DESIRABILITY OF COMPETITION IN CURRENCY OF INVOICING*

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Abstract

Two stylized facts underline the US dollar's role in the world financial markets, namely 1) dominance of dollar denomination in the cross-border asset/debt markets as well as for international trade transactions and 2) country- and firm-level dollar invoicing shares are stable. This paper, using transaction-level import data and exploiting an unanticipated US monetary policy action, documents that Indian importers reduce the share of dollar invoiced imports by 11.9% in response to a 1 percentage point decline in the cross-border dollar credit supply, challenging the second stylized fact and providing causal evidence in support of complementarities between dollar-denominated debt and trade contracts. Importers substitute dollar invoicing with Euro invoicing after the decline in dollar credit. Prior research documents substantial losses to trade volume and relationships following trade credit supply shocks. We establish a novel *dollar invoicing* channel by documenting that these losses are concentrated among firms unable to substitute away from dollar invoicing. In essence, we highlight that flexibility in trade invoicing currency acts as a shock absorber against currency-specific credit shocks, while inflexibility amplifies the adverse effects of credit shocks on trade. Lastly, global banks shield trade by supporting invoicing in alternate currencies.

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1 Introduction

A key feature of the modern international financial system is the joint dominance of the United States dollar (henceforth dollar) in the global asset/debt markets and trade invoicing.[1] However, literature is far from settled in our understanding of whether these two dominant roles played by the dollar are independent of each other or interrelated, and if they are, then the direction in which the causality runs. On the one hand, Eichengreen & Flandreau (2010); Coppola *et al.* (2023) highlights the role of thicker asset markets that lead to ease of settlement in the asset market as an independent driver of currency dominance. In Gopinath & Stein (2020); Chahrour & Valchev (2021), on the other hand, the need to invoice international trade in dollars results in a debt market dominated by the dollar. Despite these different rationales for the existence of the dominant currency, this strand of literature highlights the complementarities between dollar invoicing and dollar financing.

In this paper, we provide causal evidence for the first time in the literature to our knowledge, documenting that disruption to the supply of global dollar credit significantly alters the trade invoicing away from dollars, illustrating these complementarities between dollar financing and invoicing. In addition, our research sheds light on the perils of excessive reliance on a dominant currency by documenting that the ensuing trade losses on extensive and intensive margins after the dollar credit disruption are largely concentrated within the products and countries that are more reliant on the usage of the dollar for trade invoicing or have minimal flexibility to use alternate currencies for trade invoicing, contributing to the large literature linking adverse trade credit supply shocks and trade.[2]

The amplified trade losses in a world dominated by the dollar after disruption to dollar credit

[1] For example, 85% of India's imports are dollar-denominated, even though approximately only 10% of Indian imports are sourced from the US. As for dollar credit, according to the Bank of International Settlements (BIS), $13.1 trillion credit is outstanding by non-bank borrowers outside of the US as of September 2022.

[2] For example Ahn *et al.* (2011); Amiti & Weinstein (2011); Bricongne *et al.* (2012); Levchenko (2007); Paravisini *et al.* (2014) study the impact of credit and banking disruptions on trade outcomes.

supply is a direct consequence of the inability of some of the firms exposed to *dollarization*[3] at the product or partner level to substitute invoicing away from dollars. This inability, in turn, limits the volume of trade that these firms can support with limited dollar credit available to them. Invoicing inflexibility after dollar credit disruptions can arise for several reasons. First, while importers may want to obtain credit and invoice in alternate currencies, such as the Euro, exporters with pre-determined dollar liabilities may refuse alternate currency invoicing contracts or may offer less favorable terms to such importers (Bleakley & Cowan (2008)). Second, banks lending in alternate currencies, such as the Euro, are concentrated within the European region (Emter *et al.* (2024)). As a result, firms not connected with banks lending in these alternate currencies struggle to raise non-dollar trade credit. Third, even when Euro financing is available, the cost of hedging the mismatch between the currency of financing and the currency of invoicing (namely the dollar) can be prohibitively expensive, especially given that the covered interest parity may fail to hold during times of stress (Du *et al.* (2018)).

We establish these linkages between dollar credit, dollar invoicing, and trade causally by combining a quasi-natural event with rich transaction-level data on Indian imports, covering 3.7 million transactions. We use the plausibly exogenous variation in the supply of the bank-intermediated cross-border dollar credit originating from across India's exporting partner countries triggered by an unexpected change in the US Federal Reserve's monetary policy stance during 2013, widely known as the *taper tantrum* episode. There are two features that make our setting useful. First, unlike the Global Financial Crises of 2007-09, which disrupted the global credit supply for most important currencies (BIS (2014)), the taper tantrum was mainly a shock to the supply of dollar credit, which help us in isolating the effect of dollar financing on dollar invoicing and trade. Second, the advantage of studying invoicing choices in India is that there is a meaningful variation in the invoicing patterns, as also noted by Amiti *et al.* (2022) in the context of Belgium, unlike the papers studying invoicing patterns for the US (Gopinath *et al.* (2010)) or highly dollarized

[3]We measure dollarization in multiple ways to capture either the ex-ante share of dollar invoiced trade or the ex-ante flexibility at the product or country level to substitute the dollars with other currencies for trade invoicing. We describe these measures in detail in Section 5.

countries such as Colombia (Gopinath *et al.* (2020)).

We begin by documenting a novel finding that Indian importers, on average, reduce their dollar invoicing by 7.3 percentage points (pp.) or 11.9% (relative to the mean dollar invoicing share) more while trading the same product with the countries experiencing a 1 pp. greater reduction in cross-border dollar credit around the taper tantrum episode. This result not only highlights the causal effect of dollar financing on dollar invoicing but also contrasts with the literature documenting that firm-level dollar invoicing is stable (Gopinath & Itskhoki (2011)). Firms substitute dollar invoicing mainly with Euros, even while trading with non-Eurozone partners. We find only a moderate shift of invoicing towards the importer's currency, namely, INR. To estimate these effects, we use a difference-in-difference (DiD) setting and absorb firm×product×time fixed effects as in Paravisini *et al.* (2014). These fixed effects allow us to compare the invoicing responses of a given firm while importing a given product at a given time from two countries differentially affected by the dollar credit shock.

Our next result highlights the critical role of bank intermediation in the cross-border dollar credit market. The dollar credit shock, which we measure as the decline in the dollar credit originated by the exporting-country banks in favor of other banks globally, captures the fact that international trade credit is primarily intermediated between exporting- and importing-country banks. We find that changes in dollar credit supply to non-financial firms have no impact on dollar invoicing. Similarly, changes in non-dollar credit do not change dollar invoicing, highlighting the tight link between the supply of credit in a particular currency and trade invoicing in that currency, consistent with the complementarities highlighted in Gopinath & Stein (2020); Chahrour & Valchev (2021); Coppola *et al.* (2023).[4]

Next, we turn to document the linkages between dollar trade credit and trade and highlight how a lack of flexibility in the currency of invoicing amplifies these adverse real effects of dollar

[4]Our shock measures are constructed using the cross-border assets and liabilities maintained by the Bank for International Settlements (BIS). It provides information on credit to non-financial firms as well as credit decomposition into major currencies. We provide information on these data in Section 2.

credit shocks. To this end, we quantify *dollarization* for a given country-product pair using two measures: first, the ex-ante dollar invoicing shares for that country-product (*share measure*), and second, the flexibility in terms of usage of alternate currencies for invoicing the trade within that country-product pair (*flexibility measure*). Subsequently, we construct a firm-level shift-share measure of dollarization on these two dimensions by measuring the firm's ex-ante exposure to the dollarized country-product pairs.

We begin by documenting the well-known *trade credit channel*, showing that imports for a given firm-product pair decline, both on the intensive and extensive margin, more when the exporting country experiences a more severe dollar credit shock. However, the novel contribution of our results lies in documenting that this adverse trade impact is largely concentrated within the more dollarized firms. The estimated exit probability for a firm from a given country-product pair rises by more than double for the sub-sample of firms with above-median dollarization relative to those with below-median dollarization. We strengthen our findings by doing a tight comparison between two firms importing the same product from the same country but having varying exposure to dollarization by absorbing exporting country×time fixed effects. We continue to find a large effect of dollarization on amplifying trade losses.

We trace the origins of the amplified trade losses after disruption to dollar credit in more dollarized product-country pairs to the inability of the importers to substitute dollar invoicing away from dollars within these dollarized trade segments. Our analysis reveals that firms with low exposure to dollarization significantly reduce their dollar invoicing post-taper in response to the dollar credit shock, while highly dollarized firms with little flexibility in invoicing patterns do not exhibit any significant reduction in dollar invoicing. We provide within-country evidence supporting this finding by saturating our model with exporting-country×time fixed effects. We show that out of the two firms trading within a given country-product pair, a firm having one standard deviation less dollarization (using the shared measure) reduces the dollar invoicing by 5.3 pp. or 8.5% more in the post-taper period. In terms of real effects, this rigidity and over-reliance

on dollars implies that firms with high dollarization are able to support less trade and even lose trade relationships with a greater likelihood compared to firms with less exposure to dollarization. In short, our results highlight the potential shock-absorbing role that invoicing flexibility could provide during times of stress to dollar trade credit. On the flip side, the lack of flexibility in the currency of invoicing acts as a leverage to magnify the adverse effects of credit shocks on trade.

Finally, we examine the role played by global banks in mitigating adverse trade credit shocks by enabling firms to substitute away from dollar invoicing. We hypothesize that the local/Indian subsidiaries of the global banks in India can leverage the strength of their internal capital markets by drawing on their parents' multi-currency treasury. In turn, this allows the importers connected to these global banks to maintain the trade volume and trade connections by using alternate currency invoicing more efficiently than those firms reliant solely on domestic banks. We provide evidence consistent with this narrative. In particular, we document that the firms trading with the exporting countries whose banks are present in India reduce their dollar invoicing after the taper tantrum, thereby suffering less adverse trade consequences.

Related Literature: This paper contributes to the literature on two key dimensions. First, by utilizing high-frequency trade invoicing data, we shed light on the yet-not-well-documented dynamics of trade invoicing choices and, in particular, document that trade invoicing responds to the trade credit shocks in the *short-run* and shifts in invoicing can persist well beyond after the credit markets have stabilized. Second, we provide robust evidence in support of what we call the *dollar invoicing channel* showing that trade losses in response to trade credit disruptions are more severe for the more dollarized firms. We place these contributions in the context of various strands of literature in the following paragraphs.

First, we complement the growing theoretical literature (Gopinath & Stein (2020); Chahrour & Valchev (2021); Coppola *et al.* (2023)) studying the rise of dominant currencies. Despite various mechanisms through which these papers rationalize the existence and durability of dominant

currencies, all these papers feature complementarity between the dominant currency invoicing of international trade and the dominant currency denomination in the asset market, which supports the financing of the trade. We contribute to this literature by providing the first causal evidence, to the best of our knowledge, in favor of one direction of this complementarity running from dollar financing to dollar invoicing by showing that disruption to the supply of international dollar-denominated credit affects the usage of dollars for invoicing the trade.[5]

Second, our paper is connected to the vast strand of literature linking trade credit conditions with trade outcomes. A number of papers also document the importance of trade finance during the trade collapse of 2008 (see Chor & Manova (2012); Bricongne *et al.* (2012); Levchenko *et al.* (2010). This literature also documents the role played by banks in supporting international trade. For example, firms linked to unhealthy banks (Amiti & Weinstein (2011)) or banks exposed to capital reversals (Schnabl (2012); Paravisini *et al.* (2014)) suffer in terms of export growth. Manova (2012) builds a model showing significant trade losses due to credit constraints both on intensive and extensive margins. Our paper contributes to this literature by establishing a novel *dollar invoicing channel*, highlighting that the rigidity in trade invoicing currencies interacts with disruptions in the credit markets to amplify trade losses.

Third, our paper is also tightly linked to the literature documenting the time series and cross-sectional determinants of trade invoicing: industry competition, exporting country size (Goldberg & Tille (2008)), transaction size, exchange rate volatility, liquidity (Goldberg & Tille (2016)), competitor's choice of invoicing currency and exposure to imported inputs (Amiti *et al.* (2022)), currency depreciation (Corsetti *et al.* (2022)). We add to this literature by showing that the international supply of dollar credit is a determinant of the time-series variation of the dollar invoicing. Moreover, we provide evidence that short-term credit disruptions can persistently alter

[5]When confronted with dollar invoiced imports, demand for dollar assets can arise as a safe store of value (Gopinath & Stein (2020)) or as a safe collateral choice (Chahrour & Valchev (2021)). In Coppola *et al.* (2023), on the other hand, the dominant currency emerges, despite trade being denominated in local currency, as thicker asset markets dominated by a single currency generate liquidity premia for investors. Mukhin (2022) develops a model where complementarities in price setting and input-output linkages give rise to dominant currency, while uncertainty in government policies can tilt private contracts to be dollarized as in Drenik *et al.* (2021).

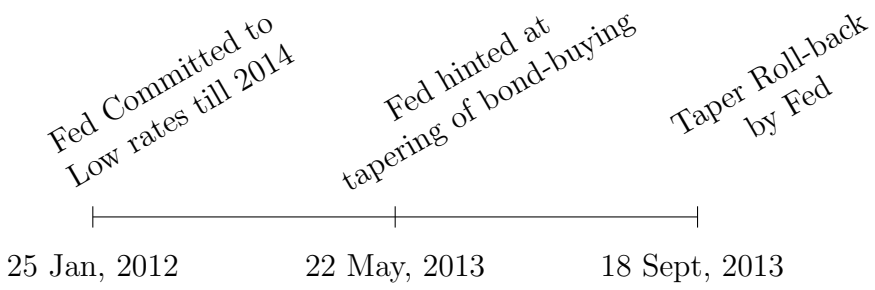
the choice of currency for trade invoicing well beyond after the credit markets have stabilized.

Fourth, a large literature studies the various economic implications of the dominant currency paradigm, including that for exchange rate passthrough(Gopinath *et al.* (2010); Goldberg & Tille (2016); Cravino (2017); Devereux *et al.* (2017); Boz *et al.* (2019); Gopinath *et al.* (2020); Auer *et al.* (2021); Amiti *et al.* (2022)), and spillovers of the US monetary policy (Zhang (2022)). We contribute to this literature by providing causal evidence that dominant currency invoicing interacts with the US monetary policy shocks to magnify trade losses. in line with the prediction from Zhang (2022) that more dollarized countries are more exposed to the US monetary policy shock in terms of exchange rates, equity prices, and output.

Fifth, our evidence also reaffirms the role played by global banks in supporting international trade (Claessens *et al.* (2017); Demir *et al.* (2017)), and global bank's internal capital markets (Houston *et al.* (1997); Cremers *et al.* (2010); Cetorelli & Goldberg (2012a); Ben-David *et al.* (2017); Gupta (2021); Lu *et al.* (2024)). We add to this literature by highlighting that global banks smooth out the dominant currency credit supply shocks by enabling the importers connected with these global banks to invoice the trade in alternate currencies, plausibly exploiting the bank's multi-currency internal capital markets.

The rest of the paper is organized as follows. Section 2 describes the context of Taper Tantrum; Section 3 describes the data and empirical strategy; Section 4 describes the main results; Section 5 establishes the novel trade invoicing channel; Section 6 establishes the role of foreign banks; and Section 7 concludes.

Figure 1: Timeline of the Taper Tantrum Episode



Notes: The figure provides the main sequence of events during the taper tantrum episode. The Fed hinted at tapering its bond-buying program in May 2013, while it reversed that stance in September 2013.

2 Taper Tantrum and the Dollar Credit Shock

2.1 The Taper Tantrum Episode

Figure 1 provides the timeline of events during the taper tantrum episode, the quasi-natural experiment that we utilize in this paper. On January 25, 2012, the Federal Reserve Bank (Fed) stated that it would maintain low interest rates "at least through late 2014" as part of its forward guidance policy. However, on May 22, 2013, the Fed Chairman unexpectedly reversed this policy and signaled the possibility of tapering off the bond-buying program before the earlier-stated deadline. This unanticipated change in the Fed's stance led to a sharp impact on cross-border capital flows, exchange rates, equity prices, and credit default spread in several countries (Acharya & Vij (2024); Bowman *et al.* (2015); Chari *et al.* (2020); Mishra *et al.* (2014); Sahay *et al.* (2014); Sarmiento (2024)), and most importantly the cross-border bank lending (Avdjiev & Takáts (2014, 2018)).[6]

The taper tantrum episode provides an excellent laboratory to study the question at hand for several reasons. First, the taper episode was a completely unexpected monetary policy action,

[6]For example, cross-border lending growth to emerging markets slowed down sharply to 2.5% during second and third quarter of 2013, from 10% during previous two quarters. For a sample of 53 countries studied by Eichengreen & Gupta (2015), by August 2013, a median country experienced 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.

with substantial revisions to the expected short-term rates and term premia (Chari *et al.* (2020)).[7] Second, as noted earlier, the taper tantrum episode originated in the United States but had significant spillover effects on cross-border lending of other countries, which creates plausibly exogenous variation in the dollar credit for reasons unrelated to the fundamentals of the exporting country. Third, the taper disrupted the ongoing recovery in the cross-border dollar credit market after the slump witnessed during the Global Financial Crises (GFC) of 2008 and hence was economically significant.[8] Moreover, while the global credit supply for several major currencies was disrupted during the GFC, the taper tantrum primarily represented a shock to the supply of dollar credit. Fourth, by September 2013, the Federal Reserve reversed its earlier tapering announcements, leading to a recovery in the global dollar credit market by the fourth quarter of 2013. This allows us to study whether the short-term disruptions in the global dollar credit market have lasting impact on invoicing and trade beyond the immediate period of disruption.

2.2 Construction: Dollar Credit Shock

Our objective is to measure the decline in cross-border dollar credit following the taper tantrum, which we do by exploiting the intricacies of trade credit markets. In particular, given longer transportation time, potential custom delays, and challenges in cross-border contract enforcement leading to greater default and settlement risks, international trade credit is predominantly bank-intermediated (Niepmann & Schmidt-Eisenlohr (2017)). Additionally, trade credit is generally used as an export promotion tool and largely provided by the exporter's country bank. For instance, trade credit extended to Indian exporters by India's EXIM Bank (Export-Import Bank) is 14 times larger than the trade credit extended by the same bank to India's importers, underscoring

[7] The expected Fed rates by 2019 (as implied from the overnight index swaps or OIS forward curve) shot up from 2.75% right before the taper announcement to around 4% by the end of June of 2013, and the number of expected Fed rate hikes over the next two years went up from less than 1.5 to more than 3 over the same time. Consequently, the 10-year yield on the US Government bonds spiked from 1.93% on May 21, 2013, to 2.03% on May 22 after the announcement and kept rising to reach 2.16% by May 28.

[8] By the end of 2012, trade-weighted median cross-border dollar loans outstanding were 16% below the pre-GFC levels. However, the taper tantrum interrupted nine consecutive quarters of positive growth in trade-weighted median cross-border dollar credit, resulting in a sudden reversal of dollar capital flows (Ghosh *et al.* (2016)).

the reliance of Indian importers on trade credit sourced from exporter-country banks.

To understand the operational framework of a standard trade transaction, consider the following example. First, an importer (M) and exporter (X), agree on the terms of contract such as product, quantity, quality, price, and the date of delivery. The importer M then uses the contract to procure a Letter of Credit, or LoC, from its bank (Bank_M) and provides it to exporter X. Importantly, note that the LoC does not result in any disbursal of funds to M, and therefore it is not trade credit. Bank_M only bears the risk of non-payment by M upon X meeting the contract terms. Bank_X purchases the LoC at a discount and disburses funds to X. This is the only instance of credit creation in this transaction. Notably, when Bank_X disburses funds to X, it is recorded as a liability, not against X, but against Bank_M (International Monetary Fund (2019)) as the money is disbursed against the LoC provided by Bank_M. In essence, it is recorded as cross-border bank-to-bank credit between country X and M. A large part of this cross-border bank credit is denominated in dollars. Motivated by this operational framework underlying international trade transactions, we focus on the deterioration in the volume of the cross-border dollar credit extended by the exporting country banks to the banks in other countries around the taper tantrum episode.

The data on the cross-border loans comes from the Bank of International Settlement (BIS). Table A6.1 of the locational banking statistics provided by BIS gives credit outstanding between each country's reporting banks and "All other countries", broken down by currencies and sector of the borrowing country (bank, non-bank financial, and non-financial) at a quarterly frequency. Our dollar credit shock measures the change in the dollar credit outstanding between the respective banks of the exporting and borrowing/importing country (*bank-to-bank credit*) around the taper tantrum. In particular, for the exporting country c, the cross-border dollar credit shock is defined as:

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

where $\text{Dollar Credit}_{c,\text{Q2 2013}}$ is the stock of cross-border dollar credit originated by banks in the

exporting country c. Because we multiply the quarter-on-quarter credit change by -1, a positive $shock_c$ value indicates a *drop* in the cross-border bank credit by banks of exporting country c from pre- to post-taper.

2.3 Shock Summary Statistics

Table 1 provides summary statistics for the dollar credit shock variable for 125 countries with which India had positive trade during 2012. We observe a significant reduction in bank-to-bank cross-border dollar credit around taper with the trade-weighted median and 75^{th} percentile of the credit shock of 2.39% and 11.60%, respectively.[9] The group of emerging countries was worst hit with a median and 75^{th} percentile emerging country suffering a cross-border dollar credit decline of 8.28% and 17.06%, respectively. Importantly, some of the top exporting countries to India reduced the dollar credit significantly after the taper.[10]

Interestingly, the dollar credit shock around the taper tantrum exhibits significant heterogeneity across countries, with the country at the 25^{th} percentile of the shock distribution gaining 3.85% to the stock of cross-border dollar credit. Notably, Euro area banks collectively expanded their cross-border dollar lending by 10.26% and a median EU country by 3.20% during the taper episode, highlighting the potential role played by the European banks in smoothing out the dollar credit shock on trade.[11] As we discuss subsequently, this rich cross-sectional variation in dollar credit shock across countries strengthens our identification strategy, as a given importer is likely to trade with countries heterogeneously exposed to the dollar credit shock.

We compute alternate shocks to understand how they correlate with our baseline shock measure. When the cross-border dollar credit decline is computed over two quarter-window around

[9] Trade weights for Indian imports are computed using the United Nation's COMTRADE database.

[10] For example – China by 17.05%, the USA by 6.11%, Saudi Arabia by 8.28%, Switzerland by 11.59%, South Africa by 6.82%, Malaysia by 9.43%, and Belgium by 3.75%.

[11] EU banks have been shown to be active in the dollar lending market before the Global Financial Crises with roughly 4.5 trillion dollars of outstanding loans in dollars (Baba *et al.* (2009)).

the taper tantrum instead of one (last row of panel A) the resultant decline is more, suggesting that the adverse dollar credit supply shock persists until the third quarter of 2013. The emerging market economies took longer to recover the lost credit supply (Figure 2). In Panel B, we alternatively compute credit shocks as a decline in cross-border dollar credit by exporting country banks to *All the sectors* of the borrowing country and to the *non-financial* sector. The correlation of merely -0.05 between our baseline shock tracing decline in *bank-to-bank* dollar credit and *bank-to-non financial* suggests that the bank-intermediated global credit, which includes trade finance and guarantees has different dynamics compared to the term-loans issued by the global banks to the non-financial sector. In fact, given the shorter maturity, rollover requirements, and lower collateralization of trade finance credit compared to other loans, it becomes the most vulnerable segment to be curtailed by banks during periods of credit stress and captured through our baseline shock measure.

3 Empirical Methodology

In this section, we describe our data and empirical strategy. We use the taper tantrum episode to construct plausibly exogenous variation in dollar credit at the country level as described above and trace its impact on firm-level dollar invoicing.

3.1 Data

Our primary dataset comprises customs data sourced from Cybex Exim Solutions, encompassing 31.5 million import transactions for India between September 2012 and February 2014, i.e., both before and after the taper tantrum. Each transaction provides us with information on the importing firm with masked identity, exporting country, the port of import, the product identified at the HS-8 level, transaction quantity and value, import duty, and most importantly for a sub-sample

of 3.7 million transactions, the details on invoicing currency. The full and invoicing sample record the imports of $424.86 billion and $33.10 billion, respectively, and cover 56.7% and 4.40% of the total imports recorded by Indian customs during the sample period.[12]

Table 2 provides the summary statistics for the important trade and invoicing variables for the period prior to the Taper Tantrum between September 2012 and May 2013 (Pre-Period). The full sample has 97,947 firms, importing from 213 countries, importing 98 products (identified at HS-2 level), and forming 485,920 Firm-Country-Product triples (Panel A). Panel B provides depth and breadth of the trade relationships. During the pre-period, a median (mean) firm carries out 10 (156) transactions and has trade relationships with 1 (2.39) countries, and operates across 2 (4.96) country-product pairs. The median (mean) transaction size is INR 3216 (INR 37,441) or $59 ($687) (using the average exchange rate during the pre-period), highlighting the excessively small establishment sizes in India (Bertrand *et al.* (2021); Kothari (2014)).

Panels C to E provide patterns on the invoicing currency at various aggregation levels. Panel C documents that a large fraction (74.9% of firms and 91.2% of firm-country-product triples) rely on a single currency (mainly USD) for invoicing. 84% of the firms and 74% triples using a single currency use USD to invoice trade. A very small fraction of firm invoices in the domestic currency, namely INR, but 20% use the Euro to invoice at least some transactions.

Panel D and E provide distributional statistics for invoicing for firms and firm-country-product triples. The mean USD (Euro) invoicing share is 81.58% (12.76%), which matches fairly well with the numbers reported in Boz *et al.* (2022) (86.06% and 9.44% for 2012, respectively). Though the unconditional share of the Euro in trade invoicing is low for India, conditional on a firm using the Euro for at least one transaction, the share of Euro invoicing for those firms jumps to 63.71%. The mean share of Euro invoicing conditional on it being positive is even more pronounced at 96.81% for a given firm-country-product triple, suggesting that firms or triples using the Euro rely on it to

[12]We confirm that the main, as well as invoicing sample, is consistent with the characteristics of the Indian imports in terms of commodities, exporting partners, etc. Also see Chaurey *et al.* (2024) for more details on these data.

invoice a significant fraction of its trade. This feature of the Euro is also true while trading with non-Eurozone exporting countries, as shown by the last row of Panel E. In short, the summary statistics highlight the dominance of the USD for invoicing Indian imports and also a smaller but economically meaningful invoicing in the Euro.

3.2 Identification Strategy

To draw causal inference about how dollar credit shocks affect dollar invoicing, we exploit the cross-country variation in dollar credit shock ($shock_c$) and estimate the heterogeneous invoicing patterns of a given firm across multiple trading partners hit with dollar credit shocks of varying intensity. We aggregate our transaction-level import data at firm×exporting country×product×month level.

Our primary dependent variable is the share of dollar invoiced trade (imports), $inv^{\$}_{fcpt}$, where f, c, p, and t indexes the importing firm, exporting country, product (defined at the HS2 level), and month/time respectively. The impact of the dollar credit shock on dollar invoicing is estimated using the following difference-in-differences (DiD) specification on a window of nine months around the taper tantrum event (i.e., September 2012 – February 2014):

$$inv^{\$}_{fcpt} = \beta_0 \text{ shock}_c + \beta_1 \text{ Post}_t + \beta_2 \text{ shock}_c \times \mathbb{1}(\text{Post}_t) + \delta_{fpt} + \gamma_{cp} + \theta' \mathbb{X}_{ct} + \varepsilon_{fpct} \tag{2}$$

where $shock_c$ is the dollar credit shock as defined in Equation 1, and $\mathbb{1}(\text{Post}_t)$ is a dummy variable that takes a value one after May 2013 and zero until May 2013. The main coefficient of interest β_2 estimates the additional change in the share of dollar invoiced imports from country c from the pre- to post-taper period in response to a 1 pp. larger dollar credit shock in that country. In particular, the specification includes firm×product×time fixed effects (δ_{fpt}), which identify β_2 using the cross-country variation in dollar credit shock within a given firm-product pair. Intuitively, we compare the change in dollar invoicing share from the pre- to post-taper period for a given firm importing a given product (e.g., leather shoes) from two countries (e.g., Italy and

Spain) experiencing differential dollar credit shock. In addition, the specification includes exporting country×product fixed effects (γ_{cp}) and a robust set of exporter's country×time controls ($\mathbb{X}_{ct}$). The standard errors are double-clustered at the exporter country and product levels.

The fixed effects δ_{fpt} and γ_{cp} control for several observed and unobserved factors that can jointly affect both the severity of dollar credit shock on one hand and the invoicing choices and the trade for the firms on the other. Our firm×product×time fixed-effects (δ_{fpt}) are similar to Paravisini *et al.* (2014) and account for observed or unobserved, time-varying or invariant factors specific to a 1) firm 2) product, and most importantly 3) firm-product combination. A prime example of a firm-specific time-varying unobserved factor would be a change in a firm's preference for dollar invoicing across all its trading partners in response to a change in its currency risk management policy. Our estimation is robust to a change in the firms' preferences occurring exactly after the taper tantrum, provided it affects all the firms' trading partners similarly. The only threat to our identification comes from the shocks to a firm's preferences that are correlated with the dollar credit shock. However, this scenario is highly unlikely, as the taper tantrum provides an exogenous variation in the dollar credit supply.

δ_{fpt} also control for the unobserved changes to the firm's overall financial position (*demand*) or shocks to the health of its lenders (*supply*), which can affect its invoicing patterns and trade. An example of a product-specific time-varying factor that δ_{fpt} absorbs is a global decline in trade of a particular product or changing invoicing patterns for a product globally. Controlling for product×time unobserved factors is vital in the context of international trade due to seasonality, which changes the composition of merchandise trade over the months within a year. To the extent that different goods have varying degrees of dollar invoicing, seasonality can confound our results.

The term γ_{cp} controls for any exporting country×product level time-invariant factors. It includes 1) any time-invariant country characteristics (such as ex-ante GDP per capita and credit ratings, among others) or 2) any time-invariant country factors specific to a given product that might confound the impact of the shock on invoicing and trade patterns. For instance, countries

can suffer from a product-specific persistent credit supply crunch for a given product or product-specific trade financing schemes in a particular currency.[13] Later, we also extend our model to include exporting country×product×firm fixed effects.

Since our identification depends on cross-country variation generated by the shock, we cannot include time-varying country fixed effects in our specification. Instead, we include time-varying country-level controls in $\mathbb{X}_{ct}$ grouped into macroeconomic variables (inflation, industrial production growth), external variables (export growth, currency depreciation, and volatility), and financial variables (equity returns, interest rate, and credit/GDP ratio) to filter out the impact of these country-specific dynamic factors. These covariates capturing the economic condition in the exporting country are potentially correlated with the dollar credit shock, and the response of dollar invoicing shares, and trade flows can respond to the covariates. By including these controls, we ensure that our estimates isolate the causal effect of the dollar credit shock on invoicing.

4 Impact of Dollar Credit Shocks on Dollar Invoicing

In this section, we present the results on importer invoicing patterns following a shock to the supply of dollar credit after the taper tantrum.

4.1 Importer Dollar Invoicing after Taper Tantrum

We now turn to address the key question – do Indian importers respond to adverse dollar credit shock by reducing the share of dollar-invoiced imports? Using the framework described in Section 3.2, we estimate Equation 2 with the share of dollar invoiced firm×exporting country×product×time imports as the dependent variable. Table 3 reports the estimation results.

[13] Since our estimation window is 18 months, any country-product specific factor that is otherwise time-varying but is constant during this window is also controlled for by our country×product fixed effects.

We begin in column 1 by estimating Equation 2 without any controls but including the firm×product×time and exporting country×product fixed effects so that we compare the pre- to post-taper change in the share of dollar invoiced imports for a given firm-product pair across countries that experience dollar credit shocks of varying intensities after controlling for time-invariant country-product level characteristics. The point estimate of the response of share of dollar invoicing to the credit shock measured by the coefficient on the interaction term, $\text{shock}_c \times \mathbb{1}(\text{Post}_t)$ is negative (-0.069) and statistically significant at 1% confidence level. The response is large economically, too. A 1 pp. higher dollar credit shock implies that the share of dollar invoiced imports for a given firm-product pair from that country additionally falls by 6.9 pp., which is 10.8% ($\frac{-0.069}{0.638}$) relative to the sample mean of 63.8%.

Columns 2 and 3 progressively add the macroeconomic, external, and financial variables to capture the time-varying economic conditions within the exporting country. The strength of our estimate of the response of dollar invoicing to credit shock is virtually unchanged, both statistically and economically, and increases slightly compared to column 1. A rich set of controls ameliorates the concern that the change in the intensity of dollar invoicing is potentially driven by the correlated change in economic conditions of exporting countries around the taper tantrum rather than by the dollar credit shock. Many countries experienced heightened currency volatility as well as sharp depreciation of currencies against the dollar after the taper tantrum. Currency volatility has been shown to affect the choice of the invoicing currency (Goldberg & Tille (2016)).[14] In addition, currency fluctuations affect banks' lending capacity through the net currency exposures of these banks (Agarwal (2021)). However, our result is robust even after controlling for currency movement and volatility. We treat the specification in column 3 as our preferred baseline specification. The results in the tables that follow use this specification unless mentioned otherwise.

In column 4, we rule out that the endogenous matching of firms with countries or products

[14]The rise in currency volatility in exporting countries is found to boost the vehicle currency invoicing. If anything, by excluding the currency volatility from controls, we would underestimate the response of dollar invoicing to dollar credit shock. Consistent with this logic, we find that the dollar invoicing responds more strongly in columns 2 and 3 when we control for currency variables as compared to column 1.

is driving our results. We achieve this by absorbing the firm×country×product fixed-effects and identifying the response coefficient by estimating within the firm-country-product change in share of dollar invoicing in response to the shock. A within-tuple comparison rules out compositional changes in firm-country-product groups driving our DiD estimates.[15] Note that we continue to absorb the firm×product×time fixed effects, which control for any time-varying average product demand or firm-wide demand for dollar invoicing. We find that the coefficient on the interaction term continues to be negative and significant (-0.055).

Next, in column 5, we vary the fixed effects to utilize a larger sample of data for identification. The fixed effects in columns 1 through 3 have a strict specification where the coefficient is identified from the set of firm-product pairs having at least two partner countries present in both the pre-taper and post-taper periods. Here, we instead control for time-varying firm-specific factors (firm×month fixed-effects) and time-varying product-specific factors like demand (product×month fixed-effects) and obtain the qualitatively and quantitatively similar result as in the more restrictive specification in column 3.

In column 6, motivated by the fact that the distribution of the share of dollar invoicing is bimodal with 98.7% values being either 0 or 1, we alter our dependent variable to a binary variable capturing dollar invoicing. A given firm seldom imports the same product from the same country in two different currencies in a given month. Hence, an adjustment to invoicing currency in response to the dollar credit shock is likely to be either none or complete. To measure this extensive margin of adjustment, we change our dependent variable to a dummy, which takes a value of one if a firm-country-product-time share of dollar invoicing is positive and takes a value of zero otherwise. Once again, we obtain a statistically significant negative coefficient on $\text{shock}_c \times \mathbb{1}(\text{Post}_t)$ with a magnitude of -0.065. The probability that 100% of firm-country-product-time imports are invoiced

[15]For instance, only larger firms might be able to import from hard-to-access smaller countries, and these pairs are more likely to invoice in the local currency of the large firm due to higher negotiating power. At the same time, a dollar credit shock could hit these smaller exporting countries more severely. Lager firms are more likely to survive the trade connections post-taper compared to smaller firms, which are likely to invoice in dollars. Such a compositional shift post-taper could explain our results rather than any change in dollar invoicing intensity within a firm-country pair.

in non-dollar currency rises from pre- to post-taper additionally by 6.50 pp. in response to a 1 pp. larger dollar credit shock.

Finally, in column 7, we test if the results hold at a higher (firm-country-time) level of aggregation as our shock is defined at the exporting country level. We define the dependent variable is the firm×country×time share of dollar invoiced imports. The coefficient on the interaction term is once again negative and significant and similar to the magnitude (-0.07) of the baseline estimate.

In a nutshell, Table 3 causally establishes a novel fact that importers respond to a decline in cross-border dollar credit from exporting country banks by reducing the share of their imports invoiced in dollars.

4.2 Role of Bank Intermediation and Dollar Credit

In this section, we conduct two tests to highlight the role of the dollar credit relative to credit in alternative currencies and the role of bank-to-bank intermediation relative to bank-to-non-financial-firm credit. The first test explores the role of a shock to cross-border dollar credit relative to the shock to cross-border credit in other currencies. As importers attempt to minimize the currency mismatch, the invoicing currency and the currency of trade credit are likely to be the same. Hence, a credit shock to a particular currency (say, the dollar) is likely to affect invoicing in that currency more prominently.

The second test focuses on the role of bank-to-bank intermediation for international trade. As the motivating example discusses, banks are important intermediaries in international trade transactions. Once an exporter (X) and an importer (M) agree to the contract terms, the importer secures a letter of credit (LoC) from her bank (Bank_M). The exporter's bank (Bank_X) discounts the LoC and disburses funds to X. A liability is created on Bank_X, which appears as cross-border *bank-to-bank* credit from X's country to M's country in the BIS dataset. In short, bank-to-bank networks are important channels through which cross-border trade credits operate.

Given these facts, we make two hypotheses about the role of banks and dollar credit:

1. Since dollar trade credit supports dollar invoicing, shocks to non-dollar credit should have a muted impact on dollar invoicing.

2. Since bank-to-bank dollar credit drives the trade credit, shocks to bank-to-non-financial-firms dollar credit should have a limited impact on dollar invoicing.

Table 4 provides these results. Column 1 reproduces the baseline result (column 3 of table 3), showing that a deterioration of *bank-to-bank* cross-border dollar credit around taper-tantrum leads to a significant fall in the share of dollar invoicing. The first test (column 2) holds the currency of credit as dollars but traces the credit to various types of foreign borrowers. In particular, we use the BIS data to construct a *bank-to-non-financial-firm* dollar credit shock based on the dollar credit outstanding between the exporting country banks and non-financial firms in the rest of the world. Column 2 shows that dollar invoicing does not change from the pre- to the post-taper period in response to the *bank-to-non-financial-firm* dollar credit shock. The coefficient on the interaction term between the shock and post-taper dummy in column 2 is economically small and statistically insignificant. This result highlights the special role played by the *bank-to-bank* networks in supporting dollar trade invoicing.

In the second test (column 3), we construct a *bank-to-bank non-dollar* credit shock based on changes in the non-dollar credit lent by the exporting country banks around the taper tantrum. Column 3 again shows that dollar invoicing is non-responsive to non-dollar credit shocks. This highlights the crucial role played by the dollar credit in determining the dollar invoicing.

4.3 Substitution to Alternate Currencies for Invoicing

If importers, on average, reduce their share of dollar-invoiced imports in response to dollar credit shock after the taper tantrum, which alternate currencies substitute dollar invoicing? We employ

the same estimation strategy as earlier, with the share of firm×country×product×time imports invoiced in a given currency as the dependent variable. Table 5 documents the results.

Column 1 shows a modest substitution towards the local currency invoicing, namely the Indian Rupee (INR), with the response coefficient to dollar credit shock of 0.015, which is statistically significant at a 10% confidence level. Economically, INR fills 20% of the void created by the fall in the share of dollar invoicing. The limited shift towards local currency pricing is in line with Goldberg & Tille (2016), who document that larger transactions relative to the industry average use local currency pricing. With Indian import transactions being relatively smaller than industry averages, the result is consistent with their prediction. Additionally, we find no evidence for a shift in invoicing towards currencies of other major trade partners of India – JPY (column 3), GBP (column 4), or producer currency, i.e., the exporters' currency (column 5).

Next, we explore if importers shift towards the second largest vehicle currency in international trade, the Euro. India's imports from European countries are predominantly invoiced in Euros, with an 80% pre-taper share of Euro invoicing. However, if the exporter is from a non-European Union country, the share of Euro invoicing in the pre-period is only 3.07%. Column 2 shows that the share of Euro invoicing increases after the shock to dollar credit in the post-taper period. A 1 pp. larger dollar credit shock leads to a 7.30 pp. fall in dollar invoicing (Column 3 of Table 3), out of which the Euro captures 4.9 pp. share. Collectively, INR and Euro capture 6.4 pp. of the fall 7.30 pp. fall in dollar invoicing in a country experiencing a 1 pp. larger dollar credit shock.

Interestingly, we find that the Euro invoicing rises for imports from non-EU countries (column 7). In contrast, imports from the EU region show no change in Euro invoicing post-taper (column 6), mainly explained by the fact that ex-ante trade with European exporters was already predominantly invoiced in Euros before the taper tantrum. In summary, the Euro emerges as the primary substitute for dollar invoicing after the dollar credit shock.

4.4 Dynamics of Dollar Invoicing around the Taper-Tantrum

The key identifying assumption for our differences-in-differences estimation is the parallel trend assumption, implying that firm-level dollar invoicing in both the treated (high dollar credit shock countries) and the control (low dollar credit shock countries) groups would have similar outcomes in the absence of the taper tantrum shock. We tackle this concern in two ways. First, following Atanasov & Black (2021), we conduct the pre-treatment balancing tests and find that the GDP per capita and sovereign credit ratings are statistically and economically indistinguishable from each other across the countries experiencing above- and below-median dollar credit shocks. Such balanced treatment and control groups are more likely to satisfy the parallel trend assumption.

Second, given that we do not observe the counterfactual of no treatment to test the parallel trend assumption, following Roberts & Whited (2013), we conduct the falsification test to confirm that the dollar invoicing shares of imports were evolving parallelly across the treated and control firm-country-product tuples in the pre-taper period. To this end, we estimate the following model by interacting time dummies with the country's dollar credit shock as follows:

$$inv_{fcpt} = \beta_0.\text{shock}_c + \sum_t \gamma_t.\mathbb{1}(t) + \sum_t \beta_t.\text{shock}_c \times \mathbb{1}(\text{t}) + \delta_{fpt} + \delta_{cp} + \theta'\mathbb{X}_{ct} + \varepsilon_{fpct} \tag{3}$$

where $\mathbb{1}(\text{t})$ is the dummy taking value of 1 for time t and 0 otherwise. The rest of the variables and fixed effects are as in Equation 2. β_t measures the difference in the share of dollar invoicing at time t for a given firm-product pair across two countries, where one country received 1 pp. larger dollar credit shock than the other. We create nine non-overlapping time groups between the third quarter of 2012 and the second quarter of 2014 and consider the time group of April-May 2013 as the base time group so that $\beta_{\text{Apr-May,2013}} = 0$, i.e., we compare the differences in dollar invoicing shares in t relative to April-May 2013. The results are presented in Figure 3.

We find that the β_t coefficients on the interaction terms for the months before the event are statistically insignificant, confirming that the results are not driven by the possibility that the

dollar invoicing was already evolving differently in the pre-taper period across countries experiencing heterogeneous dollar credit shocks. In contrast, we obtain statistically significant negative coefficients for most t in the post-taper tantrum period. The economic magnitude of the response of dollar invoicing to dollar credit shock is comparable to the baseline estimation in column 3 of Table 3. That is, we find that the dollar invoicing falls relatively more in the countries more affected by the dollar credit shock.

5 The Invoicing Channel of International Trade

Our analysis so far provides causal evidence that the dollar invoicing share of Indian imports, on average, declines more, with the exporting countries experiencing a more significant fall in dollar credit. In this section, we study how ex-ante rigidity in trade contracts, particularly with regard to invoicing, affects firms' ability to invoice in alternate currencies and the resulting trade outcomes following the taper tantrum.

As highlighted in the introduction, rigidity in dollar invoicing could stem from several factors. First, importers may seek alternate invoicing currency but exporters with pre-determined dollar liabilities may refuse such contracts or offer less favorable terms. Second, access to non-dollar trade credit is limited by the geographical concentration of banks lending in these alternate currencies. In the short-run, firms may not develop new banking connections to access non-dollar trade credit. Third, the high cost of hedging and currency mismatch, specifically during stress periods like the taper tantrum, may further discourage switching invoicing currency.

5.1 Construction: Dollarization Measures

To test these ideas, we quantify the rigidity of dollar invoicing using two measures of ex-ante dollarization. For a given country-product pair, we measure its ex-ante reliance on dollar invoicing

and the flexibility such a country-product pair may offer to invoice in alternate currencies. These measures effectively capture invoicing rigidity by reflecting the structural constraints imposed by pre-existing dependence on dollar invoicing and the capacity to transition to other currencies. We subsequently use these measures to construct Bartik-style firm-level indicators of dollarization.

First, we define the ex-ante reliance of an exporting country-product pair on dollar invoicing as the ex-ante share of dollar-invoiced country-product trade over the nine-month pre-taper period. We call this the *share measure of dollarization* and denote it by $\$_{cp}^{pre}$ for a given exporting country c and product p pair. Second, we define the currency of invoicing flexibility of a country-product pair as the equally weighted standard deviation of dollar invoicing shares across all the firms operating within the country-product pair during the pre-period. We refer to this as the *flexibility measure of dollarization* and denote it by $\sigma\left(\$\right)_{cp}^{pre}$. The two measures are conceptually distinct and the data exhibit a modest negative correlation of -0.152 between these two measures.[16]

Having defined these measures at the country-product level, we proceed to construct a firm-level measure of dollarization using a Bartik-style approach. Specifically, we weight the country-product dollarization by a given firm's pre-period trade weight with that country-product pair. In particular, the share measure of dollarization for firm f is given by:

$$\$_{f}^{pre} = \sum_{cp} \left(\frac{trade_{fcp}^{pre}}{trade_{f}^{pre}} \right) \times \$_{cp}^{pre} \tag{4}$$

where $trade_{fcp}^{pre}$, and $trade_{f}^{pre}$ respectively denote the trade for a given firm-country-product (fcp) triplet and the aggregate trade of the firm over all the country-products during the pre-period. Therefore, a firm's share measure of dollarization captures a weighted average exposure to the share measure of various country-product pairs in which the firm has active trade in the pre-

[16]The mean and the median share of ex-ante dollar invoicing (share measure) across 2008 unique country-product pairs is 0.62 and 0.96, respectively, with a standard deviation of 0.44, suggesting a significant variation across country-product pairs. The flexibility measure has a mean, median, and standard deviation of 0.16, 0, and 0.21, respectively. A large part of the variation in these measures comes from the cross-section of countries relative to products (see R^2 in Appendix Table A1).

period. Similarly, the flexibility measure of dollarization for firm f is computed as:

$$\sigma(\$)_f^{pre} = \sum_{cp} \left(\frac{trade_{fcp}^{pre}}{trade_f^{pre}} \right) \times \sigma\left(\$\right)_{cp}^{pre}. \tag{5}$$

Our Bartik-style variables rely on dollarization measures at the country-product level, $\$_{cp}^{pre}$ or $\sigma\left(\$\right)_{cp}^{pre}$, which are largely exogenous to a firm's decision-making. Additionally, the exposure weights $\left(\frac{trade_{fcp}^{pre}}{trade_f^{pre}}\right)$ are constructed using pre-period data, ensuring they are not affected by firm behavior in the post-taper tantrum period. In contrast, defining a firm's dollarization directly – for instance, as the share of its pre-period trade invoiced in dollars, is likely to be endogenous and correlated with both observable and unobservable firm characteristics, such as ex-ante banking connections. By relying on exogenous variation at the country-product level, our approach mitigates potential concerns about reverse causality and endogeneity.

The mean, median, and standard deviation of the firm's ex-ante dollar-invoiced trade is 0.76, 0.90, and 0.27, while the same statistics for invoicing flexibility measure are 0.19, 0.16, and 0.10, respectively. In our data, while Latin American economies exhibit a very high share of dollar-invoiced trade, most European economies have low shares of the trade invoiced in dollars. There are countries other than European economies with low usage of dollars for trade invoicing, such as Australia (65%), Turkey (61%), Ukraine (61%), and Japan (36%). These data features are consistent with Boz *et al.* (2022). Similarly, some product groups have a high share of dollar invoiced trade, such as Ores, Slag, and Ash (95%), Fertilizers (97%), while other products exhibit low dollar invoicing, such as dairy produce (17%), railways/locomotives (47%).

5.2 Dollarization and Heterogeneity in Invoicing Responses

First, we estimate the heterogeneous invoicing responses to the dollar credit shock for more dollarized firms relative to less dollarized firms. Table 6 presents the results with the share measure

of dollarization. The dependent variable is the share of dollar invoiced imports for a given firm-country-product at time t. We use the dollarization measured both at the country-product pair level (columns 1-2) and at the firm level (columns 3-5). We absorb a standard set of fixed effects, namely country×product and firm×product×time fixed effects. The estimates show that highly dollarized country-product pairs (column 1) or firms with high exposure to dollarized country-product pairs (column 3) experience neither statistically nor economically significant additional reduction in the share of dollar invoiced imports from pre- to post-taper in response to a larger dollar credit shock. On the contrary, there is a drop in the share of dollar invoicing within the less dollarized country-product pairs (column 2) or less dollarized firms (column 4) after the shock. Economically, the drop in the dollar invoicing is larger for this group of country-product pairs and firms. For firms with below-median exposure to the share measure of dollarization, a 1 pp. larger dollar credit shock leads to a 9.60 pp. or a 20% drop (relative to the mean share of dollar invoicing, $\frac{-0.096}{0.461}$) in the share of dollar invoiced trade.

In column 5, we perform the most stringent test by including a triple interaction term between the credit shock, firm dollarization, and a post-taper dummy to estimate the dynamics of share of dollar invoicing within a given country for two firms with varying levels of dollarization. The triple interaction term is statistically significant, showing that a firm with one standard deviation (0.244) less dollarization reduces its share of dollar invoicing by 8.50% ($0.221 \times \frac{0.244}{0.633}$) relative to the mean share of the dollar share of invoicing more from pre- to post-taper in a given country experiencing a 1 pp. higher dollar credit shock.

Table 7 documents a parallel set of results using the flexibility measure of dollarization. The share of dollar invoicing drops in the post-taper period in response to the dollar credit shock only for the country-product pairs (column 2) or firms having above-median invoicing flexibility (column 4). The reduction is statistically significant and economically large. Using estimates from column 4, a firm with above-median invoicing flexibility reduces its share of dollar invoicing by 9.2 pp or 15.9% ($\frac{-0.092}{0.579}$) more for a 1 pp. higher dollar credit shock. Column 5 repeats the

'within-country' test by exploiting the within-country variation across firms in terms of the firm's invoicing flexibility. The triple interaction term is again significant and shows that a firm with one standard deviation (0.101) more invoicing flexibility reduces its share of the dollar invoicing by 7.9% ($-0.501 \times \frac{0.101}{0.633}$) relative to the mean share of the dollar share of invoicing more in a given country experiencing a 1 pp. higher dollar credit shock.

Overall, Tables 6 and 7 provide strong evidence that less dollarized firms are able to reduce their dependence on dollar invoicing when dollar credit became difficult to obtain following the taper tantrum. The similarity in the magnitudes of invoicing responses across the two dollarization measures further strengthens the credibility of these findings. In the next part, we show that this inability to switch out of the dollar trade settlement hurts the dollarized firms, both in terms of trade volumes and trade relationships.

5.3 Dollarization and Amplification of Real Effects

A growing body of literature has documented the adverse effects of trade credit and international bank lending shocks on international trade.[17] Adding to this body of literature, our aim is to highlight how dollarization of trade interacts with the dollar credit shock to amplify the adverse effects on trade. In particular, we present evidence that a significant fraction of the trade decline following a reduction in the cross-border dollar credit is concentrated within the more dollarized firms. We call this the *dollar invoicing channel* of international trade.

We analyze the effects on both the intensive and extensive margins of trade. However, the fact that the dollar and non-dollar credit markets are segmented across the set of banks (Emter *et al.* (2024)), coupled with another observation that banks specialize in lending in certain geographies (Paravisini *et al.* (2020)), tilts our priors towards a strong extensive margin adjustment of the trade in response to dollar credit shocks. To this end, we define a dummy capturing the exit of a

[17] For example, see the trade collapse literature, for example Levchenko *et al.* (2010); Ahn *et al.* (2011); Bricongne *et al.* (2012); Chor & Manova (2012); Paravisini *et al.* (2014).

firm from a particular country-product pair during time t (denoted by $\mathbb{1}(Exit)_{fcpt}$) as:

$$\mathbb{1}(Exit)_{fcpt} = \begin{cases} 1 & \text{if} \quad trade_{fcpt-1} > 0 \quad \& \quad trade_{fcpt} = 0 \\ 0 & \text{if} \quad trade_{fcpt-1} > 0 \quad \& \quad trade_{fcpt} > 0 \\ . & \text{otherwise} \end{cases} \tag{6}$$

i.e., for the period t, $\mathbb{1}(Exit)_{fcpt}$ is defined only for the firm-country-product triplet, which is active during the last time period $t-1$. The intensive margin of international trade is analyzed using the log of the firm-country-product-time imports denoted by $log(imports_{fcpt})$. Tables 8 and 9 document the evidence supporting the dollar invoicing channel.

We begin by estimating the standard specification linking the credit shocks and international trade using full imports sample as follows:

$$y_{fcpt} = \delta_{fct} + \gamma_{cp} + \beta \, \text{shock}_c \times \mathbb{1}(\text{Post}_t) + \varepsilon_{fcpt} \tag{7}$$

where y_{fcpt} is $\mathbb{1}(Exit)_{fcpt}$. The model has the same set of fixed effects used so far, namely the firm×product×time fixed effects (δ_{fct}) and country×product fixed effects (γ_{cp}). Column 1 of Table 8 with $y_{fcpt} = \mathbb{1}(Exit)_{fcpt}$ reports a β of 0.099, which is statistically significant and economically large. A 1 pp. larger dollar credit shock implies a 9.9 pp. or 23% ($\frac{0.099}{0.43}$) increase from the pre- to post-taper period in the probability of a firm's exit from a given country-product pair. This result corroborates the prior evidence in the literature documenting the negative effects of trade credit shocks on trade.

Next, we highlight the importance of a firm's exposure to dollarization in determining trade outcomes. We estimate the Equation 7 separately on the sample of firms with above- and below-median share measure of dollarization.[18] The firm's exit probability rises additionally by 19.7 pp.

[18]The dollarization measure is computed for the set of firms with invoicing information available in the pre-taper tantrum period.

or 40.4% ($\frac{0.197}{0.488}$) from the pre- to post-taper period in response to a 1 pp. higher dollar credit shock for the firms with above-median dollarization (column 2). In contrast, the exit probability rises by only about half of that magnitude (by 8.1 pp) for the set of below-median dollarized firms (column 3). Importantly, firms with low dollarization are able to substitute away from dollar invoicing more effectively (Tables 6 and 7). Together these results show that firms with low dollarization are able to switch out of dollar more easily and mitigate the impact of adverse cross-border dollar credit shocks on trade more efficiently.

In column 4, we utilize a *within-country* variation in dollarization across firms importing from a given country to sharpen the estimated effects of dollarization on trade in the aftermath of the taper tantrum shock. In particular, we consider a triple interaction between shock_c, $\mathbb{1}(\text{Post}_t)$, and firms' dollarization, and absorb country×time fixed effects, which effectively compares the exit probability for two firms importing from a given country with heterogeneous exposure to dollarization. Estimates in column 4 suggest a much bigger rise (34.9 pp.) in the exit probabilities for more dollarized firms in the post-taper period, which is statistically significant. Economically, this is a large relative jump in exit probability for the dollarized firms; within a given country facing 1 pp. larger dollar credit shock, a 1 standard deviation (0.235) higher exposure to dollarization implies that the exit probability goes up by an additional 18.9% ($0.349 \times \frac{0.235}{0.433}$) from pre- to post-taper period.

Lastly, in column 5, we conduct a similar within-country test for intensive margin of trade using the natural logarithm of firm-country-product-time imports as the dependent variable conditional on being non-zero. Estimates again suggest a negative coefficient of -0.759 on the triple interaction. Economically, this implies that within a country experiencing a 1 pp. higher dollar credit shock, a firm with one standard deviation (0.244) higher exposure to dollarization exhibits a 27.60% additional drop in trade value.

Table 9 documents a parallel set of results where we consider the flexibility measure of dollarization. Note that higher flexibility is interpreted as low dollarization. Again, we obtain the

same conclusions. The exit probabilities increase in response to the trade credit shock primarily for the firms with below-median invoicing flexibility. Column 4, using country×time fixed effects, confirms a significantly lower increase in the exit probability from the pre to post-taper period for the firms having more invoicing flexibility. The economic magnitudes using the two measures of dollarization are again roughly similar.

In summary, Tables 8 and 9 provide strong evidence that more dollarized firms suffer worse trade outcomes in response to a decline in dollar credit. These results quantify how dollarization may amplify the adverse impact of a dollar credit shock on trade. We call this the *dollar invoicing channel* of international trade and it operates over and above the usual *trade credit* channel of international trade highlighted in the literature so far.

Firm-Wide Real Effects: The results so far document significant and amplified trade disruption through the dollar invoicing channel for a given firm within a country-product pair. However, it is possible that importers substitute their export partners and/or products (if the production process allows it) and face minimal overall trade disruptions. Nonetheless, the scope for substitution is likely constrained due to the well-documented stickiness of international trade relationships. Factors such as relationship-specific investments, search costs, incompleteness of trade contracts, or institutional quality (Antràs & Chor (2013); Levchenko (2007); Nunn (2007)) limit such adjustments. Given this prior evidence on sticky trade relations and their perverse effects on trade, we hypothesize that that firms are largely unable to smooth out the disruptions to their existing relations caused by the taper-induced dollar credit shock.[19]

To this end, we estimate whether more dollarized firms suffer a bigger fall in their aggregate imports after the shock. We estimate the following model on the firm×time panel:

$$\ln(imports_{ft}) = \delta_f + \gamma_t + \beta \, \text{shock}_f \times \mathbb{1}(\text{Post}_t) + \varepsilon_{ft} \tag{8}$$

[19]This result complements the recent evidence documenting how stickiness amplifies the effects of uncertainty shocks on the trade (Martin *et al.* (2023)).

where δ_f, and γ_t denote firm- and time-fixed effects, respectively. shock_f is the dollar credit shock for firm f, defined as a weighted average of dollar credit shock across all its ex-ante trading partner countries.[20] Hence, our model identifies the trade disruption within a firm and controls the aggregate trade patterns through time fixed effects.

Table 10 documents the results. In column 1, we estimate the model in Equation 8 on the sample of all the firms. The DiD coefficient on the interaction of the Post and the firm's credit shock (-0.361) is statistically significant, documenting negative impact on firm-level trade in response to dollar credit shock. This is a classical test of how relationship stickiness can adversely impact the firm trade in response to trade credit shock. Importers lose out on the aggregate firm-level trade as they cannot substitute severed relations within the affected geographies with new ones.

We now study the impact of dollarization on overall firm imports. Columns 2 and 4 confirm that the decline in firm-level trade is mainly concentrated within firms with above-median dollarization. In contrast, columns 3 and 5 document less or insignificant loss to trade for firms with below-median dollarization. Overall, Table 10 highlights the adverse effects of the dollar credit shock on trade, with the impact being disproportionately greater for more dollarized firms.

6 The Role of Global Banks

Having established the constraints imposed by dollarization, we now explore whether the presence of global banks can mitigate some of these adverse effects. Global banks play a vital role in supporting international trade in multiple ways and are well-positioned to support international trade during stress periods, such as the taper tantrum. First, relative to domestic banks, subsidiaries

[20] In particular:

$$\text{shock}_f = \sum_{pc \in PC_f} \left(\frac{trade_{fpc}^{pre}}{trade_f^{pre}} \right) \times \text{shock}_c \tag{9}$$

of global banks may use their internal capital markets and tap into parent institutions' liquid treasury, enabling them to provide trade credit more efficiently (Cetorelli & Goldberg (2012b)) even in countries more affected by the shock. Second, by virtue of operating in multiple countries, global banks might be better able to provide liquidity to firms in alternate currencies, allowing firms to substitute invoicing currency after the shock to dollar credit. Third, global banks are more likely to provide specialized forms of trade finance, such as letters of credit. Fourth, the geographic proximity of global banks has been documented to boost international trade (Claessens *et al.* (2017)) by resolving asymmetric information problems (Portes & Rey (2005); Michalski & Ors (2012)), or by helping enforce incomplete trade contracts more efficiently (Oslen (2016)).

Hence, we conjecture that firms associated with global banks are better positioned to secure trade credit in alternate currencies other than the dollar in the aftermath of the taper tantrum episode and sustain their trade relations. In other words, trade facilitated by global banks is likely to be less vulnerable to the dollar invoicing channel relative to trade intermediated solely through domestic banks. To investigate this, we use the presence of exporting country banks in India as a proxy for the involvement of global banks in facilitating Indian imports.[21] As of 2012, 23 countries, including both developed and developing nations, had their affiliate banks operating in India.[22]

To analyze the impact of of exporting country bank's presence in India on Indian importer's invoicing and trade outcomes, we begin by defining a shift-share measure for each importing firm, capturing the potential banking relations with these global banks operating in India. In particular, we measure a firm's exposure to foreign banking presence in India as the share of the firm's ex-ante trade with the countries having a banking presence in India in 2012. For a firm f, foreign bank

[21] Cerutti *et al.* (2015) document how international banks rely on foreign banking units to supply cross-border credit, rather than extending the credit directly from the headquarters.

[22] These includes Belgium, Canada, France, Germany, Hong Kong, Indonesia, Japan, Mauritius, Netherlands, Oman, Russia, Singapore, South Africa, South Korea, Sri Lanka, Switzerland, Thailand, United Arab Emirates, United Kingdom, and the United States Of America. One example of an affiliate of a foreign bank operating in India is "Abu Dhabi Commercial Bank Ltd." Typically, such affiliates specialize in providing trade credit to Indian firms trading with partners from Abu Dhabi. Appendix Table A2 gives summary on these country characteristics based on foregin bank affiliate in India.

exposure is defined as:

$$\text{FB}_{\text{f}}^{pre} = \sum_{c} \left(\frac{trade_{fc}^{pre}}{trade_{f}^{pre}} \right) \times \mathbb{1}\left(\text{Banking Presence in India}\right)_{c} \tag{10}$$

where both exposure weights, $\sum_{c} \left(\frac{trade_{fc}^{pre}}{trade_{f}^{pre}} \right)$, and banking presence, $\mathbb{1}\left(\text{Banking Presence in India}\right)_{c}$ are pre-period variables. Since firms do not directly influence the foreign bank presence, this variable provides a valid shift-share measure for analyzing the firm invoicing and import response.[23]

6.1 Global Banks' Presence and Invoicing

We start by analyzing how firms' exposure to foreign banks influences their invoicing responses to the dollar credit shock. Table 11 presents evidence consistent with our hypothesis that global banks play a critical role in enabling firms to access trade credit in alternate currencies, thereby facilitating invoicing in non-dollar currencies when dollars become scarce. In Columns 1–2, we split the firms into below-median (Low) and above-median (High) exposure to foreign banking presence in India, respectively. We estimate our baseline invoicing specification with firm×product×time and country×product fixed effects and standard country controls used throughout the paper. The dependent variable is the share of monthly firm-country-product imports invoiced in dollars. We find that the share of dollar invoiced trade reduces substantially more, both economically and statistically, (by 6.9 pp., Column 2) from the pre- to post-taper period for firms with high foreign bank exposure in response to a 1 pp. larger dollar credit shock. In contrast, firms with low exposure show statistically insignificant change in their dollar invoicing patterns (Column 1).

In column 3, we estimate a specification with triple interaction term (shock_c, $\mathbb{1}(\text{Post}_t)$, and the firm's foreign bank exposure (FB_f^{pre})) that exploits the variation within a given exporting country across firms with differing levels of exposure to global banks. The specification allows us to study the differential invoicing responses to a dollar credit shock by two firms importing from a

[23] A median firm has no foreign banking exposure; however, the mean foreign exposure is 22.55%.

given country but having differential access to global banks within India, thereby better isolating the role of global banks. We achieve this by absorbing exporting country×time fixed effects. The coefficient on the triple interaction term is -0.103 and statistically significant, showing that a firm having one-standard-deviation higher foreign bank exposure reduces dollar invoicing by an additional 6.28% $\left(-0.103 \times \frac{0.368}{0.603}\right)$ in response to a 1 pp. larger dollar credit shock within a given country. These results underscore the importance of global banks in enabling firms to switch to alternate currencies for invoicing during periods of dollar scarcity.

Online Appendix Section A.1 provides similar evidence, where we estimate the invoicing changes for imports coming from countries with and without a banking presence in India instead of using firm-level exposure to banking presence. We obtain similar results with a higher and significant decline in dollar invoicing coming from countries with a banking presence in India.

6.2 Global Banks' Presence and Real Effects

We next test if firms with better foreign bank exposure are able to maintain trade relationships, given their stronger ability to switch out of dollar invoicing. Columns 4-6 of Table 11 present the evidence in support of this hypothesis. We re-estimate the trade model in Equation 7, on the sample of firms with below-median (Low) and above-median (High) foreign bank exposure. We study the trade responses on the extensive margin where the dependent variable is the dummy for firm-country-product exit during time t and the coefficient of interest is the interaction term $\text{shock}_c \times \mathbb{1}(\text{Post}_t)$. Column 4 shows that for the firms with below-median foreign bank exposure, the probability of exit from a country-product pair rises from the pre- to post-taper period by an additional 18.7 pp. or by 38% (0.187×0.408) relative to mean exit probability in response to a 1 pp. larger dollar credit shock. Contrary to this, column 5 shows that for firms with high foreign bank exposure the adverse trade impact is completely mitigated as the coefficient on the

interaction term is both statistically and economically insignificant.[24]

In column 6, we sharpen our estimation by utilizing a within exporting-country variation in foreign bank exposure across importing firms by absorbing country×time fixed effects. We estimate a model with triple interaction between the post-taper dummy, the dollar credit shock, and the firm's foreign bank exposure. We obtain a statistically and economically significant negative coefficient of -0.271 on the triple interaction, indicating that access to global banks mitigates the adverse effects of dollar credit shock on the extensive margin. Quantitatively, this means that in response to a 1 pp. higher dollar credit shock, a firm's exit probability rises by 20.6% less $\left(-0.271 \times \frac{0.538}{0.433}\right)$ relative to the mean exit probability if a firm has one-standard-deviation higher foreign bank exposure.

We conduct two further tests, with results provided in the Online Appendix. The first test evaluates whether foreign bank exposure helps mitigate trade losses for firms that are more dollarized. Columns 3 and 4 in Table A4 show that higher firm dollarization (based on share measure) leads to an increase in the exit probabilities from pre- to post-taper in response to a dollar credit shock, primarily for trade relationships where exporting countries do not have a banking presence in India. Therefore, the adverse effect of high dollarization could be compensated by exposure to global banks. Lastly, we analyze the intensive margin of trade losses using the logarithm of the firm-country-product-month imports as the dependent variable. We find modest effects of foreign banking exposure on trade volume in response to the dollar credit shock (results available on request). This is consistent with the evidence so far that the real effects are more pronounced on the extensive margin.

Overall, we provide robust evidence that the presence of global banks helps firms to maintain trade relationships by allowing them to switch to alternative currencies for trade invoicing during periods of dollar scarcity.

[24]Estimating real effects separately for countries with and without a banking presence in India gives results in similar direction (Columns 1 and 2 in Appendix Table A4).

7 Conclusion

Building on prior research highlighting the complementarities between dollar invoicing and dollar financing, our paper is the first to provide causal evidence demonstrating how a reduction in dollar financing leads to a decline in dollar-denominated trade invoicing. Our analysis establishes several novel empirical findings. First, contrary to the widely held belief of stickiness, firm-level dollar invoicing adjusts in the short run in response to dollar credit shocks, with firms switching to Euro invoicing when faced with dollar scarcity. Second, firms with high ex-ante dollarization are unable to reduce their dependence on dollar invoicing despite facing tight dollar credit conditions. Third, we identify a *dollar invoicing* channel of international trade, highlighting how rigidity in invoicing currency has significant real consequences. Firms unable to substitute away from dollar invoicing after adverse dollar credit supply shocks experience a substantial loss of trade relationships and trade volume. This highlights how the negative effects of credit shocks on trade can be amplified, particularly when the shock occurs in the dominant invoicing currency like the dollar. Finally, exposure to global banks can mitigate the impact of dollar credit shocks by enabling firms to transition to alternative invoicing currencies and maintain trade relationships. These findings have direct implications for research examining the transmission of high-frequency external shocks to domestic outcomes, such as trade and inflation, under different invoicing regimes as well as understand the resilience of global trade networks in the face of credit disruptions.

Our findings also have significant policy implications and contribute to the ongoing debate on de-dollarization, where countries are actively exploring alternate payment systems that utilize currencies other than the dollar. For instance, Saudi Arabia ended its petrodollar deal with the US in April 2024, which now allows Saudi Arabia to use alternative currencies to invoice oil exports. Our results show that firms with more diversified and flexible trade invoicing regimes are better positioned to mitigate the adverse effects of credit disruptions in dominant currency like the dollar. Countries and firms can, therefore, achieve resilience by proactively establishing banking connections that facilitate trade finance in multiple currencies and by negotiating broader trade

contracts with counterparties to allow payments in alternate currencies during episodes of credit disruption.

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Tables

Table 1: Cross-Border Dollar Credit Shock

This table provides summary statistics of baseline dollar credit shock. The shock is as defined in Equation 1 and is given by:

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

where Dollar $\text{Credit}_{c,\text{Q2 2013}}$ is the stock of cross-border dollar credit by banks in the country c. Because we multiply the quarter-on-quarter credit change by -1, a positive $shock_c$ value indicates a *drop* in the cross-border bank credit by banks of exporting country c from pre- to post-taper. We construct our dollar credit shock as the drop in the aggregate dollar credit by the banks of exporting countries around the taper episode. We construct the shock this way to generate a more intuitive negative coefficient on the impact on dollar invoicing when dollar credit falls.
We refer to this shock as *Bank-To-Bank Dollar Credit Shock*. In Panel B, we compute the correlation of this baseline shock with various alternative definitions of shocks. *Bank-To-All* and *Bank-To-Non Financial* includes dollar credit extended by exporting country banks to *All* and Non-Financial sector of borrowing country. EM – Emerging Market, EU – European Union, Two-quarter window – Calculating average growth over two quarters before and after.

Panel A: Pre to Post % Change in Dollar Credit
from Exporting Country Banks to Borrowing Country Banks

	P75	Median	P25	Mean	SD	N
(Baseline) 1-quarter window	11.594	2.397	-4.069	-1.332	50.759	125
EM	17.060	8.285	-1.646	6.432	15.610	22
EU	3.752	-3.206	-10.775	-6.759	14.419	19
Two-quarter window	14.757	2.671	-9.031	-7.215	57.304	125

Panel B: Correlation Across Measures of Dollar Credit Shocks

Dollar Credit Shock Between Exporting Country Banks and Importing Country	
Banks	1
All Borrowers	0.67
Non-Financial Firms	-0.05

Table 2: Customs Data: Summary Statistics

This table presents the summary statistics on trade and invoicing patterns in the pre-Taper Tantrum period starting from September 2012 up until May 2013 in the customs data.

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 Per 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

Panel C: Count Statistics for Invoicing

Unit	N	Single Currency	100% USD Invoicing	USD Inv>0	INR Inv>0	Producer Currency Inv>0	EUR Inv>0
Firm	20809	15588	13194	18202	274	19338	4166
Firm-Ctr	36366	32105	24597	28434	411	35961	6449
Firm-HS2	53599	45035	35712	43584	668	51212	9571
Firm-Ctr-HS2	70451	64285	48121	53592	876	69909	11959

Panel D: Firm-Level Invoicing Patterns

Statistics	N	P25	P50	P75	Mean	SD
Firm's USD Inv % (Value)	20809	95.78	100	100	81.58	36.05
Firm's USD Inv % (Transaction)	20809	92.86	100	100	81.28	36.06
Firm's INR Inv %	20809	0	0	0	0.79	8.39
Firm's PC Inv %	20809	0	0	9.16	18.70	35.78
Firm's EUR Inv %	20809	0	0	0	12.76	30.88
Firm's INR In % | INR Share>0	274	9.99	83.05	100	60.26	42.06
Firm's EUR Inv % | EUR Share>0	4166	22.84	79.87	100	63.71	38.96

Panel E: Firm-Country-Product Level Invoicing Patterns

Statistics	N	P25	P50	P75	Mean	SD
USD Invoicing %	70450	78.53	100	100	75.31	42.88
EUR Invoicing %	70450	0	0	0	16.43	36.87
EUR Invoicing %|EURO Share>0	11955	100	100	100	96.8174	15.12962
EUR Invoicing % With Non-Euro Partners	58746	0	0	0	3.76	18.81
EUR Invoicing % With Non-Euro Partners|EURO Share>0	2433	100	100	100	90.85	25.17

Table 3: Dollar Credit Shock and Dollar Invoicing

This table estimates the response of the share of dollar-invoiced trade to the cross-border dollar credit shock. The dependent variable in columns 1-5 (7) is the share of firm-country-product-month (firm-country-month) dollar-invoiced imports invoiced and denoted by Share of Dollar Invoiced Imports$_{fcpt}$ (Share of \$ Invoiced Imports$_{fct}$). In column 6, the dependent variable is the dummy indicating if a firm-country-product had any transaction invoiced in dollars during that month. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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$_c \times \mathbb{1}(\text{Post}_t)$	-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)
Inflation (%)		0.004	0.003	-0.002	0.002	0.003	0.002
		(0.004)	(0.004)	(0.002)	(0.004)	(0.005)	(0.006)
Industrial Growth (%)		0.001	0.001	0.001	0.001	0.001	0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Export Growth (%)		-0.010	-0.021	-0.013	-0.043	-0.013	-0.081***
		(0.024)	(0.029)	(0.022)	(0.029)	(0.027)	(0.027)
Currency Depreciation (%)		0.085	0.189	-0.035	0.242	0.199	-0.003
		(0.172)	(0.191)	(0.076)	(0.194)	(0.218)	(0.296)
Currency Volatility (%)		-1.432*	-0.952	0.182	0.489	-1.002	1.038
		(0.821)	(1.061)	(0.719)	(1.226)	(1.067)	(1.713)
Equity Returns (%)			-0.000	0.000	0.000	-0.000	0.001
			(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Interest Rate (%)			-0.000	0.003	-0.005	-0.000	-0.010
			(0.004)	(0.003)	(0.006)	(0.004)	(0.008)
Credit To GDP (%)			-0.001	0.001	-0.000	-0.001	-0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
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

Table 4: Dollar Invoicing: Role of Bank-to-bank Dollar-denominated Credit

This table estimates the response of the share of dollar-invoiced trade to the cross-border credit shocks computed for alternate set of borrowers and currencies. The dependent variable in all the columns is the share of firm-country-product-month dollar-invoiced imports and denoted by Share of Dollar Invoiced Imports$_{fcpt}$. Column 1 (2) measures the dollar credit shock as the drop in the outstanding cross-border dollar credit between exporting country banks and importing country banks (non-financial firms) from first to second quarter of 2013. Column 3 measures the cross-border credit shock as the drop in the cross-border non-dollar credit between exporting and importing country banks from first to second quarter of 2013. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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$_c$ × $\mathbb{1}(\text{Post}_t)$	-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×HS2×Time FE	✓	✓	✓
Country×HS2 FE	✓	✓	✓
Y-Mean	0.611	0.611	0.611

Table 5: Invoicing Currency Substitution after Dollar Credit Shock

This table documents the response of share of trade invoiced in alternate currencies to the cross-border dollar credit shock. The dependent variable in all the columns is the share firm-country-product-month imports invoiced in various currencies as highlighted in the columns heading. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock_c refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level. INR - Indian Rupee, EUR - Euro, JPY - Japanese Yen, GBP - Great Britain Pound, PC - Producer Currency.

	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)
$\text{shock}_c \times \mathbb{1}(\text{Post}_t)$	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
Macro Controls	✓	✓	✓	✓	✓	✓	✓
External Controls	✓	✓	✓	✓	✓	✓	✓
Financial Controls	✓	✓	✓	✓	✓	✓	✓
Firm×HS2×Time FE	✓	✓	✓	✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓	✓	✓	✓	✓
Y-Mean	0.611	0.611	0.611	0.611	0.611	0.218	0.778

Table 6: Dollarization (Share Measure): Dollar Invoicing after Dollar Credit Shock

This table documents how the response of dollar invoicing of trade to the cross-border dollar credit shock varies with the extent of trade dollarization. The dependent variable in all the columns is the share of firm-country-product-month dollar-invoiced imports and denoted by Share of Dollar Invoiced Imports$_{fcpt}$. Column 1 (2) uses a sub-sample of country-product pairs with above-median (below-median) share measure of dollarization, denoted by $\$_{cp}^{pre}$. Column 3 (4) uses a sub-sample of firms with above-median (below-median) share measure of dollarization, where firm's dollarization is measured as in Equation 4, and denoted by $\$_{f}^{pre}$. Column 5 uses firm's share measure of dollarization $\$_{f}^{pre}$. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$				
Dollarization	Share ($\$_{cp}^{pre}$)		Firm's Share ($\$_{f}^{pre}$)		
	High	Low	High	Low	
	(1)	(2)	(3)	(4)	(5)
shock$_c$ × $\mathbb{1}(\text{Post}_t)$	0.016	-0.096***	0.002	-0.086***	
	(0.029)	(0.021)	(0.047)	(0.015)	
shock$_c$ × $\mathbb{1}(\text{Post}_t)$×$\$_{f}^{pre}$					0.221**
					(0.100)
shock$_c$×$\$_{f}^{pre}$					-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

Table 7: Dollarization (Flexibility Measure): Dollar Invoicing after Dollar Credit Shock

This table documents how the response of dollar invoicing of trade to the cross-border dollar credit shock varies with the extent of trade dollarization. The dependent variable in all the columns is the share of firm-country-product-month dollar-invoiced imports and denoted by Share of Dollar Invoiced Imports$_{fcpt}$. Column 1 (2) uses a sub-sample of country-product pairs with below-median (above-median) invoicing flexibility, denoted by $\sigma(\$)^{pre}_{cp}$. Column 3 (4) uses a sub-sample of firms with below-median (above-median) invoicing flexibility, where firm's invoicing flexibility is measured as in Equation 5, and denoted by $\sigma(\$)^{pre}_{f}$. Column 5 uses firm's invoicing flexibility measure $\sigma(\$)^{pre}_{f}$. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$				
Dollarization	Flexibility ($\sigma(\$)^{pre}_{cp}$)		Firm's Flexibility ($\sigma(\$)^{pre}_{f}$)		
	Low	High	Low	High	
	(1)	(2)	(3)	(4)	(5)
shock$_c$ × $\mathbb{1}(\text{Post}_t)$	-0.046	-0.094***	-0.048*	-0.092***	
	(0.033)	(0.020)	(0.026)	(0.017)	
shock$_c$ × $\mathbb{1}(\text{Post}_t)$×$\sigma(\$)^{pre}_{f}$					-0.501***
					(0.159)
shock$_c$×$\sigma(\$)^{pre}_{f}$					0.050
					(0.344)
Adj. R-Sq.	0.989	0.668	0.851	0.675	0.631
Obs	1085	30858	6474	29375	44669
Macro Controls	✓	✓	✓	✓	✓
External Controls	✓	✓	✓	✓	✓
Firm×HS2×Time FE	✓	✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓	✓	
Country×Time FE					✓
Y-Mean	0.567	0.598	0.716	0.579	0.633
SD-Dollarization	0.000	0.133	0.045	0.076	0.101

Table 8: Real Effects of Dollarization (Share Measure)

This table documents how the response of international trade to the cross-border dollar credit shock varies with the extent of trade dollarization. The dependent variable in columns 1-4 is a dummy indicating firm-country-product exit during the period t defined in Equation 6 and denoted by $\mathbb{1}(Exit)_{fcpt}$. The dependent variable in column 5 is the natural logarithm of the firm-country-product-month imports, denoted by $\ln(\text{Imports})_{fcpt}$ conditional on being non-zero. Column 3 (4) uses a sub-sample of firms with above-median (below-median) share measure of dollarization, where firm's dollarization is measured as in Equation 4, and denoted by $\$_f^{pre}$. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock_c refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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

Table 9: Real Effects of Dollarization (Flexibility Measure)

This table documents how the response of international trade to the cross-border dollar credit shock varies with the extent of trade dollarization. The dependent variable in columns 1-4 is a dummy indicating firm-country-product exit during the period t defined in Equation 6 and denoted by $\mathbb{1}(Exit)_{fcpt}$. The dependent variable in column 5 is the natural logarithm of the firm-country-product-month imports, denoted by $\ln(\text{Imports})_{fcpt}$ conditional on being non-zero. Column 2 (3) uses a sub-sample of firms with below-median (above-median) invoicing flexibility measure of dollarization, where the firm's invoicing flexibility measure is defined in Equation 4, and denoted by $\sigma(\$)_f^{pre}$. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock_c refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

Dependent Var.	$\mathbb{1}(Exit)_{fcpt}$				$Log(\text{Imports})_{fcpt}$
Dollarization	Firm's Flexibility ($\sigma(\$)_f^{pre}$)				
		Low	High		
	(1)	(2)	(3)	(4)	(5)
$\text{shock}_c \times \mathbb{1}(\text{Post}_t)$	0.099***	0.193***	0.075**		
	(0.031)	(0.050)	(0.028)		
$\text{shock}_c \times \mathbb{1}(\text{Post}_t) \times \sigma(\$)_f^{pre}$				-0.716***	0.689
				(0.260)	(1.057)
$\text{shock}_c \times \sigma(\$)_f^{pre}$				1.455***	-8.280**
				(0.474)	(3.210)
Adj. R-Sq.	0.355	0.313	0.370	0.361	0.512
Obs.	50388	10262	40062	60943	44669
Macro Controls	✓	✓	✓	✓	
External Controls	✓	✓	✓	✓	
Firm×HS2×Time FE		✓	✓	✓	✓
Country×HS2 FE	✓	✓	✓		
Country×Time FE				✓	✓
Y-Mean	0.430	0.454	0.424	0.433	10.341
SD-Dollarization		0.044	0.073	0.098	0.101

Table 10: Firm-Level Real Effects

This table documents the response of the international trade to the cross-border dollar credit shock at the firm level. The dependent variable is natural logarithm of the firm-month imports denoted by $Log(\text{Imports})_{ft}$. Column 2 (3) uses a sub-sample of firms with below-median (above-median) invoicing flexibility measure of dollarization, where the firm's invoicing flexibility measure is defined in Equation 4, and denoted by $\sigma(\$)_f^{pre}$. Column 4 (5) uses a sub-sample of firms with above-median (below-median) share measure of dollarization, where firm's dollarization is measured as in Equation 4, and denoted by $\$_f^{pre}$. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock_f refers to the firms' exposure to the drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 9. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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

Table 11: Role of Global Banks for Trade Invoicing

This table documents that the response of dollar trade invoicing and trade to the dollar credit shock varies with the firm's exposure to foreign banks. The dependent variable in Columns 1-3 is the share of firm-country-product-month trade that is invoiced in dollars and denoted by Share of Dollar Invoiced Imports$_{fcpt}$. The dependent variable in Columns 4-6 is the dummy indicating the firm-country-product exit during the period t as defined in Equation 6, and denoted by $\mathbb{1}(Exit)_{fcpt}$. Column 1 and 4 (2 and 5) uses a sub-sample of firms with low (high) exposure to foreign banks, where we use the median exposure to split the firms into these two categories. The firm's exposure to foreign banks is denoted by FB_f^{pre} and is defined in equation 10. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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$_c$ × $\mathbb{1}$(Post$_t$)	-0.040	-0.069***		0.187***	-0.012	
	(0.024)	(0.017)		(0.054)	(0.046)	
shock$_c$ × $\mathbb{1}$(Post$_t$) × FB_f^{pre}			-0.103**			-0.271***
			(0.040)			(0.097)
$\mathbb{1}$(Post$_t$) × 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 × Hs2 × Time FE	✓	✓	✓	✓	✓	✓
Country × Hs2 FE	✓	✓		✓	✓	
Country × 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

Figures

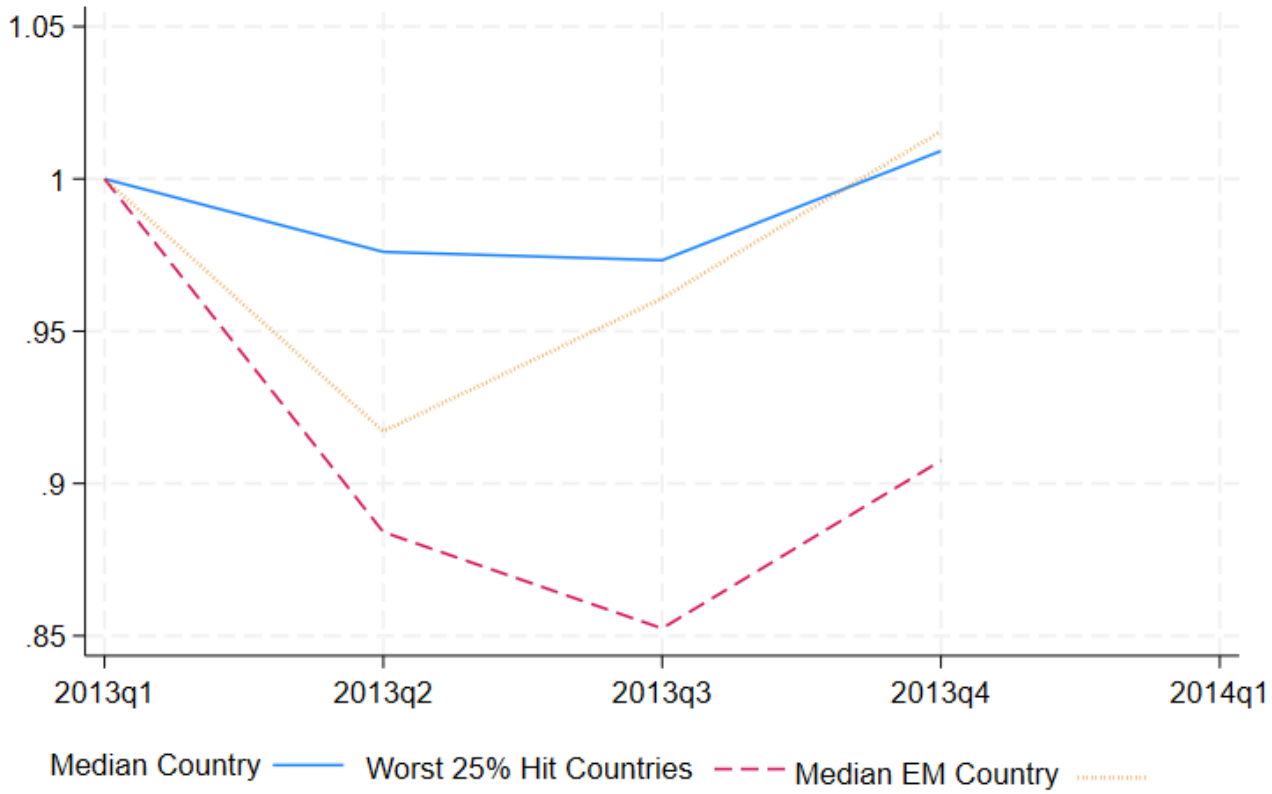


Figure 2: Cross-Border Dollar Credit (Relative to Q1-2013)

The figure plots the bank-to-bank cross-border dollar credit relative to the first quarter of 2013 (Q1-2013). The level for Q1-2013 is normalized to 1. For each quarter, we plot the trade-weighted summary statistic of the cross-border dollar credit, where we use 2012 import weights for India from the United Nations Comtrade database. The solid line plots the trade-weighted median, the dashed line plots the trade-weighted 25^{th} percentile of the relative dollar credit, and the dotted line plots the trade-weighted median of the relative dollar credit for the group of emerging economies.

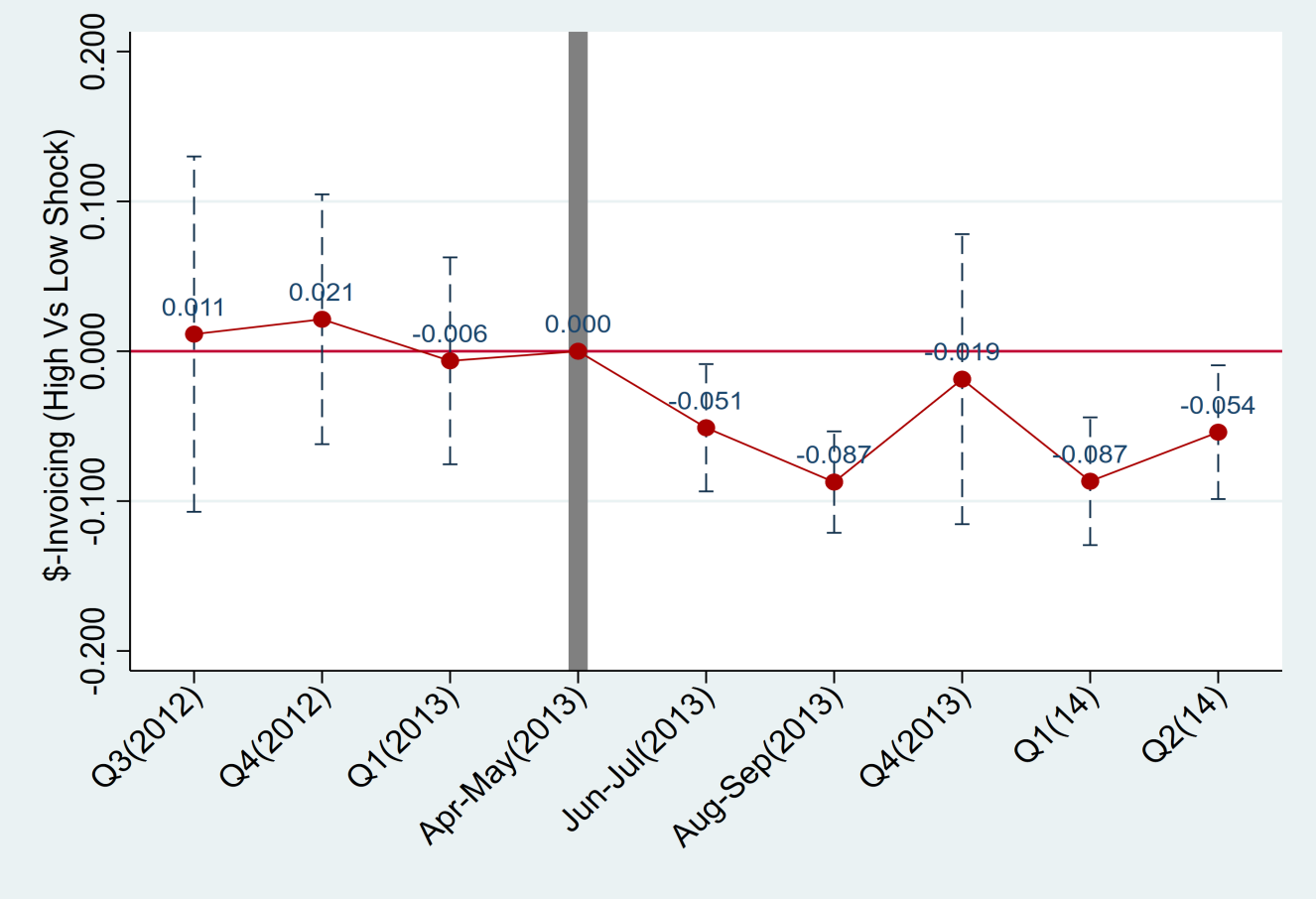


Figure 3: Dollar Credit Shock and Dollar Invoicing

This figure plots the estimates of the response of the share of dollar-invoiced trade to the cross-border dollar credit shock. We estimate the plotted coefficient (β_t) given in Equation 3. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The time periods are created by clubbing the adjacent months as highlighted on the x-axis. The plot shows the 95 percent confidence intervals around the point estimates of the β_t. Standard errors are clustered at the country and the product level. The shaded vertical line represents the period (April to May 2013), which serves as the base period, and other coefficients are relative to the coefficient in this time period.

A Appendix

A.1 Role of Foreign Banks: Invoicing

This section presents additional evidence supporting the role of global banks in alleviating dollar credit shocks by allowing firms to import in alternate currencies. Instead of using firm-level exposure to foreign banks, we simply split the panel into imports from exporting countries with and without a banking presence in India.

Table A2 reports the country characteristics of the countries with and without banking presence in India at the end of 2012. Both sets of countries experienced similar valuation losses on currencies and tightening in the financial system, as captured by the spike in the interbank lending rates. However, countries with a banking presence in India, relative to countries without any banking presence, experienced slightly smaller dollar credit shock on average (6.82% relative to 10.41%) and are substantially richer, with median GDP Per Capita almost six times larger at the end of 2012 ($42,372 relative to $7,454, where both numbers are measured in 2012 dollars). In our estimation, we use propensity-matching techniques to tackle the differences in ex-ante income level and severity of dollar credit shock across two sets of countries.

A3 documents the invoicing responses to the dollar credit shock for the imports coming from these two sets of exporting countries. Columns 1 and 2 document that the share of dollar invoicing reduces much more strongly (-12.7 pp. relative to -6.8 pp.) for the firm-country-product-month imports when these imports come from the countries having a banking presence in India.

In columns 3-4, we tackle the challenge that the two sets of countries (with and without banking presence in India) differ in terms of ex-ante per capita income levels and, to some extent, in terms of the intensity of the dollar credit shock faced by these countries. We predict the banking presence of the exporting country in India using a logit model using these two characteristics, namely, dollar credit shock and per capita income level. The pseudo-R^2 of this first stage is 18.23%, with income level positively and significantly predicting a banking presence of foreign banks in India. Having estimated the propensity score (p.score), we estimate a weighted regression with the weights of $\frac{1}{p.score}$ for observations where the exporting country has a banking presence in India and $\frac{1}{1-p.score}$ otherwise, as suggested in Imbens & Wooldridge (2009). Consistent with columns 1-2, we continue to find that the firms are able to substitute dollar invoicing with alternate currencies with almost double the intensity while importing the products from the countries having a banking presence in India.

A.2 Role of Foreign Banks: Real Effects

In columns 3-4 of table A4, we split the sample into two sets of countries with and without a banking presence in India. We consider the interaction of Post Dummy, dollar credit shock, and the firm's share of dollarization and perform a within-country test. Column 3 shows that for a given country without a banking presence in India, more dollarized firms experience a bigger rise in the exit probability from the pre- to post-taper period in response to a dollar credit shock. However, column 4 highlights global banks' role in mitigating the impact of trade credit shocks, even for dollarized firms. In particular, the coefficient on the triple interaction is economically small and statistically insignificant, which shows that more dollarized firms do not face more severe trade outcomes in response to the dollar credit shocks when exporting country banks are present in proximity.

Table A1: Variation in Measures of Dollarization

The table estimates the mean of the measures of dollarization for the pre-period spanning nine months prior to May 2013 in the cross-section of the country-product pairs. Columns 1-3 estimate the mean of share of dollar-invoiced country-product imports in the pre-period denoted by $\$_{cp}^{pre}$, and columns 4-6 estimate the mean of the flexibility in dollar invoicing for a country-product pair in the pre-period, denoted by $\sigma(\$^{pre})_{cp}$. Columns 1 and 4 include country fixed effects, while columns 2 and 5 include product fixed effects. Columns 3 and 6 include both country and product fixed effects. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

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		✓	✓		✓	✓

Table A2: Summary of Country Characteristics Sorted on Presence of Foreign Bank Affiliate in India

This table documents summary statistics of important country characteristics for a group of exporting countries with and without a banking presence in India at the end of the year 2012. Dollar credit shock refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. GDP Per Capita is measured at the end of 2012 in current dollars. Foreign investments refer to the foreign portfolio investments in debt and equity instruments at the end of 2012, and these are scaled by the 2012 GDP measured in current dollars. Currency Depreciation During Taper measures the depreciation of the country's local currency against the dollar between the end of April 2013 and the end of June 2013. The inter-bank rate refers to the average rate at which local banks report having lent to the other banks in the overnight repo market of each country, and we measure the rise in inter-bank rate between the end of April 2013 and the end of June 2013.

Variable	Mean	SD	P25	P50	P75	N
Dollar Credit Shock (%)						
Foreign Bank =0	-4.218	32.161	-14.286	-3.619	10.414	87
Foreign Bank =1	-1.881	17.017	-9.777	-1.646	6.821	23
GDP Per Capita (US $)						
Foreign Bank =0	16.406	22.992	2.285	7.454	19.881	81
Foreign Bank =1	34.411	22.977	9.416	42.372	50.176	23
% Foreign Investments / GDP						
Foreign Bank =0	0.824	1.615	0.007	0.050	0.724	14
Foreign Bank =1	0.072	6.849	-0.283	-0.016	0.125	14
Currency Depreciation During Taper (%)						
Foreign Bank =0	2.770	5.485	0.197	1.202	3.342	78
Foreign Bank =1	2.628	3.464	0.003	1.689	3.719	23
Rise in Interbank Rate During Taper (%)						
Foreign Bank =0	6.627	35.534	-7.880	0.000	4.762	36
Foreign Bank =1	0.019	5.091	-0.917	0.000	2.000	18

Table A3: Presence of Exporting Country Bank in India and Dollar Invoicing

This table documents that the response of dollar trade invoicing to the dollar credit shock varies with the exporting country's banking presence in India. The dependent variable in all the columns is the share of firm-country-product-month trade that is invoiced in dollars and denoted by Share of Dollar Invoiced Imports$_{fcpt}$. Column 1 (2) uses a sub-sample of exporting countries with (without) banking presence in India. In columns 3 and 4, observations are weighted by a function of Propensity Matching Score (PMS), where PMS is computed using a logit model estimated on the cross-section of countries that use logarithm of GDP per capita and cross-border dollar credit shock as the characteristics to predict banking presence in India. $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock$_c$ refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

Dependent Var.	Share of Dollar Invoiced Imports$_{fcpt}$			
	Exporting Country Bank Present in India		Exporting Country Bank Present in India	
	No	Yes	No	Yes
Weights			$\frac{1}{PMS}$	$\frac{1}{(1-PMS)}$
	(1)	(2)	(3)	(4)
shock$_c$ × $\mathbb{1}(\text{Post}_t)$	-0.068**	-0.127***	-0.066*	-0.138***
	(0.033)	(0.030)	(0.034)	(0.029)
Adj. R-Sq.	0.681	0.617	0.690	0.633
Obs.	15630	32595	15630	32595
Macro Controls	✓	✓	✓	✓
External Controls	✓	✓	✓	✓
Firm × Hs2 × Time FE	✓	✓	✓	✓
Country × Hs2 FE	✓	✓	✓	✓
Y-Mean	0.617	0.562	0.617	0.562
SD-Shock	0.226	0.133	0.226	0.133

Table A4: Foreign Banking Presence in India and Real Effects

This table documents that the response of trade to the dollar credit shock varies depending upon whether the exporting country has banking units present in India. The dependent variable in all the columns is the dummy indicating the firm-country-product exit during the period t as defined in Equation 6, and denoted by $\mathbb{1}(Exit)_{fcpt}$. Columns 1 and 3 (2 and 4) use a sub-sample of exporting countries with (without) banking presence in India $\mathbb{1}(\text{Post}_t)$ is a dummy variable assuming a value of 1 for the period after May 2013 and 0 otherwise. shock_c refers to the country's drop in the cross-border dollar credit between the first and the second quarter of 2013 and is defined in Equation 1. The fixed effects are mentioned at the bottom of the table. Standard errors are clustered at the country and the product level. Superscripts ***, ** ,* indicate significance at the 1%, 5%, and 10% level.

Dependent Var.	$\mathbb{1}(Exit_{fcpt})$			
	Exporting Country's Bank Presence in India			
	No	Yes	No	Yes
	(1)	(2)	(3)	(4)
$\text{shock}_c \times \mathbb{1}(\text{Post}_t)$	0.087**	0.093		
	(0.041)	(0.053)		
$\text{shock}_c \times \mathbb{1}(\text{Post}_t) \times \$_f^{pre}$			0.399**	0.100
			(0.172)	(0.267)
$\text{shock}_c \times \$_f^{pre}$			-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