Bank Loans, Trade Credit and Export Prices: Evidence from Exchange Rate Shocks in China*

George Cui† Xiaosheng Guo‡

Leticia Juarez§

Sunday 21st September, 2025

[Updated frequently - Click here for latest version]

Abstract

This paper examines the impact of trade credit and bank loans on firms' exchange rate pass-through. Using a comprehensive dataset including customs transaction records and balance sheet data for Chinese exporters during 2000-2011, we document that firms that more intensively extend trade credit to their buyers exhibit more complete exchange rate pass-through. Further empirical investigation sheds light on the mechanism: First, the usage of trade credit positively correlates with exporters' dependence on bank loans. Second, the firm-level bank loan interest rate decreases with home currency depreciation. Motivated by these findings, we develop a theoretical model where exporters constrained by working capital simultaneously extend trade credit to buyers and rely on bank borrowing. The model shows that home currency depreciation improves exporters' performance, reduces default risk, and lowers borrowing costs, ultimately enhancing exchange rate pass-through. By endogenizing the interest rate based on default risk, the model reveals a novel channel through which firms' financial activities shape exchange rate pass-through dynamics.

JEL Classifications: *F31, F34, G32*

Keywords: *Exchange rate pass-through, Trade credit, Financial constraints*

†International Monetary Fund

‡University of Michigan

§Inter-American Development Bank (IADB)

*George Cui (Email: gcui@imf.org), Xiaosheng Guo (Email: xsguo@umich.edu), Leticia Juarez (Email: leticiaj@umich.edu). We thank Javier Cravino, Andrei Levchenko, Pablo Ottonello, John Leahy, Sebastian Sotelo, Kathryn Dominguez, Stephen Terry, Linda Tesar, Marco Rojas, Ina Simonovska, Ezequiel Garcia Lembergman, David Kohn, Nan Li, Roman Merga, Friederike Niepmann,Tim Schmidt-Eisenlohr and Petia Topalova for insightful comments and discussions. We would also like to thank seminar participants at University of Michigan, EEA-ESEM Conference and SECHI Conference. All remaining errors are our own. The views expressed in this paper are our own, and do not represent the views of the IMF, its Executive Board or its management, nor of the IADB.

1. Introduction

Trade credit holds significant macroeconomic relevance in the global economy. Currently, trade finance underpins approximately 80-85% of international trade transactions (International Chamber of Commerce, 2023), underscoring its role as a vital mechanism in facilitating global commerce. Despite its significance, the macroeconomic implications of trade credit—particularly its role in transmitting shocks across borders—remain underexplored. Trade credit is related to the arrangement of cross-border payments over time between exporters and importers. The use of trade credit potentially interacts with exchange rate fluctuations in affecting the pricing of internationally traded goods.

This paper studies the impacts of trade credit and bank loan on the adjustment of export prices in response to exchange rate fluctuations (i.e., exchange rate pass-through) and examines the underlying mechanism. Leveraging a comprehensive dataset from China, which combines firm-level balance sheets with transaction-level export prices, we find that increased trade credit extended to importers amplifies the pass-through of exchange rate shocks to importer prices[1]. Motivated by the empirical findings, we propose a novel mechanism in which exporters, constrained by limited working capital due to extending trade credit, seek bank financing and incur additional financing costs. These costs are shaped by the bank's evaluation of the exporter's default risk, which varies with exchange rate fluctuations. Consequently, marginal financing costs become responsive to exchange rate shocks, influencing the degree of exchange rate pass-through. We introduce a theoretical framework that incorporates this mechanism to quantitatively analyze exchange rate pass-through in the context of extending trade credit. The model's outcomes align with the micro-level empirical evidence.

We begin by empirically studying the impact of trade credit on exchange rate pass-through and the underlying mechanism. Our analysis draws on a dataset from China spanning 2000 to 2011. This dataset combines three data sources: First, balance sheets of Chinese firms, detailing total revenue, trade credit, long-term debt and financing costs; second, transaction-level Chinese custom records, capturing export prices across various goods and destinations; third, bilateral exchange rates between the Chinese RMB and foreign currencies. Using the dataset, we document three key empirical finding. First, export prices, denominated in the exporter's currency, are less responsive to exchange rate shocks (i.e. more complete exchange rate pass-through) for the exporters that more intensively extend trade credit to their buyers. Second, the approximated firm-level interest rate declines when the home currency depreciates against the currencies used in the exporting destinations. Third, trade credit and bank loans are positively related for exporters at the firm level. Additionally, larger firms exhibit a more pronounced correlation between trade credit and bank loan usage.

The first empirical finding highlights that extending trade credit moderates the effects of exchange

[1] The international economics literature defines exchange rate pass-through as the change in international prices, expressed in the buyer's currency, in response to a change in the exchange rate. A more complete exchange rate pass-through corresponds to export prices in the seller's currency being less responsive to exchange rate shocks. In this paper, we use "exporter price" to denote the price of goods in the exporting country's currency and "importer price" to refer to the price in the destination country's currency.

rate shocks on prices in exporter currency, while amplifying the impact on prices in importer currency. The subsequent two findings reveal the underlying relationship between trade credit and bank financing, which supports the proposed mechanism: When there is a depreciation of the home currency, banks reduce interest rates for exporters, anticipating a lower default rate. This decrease in interest rates is transmitted into exporting prices, given the reliance on trade credit. The following provides additional details about the model. Exporters who extend trade credit to buyers are incentivized to seek bank loans to meet their working capital needs. This reliance on external finance introduces additional marginal financing costs into export pricing. These costs decline as banks perceive the exporter's default probability to decrease with home currency depreciation. Moreover, the responsiveness of financing costs to bilateral exchange rate shocks increases with the level of trade credit extended, since higher trade credit requires greater bank borrowing, making exporters more sensitive to shocks that can possibly influences the repayment decision. Consequently, the level of trade credit influences exchange rate pass-through by amplifying the sensitivity of marginal financing costs to exchange rate fluctuations.

These empirical findings motivate a theoretical framework in which trade credit influences the sensitivity of price dynamics to exchange rate shocks. The model combines a monopolistically competitive export market with a competitive banking sector, linked through a working capital constraint arising from the exporter's trade credit extension. When facing exchange rate shocks, exporters set export prices to maximize expected profits, considering two additional factors: borrowing amount and the default probability on bank loans, based on a firm-specific interest rate. A key feature of the model is that the bank endogenously determines the interest rate, fully accounting for the exporter's default risk, which is the source of financial market friction. The model yields a first-order analytical solution for the firm-level interest rate in equilibrium, which responds to exchange rate fluctuations. This responsiveness of interest rate to exchange rate shocks underpins the dynamics of exchange rate pass-through in the empirical analysis.

Our model yields three theoretical outcomes. First, the model explicitly characterizes the optimal pricing structure. The export price incorporates an additional marginal financing cost term when the exporter extends trade credit, which increases with the trade credit-to-sales ratio and the firm-specific bank loan interest rate. This marginal financing cost term corresponds to the implicit trade credit premium documented in previous literature[2] and offers an alternative way to measure the price premium when transaction-level trade credit contracts are unobservable. Furthermore, the first-order analytical solution for the firm-level interest rate in equilibrium predicts that the interest rate decreases with a reduction in extended trade credit and with home currency depreciation, which aligns with our empirical findings. Lastly, and serving as the main contribution of the paper, the model predicts that the exchange rate elasticity of importer prices increases in magnitude as exporters grant more trade credit.

[2]See Amberg, Jacobson and von Schedvin (2021).

We proceed by calibrating the model using reduced-form estimates to quantify the overall exchange rate pass-through at varying levels of trade credit. The simulation results reveal an inverted U-shaped curve for exchange rate pass-through elasticity as the average trade credit share in the economy increases. This finding suggests that while moderate levels of trade credit amplify the pass-through of exchange rate shocks to importer prices, excessively high trade credit shares lead to diminishing effects of exchange rate shocks on importer prices, ultimately producing the observed inverted U-shaped pattern. This result stems from the influence of trade credit share on the response of exporter-specific interest rates to exchange rate shocks. A depreciation of the home currency can either increase borrowing demand or enhance profitability, leading to an ambiguous effect on an exporter's default probability—and, consequently, on the bank loan interest rate. When trade credit extension reaches excessively high levels, the resulting surge in borrowing amplifies the borrowing demand channel, making it the dominant factor in determining the interest rate response to exchange rate shocks. This exerts downward pressure on the exchange rate pass-through elasticity.

Related literature. Our paper contributes to three strands of the literature. The first addresses the determinants of trade credit and its role in international trade. A well-established body of research suggests that financial constraints and trade credit shape firms' domestic pricing strategies, as shown by Gilchrist et al. (2017); Hardy, Saffie and Simonovska (2022); Almut, Balleer; Nikolay, Hristov; Dominik (2017); Kohn, Leibovici and Szkup (2020), yet there is limited evidence on the pricing of internationally traded goods and its implications. A number of papers explore various factors influencing firms' decisions to extend or use trade credit (Antras and Foley, 2015; Ma and Schmidt-Eisenlohr, 2023; Benguria, Garcia-Marin and Schmidt-Eisenlohr, 2023). Relevant studies focus specifically on the effects of trade credit on corporate default risk (Jacobson and Von Schedvin, 2015; Barrot, 2016; Amberg et al., 2021), the transmission of monetary policy (Nilsen, 2002; Adelino et al., 2023), and economic growth (Fisman and Love, 2003). One related line of research examines the role of trade credit in working capital and liquidity propagation. For instance, Desai, Foley and Hines Jr (2016) shows that U.S. multinationals use trade credit to transfer capital from low-tax to high-tax jurisdictions, while Lin and Ye (2018) finds that global liquidity shocks significantly affect multinationals' provision of trade credit to Chinese firms. Closer to our research, Hardy, Saffie and Simonovska (2023) explores domestic trade credit relationships and their implications for risk exposure. This paper extends this line of research by investigating the interplay between trade credit and bank loans in the context of exchange rate pass-through. Although explicit trade credit contracts are unobservable, we identify the impact of trade credit on firm borrowing and financing costs through both empirical analysis and theoretical modeling, revealing the mechanism by which trade credit affects the pricing of internationally traded goods and exchange rate pass-through.

Second, this study relates to the body of work on exchange rate pass-through and underlying mechanism. There is a large body of work that focuses on different reasons why the exchange rate pass-through is incomplete, such as markup adjustment, local costs, or barriers to prices adjustment

(Amiti, Itskhoki and Konings, 2014; Atkeson and Burstein, 2008; Campa and Goldberg, 2005; Gopinath, Itskhoki and Rigobon, 2010; Burstein and Gopinath, 2014; Auer and Schoenle, 2016; Berman, Martin and Mayer, 2012; Kim and Lee, 2024). This paper sheds light on an understudied source for facilitating exchange rate pass-through to importer prices, which is trade credit interacted with bank loans. Strasser (2013) explores the effects of credit constraints on exports responses to shocks in terms of prices and quantities in international markets. We contribute to this literature both new empirical evidence and a theoretical model disentangling the mechanism through which the interaction between trade credit and bank loans is connected and how this, in turn, affects the degree of exchange rate pass-through.

Third, our paper contributes to the literature relating firms' liquidity constraints and pricing decisions. Liquidity constraints can be divided into financial constraints related to domestic banks and trade credit. As regards bank loans, Gilchrist et al. (2017) shows that liquidity-constrained firms increased prices during the Great Recession in 2008, while unconstrained firms decreased prices. In contrast, Kim (2021) finds that a negative credit supply shock decreases output prices during the Lehman Brothers failure. In terms of trade credit, Amberg, Jacobson and von Schedvin (2021) finds firms issuing more trade credit increased product prices significantly more during the Great Recession. All of this literature focuses on the domestic prices of firms, while our paper expands into the international markets and, at the same time, combines in a model both mechanisms of the trade credit offered by firms and the financial constraints related to bank loans.

This paper is organized as follows. Section 2 describes the data and stylized facts. Section 3 presents the main empirical findings. Section 4 introduces a model that accounts for the empirical patterns and details a mechanism behind these patterns. In Section 5, we calibrate the model and conduct quantification. Section 6 concludes.

2. Data and Relevant Patterns

In this section, we describe the dataset used for our empirical analysis and outline the key stylized facts on trade credit, exchange rate and exporters.

2.1 Data Description

Our sample of firms is drawn from two primary data sources in China. First, we obtain firm-level balance sheet data from the survey of Chinese manufacturing firms conducted by the National Bureau of Statistics of China. The survey covers the performance of more than 190,000 manufacturing firms from 2000 to 2011. These survey data provide variables related to the firm's credit conditions, including trade credit (recorded on the balance sheet as accounts receivable), long-term debt, and interest costs. Additionally, we include variables that indicate firm size, such as annual employment and sales. Second, we utilize a panel from Chinese customs that encompasses the universe of Chinese trade transactions with over 80 trade partners. This dataset contains information on export and import flows by firm, product (at the 8-digit HS code level), and trade partners for each year. We merge these two datasets for the period 2000 to 2011 using firm identifiers and construct the sample for our empirical analysis [3].

The dependent variable in our primary empirical analysis is the export price, which is proxied by unit value, calculated as export value divided by export quantity at the firm-product-destination level. To account for measurement error or compositional changes within HS codes, we exclude observations where the percentage change in unit values exceeds 200 percent.

A key variable of interest is the level of trade credit that the exporter extends to buyers. To measure the relative scale of trade credit usage at the firm level, we calculate the trade credit share as the ratio of trade credit to total revenue. Specifically, the trade credit share for firm i in year t is calculated as

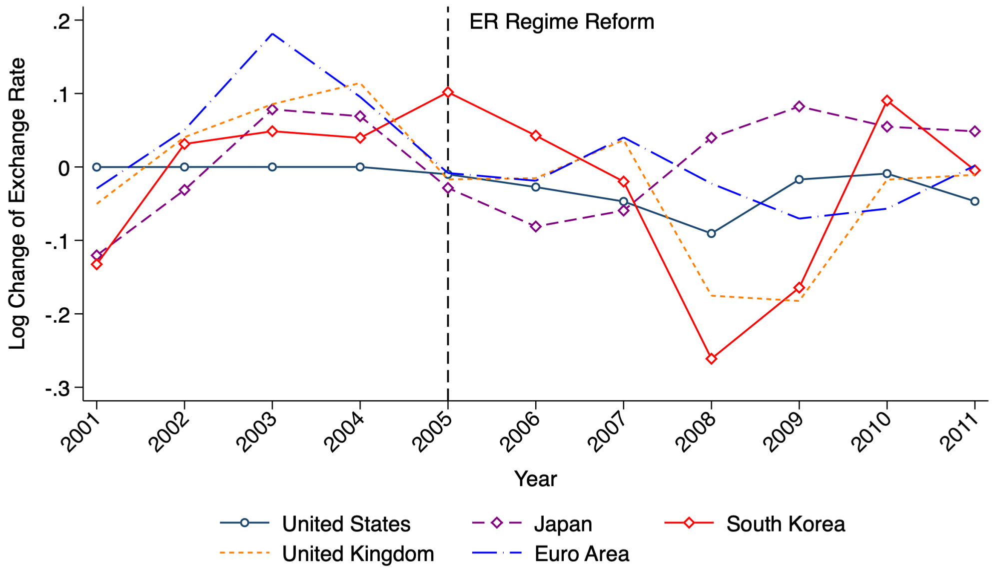
$$\phi_{i,t} = \frac{\text{Accounts Receivable}_{i,t}}{\text{Total Revenue}_{i,t}} \tag{1}$$

where the accounts receivable entry in the balance sheet represents the year-end outstanding balance of sales yet to be collected from buyers. The term structure of this variable is ambiguous, as it does not specify the time frame for when the trade credit will be repaid. Therefore, we do not discuss the duration of the trade credit here. In our empirical practice, we use the averaged value of this variable over time to obtain a firm-level measure of trade credit. We will elaborate on key stylized findings related to trade credit from the dataset in the following section.

In addition to the firm panel, we also use annually averaged nominal bilateral exchange rates from the IMF to construct exchange rate shocks at the importing-country level. Figure 1 shows the paths of bilateral exchange rate shocks between the Chinese RMB and the currencies of major trade partners from 2000 to 2011, reflecting the influence of China's exchange rate regime. Before 2005, the Chinese government maintained a fixed exchange rate policy pegged to the US dollar. As a result, there were no bilateral exchange rate shocks between China and the United States before 2005. In July 2005, China implemented a reform to make its exchange rate more flexible, transitioning to a managed float using a basket of currencies as an anchor and allowing for some fluctuation bands. These bands were frequently adjusted, and the variation in exchange rates increased over time. After temporarily setting aside the goal of a managed floating exchange rate during the financial crisis, the Chinese government renewed its focus on exchange rate flexibility in 2010. Although China's exchange rate was managed during the sample period, significant variation in bilateral exchange rates can still be observed, providing a robust context for empirically examining the impacts of exchange rate fluctuations.

[3]To avoid noise in the survey, we deleted unusual entries, including negatives of key variables in the balance sheet and missing data.

Figure 1: Times Series of Change in Exchange Rates



Note: This figure shows the log change of exchange rates between Chinese RMB and foreign currencies from 2001 to 2011. The annual exchange rate is calculated as Chinese RMB per 1 unit of exporting destination's currency averaged from monthly data. The vertical dash line indicates year 2005 when China implemented a reform to make its exchange rate more flexible, transitioning to a managed float using a basket of currencies as an anchor and allowing for some fluctuation bands.

2.2 Stylized Facts

In this section, we investigate the role of trade credit in China, particularly its significance for exporters and implications for firm behavior. Additionally, we discuss the factors determining the trade credit share.

2.2.1 Trade Credit in China

Trade credit plays an important role for Chinese exporters in managing relationships with foreign buyers. By allowing overseas customers to delay payments, Chinese firms make their products more competitive in global markets, offering flexible payment terms that help secure larger orders and long-term contracts. This flexibility is especially valuable in regions where access to affordable credit is limited, as it enables buyers to manage their cash flow more effectively while maintaining business with Chinese suppliers. For exporters, this practice enhances their international presence and strengthens business ties, particularly in sectors like manufacturing, where China holds a dominant position.

However, extending credit to foreign buyers entails significant risks. Payment delays can create cash flow challenges for Chinese exporters, especially during periods of economic instability or market fluctuations. Furthermore, currency risks and geopolitical factors can complicate the recovery of receivables. To mitigate these risks, many Chinese firms use trade credit insurance or require partial upfront payments to safeguard their financial health. Despite these challenges, the strategic extension of trade credit remains crucial for exporters, helping them remain competitive, build trust with international partners, and sustain growth in foreign markets. Balancing the management of both receivables and payables is essential for maintaining stable operations, particularly in China's export-driven economy.

The summary statistics in Table 1 provide an overview of trade credit and debt across firms of different sizes, classified into quartiles based on the number of employees. Receivables and payables both increase with firm size, indicating that larger firms tend to extend and receive more trade credit. Notably, payables outweigh receivables across all firm size categories, suggesting that Chinese firms on average receive more credit from their suppliers than they extend to their buyers. Moreover, the receivables-to-sales ratio remains relatively stable across firm sizes, while the payables-to-sales ratio exhibits a slight decline, suggesting a potential liquidity advantage for larger firms.

Table 1: Summary Statistics

	Full Sample	Firm Size Quartiles (%) (Small to Large)			
		0-25	25-50	50-75	75-100
Receivables	23520.9	3920.1	7126.2	12203.6	68521.6
	(203128.4)	(23370.9)	(28395.6)	(31322.1)	(393048.4)
	[406305]	[99339]	[98223]	[103628]	[105115]
Payables	38771.5	5693.3	10411.1	16522.4	105395.7
	(290554.0)	(15637.0)	(41900.6)	(45646.9)	(527109.6)
	[242196]	[55480]	[54171]	[61427]	[71118]
Debt	99481.0	15288.8	25035.5	45963.2	312400.1
	(895793.7)	(199594.9)	(74581.3)	(171223.5)	(1753419.6)
	[463505]	[120988]	[111844]	[114857]	[115816]
Receivables/Sales	0.167	0.167	0.168	0.164	0.169
	(0.199)	(0.207)	(0.201)	(0.197)	(0.190)
	[358067]	[87751]	[86749]	[91329]	[92238]
Payables/Sales	0.191	0.194	0.196	0.189	0.185
	(0.242)	(0.259)	(0.254)	(0.244)	(0.217)
	[203162]	[46040]	[45455]	[51732]	[59935]
Interest Rate	0.0204	0.0185	0.0207	0.0215	0.0209
	(0.0446)	(0.0479)	(0.0476)	(0.0462)	(0.0352)
	[415766]	[107813]	[101617]	[103988]	[102348]
Interest Cost	2043.5	307.6	508.4	1014.4	6469.0
	(20140.1)	(9018.9)	(2210.8)	(6656.9)	(38621.7)
	[418439]	[109354]	[102087]	[104413]	[102585]
Obs	463671				
N firms	152407				

Notes: Summary statistics about trade credit and debt by firm size: mean, standard error in parenthesis, and N in brackets. Firm size quartiles are determined by the number of employees, with Quartile 1 representing the smallest firms and Quartile 4 representing the largest firms. Receivables: Value in RMB of the loan given by the exporter firm. Payables: Value in RMB of the debt held by the importer. Debt: Value of the debt held by the firm with the bank. Receivables/debt: Trade credit given by the exporter over their debt with the bank. Receivables/sales: Trade credit given by the exporter over their sales. Payables/debt: Trade credit taken by the importer over their debt with the bank. Payables/sales: Trade credit taken by the importer firm over their sales.Payables/Debt and Receivables/Debt were considered missing if their values were negative or exceeded 2. Full sample contains all the firms-period with non missing employment values.

2.2.2 The Determinants of Trade Credit Share

The trade credit share, measured as the ratio of receivables to sales, is shaped by various factors related to market conditions, financial structures, and institution in China. First, access to formal credit varies across firms, particularly for small and medium-sized enterprises (SMEs), which often turn to trade credit as a supplementary financing tool. While larger firms may have greater access to bank loans, SMEs frequently rely on trade credit to manage liquidity and sustain operations. This reliance suggests that trade credit is influenced by external financial conditions and credit availability rather than purely firm-specific choices.

Second, trade credit arrangements are shaped by broader market forces, including supply chain relationships and competition in international markets. Chinese exporters, for example, frequently extend trade credit to foreign buyers as part of their competitive strategy to secure market share and maintain long-term business relationships. These decisions are influenced by external demand conditions and industry norms rather than solely by a firm's internal financial considerations. As a result, the receivables-to-sales ratio is often driven by factors beyond a firm's direct control, such as global trade dynamics and buyer financing needs.

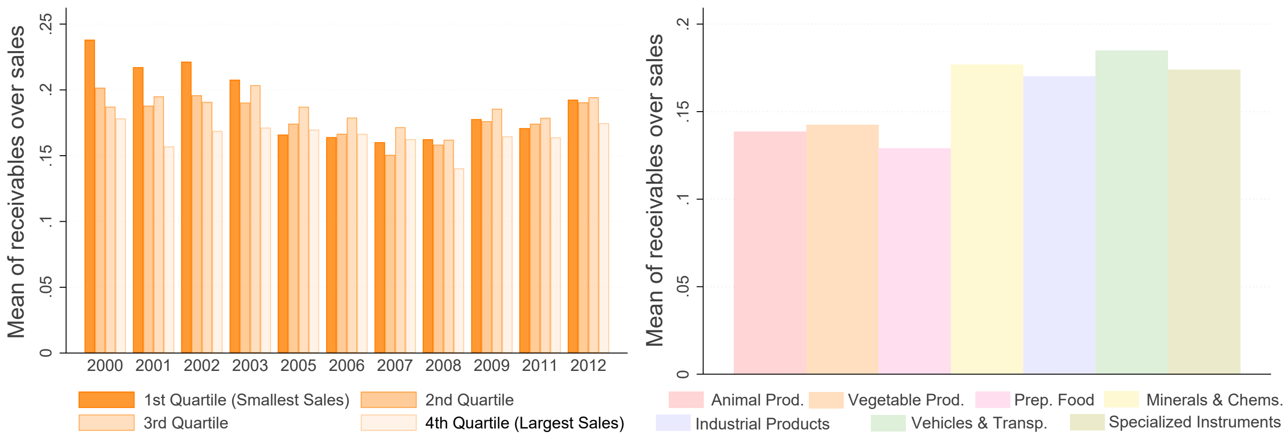
Lastly, regulatory frameworks and financial policies also play a role in determining trade credit practices. Instruments such as export credit insurance and other policy measures provide firms with additional mechanisms to manage trade-related financing risks. Firms may adjust their trade credit policies in response to these regulatory and policy incentives, reinforcing the idea that trade credit conditions are influenced by external institutional settings.

Figures 2 illustrate that trade credit remains relatively stable across different years, sectors, and firm sizes. The lack of significant variation suggests that the trade credit share is not primarily determined by firm-specific strategies but rather by external factors affecting firms in a similar manner across the economy.

This stability across years, sectors, and firm sizes provides strong justification for treating trade credit as exogenous in both the empirical analysis and the model. Since trade credit behavior seems to be primarily influenced by external factors—such as market structures, credit access constraints, and institutional conditions—rather than firm-specific decisions, it is appropriate to assume that trade credit shares are not endogenously determined. This assumption underpins our approach in both the empirical section and the model, where trade credit is considered to be shaped by external forces beyond the firm's control.

To summarize, our analysis reveals substantial variation in trade credit usage among exporters, with trade credit shares demonstrating exogeneity across multiple dimensions. We also observe the price premium associated with trade credit extension in export prices. In the following section, we examine how heterogeneous trade credit share influences exchange rate pass-through patterns among Chinese exporters.

Figure 2: Trade Credit Share Over Time and Trade Credit Across Sectors



Panel A: Trade Credit Share Over Time

Panel B: Trade Credit Share Across Sectors

Notes: Panel A shows the mean of receivables divided by sales over the years by firm sizes in quartiles according to their sales. Panel B shows the mean of receivables divided by sales across sectors. Sectors are measured as HS2 products.

3. Empirical Evidence

This section establishes the relationship between export prices and financing practices including trade credit and bank loans. We begin by shedding light on the relationship between exchange rate pass-through and the trade credit share. Building on this key finding, we empirically investigate the underlying mechanism driven by the interaction between bank loans and trade credit. The section concludes with a series of robustness tests.

3.1 Main Empirical Findings

Fact I: Higher Firm-level Trade Credit Extension is Associated with More Complete Exchange Rate Pass-through.

We begin by examining how exporters adjust prices in response to exchange rate shocks in the context of trade credit usage. In addition to the standard estimation of exchange rate pass-through elasticity, we introduce an interaction term between bilateral exchange rate shocks and the firm-level trade credit share, as defined in equation (1), to capture cross-sectional variation in the pass-through. Our primary empirical specification is constructed as follows.

$$\Delta p_{i,j,k,t} = \underbrace{[\alpha + \beta \phi_{i,0}]}_{1-ERPT} \Delta e_{k,t} + n_{i,t} + \varphi_{j,k} + \varphi_i + \varphi_t + \varepsilon_{i,j,k,t} \tag{2}$$

where $\Delta p_{i,j,k,t}$ represents the log change in the price of good j denominated in the producer's currency (Chinese RMB), exported by firm i to destination country k at time t. $\Delta e_{k,t}$ is the log change in the bilateral exchange rate (Chinese RMB per unit of destination k's currency). An increase in $e_{k,t}$ corresponds to a depreciation of the Chinese RMB relative to the currency of destination k. In our main specification, we use $\phi_{i,0}$ which is firm i's trade credit (receivables) as a share of total sales in the first year that the firm appears in the dataset.

In our exchange rate pass-through regression, we include product-destination fixed effects to control for time-invariant factors like marginal production costs and competitive conditions—such as the number of suppliers in the market, buyer price sensitivity, and market concentration. These fixed effects capture specific characteristics of each product-market pair that might otherwise confound the relationship between exchange rates and pricing. We also add time-fixed effects to control for temporal shocks and global economic conditions affecting all firms simultaneously, such as commodity price fluctuations or global demand changes. Additionally, to account for the role of firm size in exchange rate pass-through, we include $n_{i,t}$, defined as the log of employment for firm i at time t, interacted with the bilateral exchange rate. This term allows us to observe how exchange rate sensitivity changes with firm size, yielding a clearer view of how trade credit and exchange rate dynamics vary across firms of different scales.

The exchange rate pass-through elasticity to be estimated is $\alpha + \beta\phi_{i,0}$. Since we are using export prices in the producer's currency as the dependent variable, complete pass-through of exchange rate shocks to export prices occurs when $\alpha + \beta\phi_{i,0} = 0$. In this case, an x% depreciation of the Chinese RMB would not affect the export price in RMB, but would result in an x% decrease in the good's price denominated in the destination country's currency.

The coefficient β in the regression is our main coefficient of interest. It quantifies the extent to which the trade credit share influences the response of export prices to exchange rate shocks. Even under a fixed exchange rate regime or with minor exchange rate fluctuations, the coefficient β remains meaningful as we include in the regression bilateral exchanges, which means we have many exchange rates besides Chinese RMB-US dollars. Therefore, the exchange rates with other currencies still move even if the Chinese RMB-US dollar exchange rate is fixed. A negative β suggests that a higher ϕ_i enhances the transmission of exchange rate shocks to the price in the buyer's currency, resulting in a more complete exchange rate pass-through. For instance, for a 1% depreciation of the Chinese RMB, the export price in RMB would increase by $\alpha + \beta\phi_i$% for an exporter with a trade credit share of ϕ_i, which is less than that for an exporter who does not extend trade credit.

Table 3 presents the main results from estimating equation (2). We begin by estimating the direct average elasticity of export prices with respect to exchange rate shocks, as shown in column 1. The exchange rate pass-through elasticity to prices in the producer's currency is 0.05 in our sample, which corresponds to a 95 percent pass-through.

Column 2 presents the primary result from our main specification. We use firm fixed effects to account for unobservable time-invariant firm characteristics and time fixed effects to capture changes over the years. Product-destination fixed effects control for specific costs within each product-destination pair. The estimated value of α increases significantly, as the simple average coefficient in column 1 incorporates firm heterogeneity. Firms' trade credit share levels contribute to differing responses of export prices to the same exchange rate shock. Exporters with a higher trade credit share relative to total sales exhibit a higher exchange rate pass-through. Specifically, a 10 percent higher trade credit share results in a 1.92 percent increase in pass-through to export prices. Based on the results in column 2, a firm without delayed payments in sales exhibits a 92.66 percent (= $1 - 0.0734$) exchange rate pass-through, while a firm with 20 percent of total revenue extended as trade credit demonstrates a 95.6 percent (= $1 - 0.0734 + 0.192 * 0.2$) exchange rate pass-through.

Table 3: Trade Credit Share and Exchange Rate Pass-through

Dependent Variables: $\triangle p_{i,j,k,t}$	(1)	(2)	(3)	(4)	(5)	(6)
$\triangle e_{k,t}$	0.0500***	0.0734***	0.0812***		0.0682***	0.135***
	(0.0111)	(0.0126)	(0.0146)		(0.0200)	(0.0497)
$\phi_{i,0}$		-0.0703***	-0.0615***	-0.0668***	-0.103***	-0.103***
		(0.00856)	(0.00805)	(0.00866)	(0.0117)	(0.0117)
$\triangle e_{k,t} \times \phi_{i,0}$		-0.192***	-0.143***	-0.156***	-0.197***	-0.204***
		(0.0404)	(0.0343)	(0.0439)	(0.0526)	(0.0531)
$n_{i,t}$					-0.00596***	-0.00620***
					(0.00189)	(0.00185)
$\triangle e_{k,t} \times n_{i,t}$						-0.0103
						(0.00628)
Fixed Effects:						
$\varphi_{j,k} + \varphi_i + \varphi_t$	Yes	Yes	No	No	Yes	Yes
$\varphi_{j,t} + \varphi_i + \varphi_k$	No	No	Yes	No	No	No
$\varphi_{j,k,t} + \varphi_i$	No	No	No	Yes	No	No
N	2368425	2368425	2430135	2160217	1644295	1644295
R^2	0.119	0.119	0.0902	0.208	0.150	0.150

Notes: This table reports the regression results from equation 2. Standard errors are clustered at country-time level and reported in parenthesis. Products are at 8-digit HS code level. Fixed effects: $\varphi_{j,t} + \varphi_i + \varphi_k$ is the combination of product-time, firm and country fixed effects; $\varphi_{j,k} + \varphi_i + \varphi_t$ is the combination of product-destination, firm and time fixed effects; $\varphi_{j,k,t} + \varphi_i$ is the combination of product-destination-time and firm fixed effects.
* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

By controlling for different fixed effects, we can account for unobservable changes in various factors. Column 3 presents the regression results with firm, destination, and product-time fixed effects included in the specification. The product-time fixed effects control for time-varying marginal costs that are common to producers of the same product. The coefficient for the trade credit share interaction term is -0.143, only slightly lower in magnitude compared to that in column 2. In column 4, we introduce even stricter product-destination-time fixed effects to capture all marginal costs that are not firm-specific. The coefficient on the exchange rate shock is absorbed into the fixed effects. Comparing the point estimates in column 4 with those in column 3, the results show little variation, and the estimates remain highly significant.

To assess whether firm size impacts the pass-through of exchange rate shocks to export prices, which could potentially diminish the role of trade credit in this process, we include the log of firm i's employment in year t and an interaction term with the exchange rate shock in the regression. The results are presented in columns 5 and 6 respectively. Compared to the point estimates in column 2, the estimated β remains largely unchanged when controlling for firm size. Column 6 also indicates that firm size does not influence the exchange rate pass-through elasticity.

To summarize, our main result demonstrates that the pass-through of exchange rate shocks to export prices varies with the firm-level trade credit share. The empirical analysis shows that the response of export prices to exchange rate shocks is stronger for exporters with a larger share of revenue in trade credit. Section 3.3 provides a series of robustness checks for this empirical finding.

3.2 Mechanism

Building on empirical evidence that a higher trade credit share amplifies the response of export prices in buyer's currency to exchange rate shocks, we seek to elucidate the underlying mechanism by which trade credit plays this role.

Fact II: Firm-level Interest Rate Decreases in Response to Home Currency Depreciation

We estimate equation 3 to examine how proxied firm-level interest rates respond to exchange rate shocks:

$$r_{i,t} = \alpha + \beta \Delta e_{i,t} + \varphi_i + \varphi_t + \varepsilon_{i,t} \tag{3}$$

where $r_{i,t}$ is calculated by financing costs or interest costs over total debt balance outstanding of firm i in year t. We use $r^F_{i,t}$ and $r^I_{i,t}$ to represent them respectively. φ_i and φ_t are firm and time fixed effects. $\Delta e_{i,t}$ is the firm-level exchange rate shock constructed as

$$\Delta e_{i,t} = \sum_{k \in \Omega_{i,t}} \Delta e_{k,t} \times \Gamma_{i,k,t}$$

where $\Gamma_{i,k,t}$ is the exporting share of firm i to destination k in period t. $\Omega_{i,t}$ is the a set of exporting countries of firm i in period t. The regression results are shown in Table 4.

Table 4: Firm-level Interests and Exchange Rate Shocks

Dependent Variables:	$r^F_{i,t}$ (1)	$r^F_{i,t}$ (2)	$r^F_{i,t}$ (3)	$r^I_{i,t}$ (4)	$r^I_{i,t}$ (5)
$\triangle e_{i,t}$	-0.556***	-0.498***	-0.474**	-0.155*	-0.211**
	(0.158)	(0.163)	(0.203)	(0.0838)	(0.106)
$\triangle e_{i,t-1}$			-0.287		-0.00896
			(0.219)		(0.114)
Fixed Effects:					
$\varphi_i + \varphi_t$	Yes	No	Yes	No	No
$\varphi_i + \varphi_{j,t}$	No	Yes	No	Yes	Yes
N	347197	346850	196791	360111	202865
R^2	0.511	0.523	0.544	0.595	0.634

Notes: This table reports the regression results from equation 3. Column 1-3 use financing costs over debt as dependent variable. Column 4-5 use interest costs over debt as dependent variable. Column 3 and 5 also control for lagged-one-year exchange rate shocks. Standard errors are reported in parenthesis. Fixed effects: $\varphi_i + \varphi_t$ is the combination of firm and time effects; $\varphi_i + \varphi_{j,t}$ is the combination of firm and sector-time fixed effects. * Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

We use costs associated with firm external financing over debt to approximate the firm-level interest rate. Table 4 shows that when the Chinese RMB depreciates relative to the rest of the world, the firm-level interest rate decreases. This finding suggests that banks adjust the financing costs faced by exporters downward in response to home currency depreciation. This adjustment occurs because currency depreciation benefits exporting firms, which are expected to achieve higher profitability. Increased profitability allows exporters to secure more borrowing from local banks at lower interest rates, reflecting a reduced default risk on bank loans. Exporters with external borrowing incorporate marginal financing costs into the pricing of export goods, creating an additional channel for marginal cost sensitivity to exchange rate fluctuations.

We also run equation 3 using trade credit share to examine if firms adjust their trade credit share upon exchange rate fluctuations. Table 5 shows that firm-level trade credit share generally does not respond to exchange rate shocks, aligning with the assumption that trade credit value is exogenous in the determination of exchange rate pass-through mechanism.

Table 5: Trade Credit Share and Exchange Rate Shocks

	(1) $\phi_{i,t}$	(2) $\phi_{i,t}$
$\Delta e_{i,t}$	-0.0121	-0.00526
	(0.00636)	(0.00753)
Period	No	Yes
Firm	Yes	Yes
N	277919	277919

Notes: This table reports the results of regression results from Equation 3. Standard errors are reported in parenthesis.* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

Fact III: Higher Trade Credit is Associated with Higher Bank Loans

Not all Chinese exporters grant trade credit to foreign buyers due to the high liquidity costs involved, as it ties up capital that could otherwise fund production or expansion. However, access to a variety of financial instruments, such as bank loans, often enables firms to provide trade credit without sacrificing operational flexibility. Despite the constraints, trade credit ratios remain relatively stable and exogenous, as firms have limited ability to adjust them quickly in response to changing financial conditions or demand. We examine how Chinese exporters strategically use bank loans to cover trade credit costs, maintain cash flow, and balance liquidity needs, aiming to understand the interplay between trade credit practices and financing options in export-driven operations.[4].

Figure 3 illustrates the interplay between trade credit and outstanding bank loans across the universe of Chinese exporters. In both panels, the debt share is denoted as the ratio between bank loans and sales at the firm level. The trade credit share corresponds to the ratio between the trade credit and sales. The plot is a binscatter showing the relationship between these two variables for two types of firms: small and large.

The main takeaway is that the higher the trade credit granted by the exporter, the higher the debt that the firm holds with domestic banks. The intuition behind this finding is that exporters might face a financial constraint while offering trade credit and will solve it by taking loans from domestic banks.

Figure 3 also reveals that the strength of the relationship between trade credit and bank loans varies with firm size. Small firms find it difficult to support trade credit with bank loans to cover delayed payments. A potential reason for this is small firms have less access to bank loans, while large firms might be automatically connected with banks willing to grant them credits. The lack of access could be translated into higher interests costs of bank loans.

This fact corresponds to a key intuition for our theoretical model. It motivates the connection

[4]Studies such as Hardy, Saffie and Simonovska (2022) analyze the relationship between these instruments but from the perspective of the firms receiving trade credit from their suppliers. In this paper, we shift the focus to the suppliers granting trade credit and how the extent of trade credit is related to their access and costs of bank loans.

Figure 3: Correlation between Trade Credit Share and Bank Loans

Notes: This figure shows the relationship between trade credit and bank loans for small and large firms. In the vertical axis, the debt share corresponds to bank loans/sales and, in the horizontal axis, trade credit/sales.

between domestic banks behavior and exporters' trade credit. In the Appendix, we include more detailed statistics on the relationship between trade credit and other financial instruments.

3.3 Robustness

In this section, we conduct a series of robustness checks on our main specification to further validate the role of trade credit in influencing exchange rate pass-through. These checks include controls for exporters' accounts payable, alternative definitions of trade credit share, and the use of alternative samples.

Controls for Payables. While exporters extend trade credit to buyers, they concurrently rely on trade credit when sourcing production inputs, resulting in a net balance of trade credit outstanding. Although our paper focuses on how trade credit extended by exporters affects export pricing, one might ask whether the trade credit received by exporters in this context also plays a role in the pricing process. The impact of receiving trade credit on production, however, is complex. On one hand, trade credit defers payment obligations, potentially lowering marginal costs by reducing the immediate need for external financing. Conversely, suppliers can embed a trade credit premium into input prices, which could raise marginal costs of exporters. Both mechanisms may contribute to how export prices respond to exchange rate shocks.

To explore how receiving trade credit might influence the degree to which extending trade credit to buyers affects exchange rate pass-through, we incorporate additional controls for net trade credit balance and accounts payable in the primary regression model. We define $NetReceivables_{i,t}$ as accounts receivables less accounts payable, scaled by total sales, while $Payables_{i,t}$ represents accounts payable as a share of total revenue. The results in column 1 of Table 6 indicate that an increase in the net accounts receivable share amplifies the sensitivity of export prices, denominated in the seller's currency, to exchange rate fluctuations, leading to a less complete pass-through of exchange rate shocks. To further dissect the net balance outstanding, we introduce an interaction term between payable share and exchange rate shocks within the primary specification, with and without the trade credit share controls. The results, reported in columns 2 and 3 of Table 6, show that while the interaction coefficient between trade credit share and exchange rate shock decreases slightly, it remains statistically significant and substantial. The interaction between payable share and exchange rate shocks is negative and significant, though notably smaller in magnitude than that of the trade credit share. This finding implies that exporters who receive a higher share of trade credit relative to total sales are more inclined to set lower export prices in the producer's currency when faced with exchange rate shocks. Consequently, they shift a greater portion of exchange rate fluctuations onto importers.

In conclusion, controlling for accounts payable does not significantly alter the coefficient of the interaction term between trade credit share and exchange rate shocks, underscoring the robustness of our primary specification. The findings suggest that export pricing strategies are principally influenced by the trade credit extended to importers, with additional trade credit received by exporters playing a lesser role.

Table 6: Robustness With Payables Controls

Dependent Variable: $\triangle p_{i,j,k,t}$	(1)	(2)	(3)
$\triangle e_{k,t}$	0.0784***	0.106***	0.109***
	(0.0195)	(0.0194)	(0.0197)
$\triangle e_{k,t} \times NetReceivables_{i,t}$	0.0413*		
	(0.0227)		
$\triangle e_{k,t} \times \phi_{i,0}$		-0.152***	-0.180***
		(0.0384)	(0.0380)
$\phi_{i,0}$			-0.0154***
			(0.00330)
$\triangle e_{k,t} \times Payables_{i,t}$		-0.0372**	-0.0368**
		(0.0159)	(0.0159)
Fixed Effects: $\varphi_{j,k} + \varphi_t$	Yes	Yes	Yes
N	2588698	2376396	2376396
R^2	0.0761	0.0787	0.0787

Notes: This table reports the results of equation (2) replacing $\phi_{i,0}$ with $NetReceivables_{i,t}$ and including additional variable $Payables_{i,t}$. Standard errors are clustered at country-time level and reported in parenthesis. Products are at 8-digit HS code level. Fixed effects: $\varphi_{j,k} + \varphi_t$ is the combination of product-destination and time fixed effects.
* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

Alternative Trade Credit Share Measures. As discussed in Section 2.2.2, we observe that the average trade credit to total revenue ratio remains consistent over time and stable across different groups, emphasizing the exogeneity of this trade credit measure. To ensure that the results are not sensitive to how we construct the firm-level trade credit share, we employ a range of alternative methods and fixed effects to address this issue. The results are reported in Table 9 in the Appendix. Using time-varying, lagged time-varying, initial-year trade credit share (based on the first year the firm appears in the dataset), and the average trade credit share across years, the estimated coefficients remain consistent and robust, as shown in Table 3.

Alternative Samples. To further assess the robustness of our results, we conduct analyses on alternative subsamples of the dataset, varying both time periods and export destinations. The results, presented in Table 7 in the Appendix, reflect similar patterns to those observed in the benchmark regression.

Column 1 and 2 in Table 7 present results for the subsamples from 2006 to 2011, which exclude the fixed exchange rate regime, and from 2000 to 2007, which exclude the post-global financial crisis period. The coefficient on the interaction term between trade credit share and exchange rate shocks, though slightly reduced in magnitude, remains statistically significant and negative. Columns 3 and 4 of Table 7 show results for the subsample excluding exports to the U.S. prior to 2006—during which time the Chinese RMB was pegged to the U.S. dollar—and for the subsample of the top 20 largest export destinations by value. Compared to the baseline results in Table 3, the interaction term coefficient remains strongly significant and consistent. In summary, the choice of subsamples has minimal impact on our empirical results, indicating the robustness of our findings.

Dominant Currency Paradiam (DCP) . A rising literature emphasis the important role of currency invoicing in ERPT (Gopinath, Itskhoki and Rigobon, 2010; Gopinath et al., 2020). In this section, we discuss if currency invoicing affect our mechanism. The Dominant Currency Paradigm (DCP) suggests that a significant share of global trade is invoiced in a small number of dominant currencies, with the U.S. dollar playing an outsized role (Gopinath, Itskhoki and Rigobon, 2010; Gopinath et al., 2020). Under this framework, exporters typically set prices in a dominant currency and adjust them infrequently. In our context, Chinese exporters primarily invoice their goods in U.S. dollars, making the dollar the likely dominant currency.

According to DCP, for exports to non-U.S. countries, exchange rate pass-through into import prices (in the importer's home currency) should be high and largely determined by fluctuations in the dollar exchange rate, rather than the bilateral exchange rate between China and the importing country. In contrast, for exports to the United States, pass-through into U.S. import prices should be relatively low, since both pricing and invoicing occur in dollars.

While the DCP framework may shape exchange rate pass-through patterns, we argue that it does not alter our main conclusions. We leverage a ER regime change in China. From 2001 to 2005, the Chinese currency had a fixed exchange rate with US dollar ($\triangle e_{CN,k,t} = \triangle e_{USD,k,t}$). We conduct three robustness checks: First, we restrict the sample to the period 2000–2011 using only the USD bilateral exchange rate (Column 2, Table 8) and run the following regression:

$$\Delta p_{i,j,k,t} = \left(\alpha + \beta\phi_{i,0}\right)\Delta e^{\$}_{k,t} + n_{i,t} + \varphi_{j,k} + \varphi_i + \varphi_t + \varepsilon_{i,j,k,t} \tag{4}$$

where $\Delta e^{\$}_{k,t}$ is the exchange rate between US dollar and importer's currency in year t. The other variables are the same as those in Equation 2. Second, we split the sample into two sub-periods—2000–2005 and 2006–2011 (Columns 4 and 3 in Table 8, respectively). Third, we broaden the sample to include dollarized or predominantly dollar-invoicing economies (Column 5 in Table 8).

In Column (2) in Table 8, we re-estimate our baseline using only the USD exchange rate for all countries between 2000 and 2011. This isolates the role of the dollar as the pricing currency across all destinations, consistent with DCP. In Columns (3) and (4) in Table 8, we split the sample into pre- and post-reform periods. In Column (4), the 2000–2005 window captures the era when the RMB was effectively pegged to the U.S. dollar, implying that bilateral exchange rates with most destinations moved in sync with the dollar. In Column (3), we focus on 2006–2011, when the RMB was allowed to appreciate, and local currency fluctuations became more relevant. In both cases, our key coefficients remain stable.

Finally, in Column (5) in Table 8, we include exports to dollarized economies or countries with widespread dollar invoicing—contexts where DCP is most likely to dominate pricing behavior and bilateral exchange rate pass-through should be minimal. The continued relevance of trade credit in this context reinforces the idea that our mechanism—operating through financing constraints—is orthogonal to pricing currency effects and not simply a reflection of nominal price rigidity under DCP.

Table 8: Robustness With Dominant Currency Paradigm

Dependent Variables: $\triangle p_{i,j,k,t}$	USD ER (1)	2000-2011 (2)	2006-2011 (3)	2000-2005 (4)	Dollarized (5)
$\triangle e^{\$}_{k,t}$	0.0500***	0.0756***	0.0633***		
	(0.0111)	(0.0128)	(0.0226)		
$\phi_{i,0}$		-0.0677***	-0.0520***	-0.0795***	-0.0940***
		(0.00849)	(0.0133)	(0.0135)	(0.0147)
$\triangle e^{\$}_{k,t} \times \phi_{i,0}$		-0.210***	-0.197***		
		(0.0402)	(0.0719)		
$\triangle e_{k,t}$				0.0611***	0.0717***
				(0.0132)	(0.0245)
$\triangle e_{k,t} \times \phi_{i,0}$				-0.175***	-0.167**
				(0.0498)	(0.0814)
Fixed Effects:					
$\varphi_{j,k} + \varphi_i + \varphi_t$	Yes	Yes	Yes	Yes	No
$\varphi_{j,t} + \varphi_i + \varphi_k$	No	No	No	No	Yes
N	2368425	2368425	1411588	918028	327333
R^2	0.119	0.119	0.169	0.124	0.185

Notes: This table reports the regression results from equation 2 using bilateral exchange rate between US Dollar and currency of country k (USD/currency k), alternative periods, and subsample of export destinations to account for the dominant currency paradigm. Standard errors are clustered at country-time level and reported in parenthesis. Products are at 8-digit HS code level. Fixed effects: $\varphi_{j,t} + \varphi_i + \varphi_k$ is the combination of product-time, firm and country fixed effects; $\varphi_{j,k} + \varphi_i + \varphi_t$ is the combination of product-destination, firm and time fixed effects.
* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

Taken together, these tests demonstrate that the dominant currency framework does not overturn our main findings. Even when pricing in dollars, exporters' financial constraints—shaped by trade credit and bank lending—continue to influence the degree of exchange rate pass-through. This highlights a distinct mechanism that operates alongside, but independently from, the dominant currency pricing effects.

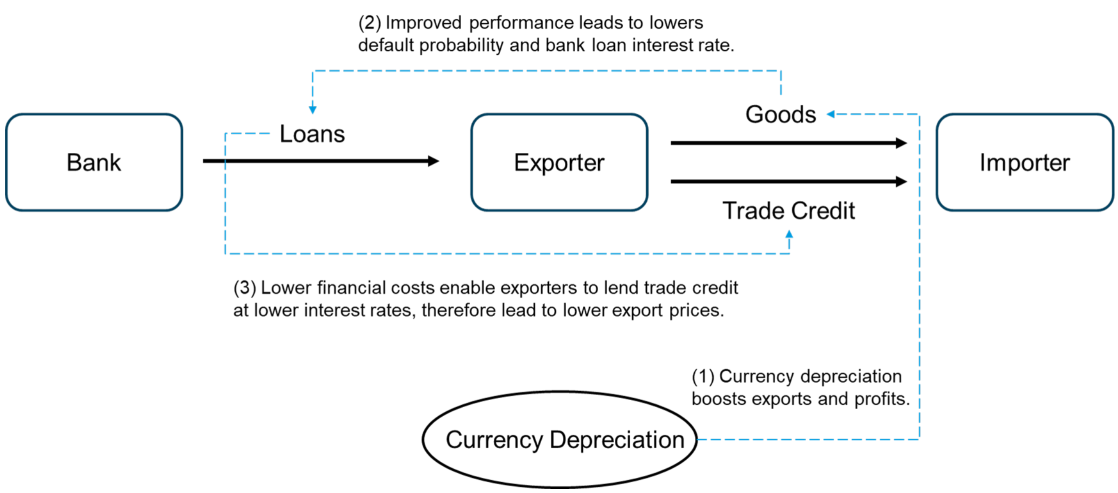
4. Theoretical Framework

Motivated by the empirical findings, this section introduces a theoretical framework to show how firm-level trade credit intensity shapes the degree of exchange rate pass-through to export prices. Our model combines key features of trade credit provision, bank financing, and default risk in a coherent partial equilibrium setting.

4.1 Model Setup

There is one source country, denoted by m, and multiple destination countries denoted by $k \in K$ and multiple sectors indexed by $s \in S$. In our model there are three groups of agents: exporters, foreign buyers and domestic banks. Exporters are monopolistic competitive variety producers in the source country. The domestic banking sector is perfectly competitive. There are two exogenous shocks: an exchange rate shock and a liquidity shock. Exporters sell their goods to foreign buyers, offering them delayed payment options (trade credit) while seeking loans from domestic banks. In Figure 4 we illustrate the connection between the agents, and in the remainder of this section, we describe each agent and their maximization problem in detail.

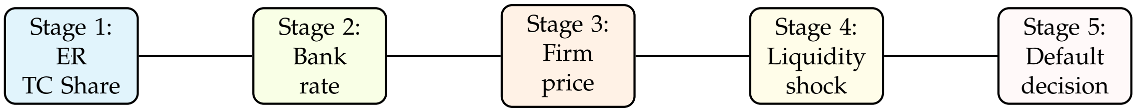
Figure 4: Model Environment and Mechanism



Notes: This figure displays the model environment and key mechanism. This figure illustrates the mechanism through which currency depreciation affects exporter behavior. Currency depreciation increases exporter profits (1), reducing default risk and lowering loan interest rates from banks (2). These lower financial costs, in turn, enable exporters to offer trade credit at lower rates, facilitating increased exports through more competitive pricing (3).

The timeline of trade and financial contracting is as follows. First, exchange rates and trade credit shares are realized. Second, the bank sets an interest rate to the exporter. Third, the exporter sets prices, borrows bank loans, and receives prepayments from buyers. Fourth, an exogenous liquidity shock is realized, reducing export profits. Fifth, the variety arrives at the destination, buyers finish the payments, and the exporter decides whether to default to the bank. In the end, the bank collects

Figure 5: Timeline of stages in the model



Notes: This figure displays the model timeline. First, exchange rates and trade credit shares are realized. Second, the bank sets an interest rate to the exporter. Third, the exporter sets prices, borrows bank loans, and receives prepayments from buyers. Fourth, an exogenous liquidity shock is realized, reducing export profits. Fifth, the variety arrives at the destination, buyers finish the payments, and the exporter decides whether to default to the bank. In the end, the bank collects the repayments.

the repayments. This timeline is illustrated in Figure 5.

4.2 Foreign Buyers

The consumer preference in country k is characterized by a Cobb-Douglas aggregator $U_k = \prod_{s=1}^{S} Q_{ks}^{\theta_{ks}}$ over CES aggregators over varieties in each sector

$$Q_{ks} = \left[\sum_{i \in \Omega_{ks}} \gamma_{ik}^{1/\varepsilon} q_{ik}^{(\varepsilon-1)/\varepsilon} \right]^{\varepsilon/(\varepsilon-1)} \tag{5}$$

where θ_{ks} is the share of each sector in country k's total expenditure ($\theta_{ks} \in (0,1)$ and $\sum_s \theta_{ks} = 1$), Ω_{ks} is the set of varieties in sector s available to country k, γ_{ik} is a demand shifter reflecting country-specific preference in a variety and ε is the elasticity of substitution ($\varepsilon > 1$). Thus, country k's demand for a variety can be expressed as a decreasing function of the price p_{ik}^*:

$$q_{ik} = \gamma_{ik} \theta_{ks} Y_k p_{ik}^{*-\varepsilon} P_{ks}^{\varepsilon-1} \tag{6}$$

where P_{ks} is the sectoral price index in country k. We define the exchange rate e_{mk} as units of Chinese currency (*Renminbi*, RMB) per currency of the destination country k. An increasing e_{mk} indicates RMB depreciation relative to currency k.[5]

4.3 Exporters

Financing, liquidity shock and default. Exporters face liquidity constraints in financing their working capital, meaning that the variable cost has to be covered through borrowing. There are two ways to finance working capital, as shown in Figure 4. First, the exporter can request an upfront payment from its foreign buyer at the beginning of the period. When the variety arrives at the destination, the buyer can transfer the rest of payments to the exporter. The end-of-period payments are defined as trade credits, which is known as receivables. Trade credit share ϕ_i is the share of receivables over sales. In this model, we assume that ϕ_i is exogenously determined. Second, the exporter can borrow bank loans b_{ik} at a given interest rate r_{ik}. The exporter can default on the bank loans. The bank

[5]For simplicity, we use k to denote both the destination country and its currency.

expects to collect the loan repayments with probability $\lambda_{ik} \in (0,1)$. In the model, λ_{ik} is endogenously determined by the exchange rate between country m and k.

The uncertainty of default is introduced by an liquidity shock. The exporter defaults to bank loans if the exogenous liquidity shock reduces total profits to less than zero. Thus, default probability λ_{ik} is

$$\lambda_{ik} = Pr[\pi_{ik} - F_{ik} < 0], \tag{7}$$

where $\pi_{ik} = p^*_{ik} e_{mk} q_{ik} - \tau_{mk} c_{ms} q_{ik} - r_{ik} b_{ik}$ is the profit and F_{ik} is an exogenous liquidity shock. Suppose the liquidity shock follows a probability distribution characterized by the cumulative distribution function $G(F)$ and has a mean value of $\bar{F}$. The default probability can be expressed as

$$\lambda_{ik} = 1 - G(\pi_{ik}). \tag{8}$$

Exporter's Problem. Firms in country m can export to each country k by incurring iceberg trade costs such that $\tau_{mk} > 1$ units of a variety need to be exported for each unit to arrive at the destination. Exporters choose export price and quantity in each market k to maximize expected profits:

$$\Pi_{ik} = (1 - \lambda_{ik})(\pi_{ik} - \bar{F}) = (1 - \lambda_{ik}) \left(p^*_{ik} e_{mk} q_{ik} - \tau_{mk} c_{ms} q_{ik} - r_{ik} b_{ik} - \bar{F} \right) \tag{9}$$

subject to foreign demand (Equation 6), default probability (Equation 8) and credit constraint

$$(1 - \phi_i) p^*_{ik} e_{mk} q_{ik} + b_{ik} \geq \tau_{mk} c_{ms} q_{ik}. \tag{10}$$

The profit expression indicates that the exporter earns profits equal to sales revenue minus variable production costs, borrowing costs, and the expected liquidity shock, provided the contract is fully enforced. In the event of default, the exporter earns no profits. The credit constraint captures the fact that the exporter finances its variable production costs through a combination of prepayments from buyers and bank borrowing.

Notice that the exporter's default probability explicitly depends on the export price, as the price directly influences sales revenue, borrowing needs, and thus liquidity risk. To analytically solve the exporter's profit maximization problem with this endogenous default probability, we introduce the following lemma, which shows that the maximization of expected and variable profits are equivalent.

Lemma 1. *Conditional on firm entering the market, maximizing expected profits Π_{ik} is equivalent to maximizing variable profits π_{ik}:*

$$\frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0 \Leftrightarrow \frac{\partial \Pi_{ik}}{\partial p^*_{ik}} = 0, \quad \frac{\partial^2 \pi_{ik}}{\partial p^{*2}_{ik}} < 0 \Leftrightarrow \frac{\partial^2 \Pi_{ik}}{\partial p^{*2}_{ik}} < 0$$

Proof. See Appendix A.1.1 □

Given Lemma 1, the optimal export price can be solved as

$$p_{ik}^* = \left(\frac{\varepsilon}{\varepsilon - 1}\right) \frac{\tau_{mk} c_{ms}}{e_{mk}} \frac{1 + r_{ik}}{1 + (1 - \phi_i) r_{ik}}. \tag{11}$$

Equation (11) illustrates the impact of trade credit share on the firm's pricing in international markets. Beyond the standard factors governing export price such as the exchange rate e_{mk}, the markup $\frac{\varepsilon}{\varepsilon-1}$, trade cost τ_{mk} and marginal input costs c_{ms}, the export price expressed in the destination country's local currency is also shaped by firm-specific marginal financing costs. These costs arise from the interaction between trade credit and bank borrowing, and are captured by the term $\frac{1+r_{ik}}{1+(1-\phi_i)r_{ik}}$. This component introduces heterogeneity across firms by linking financing to pricing behavior.

This marginal financing costs corresponds to the trade credit premium discussed in Section 2.2.1. Since the model is structured within a single period, there is no term structure for the implicit trade credit premium; rather, this financial term indicates the implicit trade credit interest rate. The implicit trade credit interest rate functions similarly to the principles of a conventional credit market: a higher trade credit share (ϕ_i) indicates that the exporter extends more credit to buyers relative to sales, while a higher bank interest rate (r_{ik}) increases the opportunity cost of lending, thereby making firm-to-firm trade credit more costly. We summarize the theoretical results in Proposition 4.1.

Proposition 4.1. ***Exporters lending trade credit more intensively set higher exporting prices.*** *Exporters charge a trade credit premium, which is embedded in the export good price when trade credit is offered. The trade credit share, ϕ_i, and the external finance interest rate, r_{ik}, jointly determine the implicit trade credit interest rate. All else being equal, a higher trade credit share or a higher interest rate leads to an increase in the implicit trade credit interest rate, which, in turn, raises the export price:*

$$\frac{\partial p_{ik}^*}{\partial \phi_i} > 0, \quad \frac{\partial p_{ik}^*}{\partial r_{ik}} > 0. \tag{12}$$

Proof. See Appendix A.1.2 □

4.4 Banks

In the perfectly competitive banking market, banks set the interest rate r_{ik} by equating the expected return on lending to exporters with the alternative risk-free return r_f. Assuming the recovery amount in the event of borrower default is zero, the bank sets r_{ik} by solving

$$b_{ik}(1 + r_f) = (1 - \lambda_{ik})(1 + r_{ik}) b_{ik} + \lambda_{ik} \cdot 0 \tag{13}$$

From this, the firm-level interest rate is calculated as

$$r_{ik} = \frac{r_f + \lambda_{ik}}{1 - \lambda_{ik}} \tag{14}$$

Equation (14) illustrates the intuitive relationship where the bank sets a higher loan interest rate to compensate for a higher default probability.

4.5 Equilibrium

Suppose the liquidity shock F_{ik} follows a uniform distribution over the range $[0, F^H]$[6]. By equation (8), the default probability is given by

$$\lambda_{ik} = 1 - \frac{\pi_{ik}}{F^H} \tag{15}$$

Combining equations (11), (14) and (15) and applying a first-order approximation to r_{ik}, we can solve for the equilibrium interest rate[7]

$$r_{ik} = \frac{\xi_{ik} e_{mk}^{-\varepsilon} - 1}{2 - \varepsilon\phi_i} \tag{16}$$

where $\xi_{ik} = \frac{1+r_f}{\gamma_{ik}} F^H(\varepsilon - 1)\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{\varepsilon}\left(\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\right)^{-1}(\tau_{mk}c_{ms})^{-1}$ is the inverse of a positive combination of exogenous country, sectoral, and variety demand shocks, excluding the exchange rate shock.[8]. A lower ξ_{ik} indicates an increase in demand for variety i in destination k, leading to higher profitability for the exporter and resulting in a lower r_{ik}.

Home currency depreciation increases the demand for goods exported from China to country k, reducing the default probability for all firms exporting to that market, prompting the bank to lower the interest rate.

Given that the interest rate is responsive to exchange rate shocks, equation (16) further demonstrates how the trade credit share ϕ_i influences the elasticity of interest rate with respect to exchange rate shocks. We summarize this in Proposition 4.2.

Proposition 4.2. ***Interest Rate Sensitivity to Exchange Rate Movements and Trade Credit Share***
In a perfectly competitive banking market, the bank sets the interest rate based on the exporter's default probability. Under mild regularity conditions, the equilibrium interest rate decreases with a depreciation of the home currency and increases with the trade credit share extended by the exporter to buyers.

$$\frac{\partial r_{ik}}{\partial e_{mk}} < 0, \quad \frac{\partial r_{ik}}{\partial \phi_i} > 0$$

Proof. See Appendix A.1.4 □

[6] We assume that the lower bound of the distribution for F_{ik} is 0 to focus on liquidity shocks that only reduce net profits and the firm's ability to repay.

[7] See Appendix A.1.3 for derivation of r_{ik} and the detailed form of ξ_{ik}.

[8] The unit of ξ_{ik} is (RMB/currency of country k)$^{\varepsilon}$

4.6 Exchange Rate Pass-through

Armed with Proposition 4.1 and 4.2, we examine how the pass-through of bilateral exchange rate shocks to export prices is affected by the trade credit share that exporters extend to buyers:

$$\Psi^*_{ik} \equiv \frac{\partial \log p^*_{ik}}{\partial \log e_{mk}} = -1 + \psi_{ik} + \frac{\phi_i}{(1+r_{ik})[1+(1-\phi_i)r_{ik}]} \frac{\partial r_{ik}}{\partial \log e_{mk}} \tag{17}$$

where $\psi_{ik} \equiv \frac{\partial \log \frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}}{\partial \log e_{mk}}$ includes the elasticities of variables with respect to exchange rate shocks that have been studied in previous literature (e.g., markups or marginal costs from inputs[9]). Complete exchange rate pass-through occurs when $\Psi^*_{ik} = -1$, meaning that p^*_{ik} decreases by the same percentage as the home currency depreciates. Empirical and theoretical evidence shows that ψ_{ik} is positive, leading to exchange rate pass-through being less than 1. With trade credit lending, the response of the firm-level bank loan interest rate to exchange rate shocks enters the process of determining exchange rate pass-through and mitigates the incompleteness.

To further explore how the trade credit share affects the exchange rate pass-through elasticity into export prices, we use equation (17) to derive the partial derivative of the pass-through elasticity Ψ_{ik} with respect to the trade credit share ϕ_i.

$$\frac{\partial \Psi^*_{ik}}{\partial \phi_i} = \frac{\partial}{\partial \phi_i}\left(\frac{\phi_i}{(1+r_{ik})[1+(1-\phi_i)r_{ik}]}\right)\frac{\partial r_{ik}}{\partial \log e_{mk}} + \frac{\phi_i}{(1+r_{ik})[1+(1-\phi_i)r_{ik}]}\frac{\partial}{\partial \phi_i}\left(\frac{\partial r_{ik}}{\partial \log e_{mk}}\right) \tag{18}$$

From equation (18), we observe that the trade credit share ϕ_i influences the pass-through elasticity through two distinct channels. The first term reflects how the trade credit share affects the overall magnitude of the exchange rate pass-through. As ϕ_i increases, the exporter's borrowing costs rise due to increased reliance on external finance. The interaction of r_{ik} and ϕ_i amplifies the exchange rate pass-through, as a larger trade credit share implies a greater proportion of the firm's operations are exposed to interest rate variations that are influenced by exchange rate fluctuations. The second term captures the direct effect of changes in ϕ_i on the sensitivity of the interest rate r_{ik} to exchange rate variations. As banks increase borrowing costs for firms with a larger share of sales on delayed payment terms, the interest rate becomes more responsive to exchange rate shocks for exporters with a higher trade credit share. These two channels together demonstrate how trade credit affects the elasticity of export prices to exchange rate shocks.

Proposition 4.3. ***Impact of Trade Credit on Exchange Rate Pass-Through Level***
Exporters who grant higher trade credit share to buyers respond less intensively on pricing in home currency given exchange shocks.

$$\frac{\partial \Psi^*_{ik}}{\partial \phi_i} < 0$$

[9] See Amiti, Itskhoki and Konings (2014); Juarez (2024), among others.

Proof. See Appendix A.1.5 □

Intuitively, if the interest rate is set independently of exchange rate movements, it would not affect the level of exchange rate pass-through via this channel. Although interest rates are determined in the domestic credit market, the mechanism differs from that of borrowers selling domestically. For exporters, profitability is directly influenced by exchange rate shocks, which in turn causes firm-specific interest rates to respond to these shocks.

Incorporating trade credit into the analysis introduces a new dimension to understanding exchange rate pass-through. When exporters offer trade credit, it affects both the cost structure and the pricing behavior of the firm, leading to changes in the pass-through of exchange rate fluctuations to export prices. By factoring in the share of trade credit granted to buyers, we can observe a more complete pass-through of exchange rate shocks into prices, as compared to models that do not account for trade credit.

5. Quantitative Results

In this section, we calibrate the model using Chinese data to quantify the impact of changes in trade credit share on exchange rate pass-through. We calibrate key parameters using the coefficients estimated in Section 3.1, and based on this, we present the baseline quantitative results. We then simulate the path of exchange rate pass-through elasticity in response to changes in Chinese benchmark lending rates and quantify the significance of managing monetary policy under varying average levels of trade credit in the economy.

5.1 Linearization

From the theoretical results, we can quantitatively derive how trade credit share influences the pass-through of exchange rate shocks to export prices in equilibrium. By combining the optimal pricing equation (11) with the equilibrium interest rate equation (16), we obtain the equilibrium export price in the destination country's currency, which depends on trade credit share and demand shocks.

$$p^*_{ik} = e^{-1}_{mk} \frac{\varepsilon}{\varepsilon - 1} \tau_{mk} c_{ms} \frac{1 + D_{ik} - \varepsilon \phi_i}{2 - \varepsilon \phi_i + (1 - \phi_i)(D_{ik} - 1)} \tag{19}$$

where $D_{ik} = \xi_{ik} e^{-\varepsilon}_{mk}$ includes all potential demand shifters, such as exchange rate shocks and other exogenous demand shocks at various levels. Notably, equation (19) demonstrates a nonlinear relationship between ϕ_i and exchange rate pass-through elasticity Ψ^*_{ik}. However, due to the general insignificance of nonlinearities, we focus on the first-order approximation of equation (19). By taking log and first-order approximate D_{ik} and ϕ_i around $\bar{D}$ and $\bar{\phi}$, we have[10]

$$\Psi^*_{ik} = \left[-1 + g\left(\bar{\phi}\right) - g'\left(\bar{\phi}\right)\bar{\phi}\right] + g'\left(\bar{\phi}\right)\phi_i \tag{20}$$

where $g\left(\bar{\phi}\right) = -\frac{\varepsilon\bar{D}}{1+\bar{D}-\varepsilon\bar{\phi}} + \frac{(1-\bar{\phi})\varepsilon\bar{D}}{2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)}$ and $g'\left(\bar{\phi}\right) = -\frac{\varepsilon^2\bar{D}}{\left(1+\bar{D}-\varepsilon\bar{\phi}\right)^2} + \frac{-\varepsilon\bar{D}(2-\varepsilon)}{\left[2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)\right]^2}$.

5.2 Parameterization

Next, we aim to calibrate ε and $\bar{D}$ using our dataset to achieve the best fit for counterfactual analyses. Since the exchange rate pass-through elasticity Ψ^*_{ik} cannot be explicitly observed in data, we cannot directly estimate equation (20). To address this, we transform equation (20) by replacing differentials with changes over time ($\triangle$), resulting in the following expression for export prices in producer currency:

$$\triangle \log p_{ik} = \left[\left(g\left(\bar{\phi}\right) - g'\left(\bar{\phi}\right)\bar{\phi}\right) + g'\left(\bar{\phi}\right)\phi_i\right] \triangle \log e_{mk} + \varepsilon_{ik} \tag{21}$$

This gives closed-form expressions for the coefficients α and β in specification (2)

$$\alpha = g\left(\bar{\phi}\right) - g'\left(\bar{\phi}\right)\bar{\phi}, \quad \beta = g'\left(\bar{\phi}\right) \tag{22}$$

Equation (22) shows that when the average trade credit share in the sample changes, both α and β adjust, contributing to the overall variation in exchange rate pass-through elasticity. The average trade credit share $\bar{\phi}$ in the dataset is 0.4. Substituting this value of $\bar{\phi}$, along with the estimated coefficients from Table 3 ($\alpha = 0.0734$, $\beta = -0.192$), we obtain the following calibrated parameter values:

$$\varepsilon = 2.723, \quad \bar{D} = 10.$$

5.3 Quantification of Exchange Rate Pass-Through

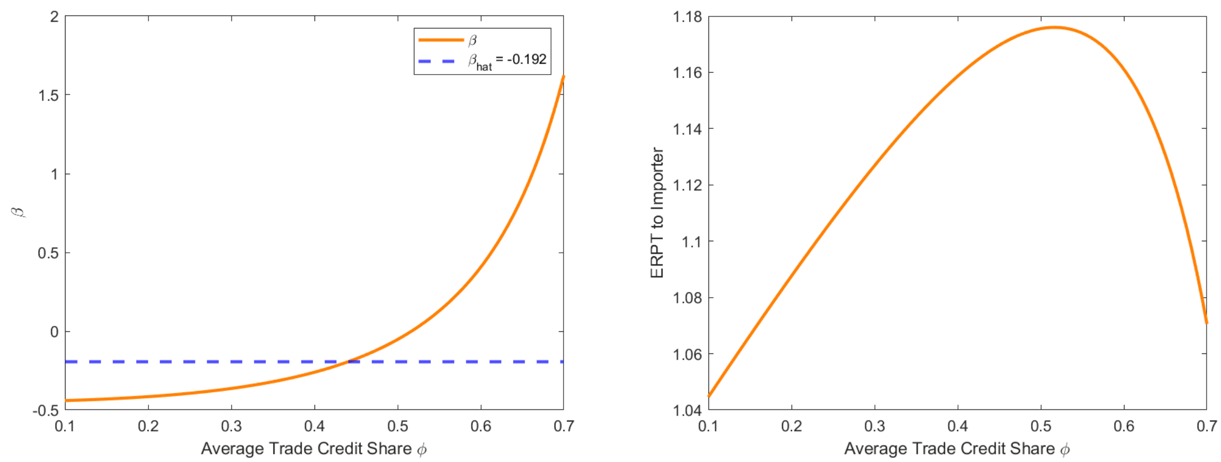
After obtaining the values of key parameters, we can now quantify how exchange rate pass-through changes with respect to variations in the average trade credit share, as predicted by our model, and compare these results with those from the reduced-form estimation.

By adjusting the average trade credit share level in the economy, we compute the corresponding values of β, which reflect the extent to which exchange rate pass-through elasticity is influenced by the trade credit share level, and the overall exchange rate pass-through in the economy. Figure 6 illustrates the path of β and exchange rate pass-through as ϕ increases. The left panel shows that, in general, a higher trade credit share raises the values of β. Notably, when ϕ is relatively low, β is negative, indicating that a higher trade credit share contributes to a more complete exchange rate pass-through. During this period, the simulation result is consistent with our empirical findings. However, when the trade credit share reaches a certain level, the estimated β turns positive, reversing

[10]See Appendix A.1.6 for proof.

the effect of trade credit share on exchange rate pass-through elasticity. Consequently, the exchange rate pass-through path in the right panel exhibits an inverted U-shape, summarizing that as the average trade credit share in the economy rises from low to high, the pass-through of exchange rate shocks to export prices initially increases and then decreases.

Figure 6: ERPT Change with Trade Credit and Overall Level



Notes: The panel on the left shows the path of β with ϕ increasing. The panel on the right shows the exchange rate pass-through to importer price for each ϕ level. Both graphs are based on model simulation.

The inverted U-shaped relationship between exchange rate pass-through and trade credit share arises due to the behavior of the implicit trade credit premium. Initially, as the trade credit share increases, the implicit trade credit premium also rises, amplifying the exchange rate pass-through. This is because exporters are more reliant on external financing, which ties the cost of trade credit to movements in exchange rates. However, as the trade credit share continues to increase beyond a certain threshold, the implicit trade credit premium becomes overly sensitive to home currency depreciation. At this point, further increases in trade credit share drive up the cost of trade credit, weakening the link between exchange rate fluctuations and export prices, thereby causing a decline in the pass-through elasticity. Thus, while moderate levels of trade credit enhance the pass-through, excessively high trade credit shares lead to diminishing effects, resulting in an inverted U-shaped pattern.

6. Conclusion

This paper highlights the significant role that financial frictions, particularly trade credit, play in determining export pricing behavior and exchange rate pass-through. Our analysis demonstrates that exporters incorporate a trade credit premium into their pricing, leading to differences in how prices adjust to exchange rate fluctuations. Specifically, exporters that extend more trade credit exhibit a higher degree of exchange rate pass-through, as the implicit interest rate embedded in their export prices adjusts in response to currency movements.

A key mechanism underlying this relationship is the interaction between trade credit financing and exchange rate dynamics. Exporters often rely on bank loans to finance trade credit, and the cost of these loans is influenced by exchange rate movements. Banks take into account that currency depreciation generally benefits exporters by improving their competitiveness and lowering their default risk, which in turn reduces their financing costs. As a result, exporters that extend more trade credit internalize this effect and adjust their pricing accordingly. When the domestic currency depreciates, these firms lower their foreign currency prices, effectively passing on the depreciation benefit to their buyers. This effect is stronger for firms that issue a higher volume of trade credit, as their financing costs are more sensitive to exchange rate movements.

Overall, our findings contribute to the literature by illustrating how financial constraints and trade credit financing influence international price-setting. By showing that firms with greater trade credit utilization exhibit a more complete exchange rate pass-through, this paper provides new insights into the interaction between financial conditions and international trade pricing. These results have important implications for both policymakers and firms, emphasizing the need to account for financial structures when analyzing exchange rate movements and their impact on global trade.

References

Adelino, Manuel, Miguel A Ferreira, Mariassunta Giannetti, and Pedro Pires. 2023. "Trade credit and the transmission of unconventional monetary policy." The Review of Financial Studies, 36(2): 775–813.

Almut, Balleer; Nikolay, Hristov; Dominik, Menno. 2017. "Financial Constraints and Nominal Price Rigidities." CESifo Working Paper no. 6309;.

Amberg, Niklas, Tor Jacobson, and Erik von Schedvin. 2021. "Trade Credit and Product Pricing: The Role of Implicit Interest Rates." Journal of the European Economic Association, 19(2): 709–740.

Amberg, Niklas, Tor Jacobson, Erik Von Schedvin, and Robert Townsend. 2021. "Curbing shocks to corporate liquidity: The role of trade credit." Journal of Political Economy, 129(1): 182–242.

Amiti, Mary, Oleg Itskhoki, and Jozef Konings. 2014. "Importers, exporters, and exchange rate disconnect." American Economic Review, 104(7): 1942–1978.

Antras, Pol, and C Fritz Foley. 2015. "Poultry in motion: a study of international trade finance practices." Journal of Political Economy, 123(4): 853–901.

Atkeson, Andrew, and Ariel Burstein. 2008. "Trade Costs, Pricing to Market." American Economic Review, 98(5): 1998–2031.

Auer, Raphael A, and Raphael S Schoenle. 2016. "Market structure and exchange rate pass-through." Journal of International Economics, 98: 60–77.

Barrot, Jean-Noel. 2016. "Trade credit and industry dynamics: Evidence from trucking firms." The Journal of Finance, 71(5): 1975–2016.

Benguria, Felipe, Alvaro Garcia-Marin, and Tim Schmidt-Eisenlohr. 2023. "Trade Credit and Relationships."

Berman, Nicolas, Philippe Martin, and Thierry Mayer. 2012. "How do different exporters react to exchange rate changes?" The Quarterly Journal of Economics, 127(1): 437–492.

Burstein, Ariel, and Gita Gopinath. 2014. "International prices and exchange rates." In Handbook of international economics. Vol. 4, 391–451. Elsevier.

Campa, Jose Manuel, and Linda S Goldberg. 2005. "Exchange rate pass-through into import prices." Review of Economics and Statistics, 87(4): 679–690.

Desai, Mihir A, C Fritz Foley, and James R Hines Jr. 2016. "Trade credit and taxes." Review of Economics and Statistics, 98(1): 132–139.

Fisman, Raymond, and Inessa Love. 2003. "Trade credit, financial intermediary development, and industry growth." The Journal of finance, 58(1): 353–374.

Gilchrist, Simon, Raphael Schoenle, Jae Sim, and Egon Zakrajšek. 2017. "Inflation dynamics during the financial crisis." American Economic Review, 107(3): 785–823.

Gopinath, Gita, Emine Boz, Camila Casas, Federico J Díez, Pierre-Olivier Gourinchas, and Mikkel Plagborg-Møller. 2020. "Dominant currency paradigm." American Economic Review, 110(3): 677–719.

Gopinath, Gita, Oleg Itskhoki, and Roberto Rigobon. 2010. "Currency choice and exchange rate pass-through." American Economic Review, 100(1): 304–36.

Hardy, Bryan, Felipe E Saffie, and Ina Simonovska. 2022. "Economic Stabilizers in Emerging Markets: The Case for Trade Credit."

Hardy, Bryan, Felipe E Saffie, and Ina Simonovska. 2023. "Trade Credit and Exchange Rate Risk Pass Through." National Bureau of Economic Research.

International Chamber of Commerce. 2023. "2023 ICC Trade Register Report: Global Risks in Trade Finance." Accessed: October 22, 2024.

Jacobson, Tor, and Erik Von Schedvin. 2015. "Trade credit and the propagation of corporate failure: An empirical analysis." Econometrica, 83(4): 1315–1371.

Juarez, Leticia. 2024. "Buyer market power and exchange rate pass-through." Available at SSRN 4420344.

Kim, Junhyong, and Annie Soyean Lee. 2024. "Liability dollarization and exchange rate pass-through to domestic prices." Available at SSRN 3941940.

Kim, Ryan. 2021. "The effect of the credit crunch on output price dynamics: The corporate inventory and liquidity management channel." The Quarterly Journal of Economics, 136(1): 563–619.

Kohn, David, Fernando Leibovici, and Michal Szkup. 2020. "Financial frictions and export dynamics in large devaluations." Journal of International Economics, 122: 103257.

Lin, Shu, and Haichun Ye. 2018. "Foreign direct investment, trade credit, and transmission of global liquidity shocks: Evidence from Chinese manufacturing firms." The Review of Financial Studies, 31(1): 206–238.

Ma, Sai, and Tim Schmidt-Eisenlohr. 2023. "The Financial Channel of the Exchange Rate and Global Trade." CESifo.

Nilsen, Jeffrey H. 2002. "Trade credit and the bank lending channel." Journal of Money, credit and Banking, 226–253.

Strasser, Georg. 2013. "Exchange rate pass-through and credit constraints." Journal of Monetary Economics, 60(1): 25–38.

A. Appendix

A.1 Theoretical Appendix

A.1.1 Proof of Lemma 1

Let the liquidity shock F_{ik} be a random variable with cumulative distribution function (CDF) $G(F)$. The exporter's profit is given by

$$\pi_{ik} = p^*_{ik} e_{mk} q_{ik} - \tau_{mk} c_{ms} q_{ik} - r_{ik} b_{ik},$$

where p^*_{ik} is the foreign price, e_{mk} is the exchange rate, q_{ik} is quantity exported, $\tau_{mk} c_{ms}$ is the marginal cost in local currency, and $r_{ik} b_{ik}$ is the interest payment.

The probability of default occurs when the liquidity shock exceeds profits:

$$\lambda_{ik} = \Pr[F_{ik} > \pi_{ik}] = 1 - G(\pi_{ik}).$$

Taking the derivative with respect to π_{ik}, we obtain

$$\frac{\partial \lambda_{ik}}{\partial \pi_{ik}} = -G'(\pi_{ik}).$$

The exporter chooses p^*_{ik} to maximize expected profit:

$$\Pi_{ik} = (1 - \lambda_{ik})(\pi_{ik} - \bar{F}),$$

where $\bar{F}$ is the expected liquidity shock.

The first-order condition (FOC) for profit maximization with respect to p^*_{ik} is:

$$\frac{\partial \Pi_{ik}}{\partial p^*_{ik}} = -\frac{\partial \lambda_{ik}}{\partial p^*_{ik}}(\pi_{ik} - \bar{F}) + (1 - \lambda_{ik})\frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0.$$

Using the chain rule:

$$\frac{\partial \lambda_{ik}}{\partial p^*_{ik}} = \frac{\partial \lambda_{ik}}{\partial \pi_{ik}} \cdot \frac{\partial \pi_{ik}}{\partial p^*_{ik}} = -G'(\pi_{ik}) \cdot \frac{\partial \pi_{ik}}{\partial p^*_{ik}},$$

we substitute into the FOC:

$$G'(\pi_{ik})(\pi_{ik} - \bar{F}) \cdot \frac{\partial \pi_{ik}}{\partial p^*_{ik}} + (1 - \lambda_{ik})\frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0.$$

Factoring:

$$\left[G'(\pi_{ik})(\pi_{ik} - \bar{F}) + 1 - \lambda_{ik}\right] \cdot \frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0.$$

This condition implies two possibilities: $\frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0$ or $G'(\pi_{ik})(\pi_{ik} - \bar{F}) + 1 - \lambda_{ik} = 0$.

Suppose the second condition holds. Rearranging:

$$\pi_{ik} - \bar{F} = \frac{\lambda_{ik} - 1}{G'(\pi_{ik})}.$$

Since $0 < \lambda_{ik} < 1$ and $G'(\pi_{ik}) > 0$, the right-hand side is negative, implying:

$$\pi_{ik} - \bar{F} < 0.$$

Thus expected profit is negative:

$$\Pi_{ik} = (1 - \lambda_{ik})(\pi_{ik} - \bar{F}) < 0,$$

which contradicts the assumption that the exporter chooses to enter. Therefore, the only feasible solution is:

$$\frac{\partial \pi_{ik}}{\partial p^*_{ik}} = 0.$$

In this paper, we focus on exporting firms and don't discuss about the enter/exit behavior of firms. Therefore, $\bar{F}$ should be set at the level that ensures that once exporter maximizes variable profits π_{ik}, $\pi_{ik} - \bar{F} > 0$. With this assumption,

$$\max_{p^*_{ik}} (1 - \lambda_{ik})(\pi_{ik} - \bar{F}) \quad \Longrightarrow \quad \max_{p^*_{ik}} \pi_{ik}$$

To ensure that the F.O.C. result of maximizing Π_{ik} also maximizes π_{ik}, we check the second-order condition.

$$\frac{\partial^2 \Pi_{ik}}{\partial p^{*2}_{ik}} = [G(\pi_{ik}) + G'(\pi_{ik})(\pi_{ik} - \bar{F})]\frac{\partial^2 \pi_{ik}}{\partial p^{*2}_{ik}} + [G'(\pi_{ik}) + G''(\pi_{ik})(\pi_{ik} - \bar{F}) + G'(\pi_{ik})]\frac{\partial \pi_{ik}}{\partial p^*_{ik}}\frac{\partial \pi_{ik}}{\partial p^*_{ik}}$$

$$0 < G(\pi_{ik}) < 1 \quad and \quad G'(\pi_{ik}) > 0$$

With $\hat{p^*_{ik}} = \text{argmax}(\pi(p^*_{ik})) = e^{-1}_{mk}\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}$

$$\begin{aligned}
\frac{\partial^2\pi_{ik}}{\partial p^{*2}_{ik}}|_{p^*_{ik}=\hat{p^*_{ik}}} &= \frac{\partial}{\partial p^*_{ik}}\left[(1+r_{ik}(1-\phi_i))(1-\varepsilon)e_{mk}q_{ik} + (1+r_{ik})\tau_{mk}c_{ms}\varepsilon\frac{q_{ik}}{p^*_{ik}}\right] \\
&= (1+r_{ik}(1-\phi_i))(\varepsilon-1)e_{mk}\varepsilon\frac{q_{ik}}{p^*_{ik}} - (1+r_{ik})\tau_{mk}c_{ms}\varepsilon\frac{(\varepsilon+1)q_{ik}}{p^{*2}_{ik}} \\
&= \frac{\varepsilon q_{ik}}{p^*_{ik}}\left[e_{mk}(1+r_{ik}(1-\phi_i))(\varepsilon-1) - (1+r_{ik})\tau_{mk}c_{ms}(\varepsilon+1)\frac{1}{p^*_{ik}}\right] \\
&= \frac{\varepsilon q_{ik}}{p^*_{ik}}\left[e_{mk}(1+r_{ik}(1-\phi_i))(\varepsilon-1) - (1+r_{ik})\tau_{mk}c_{ms}(\varepsilon+1)e_{mk}\frac{\varepsilon-1}{\varepsilon}(\tau_{mk}c_{ms})^{-1}\frac{1+r_{ik}(1-\phi_i)}{1+r_{ik}}\right] \\
&= \frac{\varepsilon q_{ik}}{p^*_{ik}}\left[e_{mk}(1+r_{ik}(1-\phi_i))(\varepsilon-1) - (\varepsilon+1)e_{mk}\frac{\varepsilon-1}{\varepsilon}(1+r_{ik}(1-\phi_i))\right] \\
&= \frac{\varepsilon e_{mk}q_{ik}}{p^*_{ik}}(1+r_{ik}(1-\phi_i))(\varepsilon-1)(-\frac{1}{\varepsilon}) < 0
\end{aligned}$$

Thus,

$$\frac{\partial^2\Pi_{ik}}{\partial p^{*2}_{ik}}|_{p^*_{ik}=\hat{p^*_{ik}}} = [\underbrace{G(\pi_{ik})}_{>0} + \underbrace{G'(\pi_{ik})}_{>0}\underbrace{(\pi_{ik}-\bar{F})}_{>0}]\underbrace{\frac{\partial^2\pi_{ik}}{\partial p^{*2}_{ik}}}_{<0} + [G'(\pi_{ik}) + G''(\pi_{ik})(\pi_{ik}-\bar{F}) + G'(\pi_{ik})]\underbrace{\frac{\partial\pi_{ik}}{\partial p^*_{ik}}}_{=0}\frac{\partial\pi_{ik}}{\partial p^*_{ik}} < 0$$

Therefore, the optimal export price $\hat{p^*_{ik}}$ maximizing Π_{ik} also maximizes π_{ik}. □

A.1.2 Proof of Proposition 4.1: Trade Credit Premium in Export Price

Keeping other things constant,

$$\frac{\partial p^*_{ik}}{\partial\phi_i} = -\frac{1+r_{ik}}{[1+(1-\phi_i)r_{ik}]^2}(-r_{ik}) = \frac{(1+r_{ik})r_{ik}}{[1+(1-\phi_i)r_{ik}]^2} > 0$$

$$\frac{\partial p^*_{ik}}{\partial r_{ik}} = \frac{1+(1-\phi_i)r_{ik} - (1-\phi_i)(1+r_{ik})}{[1+(1-\phi_i)r_{ik}]^2} = \frac{\phi_i}{[1+(1-\phi_i)r_{ik}]^2} > 0$$

As a result, p^*_{ik} increases with ϕ_i and r_{ik}. □

A.1.3 Solve Equilibrium Firm-Level Interest Rate r_{ik}

Plug equation (11) in equation (6), we have the quantity produced

$$q_{ik} = \gamma_{ik}\frac{p^{*-\varepsilon}_{ik}\theta_{ks}Y_k}{P^{1-\varepsilon}_{ks}} = \gamma_{ik}\frac{\left(e^{-1}_{mk}\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}\theta_{ks}Y_k}{P^{1-\varepsilon}_{ks}} = \gamma_{ik}e^{\varepsilon}_{mk}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P^{1-\varepsilon}_{ks}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}$$

The profits after paying the interest π_{ik} are

$$\pi_{ik} = \frac{1}{\varepsilon-1}\tau_{mk}c_{ms}(1+r_{ik})\gamma_{ik}e_{mk}^{\varepsilon}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}$$

The the default probability is

$$\begin{aligned}
\lambda_{ik} &= 1-\frac{\pi_{ik}}{F^H} = \frac{r_{ik}-r_f}{1+r_{ik}} \\
&= 1-\frac{1}{F^H}\frac{1}{\varepsilon-1}\tau_{mk}c_{ms}(1+r_{ik})\gamma_{ik}e_{mk}^{\varepsilon}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}
\end{aligned}$$

Solve for r_{ik}

$$\frac{r_{ik}-r_f}{1+r_{ik}} = 1-\frac{1}{F^H}\frac{1}{\varepsilon-1}\tau_{mk}c_{ms}(1+r_{ik})\gamma_{ik}e_{mk}^{\varepsilon}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}$$

$$r_{ik}-r_f = 1+r_{ik}-\frac{1}{F^H}\frac{1}{\varepsilon-1}\tau_{mk}c_{ms}(1+r_{ik})^2\gamma_{ik}e_{mk}^{\varepsilon}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}$$

$$\frac{1}{F^H}\frac{1}{\varepsilon-1}\tau_{mk}c_{ms}(1+r_{ik})^2\gamma_{ik}e_{mk}^{\varepsilon}\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{-\varepsilon}\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon} = 1+r_f$$

$$(1+r_{ik})^2\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon} = \frac{1+r_f}{\gamma_{ik}}F^H(\varepsilon-1)\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{\varepsilon}\left(\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\right)^{-1}(\tau_{mk}c_{ms})^{-1}e_{mk}^{-\varepsilon}$$

Let $\xi_{ik} = \frac{1+r_f}{\gamma_{ik}}F^H(\varepsilon-1)\left(\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\right)^{\varepsilon}\left(\frac{\theta_{ks}Y_k}{P_{ks}^{1-\varepsilon}}\right)^{-1}(\tau_{mk}c_{ms})^{-1}$, we solve the equation below for equilibrium r_{ik}.

$$(1+r_{ik})^2\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon} = \xi_{ik}e_{mk}^{-\varepsilon}$$

As r_{ik} is small, we first-order approximate of r_{ik} around $\bar{r}=0$.

$$f(r_{ik}) = (1+r_{ik})^2\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon}$$

$$
\begin{aligned}
f'(r_{ik}) &= 2(1+r_{ik})\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon} - \varepsilon(1+r_{ik})^2\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon-1}\frac{1+r_{ik}(1-\phi_i)-(1-\phi_i)(1+r_{ik})}{(1+r_{ik}(1-\phi_i))^2} \\
&= 2(1+r_{ik})\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon} - \varepsilon\phi_i\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon+1} \\
&= [2(1+r_{ik}(1-\phi_i)) - \varepsilon\phi_i]\left(\frac{1+r_{ik}}{1+r_{ik}(1-\phi_i)}\right)^{-\varepsilon+1}
\end{aligned}
$$

Then we have

$$
f(r_{ik}) = f(0) + f'(0)r_{ik} = 1 + (2-\varepsilon\phi_i)r_{ik}
$$

Solve for r_{ik}

$$
1 + (2-\varepsilon\phi_i)r_{ik} = \xi_{ik}e_{mk}^{-\varepsilon}
$$

$$
r_{ik} = \frac{\xi_{ik}e_{mk}^{-\varepsilon} - 1}{2-\varepsilon\phi_i}
$$

A.1.4 Proof of Proposition 4.2: Dynamics of Equilibrium r_{ik}

When $2-\varepsilon\phi_i > 0$, $\varepsilon < \frac{2}{\phi_i}$

$$
\frac{\partial r_{ik}}{\partial e_{mk}} = \frac{-\varepsilon\xi_{ik}e_{mk}^{-\varepsilon-1}}{2-\varepsilon\phi_i} < 0
$$

$$
\frac{\partial r_{ik}}{\partial \phi_i} = \left(\xi_{ik}e_{mk}^{-\varepsilon} - 1\right)\frac{\varepsilon}{(2-\varepsilon\phi_i)^2} > 0
$$

Therefore, as Chinese RMB depreciates, equilibrium r_{ik} decreases. If an exporter extends more trade credit to buyers, the r_{ik} she receives is higher. □

A.1.5 Proof of Proposition 4.3: Exchange Rate Pass-through Changes with Trade Credit

$$
\boxed{p^* = e^{-1}\frac{\varepsilon}{\varepsilon-1}\tau c\frac{1+r}{1+r\phi}}
$$

The ERPT is

$$
\begin{aligned}
\frac{\partial \log p^*}{\partial \log e} &= -1 + \frac{\partial \log(1+r)}{\partial \log e} - \frac{\partial \log\big(1+r\phi\big)}{\partial \log e} \\
&= -1 + \frac{1}{1+r}\frac{\partial r}{\partial \log e} - \frac{\phi}{1+r\phi}\frac{\partial r}{\partial \log e} \\
&= -1 + \frac{1-\phi}{(1+r)(1+r\phi)}\underbrace{\frac{\partial r}{\partial \log e}}_{<0}
\end{aligned}
$$

How does ERPT change with ϕ?

$$
\begin{aligned}
\frac{\partial}{\partial \phi}\frac{\partial \log p^*}{\partial \log e} &= \frac{\partial}{\partial \phi}\frac{\partial \log(1+r)}{\partial \log e} - \frac{\partial}{\partial \phi}\frac{\partial \log\big(1+r\phi\big)}{\partial \log e} \\
&= \frac{\partial}{\partial \phi}\Big(\frac{1-\phi}{(1+r)(1+r\phi)}\Big)e\frac{\partial r}{\partial e} + \frac{1-\phi}{(1+r)(1+r\phi)}e\frac{\partial}{\partial \phi}\Big(\frac{\partial r}{\partial e}\Big) \\
&= \frac{-(1+r)(1+r\phi) - (1-\phi)[\frac{\partial r}{\partial \phi}(1+r\phi) + (1+r)(\phi\frac{\partial r}{\partial \phi}+r)]}{(1+r)^2(1+r\phi)^2}e\frac{\partial r}{\partial e} \\
&+ \frac{1-\phi}{(1+r)(1+r\phi)}e\frac{\partial}{\partial \phi}\Big(\frac{\partial r}{\partial e}\Big)
\end{aligned}
$$

Let

$$
r = (\xi e^{-\varepsilon} - 1)\frac{1}{2-\varepsilon(1-\phi)}
$$

where $\xi = \frac{1}{\gamma}F^H(\varepsilon-1)(\frac{\varepsilon}{\varepsilon-1}\tau c)^{\varepsilon}(\frac{\theta Y}{P^{1-\varepsilon}})^{-1}(\tau c)^{-1}$

$$
\frac{\partial r}{\partial e} = \frac{1}{2-\varepsilon(1-\phi)}(-\varepsilon)\xi e^{-\varepsilon-1} < 0
$$

$$
\frac{\partial}{\partial \phi}\frac{\partial r}{\partial e} = (-\varepsilon)\xi e^{-\varepsilon-1}\frac{-\varepsilon}{(2-\varepsilon(1-\phi))^2} = \varepsilon\xi e^{-\varepsilon-1}\frac{\varepsilon}{(2-\varepsilon(1-\phi))^2} > 0
$$

$$
\begin{aligned}
\frac{\partial r}{\partial \phi} &= (\xi e^{-\varepsilon} - 1)\frac{-\varepsilon}{(2-\varepsilon(1-\phi))^2} < 0 \\
&= -\frac{\varepsilon r}{2-\varepsilon(1-\phi)}
\end{aligned}
$$

Then

$$
\begin{aligned}
\frac{\partial}{\partial\phi}\frac{\partial\log p^*}{\partial\log e} &= \frac{\partial}{\partial\phi}\frac{\partial\log(1+r)}{\partial\log e} - \frac{\partial}{\partial\phi}\frac{\partial\log\big(1+r\phi\big)}{\partial\log e} \\
&= \frac{\partial}{\partial\phi}\Big(\frac{1-\phi}{(1+r)(1+r\phi)}\Big)e\frac{\partial r}{\partial e} + \frac{1-\phi}{(1+r)(1+r\phi)}e\frac{\partial}{\partial\phi}\Big(\frac{\partial r}{\partial e}\Big) \\
&= \frac{-(1+r)(1+r\phi)-(1-\phi)[\frac{\partial r}{\partial\phi}(1+r\phi)+(1+r)(\phi\frac{\partial r}{\partial\phi}+r)]}{(1+r)^2(1+r\phi)^2}e\underbrace{\frac{\partial r}{\partial e}}_{<0} \\
&+ \frac{1-\phi}{(1+r)(1+r\phi)}e\underbrace{\frac{\partial}{\partial\phi}\Big(\frac{\partial r}{\partial e}\Big)}_{>0}
\end{aligned}
$$

$$
\begin{aligned}
&\frac{\partial r}{\partial\phi}(1+r\phi)+(1+r)(\phi\frac{\partial r}{\partial\phi}+r) \\
&= (1+2r\phi+\phi)\frac{\partial r}{\partial\phi}+(1+r)r \\
&= -(1+2r\phi+\phi)\frac{\varepsilon r}{2-\varepsilon(1-\phi)}+(1+r)r
\end{aligned}
$$

$$
\frac{2-\varepsilon+\varepsilon\phi+2r(1-\varepsilon)+2\varepsilon r\phi}{2+2r\phi-\varepsilon+\varepsilon\phi}
$$

$$
(1+r)^{1-\varepsilon}(1+r\phi)^{\varepsilon} < \xi
$$

A.1.6 Log Linearization and First-Order Approximation of Exchange Rate Pass-through

We begin with the optimal export prices equation (19)

$$
p^*_{ik} = e^{-1}_{mk}\frac{\varepsilon}{\varepsilon-1}\tau_{mk}c_{ms}\frac{1+D_{ik}-\varepsilon\phi_i}{2-\varepsilon\phi_i+(1-\phi_i)(D_{ik}-1)}
$$

where $D_{ik}=\xi_{ik}e^{-\varepsilon}_{mk}$ is the demand shifter. Take log on the right hand side, we have

$$
h(e_{mk}) = -\log e_{mk} + \log\left(\frac{\varepsilon}{\varepsilon-1}\right) + \log(\tau_{mk}c_{ms}) + \log\left(1+\xi_{ik}e^{-\varepsilon}_{mk}-\varepsilon\phi_i\right) - \log[2-\varepsilon\phi_i+(1-\phi_i)(\xi_{ik}e^{-\varepsilon}_{mk}-1)]
$$

Define $x=\log e_{mk}$, then $e^{-\varepsilon}_{mk}=exp(-x\varepsilon)$. Plug in we have

$$
h(x) = -x + \log\left(\frac{\varepsilon}{\varepsilon-1}\right) + \log(\tau_{mk}c_{ms}) + \log\left(1+\xi_{ik}e^{-x\varepsilon}-\varepsilon\phi\right) - \log[2-\varepsilon\phi+(1-\phi)(\xi_{ik}e^{-x\varepsilon}-1)]
$$

First-order approximate on $\log e_{mk}$ around $\log \bar{e}$. The result is

$$\begin{aligned}
h(x) \approx & -\bar{x} + \log\left(\frac{\varepsilon}{\varepsilon-1}\right) + \log(\tau_{mk}c_{ms}) + \log\left(1+\xi_{ik}e^{-\bar{x}\varepsilon} - \varepsilon\phi_i\right) - \log[2-\varepsilon\phi_i + (1-\phi_i)(\xi_{ik}e^{-\bar{x}\varepsilon}-1)] \\
& + \left[-1 + \frac{-\varepsilon\xi_{ik}e^{-\bar{x}\varepsilon}}{1+\xi_{ik}e^{-\bar{x}\varepsilon}-\varepsilon\phi_i} - \frac{-(1-\phi_i)\varepsilon\xi_{ik}e^{-\bar{x}\varepsilon}}{2-\varepsilon\phi_i+(1-\phi_i)(\xi_{ik}e^{-\bar{x}\varepsilon}-1)}\right](x-\bar{x})
\end{aligned}$$

Therefore, the result is

$$\begin{aligned}
\log p^*_{ik} \approx & -\log\bar{e} + \log\left(\frac{\varepsilon}{\varepsilon-1}\right) + \log(\tau_{mk}c_{ms}) + \log\left(1+\xi_{ik}\bar{e}^{-\varepsilon} - \varepsilon\phi_i\right) - \log[2-\varepsilon\phi_i + (1-\phi_i)(\xi_{ik}\bar{e}^{-\varepsilon}-1)] \\
& + \left[-1 + \frac{-\varepsilon\xi_{ik}\bar{e}^{-\varepsilon}}{1+\xi_{ik}\bar{e}^{-\varepsilon}-\varepsilon\phi_i} - \frac{-(1-\phi_i)\varepsilon\xi_{ik}\bar{e}^{-\varepsilon}}{2-\varepsilon\phi_i+(1-\phi_i)(\xi_{ik}\bar{e}^{-\varepsilon}-1)}\right](\log e_{mk}-\log\bar{e})
\end{aligned}$$

Take derivative with respect to $\log e_{mk}$, we have

$$\begin{aligned}
\frac{\partial \log p^*_{ik}}{\partial \log e_{mk}} &= -1 - \frac{\varepsilon\xi_{ik}\bar{e}^{-\varepsilon}}{1+\xi_{ik}\bar{e}^{-\varepsilon}-\varepsilon\phi_i} + \frac{(1-\phi_i)\varepsilon\xi_{ik}\bar{e}^{-\varepsilon}}{2-\varepsilon\phi_i+(1-\phi_i)(\xi_{ik}\bar{e}^{-\varepsilon}-1)} \\
&= -1 - \frac{\varepsilon\bar{D}}{1+\bar{D}-\varepsilon\phi_i} + \frac{(1-\phi_i)\varepsilon\bar{D}}{2-\varepsilon\phi_i+(1-\phi_i)(\bar{D}-1)}
\end{aligned}$$

First-order approximation on ϕ_i around $\bar{\phi}$, we have

$$\begin{aligned}
\frac{\partial \log p^*_{ik}}{\partial \log e_{mk}} = & -1 - \frac{\varepsilon\bar{D}}{1+\bar{D}-\varepsilon\bar{\phi}} + \frac{(1-\bar{\phi})\varepsilon\bar{D}}{2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)} \\
& + \left[-\frac{\varepsilon^2\bar{D}}{(1+\bar{D}-\varepsilon\bar{\phi})^2} + \frac{-\varepsilon\bar{D}[2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)] - (1-\bar{\phi})\varepsilon\bar{D}(-\varepsilon-\bar{D}+1)}{[2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)]^2}\right](\phi_i-\bar{\phi}) \\
= & -1 + g(\bar{\phi}) + g'(\bar{\phi})(\phi_i-\bar{\phi}) \\
= & [-1 + g(\bar{\phi}) - g'(\bar{\phi})\bar{\phi}] + g'(\bar{\phi})\phi_i
\end{aligned}$$

where

$$g(\bar{\phi}) = -\frac{\varepsilon\bar{D}}{1+\bar{D}-\varepsilon\bar{\phi}} + \frac{(1-\bar{\phi})\varepsilon\bar{D}}{2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)}$$

$$g'(\bar{\phi}) = -\frac{\varepsilon^2\bar{D}}{(1+\bar{D}-\varepsilon\bar{\phi})^2} + \frac{-\varepsilon\bar{D}(2-\varepsilon)}{[2-\varepsilon\bar{\phi}+(1-\bar{\phi})(\bar{D}-1)]^2}$$

Thus, we have the first-order linear form of exchange rate pass-through with respect to trade credit share ϕ_i. □

A.2 Empirical Appendix

A.2.1 Summary Statistics by export characteristics

	(1) All firms	(2) Exporters	(3) Importers	(4) Small	(5) Mid	(6) Large
Active banking debt	0.998	0.998	0.998	0.996	0.998	0.999
Debt over sales	0.486	0.446	0.536	0.458	0.478	0.517
Receivables over sales	0.184	0.142		0.168	0.166	0.167
Receivables over debt	1.428	0.842		1.395	1.189	0.913
Payables over sales	0.186		0.178	0.196	0.192	0.186
Payables over debt	0.444		0.381	0.469	0.437	0.415
Interest rate	0.028	0.041	0.030	0.036	0.033	0.028
Interest cost	4810.471	1797.884	9068.799	623.445	1140.108	6916.366

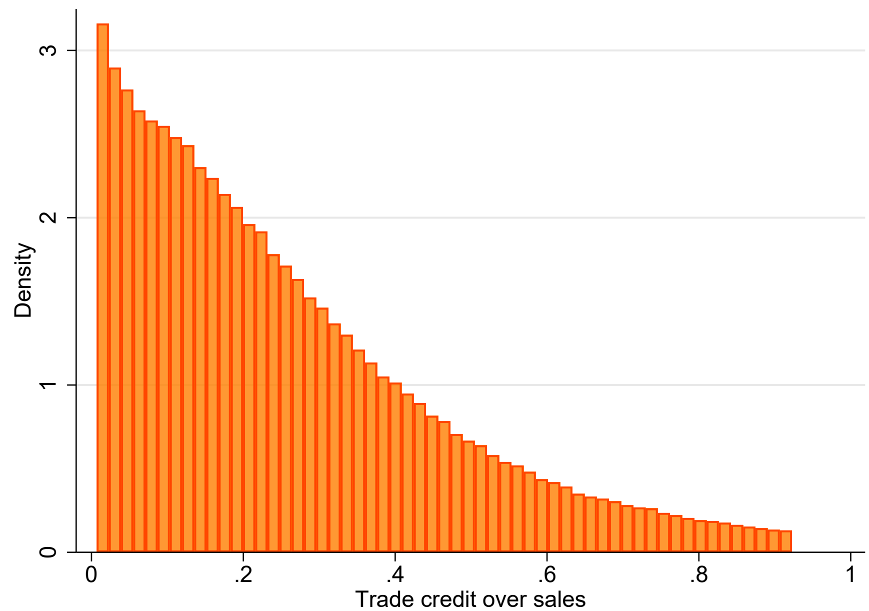
Notes: (1) contains summary statistics for the firms for we observe both export and imports operations during the period, (2) for the firms for which we only observe export operations during the period, (3) contains summary statistics for the firms for which we only observe import operations. (4), (5), & (6) contains the mean of each variable by firm's sizes

A.2.2 ER general information between RMB and the rest of the world. ER regime.

Relation with US Dollar: From 1994 to 2005 China implemented a fixed exchange rate pegged to the US dollar. In July 2005 China announced a reform to its exchange rate making it more flexible, adopting a managed flotation using as an anchor a basket of currencies that wasn't specified. However, for some years, the weight of the other currencies was tiny and the peg with the US dollar continued but allowing some fluctuation band that was announced before the start of the trading day. The ER RMB/USD was allowed to fluctuate in a daily band of 0.3% and up to 1.5% against the other market currencies: Euro, HKD, and the Japanese Yen. During the following years, the band was adjusted and allowed different daily variations. On September 2005 the trading band for non-US dollar currencies was widened to 3%. For the RMB/USD, the band was modified in May 2007 and followed the same tendency to widen previously applied to the other currencies, increasing the flotation band to 0.5%. Then in April 2012, it was widened to 1% and finally, the band was set at 2% by March 2014.

A.2.3 Trade Credit Distribution

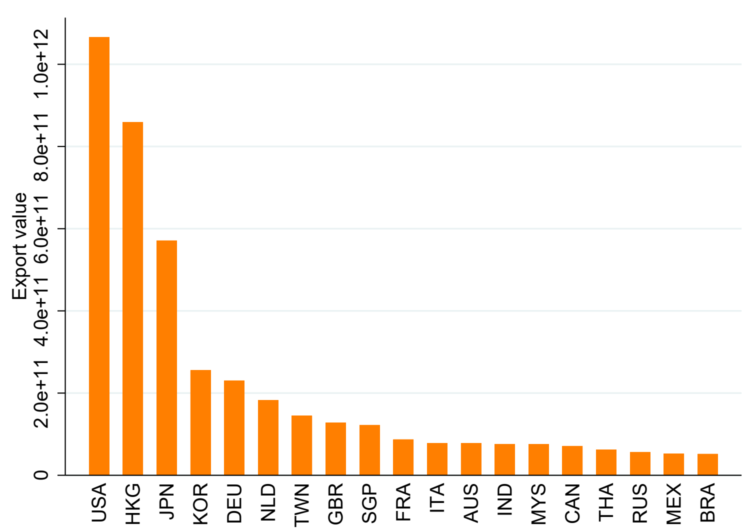
Figure 7: Distribution of trade credit over sales



Notes: Distribution of trade credit (sum of payables and receivables) over sales. The data have been winsorized at the 5% level

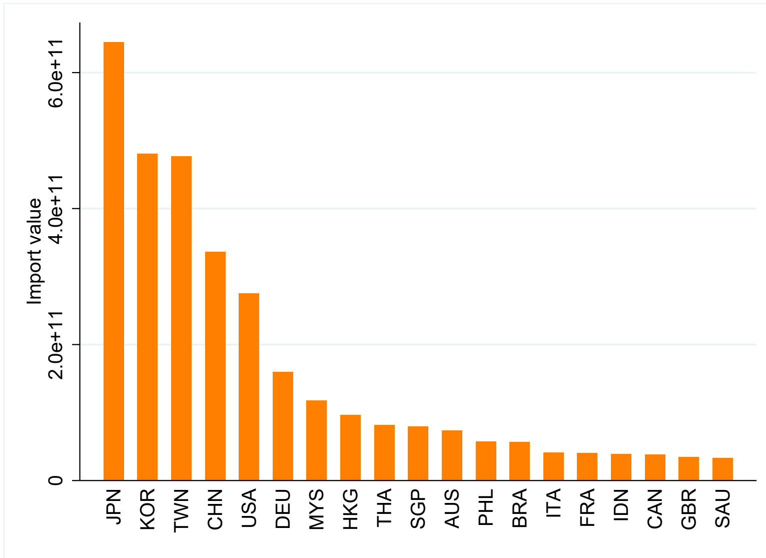
A.2.4 Top Export Destinations and Exported Products

Figure 8: Total export values by destination country



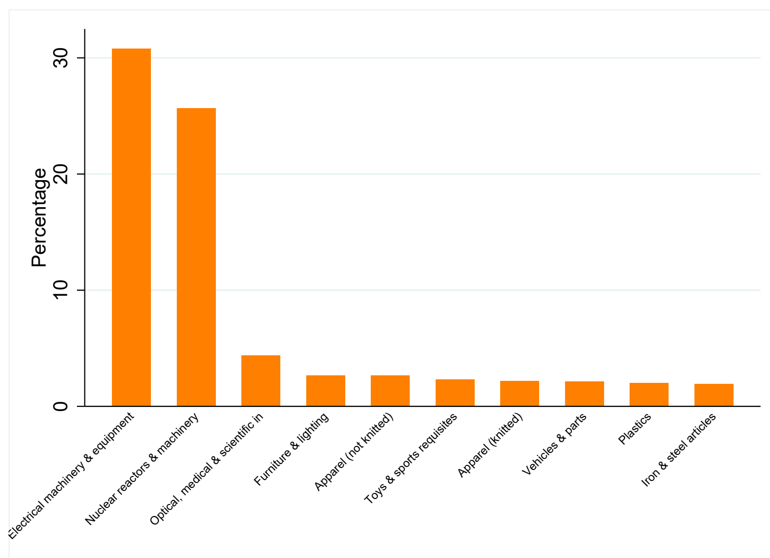
Notes: Total export values of the top 20 destination countries. Values are in RMB.

Figure 9: Total import values by origin country



Notes: Total import values of the top 20 origin countries. Values are in RMB.

Figure 10: Top 10 HS2 categories by share of total export value

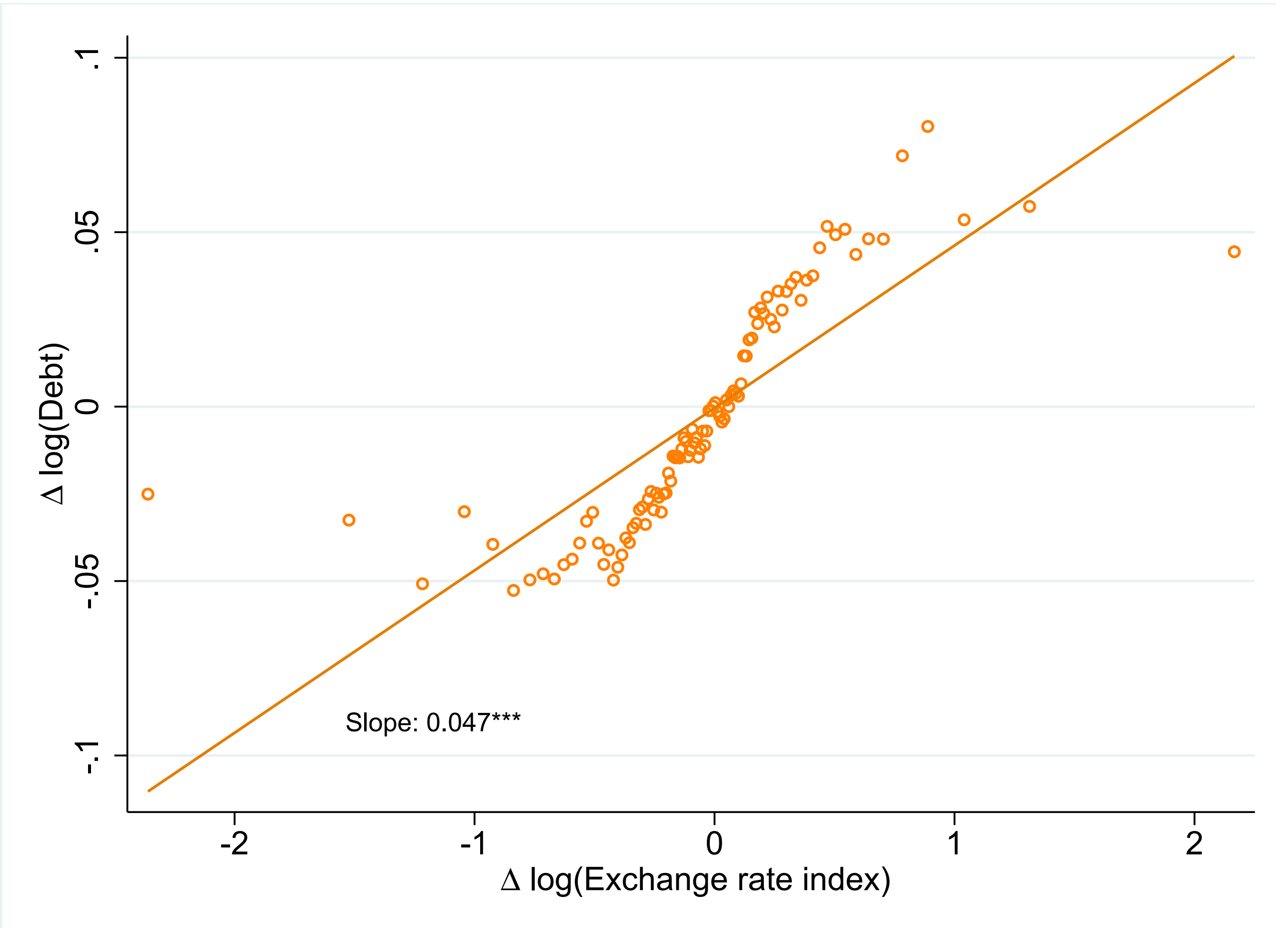


Notes: The graph displays the percentage contribution of the top 10 HS2 categories to the total export value. Each bar represents the share of total exports attributed to the respective HS2 category.

A.2.5 Robustness

A.2.6 Other checks

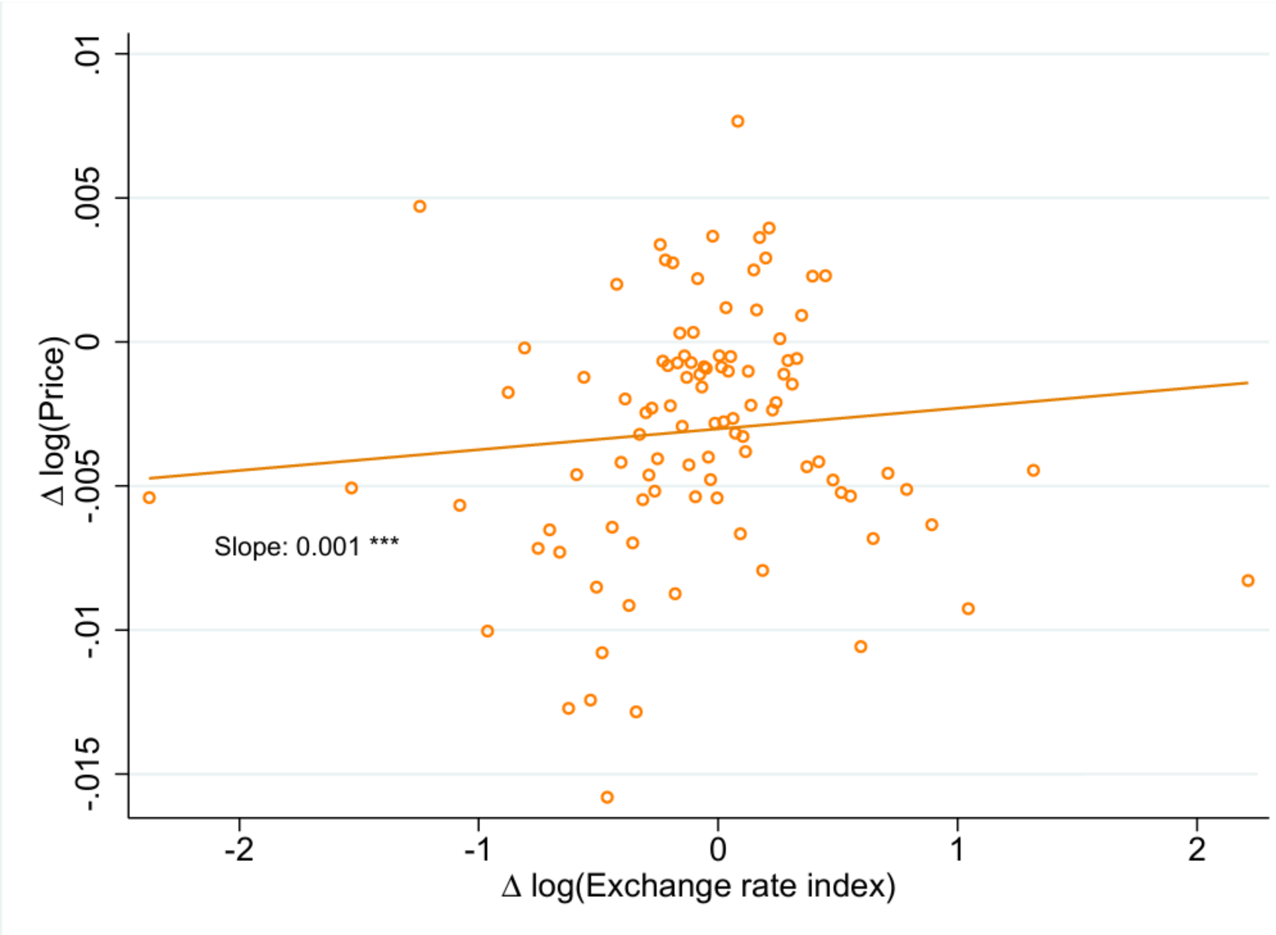
Figure 11: Firm level relationship between changes in debt and exchange rate changes



Notes: Bin scatter and regression fit line of change in debt and ER changes. The exchange rate index was computed by weighting each country's exchange rate according to the firm's total exports to that country in a given year. Controlled by Product-Destination-Year.

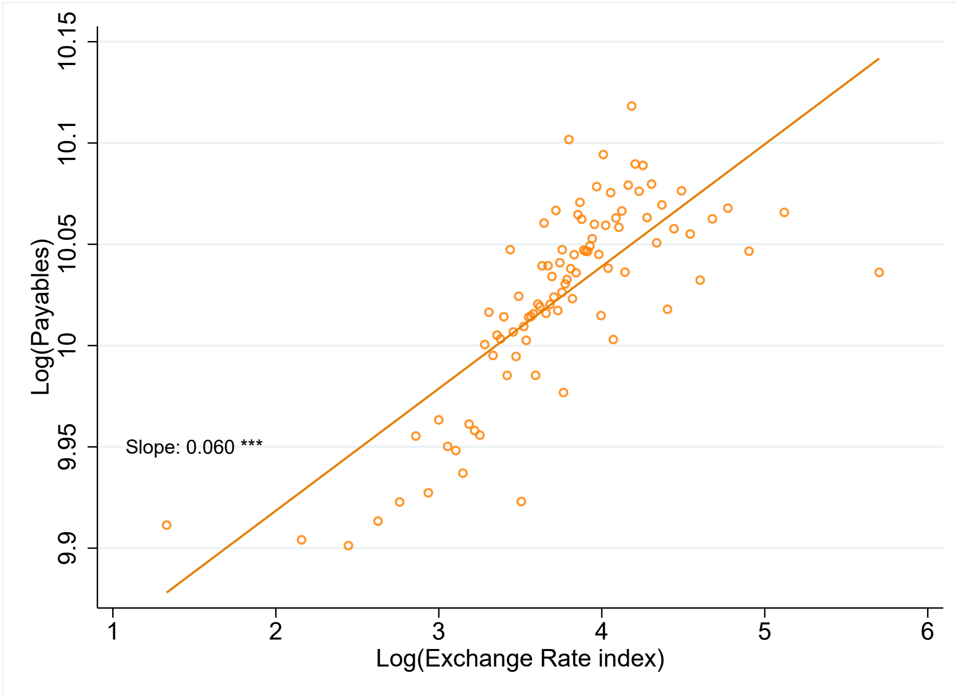
H

Figure 12: Firm level relationship between changes in prices and exchange rate changes



Notes: Bin scatter and regression fit line of change in prices and ER changes. The exchange rate index was computed by weighting each country's exchange rate according to the firm's total exports to that country in a given year. Controlled by Product-Destination-Year.

Figure 13: Relationship between exchange rate index and payables



Notes: Bin scatter and regression fit line of payables and exchange rate index. The regression includes time and firm controls. The exchange rate index was computed at the firm level by weighting each country's exchange rate according to the firm's total exports to that country.

Table 2: Summary Statistics - Restricted Sample

	Restricted Sample	%, Firm Size (Small to Large)			
		0-25	25-50	50-75	75-100
Receivables	37299.1	6255.2	11602.2	20251.6	111279.7
	(297430.9)	(36559.3)	(40224.6)	(48444.0)	(584639.0)
	[164843]	[41416]	[41008]	[41283]	[41136]
Payables	42153.2	6075.9	11325.9	19365.5	132076.6
	(326799.6)	(20010.9)	(42305.4)	(51370.7)	(642086.3)
	[164843]	[41416]	[41008]	[41283]	[41136]
Debt	133244.2	17868.5	33849.5	60886.6	421045.8
	(965780.4)	(112610.5)	(166406.9)	(138650.1)	(1888438.8)
	[164809]	[41404]	[40999]	[41272]	[41134]
Trade credit/Debt	1.345	1.661	1.535	1.208	0.976
	(46.54)	(43.98)	(63.55)	(38.56)	(34.83)
	[164519]	[41230]	[40953]	[41227]	[41109]
Receivables/Sales	0.175	0.181	0.176	0.172	0.169
	(0.191)	(0.206)	(0.197)	(0.190)	(0.169)
	[164843]	[41416]	[41008]	[41283]	[41136]
Payables/Sales	0.193	0.197	0.195	0.189	0.189
	(0.241)	(0.257)	(0.250)	(0.240)	(0.213)
	[164843]	[41416]	[41008]	[41283]	[41136]
Payables/Debt	0.413	0.428	0.413	0.407	0.406
	(0.329)	(0.341)	(0.324)	(0.342)	(0.308)
	[164519]	[41230]	[40953]	[41227]	[41109]
Interest Rate	0.0166	0.0140	0.0163	0.0179	0.0181
	(0.0378)	(0.0402)	(0.0402)	(0.0388)	(0.0310)
	[144851]	[36587]	[36646]	[36404]	[35214]
Interest Cost	2043.5	307.6	508.4	1014.4	6469.0
	(20140.1)	(9018.9)	(2210.8)	(6656.9)	(38621.7)
	[145337]	[36807]	[36732]	[36519]	[35279]
N	164843				
N firms	63128				

Notes: Summary statistics about trade credit and debt by firm size: mean, standard error in parenthesis, and N in brackets. Firm size quartiles are determined by the number of employees, with Quartile 1 representing the smallest firms and Quartile 4 representing the largest firms. Receivables: Value in RMB of the loan given by the exporter firm. Payables: Value in RMB of the debt held by the importer. Debt: Value of the debt held by the firm with the bank. Receivables/debt: Trade credit given by the exporter over their debt with the bank. Receivables/sales: Trade credit given by the exporter over their sales. Payables/debt: Trade credit taken by the importer over their debt with the bank. Payables/sales: Trade credit taken by the importer firm over their sales. This sample includes all the firms with non-missing values in the variables Payables/Sales and Receivables/Sales. Payables/Debt and Receivables/Debt were considered missing if their values were negative or exceeded 2

Table 7: Robustness With Alternative Samples

Dependent Variable: $\triangle p_{i,j,k,t}$	2006-2011 (1)	2000-2007 (2)	w/out US (3)	Top 20 (4)
$\triangle e_{k,t}$	0.0578***	0.0644***	0.0722***	0.114***
	(0.0218)	(0.0159)	(0.0127)	(0.0165)
$\phi_{i,0}$	-0.0539***	-0.109***	-0.0683***	-0.0752***
	(0.0138)	(0.0122)	(0.00896)	(0.00975)
$\triangle e_{k,t} \times \phi_{i,0}$	-0.135*	-0.147***	-0.200***	-0.220***
	(0.0781)	(0.0506)	(0.0405)	(0.0564)
Fixed Effects:				
$\varphi_{j,k} + \varphi_i + \varphi_t$	Yes	Yes	Yes	Yes
N	1411588	1383170	2271157	1808657
R^2	0.169	0.101	0.123	0.105

Notes: This table reports the results of specification in table 3 column 2 using different data samples. Standard errors are clustered at country-time level and reported in parenthesis. Products are at 8-digit HS code level. Fixed effects: $\varphi_{j,k} + \varphi_i + \varphi_t$ is the combination of product-destination, firm and time fixed effects.
* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.

Table 9: Robustness With Alternative Measures of Trade Credit Share

Dependent Variable: $p_{i,j,k,t}$	Time-varying (1)	Lagged Time-varying (2)	First-year (3)	Mean (4)
$\triangle e_{k,t}$	0.0796***	0.0807***	0.0937***	0.0907***
	(0.0134)	(0.0159)	(0.0141)	(0.0154)
ϕ_i	0.0103**	-0.00509	0.00781**	0.00571
	(0.00429)	(0.00571)	(0.00332)	(0.00376)
$\triangle e_{k,t} \times \phi_i$	-0.192***	-0.235***	-0.229***	-0.218***
	(0.0454)	(0.0476)	(0.0465)	(0.0549)
Fixed Effects:				
$\varphi_{j,k} + \varphi_i + \varphi_t$	Yes	Yes	No	No
$\varphi_{j,k} + \varphi_t$	No	No	Yes	Yes
N	2356766	1777240	2353309	2376396
R^2	0.119	0.138	0.0791	0.0787

Notes: This table reports the results of specification in table 3 column 2 by different measures of ϕ_i and fixed effects. Standard errors are clustered at country-time level and reported in parenthesis. Products are at 8-digit HS code level. Fixed effects: $\varphi_{j,k} + \varphi_i + \varphi_t$ is the combination of product-destination, firm and time fixed effects; $\varphi_{j,k} + \varphi_t$ is the combination of product-destination and time fixed effects.
* Significant at 10 percent level.** Significant at 5 percent level. *** Significant at 1 percent level.