Desirability of Competition in Currency of Invoicing

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Does a (Rigid) Dominant Currency Invoicing Ecosystem Amplify Trade Losses?

- from Currency-Specific Trade Credit Supply Shock

  $\rightarrow$ Currency-Switching frictions (banks, e.g)

  $\rightarrow$ Excessive Hedging Costs

Motivation

Motivation

- Dominance of The United States Dollar ($)
  - **Global Cross-Border Credit** 45% $-denominated [1]
  - **International Trade:** 85% of India's trade $-invoiced
- $-invoicing and $-financing complementary $\Rightarrow$ $-dominance [2]

  $-invoicing $\rightarrow$ $-Assets $\rightarrow$ cheaper $-Loans $\rightarrow$ **$-financing** $\rightarrow$ **$-invoicing**
- **Questions:**
  - Do shocks to global supply of $-financing affect $-invoicing?
  - Does dominant currency-driven invoicing rigidity magnify the trade effects of $-financing shocks?

[1] BIS Locational Banking Statistics, Dec 2024

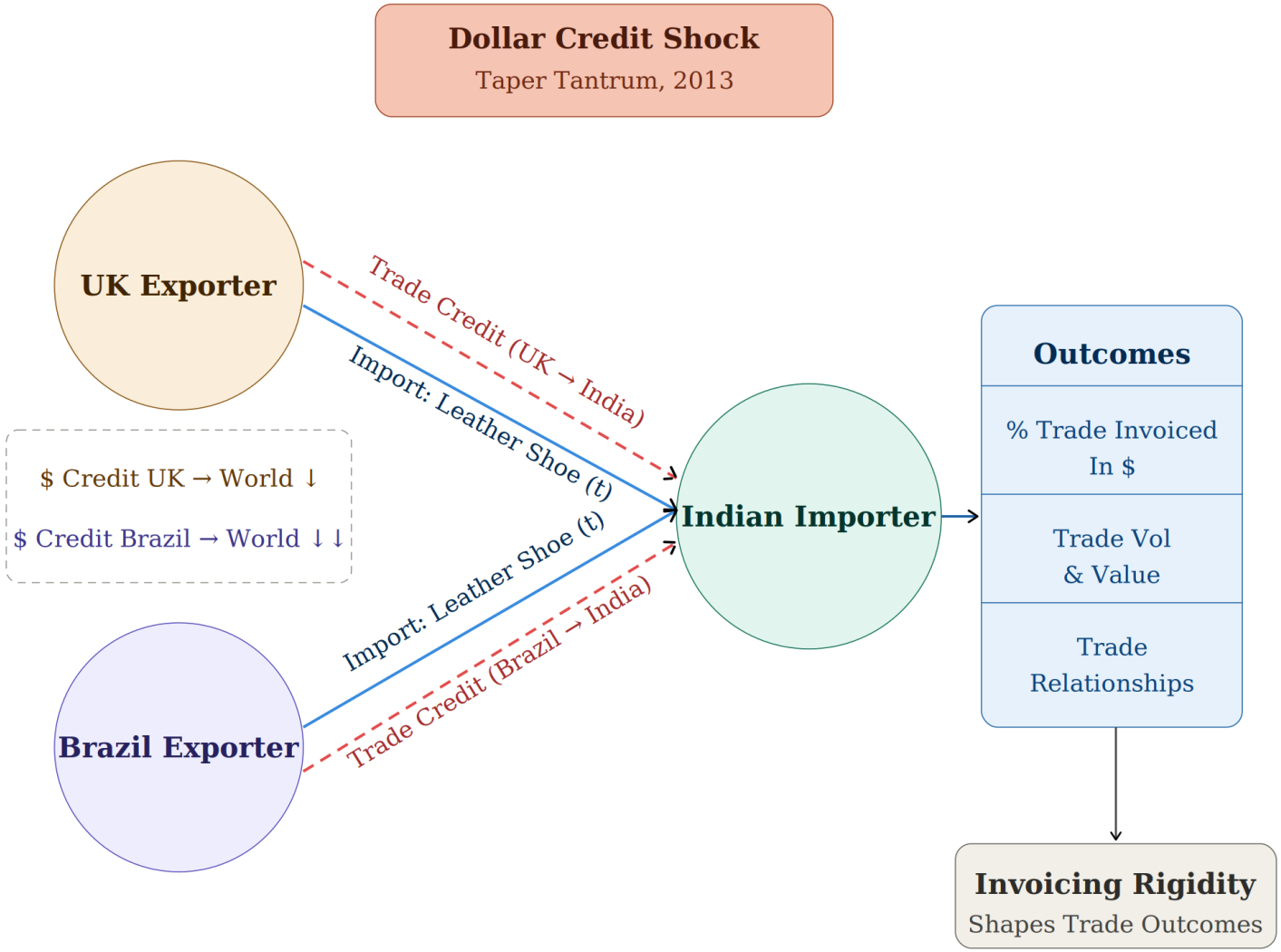
[2] [Eichengreen & Flandreau, 2010, Gopinath & Stein, 2020, Chahrour & Valchev, 2021, Coppola *et al.*, 2023]

Setting

- **Experiment:** Quasi-natural shock to global $-financing during the Taper Tantrum (2013)
- **Data:** 3.7 Mn Transactions on Indian imports 2013-2014 with information on the currency of invoicing for each transaction

  Data
- **Methodology:** Differential responses within importer - across exporters differentially hit by taper-induced $-financing shocks [Khwaja & Mian, 2008]
- **Main Take Away:** $-financing supply shocks $\Rightarrow$ $\downarrow$ $-invoicing
  - except when the invoicing is rigid in terms of currencies used to settle trade,
  - in which case trade itself $\downarrow$
- Highlighting the cushioning role of
  - **Ex-ante flexibility** in currencies used for trade invoicing

How Does Shocks To Credit Supply Of Dominant Currency Affect Trade Invoicing And Trade



Within-Importer, Same Commodity: Cross-Exporter Delta$ Credit Identifies Trade Responses

What We Find? Our Contribution

- **Result 1:** On average, $\downarrow$ \$-financing $\Rightarrow$ $\downarrow$ \$-invoicing and $\downarrow$ in trade/connections
  - Causality: Compare changes to \$-invoicing and trade within firm-product pair across exporting partners hit differentially by the taper-induced \$-financing shock.
  - Euro-invoicing replaces \$-invoicing
  - Invoicing and trade respond to shocks to bank-intermediated cross-border \$-financing

$\star$ Contribution: Highlight that invoicing patterns are dynamic even in the short-run

What We Find? Our Contribution

- **Result 2:** $\downarrow$ in \$-invoicing concentrated within less dollarized products/exporters while trade losses concentrated within highly dollarized products/exporters
  - Ex-ante flexibility to invoice in alternate currencies acts as a shock-absorber against a supply shock to dominant currency financing.

$\star$ Contribution: Highlight the \$-Invoicing Channel of Trade by showing that rigidity in invoicing amplifies trade losses

- **Result 3:** Local presence of Global banks can mitigate the adverse effects of supply shock to \$-financing even within supply chains with rigid invoicing requirements

Invoicing Flexibility, Invoicing, and Trade

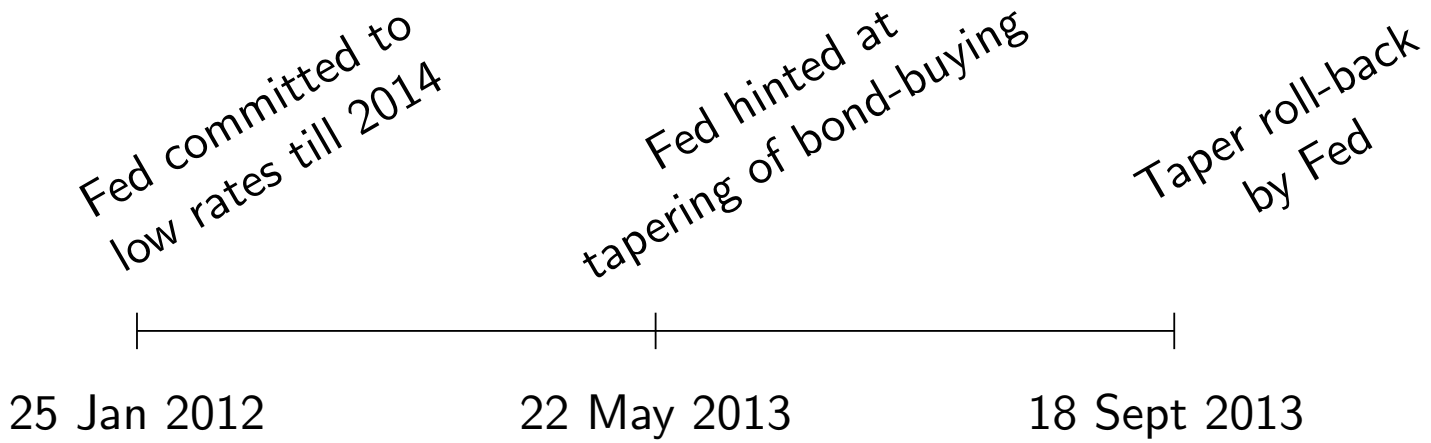
	Invoicing Flexibility	
	Low	**High**
Δ \$-Invoicing	0	$\downarrow$
Δ Trade	$\downarrow$	0

Literature

- \$ funding and invoicing: Gopinath & Stein (2020), Eichengreen & Flandreau (2010), Coppola et al. (2023), Chahrour and Valchev (2021)
- Dollar Invoicing: Bacchetta & Van Wincoop (2005), Goldberg & Tille (2008), Devereux & Shi (2013), Boz et al. (2020), Chen et al. (2022), Amiti et al. (2023)
  - documents dollar dominance in trade market and static determinants/impact of dollar invoicing on price pass-through
  - Our paper: first to analyze dynamics of trade invoicing
- Trade Credit: Amiti & Weinstein (2011), Manova (2012), Paravisini et al. (2014)
  - we highlight new dollar invoicing channel $\Rightarrow$ amplify dollar funding shocks
- Global Banks:
  - boost exports (Claessens et al. (2017)), substitute to domestic credit (Diamond-Rajan (2001), Peek-Rosengren (2000))

Taper-Tantrum and $-Financing Shock

Taper-Tantrum



- ⋆ $-cross border credit ↓ as global capital flew back to the US
- **Sharp Reactions in Asset Markets:** currency depreciation of 5.62%, decline in foreign exchange reserves of 4.55%, stock market fall of 6.21%, and widening of sovereign bond spreads by 58 basis points [Eichengreen & Gupta, 2015]

Taper-Induced $-Financing Supply Shock

- $-financing Shock $\Rightarrow$ Drop in exporter country (c) banks' *cross-border* $-lending to banks across all countries around Taper-Tantrum
  - Relevance: Trade is almost always funded by the exporter country's banks

$$\text{shock}_c = -1 \times \left\{ \frac{\text{Dollar Credit}_{c,\text{Q2 2013}}}{\text{Dollar Credit}_{c,\text{Q1 2013}}} - 1 \right\}$$

- Zero correlation between taper-induced $-financing shock and the country's GDP per capita or sovereign rating
- **Shock Statistics:** Median (2.39%), 75^{th} percentile (11.60%), Median EM (8.28%), China (17.05%), USA (6.11%), Switzerland (11.59%), Belgium (3.75%), Median Euro (-3.20%)

Taper Tantrum and Cross Border $-Financing

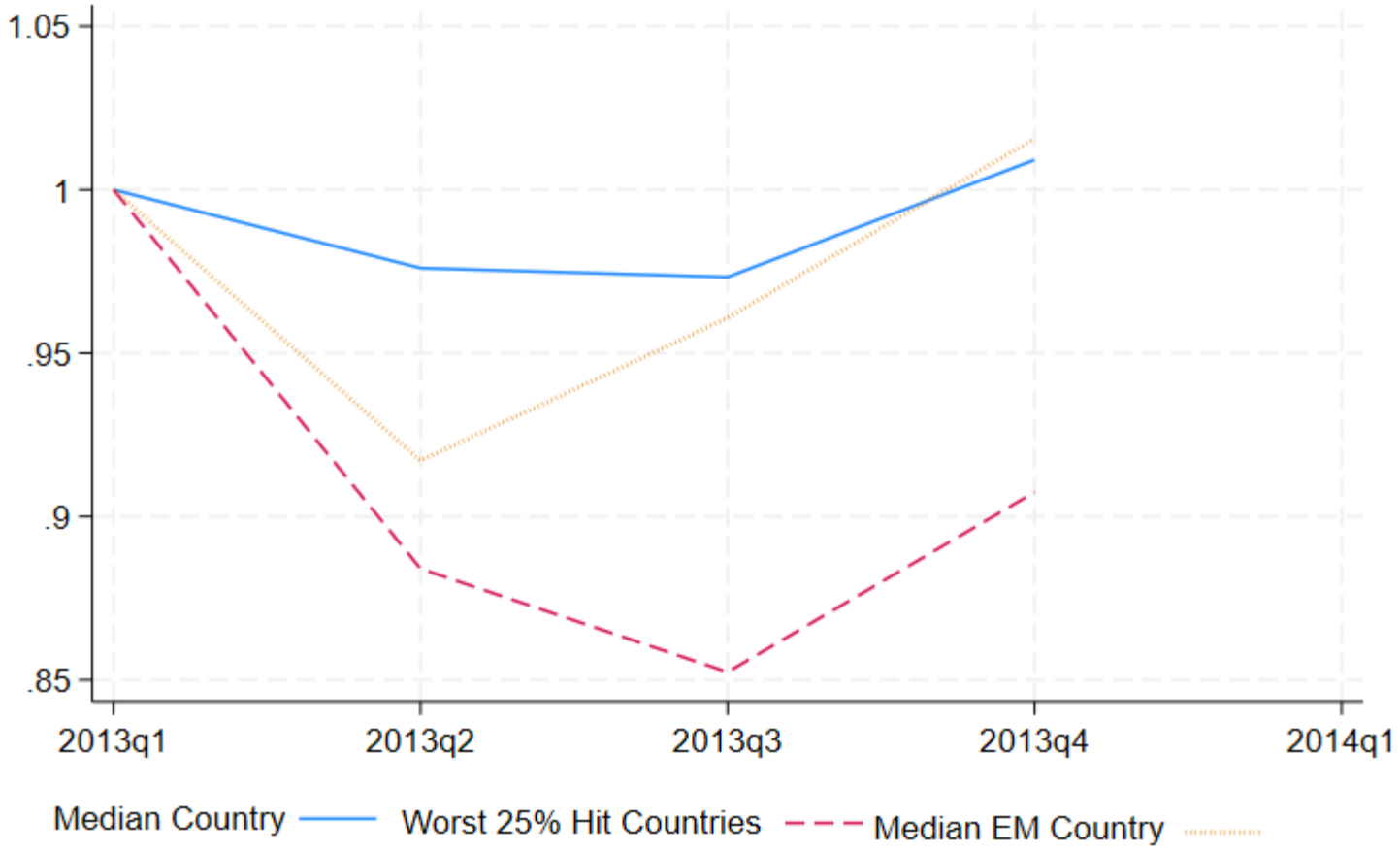


Figure: Cross-Border Dollar Credit (Relative to Q1-2013)

Results

Baseline Empirical Specification

- Importer (f) $\times$ Country of export (c) $\times$ HS2 (p) $\times$ Month (t) panel
- Standard difference-in-differences using 9-month window around May-2013

$$\$inv_{fcpt} = \underbrace{\delta_{fpt}}_{\substack{\text{Firm}\times\text{Hs2}\times\text{Month} \\ \text{fixed effects}}} + \underbrace{\gamma_{pc}}_{\substack{\text{Hs2}\times\text{country} \\ \text{fixed effects}}} + \beta_0 [shock_c] + \gamma X_{ct}$$

$$+ \underbrace{\beta_1}_{<0} [\mathbb{1}(Post) \times shock_c] + \varepsilon_{icpt}$$

- Within firm-product-month identification
  - compare the \$ invoicing $\downarrow$ within firm-product pair across trading partners differentially exposed to the taper-induced \$ credit shock
- $\beta_1 < 0 \Rightarrow$ \$-invoicing drops more for fcp than $fc'p$ if c has faced more severe lending shock than c'

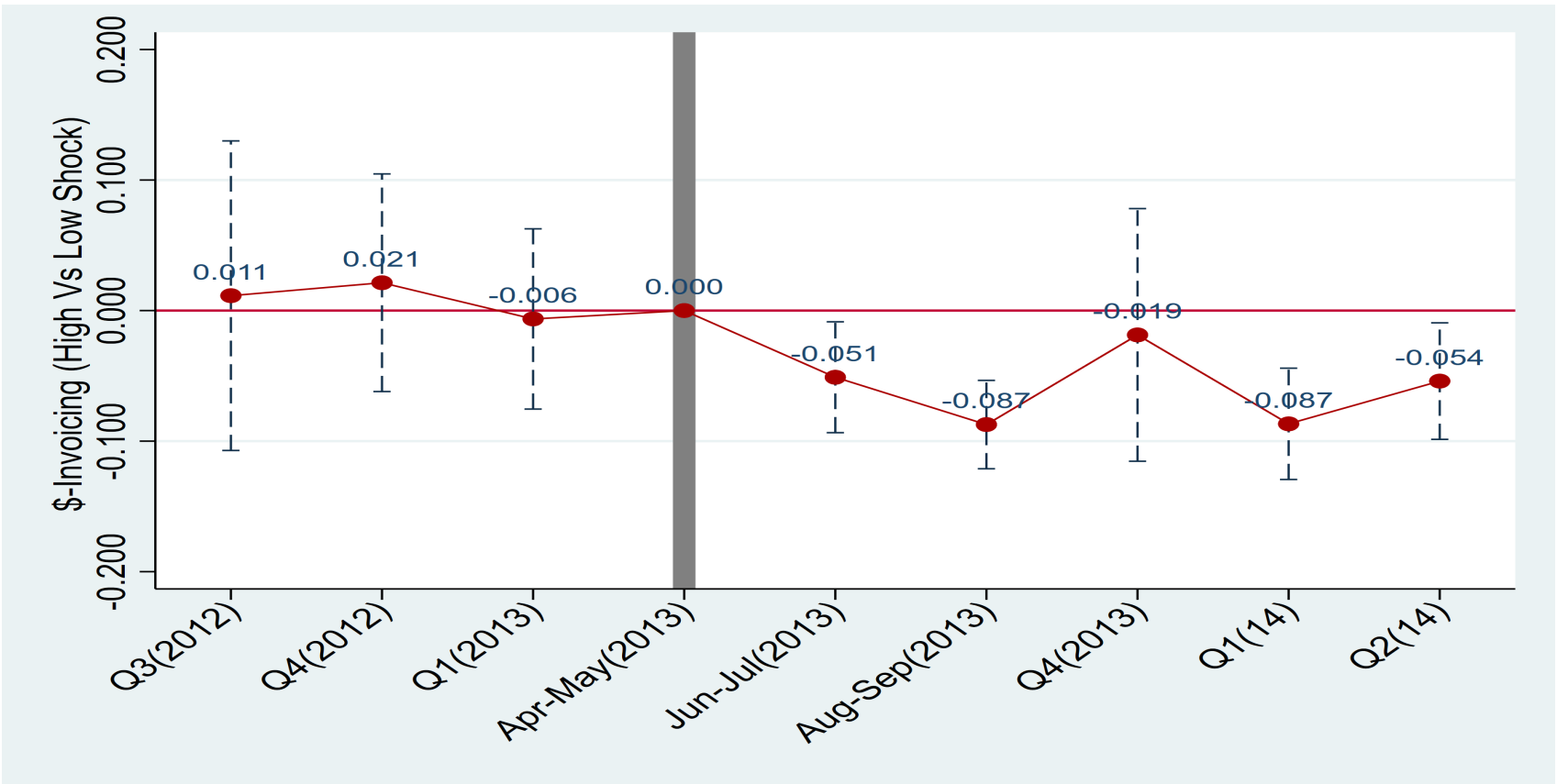
$-Financing Matter for $-Invoicing

- 1-σ $-financing shock $\Rightarrow$ $-invoicing $\downarrow$ by 7.3 percentage points or 11.94%
- Results not explained by currency depreciation [Goldberg & Tille, 2016]

Dep. Var	Share of Dollar ($) Invoiced Imports$_{fcpt}$					$ Invoiced Imports$_{fcpt} > 0$	Share of $ invoiced imports$_{fct}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
shock$_c \times \mathbb{1}$(Post$_t$)	-0.069***	-0.073***	**-0.073*** **	-0.055***	-0.075***	**-0.065*** **	-0.070***
	(0.012)	(0.013)	(0.020)	(0.016)	(0.013)	(0.018)	(0.018)
Adj. R-Sq.	0.656	0.648	0.641	0.875	0.798	0.624	0.577
Obs.	89889	72148	66837	40453	219354	66837	63016
Macro Controls		✓	✓	✓	✓	✓	✓
External Controls		✓	✓	✓	✓	✓	✓
Financial Controls			✓	✓	✓	✓	✓
Country FE							✓
Firm×Time FE					✓		✓
Firm×HS2×Time FE	✓	✓	✓	✓		✓	
Country×HS2 FE	✓	✓	✓		✓	✓	
Firm×Country×HS2 FE				✓			
Y-Mean	0.638	0.603	**0.611**	0.608	0.718	0.630	0.648

Parallel Trends and Dynamics of $-Invoicing

- $-invoicing for taper-hit countries not declining pre-taper
- $-invoicing affected beyond reversal of the Taper by the Fed in Sept-2013
- Points to fixed costs in setting up alternate invoicing mechanisms



Substitution to Other Currencies

- EUR invoicing ↑, especially from non-EU countries
- Only marginal shift to INR or producer currency invoicing (mainly due to FEMA regulations, which are relaxed only in 2022)

Share of Imports Invoiced in Column's Currency$_{fcpt}$							
Invoicing Currency	INR	EUR	JPY	GBP	PC	EUR	EUR
						EU =1	EU=0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
shock$_c$ × 𝟙(Post$_t$)	0.015*	**0.049*** **	-0.002	-0.004	0.005	0.009	**0.087*** **
	(0.008)	(0.016)	(0.007)	(0.007)	(0.022)	(0.065)	(0.026)
Adj. R-Sq.	0.673	0.670	0.601	0.552	0.710	0.609	0.424
Obs.	66837	66837	66837	66837	66837	9643	39606
Controls	✓	✓	✓	✓	✓	✓	✓
Firm×HS2×Time FE	✓	✓	✓	✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓	✓	✓	✓	✓
Y-Mean	0.611	0.611	0.611	0.611	0.611	0.218	0.778

Invoicing Channel of International Trade

Rigidity in Invoicing Contracts

Reasons behind contract rigidity?

- Exporters with **pre-determined $-liabilities** may be unwilling to accept alternate currencies
- Banks lending in other currencies (say Euro) are **segmented**, and firms may not develop new banking connections easily in the short term.
- Even if they could, hedging costs to cover currency mismatch are high, especially during times of stress
  [Gopinath & Stein, 2020, Du *et al.*, 2018]

Costly Hedging

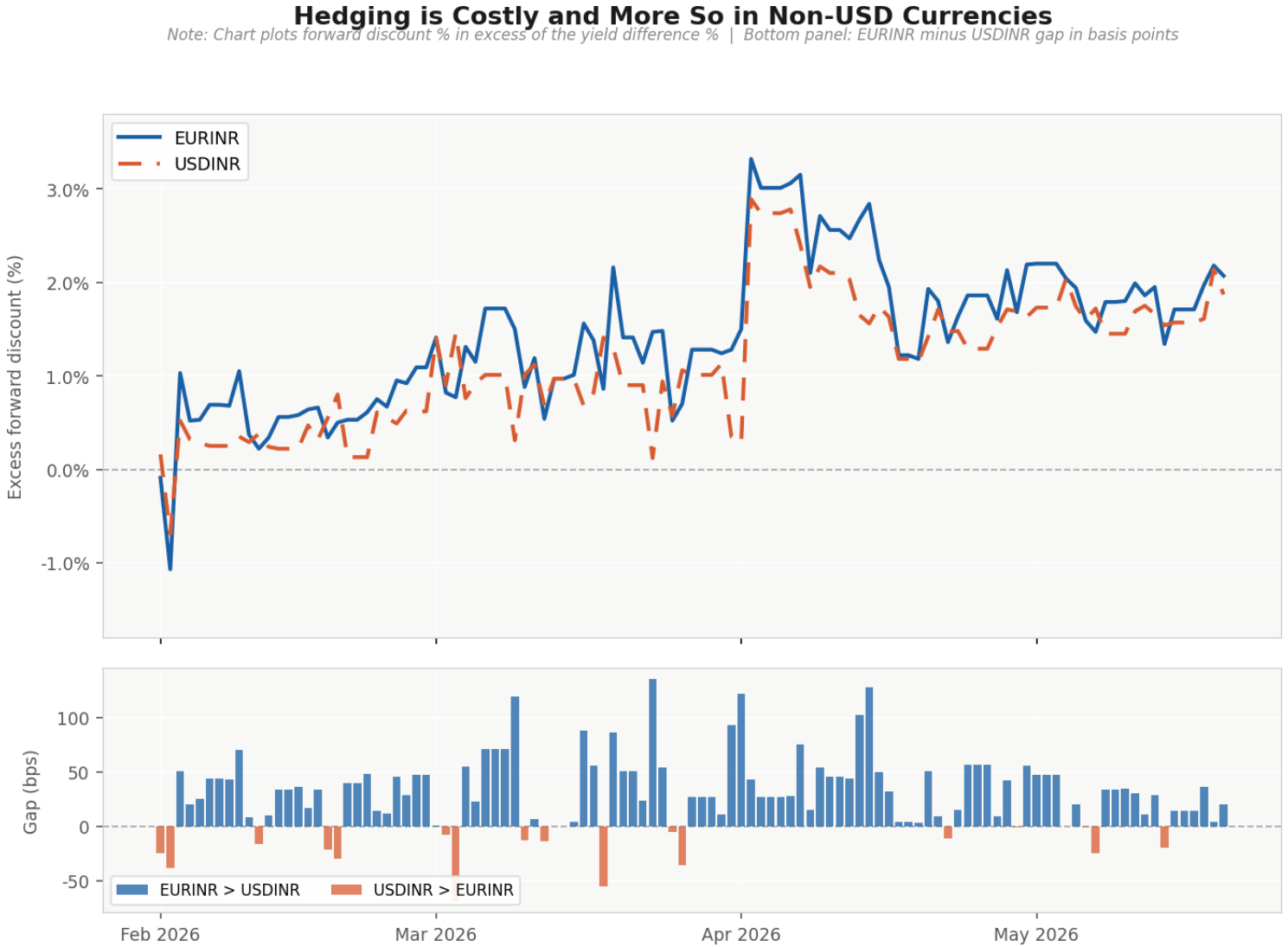


Figure:

Dollarization

- **Question:** Does the presence of a dominant currency or rigidity in currencies used for trade invoicing
  - alter the invoicing decisions? and
  - amplify trade losses?
- **Dollarization at country-product level (cp)**
  - **Usage:** pre-period share of \$-invoiced trade$_{cp}$ ($\$_{cp}^{pre}$)
  - **Flexibility:** pre-period σ of \$-invoicing shares across all the firms operating within the cp ($\sigma(\$)_{cp}^{pre}$)

Measure of Dollarization	Mean	Median	σ	$\frac{\sigma(c)}{\sigma}$
Usage	0.62	0.96	0.44	0.88
Flexibility	0.16	0	0.21	0.68

Variation in Dollarization

Invoicing Channel of International Trade

- **Firm's exposure to Dollarization** (Bartik-Style Instrument): $\Rightarrow$ Does the firm have ex-ante trade with more dollarized *cp* pairs? For example,

$$\sigma(\$)_f^{pre} = \sum_{cp} \left(\frac{trade_{fcp}^{pre}}{trade_f^{pre}} \right) \times \sigma\left(\$\right)_{cp}^{pre}.$$

  - captures exposure to dollarization driven by broader invoicing patterns for products/trading partners

- **Identifying Assumptions**
  - trade relations and products not chosen based on the invoicing patterns
  - trade relations do not influence invoicing patterns within countries/products

Dollarization and $-invoicing

- Importers exposed to dollarization are unable to reduce $-invoicing
- Robust to "within exporting country" estimation

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$				
Dollarization	Share ($\$^{pre}_{cp}$)		Firm's Share ($\$^{pre}_{f}$)		
	High	Low	High	Low	
	(1)	(2)	(3)	(4)	(5)
shock$_c$ × 𝟙(Post$_t$)	**0.016**	**-0.096*****	**0.002**	**-0.086*****	
	(0.029)	(0.021)	(0.047)	(0.015)	
shock$_c$ × 𝟙(Post$_t$)×$\$^{pre}_{f}$					**0.221****
					(0.100)
shock$_c$×$\$^{pre}_{f}$					-0.648***
					(0.156)
Adj. R-Sq.	0.489	0.674	0.791	0.689	0.633
Obs.	5426	20652	2583	33293	44669
Macro Controls	✓	✓	✓	✓	✓
External Controls	✓	✓	✓	✓	✓
Firm×HS2×Time FE	✓	✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓	✓	
Country×Time FE					✓
Y-Mean	0.967	0.461	0.933	0.577	0.633
SD-Dollarization	0.008	0.356	0.013	0.232	0.244

Dollarization and Real Effects of $-financing Shock

- 1-σ shock to $-financing $\Rightarrow$ 9.9 pp. or 23.3% $\uparrow$ in probability of trade relation ending, unconditionally
- But the probability $\uparrow$ to 40% for High-Dollarized firms!

Dependent Var.	$\mathbb{1}(Exit)_{fcpt}$				$Log(\text{Imports})_{fcpt}$
Dollarization		Firm's Share ($\$_f^{pre}$)			
		High	Low		
	(1)	(2)	(3)	(4)	(5)
$\text{shock}_c \times \mathbb{1}(\text{Post}_t)$	0.099***	**0.197****	0.081**		
	(0.031)	(0.094)	(0.032)		
$\text{shock}_c \times \mathbb{1}(\text{Post}_t) \times \$_f^{pre}$				**0.349****	**-0.759*****
				(0.145)	(0.284)
$\text{shock}_c \times \$_f^{pre}$				-0.723***	3.511**
				(0.211)	(1.427)
Adj. R-Sq	0.355	0.383	0.353	0.362	0.512
Obs.	50388	8271	42055	60943	44669
Macro Controls	✓	✓	✓		
External Controls	✓	✓	✓		
Firm×HS2×Time FE	✓	✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓		
Country×Month FE				✓	✓
Y-Mean	0.430	0.488	0.418	0.433	10.341
SD-Dollarization		0.030	0.210	0.235	0.244

Dollarization and Firm-Level Real Effects

- Firms find it difficult to substitute lost trading opportunities
- Relationship-specific investments, search costs, incompleteness of trade contracts, or institutional quality hinder the swift substitution [AntrÃ s & Chor, 2013, Levchenko, 2007, Nunn, 2007]

Dependent Var.	$Log(\text{Imports})_{ft}$				
Dollarization		Firm's Flexibility ($\sigma(\$)_f^{pre}$)		Firm's Share ($\$_f^{pre}$)	
		Low	High	High	Low
	(1)	(2)	(3)	(4)	(5)
$\text{shock}_f \times \mathbb{1}(\text{Post}_t)$	-0.361***	-0.361***	-0.258*	-0.249**	-0.044
	(0.081)	(0.112)	(0.141)	(0.117)	(0.172)
Adj. R-Sq.	0.728	0.722	0.727	0.739	0.706
Obs.	79286	47124	31209	49486	28847
Firm FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓
Y-Mean	10.891	10.756	11.132	10.764	11.150
SD-Dollarization		0.055	0.095	0.023	0.285

The Role of Global Banks

The Role of Global Banks

- **Hypothesis:** Local presence of global banks or connections with global banks can ameliorate effects of $-financing disruptions
  - Local units of global banks can tap into the **parent's liquid treasury** to access $-financing better than local banks [Cetorelli & Goldberg, 2012]
  - Global banks are more likely to lend into **alternative currencies** with operations in multiple currencies
  - **Geographic proximity** of global banks can boost international trade [Claessens *et al.*, 2017], by resolving asymmetric information problem [Portes & Rey, 2005, Michalski & Ors, 2012], or helping enforce incomplete contracts [Oslen, 2016]

$\Rightarrow$ Leverage the local presence of global banks in India from 23 countries to understand firm's exposure to global banks

$$\text{FB}_{\text{f}}^{pre} = \sum_{c} \left(\frac{trade_{fc}^{pre}}{trade_{f}^{pre}} \right) \times \mathbb{1}\left(\text{Banking Presence in India}\right)_{c}$$

The Role of Global Banks

- Firm's with access to Global Banks $\Rightarrow$ substitute \$-invoicing with alternative & suffer less trade losses

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$			$\mathbb{1}(Exit_{fcpt})$		
	Firm's Foreign Bank Exposure (FB_f^{pre})			Firm's Foreign Bank Exposure (FB_f^{pre})		
	Low	High		Low	High	
	(1)	(2)	(3)	(4)	(5)	(6)
shock$_c$ $\times$ $\mathbb{1}$(Post$_t$)	**-0.040**	**-0.069*****		**0.187*****	**-0.012**	
	(0.024)	(0.017)		(0.054)	(0.046)	
shock$_c$ $\times$ $\mathbb{1}$(Post$_t$) $\times$ FB_f^{pre}			**-0.103****			**-0.271*****
			(0.040)			(0.097)
$\mathbb{1}$(Post$_t$) $\times$ FB_f^{pre}			0.067			0.575***
			(0.112)			(0.178)
Adj. R-Sq.	0.673	0.643	0.608	0.329	0.396	0.362
Obs.	3041	41179	72733	25364	24944	60943
Macro Controls	✓	✓		✓	✓	
External Controls	✓	✓		✓	✓	
Firm $\times$ Hs2 $\times$ Time FE	✓	✓	✓	✓	✓	✓
Country $\times$ Hs2 FE	✓	✓		✓	✓	
Country $\times$ Time FE			✓			✓
Y-Mean	0.649	0.569	0.603	0.408	0.452	0.433
Shock-SD	0.176	0.171	0.175	0.161	0.157	0.153
FB-SD			0.368			0.538

The Role of Global Banks

- Access to Global Banks alleviates trade losses even for firms exposed to dollarization

Dependent Var.	$\mathbb{1}(Exit_{fcpt})$			
	Exporting Country's Bank Presence in India			
	No	Yes	No	Yes
	(1)	(2)	(3)	(4)
$shock_c \times \mathbb{1}(Post_t)$	0.087**	0.093		
	(0.041)	(0.053)		
$shock_c \times \mathbb{1}(Post_t) \times \$_f^{pre}$			**0.399****	**0.100**
			(0.172)	(0.267)
$shock_c \times \$_f^{pre}$			-0.757***	-0.310
			(0.222)	(0.295)
Adj. R-Sq.	0.298	0.400	0.331	0.398
Obs.	11401	20847	14840	26122
Macro Controls	✓	✓		
External Controls	✓	✓		
Firm × Hs2 × Time FE	✓	✓	✓	✓
Country × Hs2 FE	✓	✓		
Country × Month FE			✓	✓
Y-Mean	0.399	0.478	0.430	0.452
Dollarization-SD			0.223	0.229

Conclusion

- Use quasi-natural shock in Taper-Tantrum to the supply of global $-financing
- We show that importers swiftly substitute away from $-invoicing
- However, the rigidity in the choice of invoicing currencies limits the importer's ability to continue the trade
- Local presence of global banks minimizes the adverse effects of both the $-financing shocks as well as invoicing rigidity
- **Takeaway:** Desirable to have alternatives of currencies used to settle international trade contracts!

Appendix

Data

- Indian Imports: Cybex Exim Solutions provides transactional data on Indian imports/exports
  - 31.5 Mn. import transactions covering 56.7% of Indian imports
  - 3.7 Mn. transactions with information on the currency of invoicing covering 4.40% of Indian imports
  - Balancing tests show that the two samples have similar characteristics (products, exporters, size of transactions)
- Cross-Border Lending: BIS Locational Statistics provides cross-border claims of originating countries' banks on foreign banks, broken down by currency
- Foreign banks in India data comes from the RBI
- Macro Variables: Bloomberg

Summary Statistics 1 Summary Statistics 2

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Summary Statistics

Panel A: Count Statistics

Unit	Firms	Ctr	Hs2	Firm-Ctr	Ctr-Hs2	Firm-Ctr-Hs2
Count	97947	213	98	234117	6107	485920

Panel B: Summary Statistics of Trade Variables

Statistics	N	P25	P50	P75	Mean	SD
Firm's Total Imports (Mn, INR)	97947	0.02	0.06	0.25	2.18	77.12
No. of Transactions/Firm	97947	3	10	44	156.20	2418.54
Average Transaction Size (INR)	97947	426.23	3216.34	18552.11	37441.96	697496.30
No. of Partner Countries/Firm	97947	1	1	2	2.39	3.12
No. of Products/Firm	97947	1	1	3	3.04	3.88
No. of Country-Product Pairs/Firm	97947	1	2	5	4.96	11.11

Summary Statistics 2

Summary Statistics

Panel E: Firm-Country-Product Level Invoicing Patterns

Statistics	N	P25	P50	P75	Mean	SD
USD Invoicing %	67228	17.395	100	100	74.62	43.27
EUR Invoicing %	67228	0	0	0	16.96	37.34
EUR Invoicing % | Euro Share>0 0	11765	100	100	100	96.86	15.06
EUR Invoicing % With Non-Euro Partners	55468	0	0	0	3.58	18.37
EUR Invoicing % With Non-Euro Partners | Euro Share>0	2198	100	100	100	90.40	25.85

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Bank-to-Bank and $-Financing Matter $-Invoicing

- Variation in cross-border credit to non-financials and iii) non-$ credit does not alter $-invoicing

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$		
Type of Credit Shock	By Type of Borrower Institution		By Type of Currency
Counterparties / Currencies	Bank to Bank (Dollar)	Bank to Non-Financials (Dollar)	Bank to Bank (Non-Dollar)
shock$_c$ $\times$ $\mathbb{1}$(Post$_t$)	-0.073***	0.028	-0.005
	(0.019)	(0.049)	(0.030)
Adj. R-Sq.	0.641	0.641	0.641
Obs.	66837	66837	66837
Macro Controls	✓	✓	✓
External Controls	✓	✓	✓
Financial Controls	✓	✓	✓
Firm$\times$HS2$\times$Time FE	✓	✓	✓
Country$\times$HS2 FE	✓	✓	✓
Y-Mean	0.611	0.611	0.611

Variation in Dollarization

Dep. Var (Dollarization)	Share ($\$_{cp}^{pre}$)			Flexibility ($\sigma(\$_{cp}^{pre})$)		
	(1)	(2)	(3)	(4)	(5)	(6)
Y-Mean (Constant)	0.619***	0.620***	0.618***	0.167***	0.167***	0.168***
	(0.007)	(0.010)	(0.007)	(0.005)	(0.005)	(0.005)
Adj. R-Sq.	0.519	0.067	0.565	0.153	0.086	0.270
Obs.	2008	2019	2005	1549	1569	1543
Country FE	✓		✓	✓		✓
HS2 FE		✓	✓		✓	✓

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Dollarization and $-invoicing: IV

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$			
	Share $\$^{pre}_{fcp}$		Flexibility ($\sigma(\$^{pre}_{fcp})$)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
shock$_c$ × $measure^{pre}_{fcp}$	-0.524***	-0.545***	1.121*	0.619
	(0.119)	(0.130)	(0.571)	(4.263)
Shock$_c$ × $\mathbb{1}(Post_t)$ × $measure^{pre}_{fcp}$	0.106	0.170*	-0.075	-6.846*
	(0.084)	(0.089)	(0.845)	(3.856)
Adj. R-sq.	0.634	0.007	0.631	-0.048
Cragg-Donald F-stat		44052		181
Obs.	44669	44669	44669	44669
Firm × Month × HS-2 FE	✓	✓	✓	✓
Country × Month FE	✓	✓	✓	✓
Y-mean	0.633	0.633	0.633	0.633
SD-Dollarization	0.244	0.244	0.244	0.244

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