\Delta \ln RER_{ct}$ as controls. Firm-level markup is estimated using the method of De Loecker and Warzynski (2012). Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Robustness: Alternative Fixed Effects

Table A.8: Robustness check: alternative fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
	Firm-year FE + Product FE + Country FE				Firm-year FE + Product-Country FE			
	Baseline	FPC	External Finance	Tangibility	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.670***	0.567***	0.593***	0.946***	0.691***	0.626***	0.639***	0.841***
	(0.035)	(0.042)	(0.037)	(0.111)	(0.036)	(0.044)	(0.038)	(0.120)
$\Delta \ln RGDP_{ct}$	0.753***	0.758***	0.759***	0.755***	0.788***	0.789***	0.790***	0.788***
	(0.108)	(0.108)	(0.108)	(0.108)	(0.112)	(0.112)	(0.112)	(0.112)
$\Delta \ln RER_{ct} \times FPC_s$		0.139***				0.086**		
		(0.035)				(0.038)		
$\Delta \ln RER_{ct} \times ExtFin_s$			0.456***				0.297***	
			(0.095)				(0.104)	
$\Delta \ln RER_{ct} \times Tang_s$				-1.139***				-0.623
				(0.429)				(0.467)
Firm-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product-country FE	No	No	No	No	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	No	No	No	No
Product FE	Yes	Yes	Yes	Yes	No	No	No	No
Observations	1428072	1428072	1428072	1428072	1416558	1416558	1416558	1416558

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (1)-(4) include firm-year, country, and product fixed effects. Columns (5)-(8) include firm-year and country-product fixed effects.

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Robustness: Cross-sectional Estimations

Table A.9: Robustness check: cross-sectional estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$							
	One-year sample				Between estimator			
	Baseline	FPC	External Finance	Tangibility	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	2.841***	2.463***	2.541***	3.797***	0.766***	0.693***	0.714***	0.973***
	(0.143)	(0.175)	(0.160)	(0.405)	(0.039)	(0.047)	(0.043)	(0.117)
$\Delta \ln RGDP_{ct}$	-1.133***	-1.207***	-1.234***	-1.159***	-0.348***	-0.359***	-0.359***	-0.354***
	(0.315)	(0.315)	(0.316)	(0.315)	(0.096)	(0.096)	(0.096)	(0.096)
$\Delta \ln RER_{ct} \times FPC_s$		0.483***				0.102***		
		(0.129)				(0.037)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.673***				0.326***	
			(0.401)				(0.112)	
$\Delta \ln RER_{ct} \times Tang_s$				-4.006**				-0.852*
				(1.587)				(0.456)
Firm-product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	239338	239338	239338	239338	706717	706717	706717	706717

Notes: Robust standard errors clustered at firm level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. Columns (1)-(4) report results using a one-year sample in 2007, while columns (5)-(8) report results using between estimators (average over 2000-2007). All regressions include firm-product fixed effect.

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Discussion: Imported Product Types

- Do different product types lead to differences in buyers' market power and thus to different degrees of exchange rate pass-through?
- Different imported goods differ in local distribution costs and have different elasticities of demand for importers.
- To check this hypothesis, we classify imported products into:
  1. consumption goods, intermediate goods, and capital goods using the UN-BEC concordance.
  2. homogeneous goods (either traded in standard exchange or with referenced prices) and differentiated goods following Rauch (1999).

Discussion: Imported Product Types

Table 8: Imported product types: intermediate, consumption, and capital goods

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$			
	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	0.279***	0.039	0.138**	1.147***
	(0.060)	(0.076)	(0.065)	(0.246)
$\Delta \ln RGDP_{ct}$	0.158	0.122	0.122	0.138
	(0.184)	(0.182)	(0.182)	(0.183))
$\Delta \ln RER_{ct} \times \mathbf{1}\{i \in Consumption\}_{jct}$	0.050	0.085	0.076	0.077
	(0.126)	(0.126)	(0.126)	(0.126)
$\Delta \ln RER_{ct} \times \mathbf{1}\{i \in Capital\}_{jct}$	3.955***	3.783***	3.776***	3.864***
	(0.231)	(0.227)	(0.227)	(0.229)
$\Delta \ln RER_{ct} \times FPC_s$		0.388***		
		(0.085)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.169***	
			(0.247)	
$\Delta \ln RER_{ct} \times Tang_s$				-3.501***
				(0.938)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Market Share Control	Yes	Yes	Yes	Yes
Observations	1449033	1449033	1449033	1449033

Notes: Robust standard errors clustered at firm-product level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. The default group is intermediate goods. $\mathbf{1}\{i \in Consumption\}$ denotes that the imported good is a consumption good. $\mathbf{1}\{i \in Capital\}$ denotes that the imported good is a capital good. Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

Homogeneous

Discussion: Homogeneous vs Differentiated goods

Table A.11: Imported product types: homogeneous vs differentiated goods

	(1)	(2)	(3)	(4)
Dependent Var:	Import Prices $\Delta \ln P_{ijct}$			
	Baseline	FPC	External Finance	Tangibility
$\Delta \ln RER_{ct}$	1.172***	0.782	0.910***	2.078***
	(0.082)	(0.095)	(0.082)	(0.280)
$\Delta \ln RGDP_{ct}$	0.216	0.163	0.160	0.191
	(0.199)	(0.198)	(0.198)	(0.199)
$\Delta \ln RER_{ct} \times \mathbf{1}\{i \in Homogeneous\}$	-1.939***	-1.691***	-1.741***	-1.775***
	(0.095)	(0.090)	(0.089)	(0.092)
$\Delta \ln RER_{ct} \times FPC_s$		0.512***		
		(0.096)		
$\Delta \ln RER_{ct} \times ExtFin_s$			1.656***	
			(0.281)	
$\Delta \ln RER_{ct} \times Tang_s$				-3.839***
				(1.059)
Year FE	Yes	Yes	Yes	Yes
Firm-product-country FE	Yes	Yes	Yes	Yes
Market Share Control	Yes	Yes	Yes	Yes
Observations	1176767	1176767	1176767	1176767

Notes: Robust standard errors clustered at firm-product level; *, **, and *** indicate significance at 10%, 5%, and 1% levels. The default group is differentiated goods. $\mathbf{1}\{i \in Homogeneous\}$ denotes that homogeneous goods, which are traded in standard exchange or with referenced prices, and differentiated goods. Columns (2)-(4) use different measures of credit constraints calculated using U.S. data. All regressions include firm-product-country fixed effects and year fixed effects.

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