The Dominant Currency Financing Channel of External Adjustment *

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Abstract

We propose a new channel through which exchange rates affect trade. Exploiting the heterogeneity in firms' foreign currency debt maturity structure around a large depreciation in Colombia, we show that debt revaluation compresses imports due to higher delinquencies and interest rates, while exports are unaffected. Natural and financial hedging successfully mute the import contraction. A costly state verification model with dominant currency financing (DCF) and exporting rationalizes these findings. Quantitatively, DCF explains a significant part of external adjustment in addition to the expenditure switching channel. Pricing exports in the dominant vs. producer currency mutes the effect of DCF on trade.

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1 Introduction

The effect of exchange rate movements on trade is one of the most widely discussed topics in international economics. In traditional models, a depreciation of the domestic currency causes firms' exports to expand and imports to shrink due to changes in relative prices (Mundell, 1963; Fleming, 1962; Obstfeld and Rogoff, 1995). Standard open macroeconomy models, however, do not take into account that a depreciation of the domestic currency reduces the net worth of those firms with debt denominated in a foreign currency, i.e. the US dollar, thus affecting trade through a different channel. For firms that borrow in dollars, a depreciation of the domestic currency increases their debt burden and cost of financing in the domestic currency, which potentially induces a compression of both exports and imports.

In this paper, we document the existence of a financing channel through which exchange rate fluctuations impact trade flows, an alternative mechanism that goes beyond the well-known expenditure switching channel of external adjustment that operates through changes in relative prices. Specifically, we show that when firms not only price their trade in the dominant currency but also finance their operations in that same currency—i.e., dominant currency financing (DCF)—the financial channel generates an increase in the trade balance that cannot be attributed to the expenditure switching mechanism when the exchange rate depreciates.

Empirically, we show that while a depreciation-driven reduction in net worth significantly and persistently reduces imports for non-exporters, the revaluation of debt does not affect the imports of firms that also export. This result suggests that exports can provide a natural hedge during a depreciation period when they are priced in the dominant currency (Gopinath and Itskhoki, 2022).[1] Imports of firms with foreign currency asset holdings and those of firms that use foreign exchange derivative contracts are also unaffected by the depreciation-driven reduction in net worth, as the firms are financially hedged. Exports of more-exposed firms do not behave differently from those of non-exposed firms during or after the depreciation, reinforcing the hypothesis that exporters are hedged through their dominant currency revenues and do not reduce exports due to production constraints. In sum, the DCF channel generates an increase in the trade balance in response to a depreciation, entirely driven by an import reduction of non-exporting firms.

Although sticky prices in either the producer currency or the dominant currency could explain the improvement in the trade balance after a depreciation, the insensitivity of exports would only be consistent with a model in which firms set prices in the dominant currency.[2] However, even dollar pricing

[1] A depreciation increases the marginal cost of importers, but hedging occurs when firms price their exports in dollars.

[2] The adjustment process of traded quantities depends on the currency in which prices are set. Under producer currency pricing (PCP), a nominal depreciation of the domestic currency (all else being equal) increases the domestic price of imports and reduces the price of exports in the destination markets. Hence, it leads to an improvement in the trade balance both by increasing international demand for domestic goods and decreasing domestic demand for imported goods. Under dominant currency pricing (DCP), firms set export prices in a dominant currency regardless of the origin or destination of trade. Thus,

cannot single-handedly explain the observed behavior of imports, as the DCF channel does not lead to a decline in imports for all firms—only for non-exporting firms.

To shed light on the DCF channel, we construct a comprehensive dataset that merges highly disaggregated transaction-level trade data, loan-level data, firm-level balance sheet, and financial hedging data from Colombia, a country where trade is almost exclusively priced in US dollars. We use our unique dataset to study the trade response to a sharp and unexpected depreciation of the Colombian peso and its differential effects on exports and imports depending on firms' financial heterogeneity in terms of foreign currency borrowing.[3] We use a novel identification strategy that exploits differences in the maturity composition of firms' dominant currency debt to study the effects of dollar borrowing on external adjustment. The detailed loan-level data allows us to compute the increase in debt repayments due to the interaction between exchange rate movements and the maturity structure. Firms that happened to have dollar-denominated debt maturing at the height of the depreciation faced a large increase in their debt repayments. In contrast, for firms whose dollar debt matured predominantly just before the depreciation, their debt repayments remained almost unaffected. Because the maturity structure can be seen as exogenous to exchange rate movements, the effect of dominant currency financing on trade can likely be interpreted as causal.

We construct several measures of firm-level exposure to the exchange rate shock through their indebtedness in dollars, and we find that an increase in foreign currency debt is generally associated with an additional decrease in imports after the depreciation. First, we measure overall exposure with a firm's foreign leverage, given by the ratio of debt denominated in foreign currency to total assets. We estimate that a one standard deviation increase in the ratio is associated with an additional 10.6% reduction in imports after the depreciation. Next, we exploit the differences in the maturity structure of foreign currency debt to separate the negative effects of a liquidity shock from a wealth (net worth) shock. The liquidity shock arises when the depreciation suddenly increases a firm's cash needs due to higher than anticipated debt service payments for loans maturing in the short term. But the depreciation has additional negative consequences, even for firms with liabilities that do not mature immediately, due to the negative effect of debt revaluation on a firm's net worth. The wealth shock combines the liquidity and the debt-revaluation shocks. Consistent with our previous findings, we estimate that a one standard deviation larger liquidity shock leads to a 4.7% larger decline in imports, and a one standard deviation larger wealth shock is associated with a 5.9% larger decline in imports. Decomposing the wealth shock into the liquidity shock and the debt revaluation of loans maturing once the exchange rate stabilized, we

a depreciation increases the domestic price of imports but leaves the price of domestic exports unchanged in the destination markets. As a result, imports contract while exports remain relatively stable, and the expenditure switching effect is milder than under PCP.

[3] As foreign currency debt is also almost exclusively denominated in dollars, we use the words "dominant currency", "foreign currency", and "dollar" interchangeably.

show that the liquidity shock explains 80% of the wealth shock, while the debt revaluation only accounts for 20%.

The peso depreciation of 2014 and 2015 provides an ideal laboratory to study how differences in dollar debt affect imports and exports in response to a depreciation when trade and debt are denominated in the same (dominant) currency. The depreciation can be explained mainly by a large drop in oil prices, and therefore this shock was an event exogenous to non-commodity exporting firms, which are the focus of our analysis. Moreover, financial regulation limits banks' exposure to exchange rate movements and, hence, it is unlikely that the depreciation directly caused a credit contraction affecting the real sector. This mitigates the potential concern that firms with more foreign currency borrowing were differentially affected through credit supply contractions unrelated to their foreign currency borrowing. It is even less likely that other factors affected firms that happened to have foreign currency debt maturing when oil prices plummeted due to the predetermined maturity structure of their debt. Accordingly, our results are not affected by controlling for firm-specific bank credit supply shocks unrelated to their foreign currency borrowing. All factors considered, this event allows us to identify our proposed adjustment mechanism separately from the aggregate effect of currency crises affecting all firms.

We perform a battery of robustness tests to further ensure our results are indeed driven by the increase in the debt induced by the depreciation and not more generally by the macroeconomic environment. We conduct a placebo test where we replace the foreign currency with domestic currency debt measures, and we find that financial heterogeneity (in terms of domestic debt) did not affect the response of imports to the depreciation. We also control for additional firm characteristics other than credit supply that can affect firm-level trade flows, such as age, size, and profitability, and our estimates of the negative effect of DCF on imports are not affected. Our results are also not dependent on the large depreciation of 2014. We corroborate our main results by estimating panel regressions of imports and exports on the interaction between foreign currency leverage and the change in the exchange rate over a longer time window. As in our event-study approach, we find that non-exporting firms with higher foreign currency leverage shrink their imports after a depreciation of the peso relative to the dollar, while the interaction between foreign currency leverage and the exchange rate is not a determinant of the imports of firms that both import and export.

To quantify the macroeconomic magnitude of the effects, we conduct a simple back-of-the-envelope calculation and estimate the share of the total decline in imports attributed to foreign currency borrowing. Colombia's imports dropped sharply by $6 billion around the depreciation of the peso. We multiply the coefficient of our preferred specification with each firm's actual exposure and aggregate up. Our estimates imply that the DCF channel of external adjustment explains around 17%, or $1 billion, of the drop in imports.[4] Overall, these results imply that DCF has a contractionary impact on total trade, but because the effect only operates on imports and not on exports, the effect on the trade *balance* is expansionary.

We analyze the underlying financial frictions under a microscope by utilizing a broad range of information from our loan-level data to gain a deeper understanding of the mechanism through which the debt revaluation operates and compresses imports. One way foreign currency borrowing transmits through financial frictions to imports is by increasing default risk, and interest rates rise when the currency depreciates. The credit registry allows us to exploit variation in interest rates and delinquencies across firms (with differential degree of foreign currency financing) for the same bank at a given point in time through the inclusion of bank × time fixed effects. This estimation procedure controls for observed and unobserved time-varying characteristics of the lending bank, such as bank-specific time-varying credit supply. We find that both delinquencies and interest rates increase for firms that faced a larger liquidity shock due to the depreciation. Mirroring the results for imports, the increase in delinquencies and interest rates driven by the liquidity shock is also found only for non-exporting firms, while exporting firms are unaffected by their foreign currency borrowing. One plausible mechanism through which financial frictions affect imports is that non-exporting firms' default risk increases, which induces banks to charge a higher credit spread, preventing those firms from financing their imports. In contrast, exporting firms are naturally hedged, as their offsetting positive revenue shock from exporting due to the depreciation reduces their default probability, preventing banks from raising their interest rates.

These empirical findings can be rationalized through a simple theoretical framework with DCF under DCP. To disentangle the financial channel from the expenditure switching channel, we build a parsimonious model with foreign currency financing and financial frictions in the form of costly state verification. Borrowing in foreign currency increases the probability of default when the currency depreciates and creates a wedge between the risk-free and the firm-level interest rate, and higher borrowing costs induce a compression of imports. Exporters face a positive profitability shock that lowers their probability of default after a depreciation. This natural hedging mechanism shields exporters from higher interest rates and reduces import compression.

We next calibrate our partial-equilibrium model to conduct several counterfactual exercises. The main parameters of the model are calibrated based on existing literature, while the foreign currency leverage is measured in the data. The calibrated model allows us to study the interaction between pricing and financing currencies and therefore isolate the role of DCF on external adjustment.

We first consider firms that do not export. A depreciation leads to a reduction in their net worth, which in turn increases their probability of default and the cost of financing, inducing a contraction in

[4]This number should be taken with caution as it ignores general equilibrium effects. However, we believe that this counterfactual exercise serves as a useful lower bound benchmark to understand the macroeconomic relevance of our channel as general equilibrium effects would likely strengthen the impact.

imports. For exporting firms, a depreciation leads to an additional stream of export revenues, which relaxes the effects of the financial constraint. While in the baseline version of the model export prices are flexible, we also consider the case when exports are priced in dominant currency, consistent with Colombian exports being almost exclusively priced in US dollars. The model also allows us to study a counterfactual scenario under which Colombian exporters price their exports in producer currency (i.e., in pesos) instead. In a calibrated version of the model, DCP exporters face a higher profitability shock than PCP exporters; this relaxes the financing constraint for the DCP firms and makes them nonresponsive to changes in net worth. In contrast, PCP firms face a larger adverse net worth shock and therefore reduce their imports more. Hence, if Colombian firms were pricing their exports in pesos, exporters would unlikely be fully hedged against a depreciation-driven reduction in net worth, and imports would have declined by even more. In sum, exporting and financing in the same dominant currency is less contractionary for trade than foreign currency borrowing is under PCP.

Next, as in the empirical exercise, we compare trade dynamics in a scenario in which all foreign currency liabilities are converted to pesos before the depreciation in the model to quantify the contribution of the DCF channel relative to the pricing channel. We find that if Colombian firms would not have borrowed in dollars before the depreciation, the reduction in imports would have been 13.7% lower, similar to the 17% in the data.

Several general implications can be drawn from our analysis. First, pricing exports in a foreign, dominant currency naturally hedges exporting firms from the negative balance sheet effects that can arise after a depreciation for firms with liabilities in foreign currency; in contrast, under PCP, where exports are priced in domestic currency and imports are priced and financed in foreign currency, exporters would not be hedged against a liquidity shock when the domestic currency depreciates. Second, the composition of non-exporting importers relative to exporting importers is crucial for understanding the magnitude of the effect of DCF on external adjustment. In countries where the vast majority of firms are importers that do not export (e.g., countries with large wholesale or service sectors), the effect of DCF is likely to be larger than for countries with large manufacturing sectors that both import and export. Third, in countries where firms have substantial foreign currency asset holdings or where foreign currency derivative markets are well developed, the effect of foreign currency borrowing on imports during a depreciation is likely to be more muted. While this paper focuses on one specific country, Colombia can be seen as a typical emerging market with trade priced predominantly in a dominant currency and where the external liabilities of the corporate sector remain largely denominated in the same foreign currency.

Related Literature

Our paper relates to the literature on the effect of exchange rate movements on the external adjustment. A broader macro literature analyzes the external adjustment effects through various channels (Lane and Milesi-Ferretti, 2012; Lane and Shambaugh, 2010; Gourinchas and Rey, 2007). We contribute more specifically to the growing literature that analyzes external adjustment when trade is denominated in a few dominant currencies. The increasingly available granular trade data shows that trade is mostly invoiced in a few currencies, with the US dollar playing a dominant role among them (Goldberg and Tille, 2008; Gopinath, 2015; Boz et al., 2022). In this context, Gopinath et al. (2020) propose the dominant currency paradigm (DCP) where firms set export prices in a dominant currency, regardless of the origin or destination of trade (see Gopinath and Itskhoki, 2022, for a review).

The dominant role of the dollar in international trade pricing generates growing complementarities with firms' financing decisions. As demonstrated by Amiti et al. (2022), a firm's optimal currency choice can depend on its idiosyncratic fixed costs, including its financing options. In other words, the balance sheet composition of a firm can determine the currency of invoicing, as this choice can hedge or relax a firm's financing constraints. These complementarities between financing and invoicing in the same currency are also analyzed by Gourinchas (2021), Gopinath and Stein (2021), Bahaj and Reis (2020), and Adler et al. (2020). More generally, Doepke and Schneider (2017) show that agents tend to coordinate on a dominant unit of account to hedge against price fluctuations. We contribute to this literature by studying the effects of these complementarities on external adjustment. We follow Casas et al. (2016) and use Colombia as a laboratory to study DCF under DCP. Trade in Colombia is almost exclusively invoiced in dollars and therefore can be seen as a perfect laboratory to study the effects of currency fluctuations under DCF. We empirically show that when firms not only price imports and exports in dollars but also borrow in foreign currency, the contractionary impact of exchange rate movements on imports is even stronger, while exports are not affected. Adding DCF to DCP therefore amplifies the effect of the depreciation on the trade balance.

We also contribute to the large empirical literature on the effects of foreign currency borrowing by individual agents on real outcomes. Several studies have found negative effects of foreign currency borrowing of firms on investment (Aguiar, 2005; Kalemli-Ozcan et al., 2016) or sales (Alfaro et al., 2019) when the domestic currency depreciates. Desai et al. (2008) find that the effects of a depreciation on sales and investment are heterogeneous across firms. As Kalemli-Ozcan et al. (2016), they find that the ability to overcome financial constraints (as affiliates of multinationals can) plays a decisive role in the firms' differential response. Other studies have not been able to confirm these results and find no effect on investment (Bleakley and Cowan, 2008). Verner and Gyongyosi (2018) show that exposure to *household* foreign currency debt has negative consequences on demand after a depreciation, and that the impact of debt revaluation is particularly severe when households (not firms) hold most foreign currency debt. Moreover, firms' individual financing decisions can have broader macroeconomic implications. Du and Schreger (2022) show that higher reliance on foreign currency debt by the corporate sector is associated with higher sovereign default risk, and Korinek (2011) shows that it makes economies prone to severe financial crises. In contrast, Christiano et al. (2021) argue that dollarization can help risk sharing and is not associated with larger negative effects during banking crises. While all of these papers study the real effects of foreign currency borrowing on several outcomes, evidence of the effects on external adjustment is scant.[5]

Our paper is also related to the literature on the trade effects of financial shocks. Amiti and Weinstein (2011) and Niepmann and Schmidt-Eisenlohr (2017) provide evidence in favor of contractionary export effects of trade finance shocks. Paravisini et al. (2014) and Bruno and Shin (2019) show that firms' exposed to bank credit shocks reduce their exports. We differ from these papers in two dimensions. First, all these papers focus solely on the export response to a tightening in financial constraints while we study both imports and exports. As pointed out by Blaum (2019), studying the response of imports and exports jointly is crucial for understanding the external adjustment process of a country in response to currency movements. Second, none of these papers study shocks affecting firms directly through their borrowing in foreign currency. Our results on the muted effect on exports suggest that currency-related shocks that increase firms' debt through a domestic currency depreciation are very different from shocks that propagate through the banking system. Specifically, this finding implies that exporting firms are hedged against the DCF channel and sheds further light on the interdependence between trade and finance.

From a theoretical perspective, our paper builds on the literature by highlighting the complementarity between currency choice for financing and trade pricing, as a common currency can hedge a firm from relative price fluctuations and shape trade flows accordingly. Under the Modigliani-Miller theorem, a firm's balance sheet is irrelevant for firm allocations, such as investment, employment, sales, and profits. In particular, firm hedging is irrelevant for firm pricing and, therefore, for currency choice and pass-through as well. Our model is based on the Townsend costly state verification mechanism (Townsend, 1979). This mechanism has been used in the macro-economic literature to study the effects of financial constraints (see, e.g., Bernanke et al., 1999; Céspedes et al., 2004; Brunnermeier and Sannikov, 2014; Christiano et al., 2014). In line with this literature, we introduce several extensions to depart from the Modigliani-Miller benchmark. Specifically, we make cash flows observable at no cost to the company, while outsiders have to pay a cost.[6] The presence of verification costs and uncertainty about future cash

[5]Using aggregate country-level data, Berman and Berthou (2009) find that, in the presence of financial market imperfections (including firms borrowing in foreign currency), exports increase less (or even decrease) when the domestic currency depreciates.

[6]Froot et al. (1993) adopt a variant of the Townsend (1979) approach to show that if external sources of finance are costlier to corporations than internally generated funds, then there will typically be a benefit to hedging.

flows makes creditor demand higher interest payments from borrowers who face a higher probability of default. The interest rate is inversely related to firms' net worth.

Céspedes et al. (2004), Akinci and Queralto (2018) and Kohn et al. (2020) also study the implications of foreign currency borrowing. Akinci and Queralto (2018) show that foreign currency borrowing causes imports to drop more but exports to drop less in response to a tightening of US monetary policy. Kohn et al. (2020) more explicitly model a large devaluation and confirm that financial frictions do not contribute largely to export dynamics. The model closest to ours is that of Céspedes et al. (2004), who also use a costly state verification model in which the exchange rate devaluation negatively affects firms' net worth through their foreign currency borrowing, increasing their risk premium and interest rate. However, in our model, we allow firms to export, which partially offsets the negative effects of the debt revaluation, as it increases revenues when the currency depreciates. Moreover, we compare the implications of foreign currency borrowing between PCP and DCP and show that DCP mutes the effect of DCF on trade flows in our calibration.

The rest of the paper is structured as follows. In section 2, we describe the data and the construction of our foreign currency exposure variables. In section 3, we discuss the empirical specification. In section 4, we present the empirical results. In section 5, we present a parsimonious model with financial frictions and DCF to illustrate the mechanism and the calibration results. In section 6 we conclude.

2 Data

2.1 Sources

In order to document the DCF channel and estimate its effects on trade flows, we construct a comprehensive dataset that merges detailed information on loans, trade flows, and operational variables from balance sheets.[7] We combine information from several sources using firms' tax identification, and the resulting dataset includes firms accounting for over 90% of trade value. For our empirical analysis, we exclude the commodity-producing firms, as they could directly be affected by the oil price shock, but the results are unaffected by this choice.

Commercial loans granted to firms by Colombian banks and other financial institutions come from the credit registry of the *Superintendecia Financiera*, the agency in charge of supervising the financial sector. Every quarter, banks domiciled in Colombia report the outstanding balance, effective interest rate, and maturity date for each loan they issue. Importantly, the amounts are allocated between loans in foreign and domestic currencies. Using firms' tax ID, we construct the amount of outstanding loans in foreign and domestic currencies for each firm and quarter. Our dataset includes information for the

[7] We had access to confidential data while Casas worked at Banco de la República.

period between 2005 and 2017.

The trade data come from *DANE*, the Colombian statistical agency. This dataset covers the universe of foreign trade transactions and contains information on imports and exports at a very disaggregated level (by firm, country of origin/destination, product, and month of the year). We use publicly available data for the 2008-2018 period to construct total imports and exports for each firm by quarter.

We obtain balance sheet data from the Bureau van Dijk Orbis global database. Originally, the data are collected by the Colombian chambers of commerce and have standard variables from the balance sheets and income statements of firms (e.g., assets, liabilities, and sales). The data cover the 2004-2018 period. We complement these data with information on firms' holdings of foreign assets and foreign exchange derivative contracts from Banco de la República, the Colombian central bank.

The richness of our combined dataset is ideal for separately identifying the different mechanisms of external adjustment after currency movements. While the effects of price rigidities in the producer currency or a dominant currency or those of tighter financial constraints are observationally equivalent when looking at aggregate macro data, the cross-firm heterogeneity in financing decisions and trade responses observed in our granular data allows us to disentangle the effects of changes in relative prices from the effects of the financial channel.

2.2 Measures of Exposure and Shocks

In this section, we describe the measures of foreign currency exposure that we construct by merging the balance sheet and loan data. As foreign currency liabilities are the main driver of foreign currency mismatches on Colombian firms' balance sheets, and as bank loans comprise most of these liabilities, we focus on foreign currency bank loans to construct our measures of exposure.[8] The exposure measures described in this section are then used in the regression analysis outlined in subsection 3.1.

We construct several measures of firm-level exposure to the exchange rate shock through their indebtedness in dollars. First, we construct a measure of foreign currency leverage, which is given by total loans in foreign currency divided by firm-level assets:

$$FCL_{ft} = \frac{\sum_{i \in \Lambda^F_{ft}} L_i}{A_{ft}}, \tag{1}$$

[8] In unreported results we look at debt with foreign suppliers as an alternative measure of foreign currency liabilities. The estimation results are qualitatively equivalent to the ones obtained using the value of outstanding loans in foreign currency. We take this as suggestive evidence that the financial channel operates regardless of the type of debt. We base our analysis on the loans data for three reasons: (i) Bank loans comprise a significant fraction of firms' liabilities; (ii) the credit registry dataset includes information on the universe of loans, while we only have information on debt with suppliers for a selected subset of large firms (those subject to surveillance by the *Superintendencia de Sociedades*); and (iii) the data on loans allow us to exploit the information on their maturity date, an important feature for our identification strategy that we describe in section 3.

where Λ^F_{ft} is the set of firm f's loans with Colombian banks denominated in foreign currency in period t, L_i is the outstanding amount of each loan i, and A_{ft} is the book value of assets of firm f at time t. This measure reflects the importance of foreign currency debt relative to total assets of the firm.

We complement the foreign currency leverage with two additional measures that exploit the large heterogeneity in the maturity dates observed in the data. Firms having different maturity dates face different shocks due to the difference in the peso exchange rate between those dates. We can take advantage of this information by studying whether firms with debt that is disproportionately due during the depreciation—and therefore are affected by a liquidity shock from higher-than-anticipated debt service payments in the near term—were relatively more affected than firms with a different debt maturity structure. To draw the distinction between the measures of liquidity vis-à-vis the wealth shock and to take into account the depreciation of Colombian currency over time, we use information about the maturity date of each loan reported by Colombian banks and construct the following variables:

$$LS_{ft,t'} = \frac{\sum_{i\in\Lambda^F_{f,t}} 1_{T(i)\le t'} L_i \Delta e_{t,T(i)}}{A_{ft}} \tag{2}$$

$$WS_{ft,t'} = LS_{ft,t'} + \frac{\sum_{i\in\Lambda^F_{f,t}} 1_{T(i)> t'} L_i \Delta e_{t,t'}}{A_{ft}}, \tag{3}$$

where $T(i)$ is the maturity day of loan i, $\Delta e_{t,T(i)}$ is the depreciation of the peso between t and $T(i)$, $1_{T(i)\le t'}$ is an indicator that is equal to 1 if the loan is maturing before t' and 0 otherwise, and $1_{T(i)>t'}$ is an indicator that is equal to 1 if the loan matures after t' and 0 otherwise. [9] The first variable, LS ("liquidity shock"), measures by how much the value of the debt repayments as of t increases due to depreciation between times t and t', given the actual depreciation as of their maturity date that falls between t and t'. The second measure, WS ("wealth shock"), adds the increase in debt that matures past t' using the exchange rate in t'. In our baseline empirical strategy, we set t to 2014:Q1, as the depreciation started in 2014:Q3 (see Figure A1). This allows us to capture firms' debt that matures right before and right after the depreciation. t' is set to 2015:Q3, the height of the sudden depreciation.[10]

2.3 Descriptive Statistics and Economic Landscape

The Colombian peso officially switched to a floating status in 1999. Since then, it has been considered a commodity currency, as fluctuations in the peso are strongly correlated with fluctuations in commodity prices (particularly oil prices). Moreover, commodity price fluctuations are exogenous to the economy; while mining products (mainly oil, coal and nickel alloys) represent a large share of total exports, output is small relative to world markets. For example, in 2014 Colombia's oil production was 1.1% of world oil

[9] Payments need to be converted to pesos using the exchange rate of the payment date (Banco de la Republica, 2000) .

[10] Results are not sensitive to the choice of t and t'. Figure A2 shows the maturity distribution of loans.

production, but oil and oil products accounted for a large share of Colombian exports (mainly driven by a handful of firms). Hence, the exchange rate depends heavily on oil prices, but Colombia acts as a price-taker in the world oil market.

In 2014, the price of oil plummeted. The spot price of West Texas Intermediate (WTI) oil almost halved from over $100 per barrel in July 2014, to $53.45 by the end of the year and reached its lowest value, less than $30 per barrel, in January and February 2016. The peso-dollar exchange rate increased from roughly 1,850 at the end of July 2014 to 3,435 by mid-February 2016. Importantly, the peso depreciation was not the result of a macroeconomic crisis. According to the World Bank's World Development Indicators data, annual GDP growth in 2014, 2015, and 2016 was 4.7%, 3%, and 2.1%, respectively—lower than growth rates during the boom in commodity prices but well above the region's average; unemployment reached its 10-year minimum; and the financial system remained healthy.[11]

The depreciation of the exchange rate coincided with a drop in both exports and imports of Colombian firms. Between 2012 and 2014, imports and exports were remarkably stable. Colombian quarterly exports and imports equaled roughly $14 billion, around 39% of GDP. With the depreciation, trade dropped. While imports dropped from $16 billion to around $10 billion between 2014 and 2018, exports dropped from $14 billion to $6 billion in 2016 but then recovered back to $10 billion in 2018.[12]

Table A1 shows summary statistics for firms in terms of their assets, exports, and imports.[13] We split between non-exporters, exporters and all firms. There are 14,618 firms in our sample that import but do not export, and 7,232 that both export and import. The average size of a firm in our dataset is $12 million. Average firm-level exports before the depreciation are $127,000 but drop to $108,000 after the depreciation. Firm-level imports drop from $132,000 to $118,000.

The measures of foreign currency exposure due to indebtedness in dollars are computed as of the end of the first quarter of 2014, as described in subsection 2.2. Table A2 shows that foreign currency leverage is 4.4% for the average firm, ranging from 0.2% to 11.6% between the 10th and 90th percentiles. The average liquidity shock is close to zero, as there are many firms that have liabilities that mature before the depreciation started. A firm at the 10th percentile of the liquidity shock distribution even faces a negative liquidity shock. A negative shock reflects a decrease in the debt repayments due to the small appreciation before the large depreciation. A firm at the 90th percentile of the liquidity shock distribution sees an increase in their debt repayments purely due to the depreciation that is 0.6% of total assets.

[11]See Figure A3 for the evolution of the oil price and the peso. See Figure A4 for the evolution of the oil price and quarterly GDP growth.

[12]Notably, total exports also decreased if measured in pesos or in volumes (net kilograms). However, exports excluding oil and oil products were more stable, decreasing from $6.5 billion in 2014 to $5.3 billion in 2016 and recovering to $6.3 billion in 2018. Their value in pesos increased annually throughout the period.

[13]Because import regressions are the main focus of our empirical exercise, we focus only on firms in our sample that ever imported.

The average wealth shock, which equals the liquidity shock plus the debt revaluation after 2015:Q3, equals 0.8% of total assets. Even for the wealth shock, we see some firms with negative values—these firms benefited from the exchange rate movements before the depreciation started. For comparison purposes, all measures of foreign currency exposure entering the regressions were standardized to have a mean of zero and have a unit standard deviation.

3 Empirical Strategy

3.1 Baseline Specification

We use the unanticipated depreciation of the peso in 2014:Q3 as a natural experiment to study the DCF channel of a foreign exchange rate depreciation on trade.[14] For our baseline specification we estimate the equation of the form:

$$\ln\left(1+Y_{ft}\right) = \beta \times FCE_f \times 1(t \geq t_0) + controls_{ft} + \epsilon_{ft}, \tag{4}$$

where Y denotes either the firm-level exports or imports of firm f at time t.[15] Our measure of foreign currency exposure, FCE_f, is either the firm's foreign currency leverage, FCL_{ft}, in $t = 2014:Q1$; the liquidity shock, $LS_{ft,t'}$, calculated with $t = 2014:Q1$ and $t' = 2015:Q3$; or the wealth shock, $WS_{ft,t'}$, with $t = 2014:Q1$ and $t' = 2015:Q3$. All measures are calculated as described in subsection 2.2. $1(t \geq t_0)$ is a dummy that equals one in any quarter during or after the depreciation ($t \geq 2014:Q3$).

Standard errors are double-clustered at the firm and quarter level. The set of controls is given by firm and time fixed effects; therefore, we interpret the β coefficient as a differential effect of the financial exposure to exchange rate shocks on imports (exports) between firms with different levels of foreign currency exposure, with time fixed effects absorbing the level effect on imports (exports) of all firms. The firm fixed effects control for the time-invariant characteristics of the firm, such as the average reliance on imported inputs, size, etc. It is worth mentioning that DCF is a choice for firms—that is, firms' foreign currency debt and its maturity structure can respond to their expectations regarding exchange rate movements. Although these shocks are notoriously hard to predict, this potential endogeneity could

[14] Rodnyansky (2019) uses the depreciation of the Russian ruble due to the exogenous collapse in oil prices in 2014 to show that more productive exporters shrank relative to nonexporting firms in terms of domestic revenue, employment and profitability following the depreciation. Agarwal et al. (2020) use the oil shock with Mexican data to study the dynamics of credit supply.

[15] The logarithmic transformation of the dependent variable can introduce biases through the constant. To make sure this is not affecting our estimates, we re-estimate all regressions with an inverse hyperbolic sine transformation of Y and find almost qualitatively and quantitatively identical results. Except for small values of Y, this transformation approximately equals $\log(2Y)$, or $\log(2) + \log(Y)$, which can be interpreted in the same way as a standard logarithmic dependent variable. See Burbidge et al. (1988), or Chen (2013), for an application.

bias our results. We address this concern by studying the specific case of an unanticipated, sudden depreciation that was unrelated to the economic situation in Colombia. Given the nature of this shock, we argue that it is unlikely that firms' debt maturity profile that led to variations in the above-defined liquidity shock is systematically correlated with observed or unobserved characteristics, and therefore it is unlikely that it biases our results.

3.2 Exogeneity of Liquidity Shock

The construction of the liquidity shock is our main method for identifying the causal impact of foreign currency borrowing on trade. Because firms need to pay back their loans at specific dates during the depreciation period, we can exploit the differences in the daily exchange rate to identify our proposed mechanism. Figure A2 shows the distribution of maturity, with the weighted average original maturity at around five years.

As described in subsection 2.3, the peso did not only depreciate strongly but also exhibited large volatility, which exposed firms to high frequency movement of the exchange rate due to their debt maturity structure. While other studies have made use of a similar identification strategy (e.g., Almeida et al., 2012; Duval et al., 2020; Giannetti and Saidi, 2019), our approach is stronger for two reasons. First, Almeida et al. (2012) and Duval et al. (2020) use the Global Financial Crisis as a shock for tightening credit conditions and argue that these tightened even more for firms that had debt maturing during the crisis. However, the Global Financial Crisis has also been associated with other factors that may discourage firms from investing, such as an increase in uncertainty. In our case, as the exchange rate depreciation was driven by a drop in the oil price, which was neither caused by the Colombian economy nor affected the Colombian firms through other factors other than the exchange rate, our effects can be likely attributed to the causal effect of the exchange rate. Second, we make use of a high-frequency identification by using the date of the maturity instead of just the year or quarter, constructing an arguably more exogenous exposure to the exchange rate movements.

If our argument holds true, we would expect the liquidity shock to be uncorrelated with observed and unobserved firm characteristics that could drive the stronger decline in imports for non-exporting firms, that are those firms faced with a larger liquidity shock. Table A3 shows the results from a cross-sectional regression of the liquidity shock on various firm-level variables. It shows no statistically significant relationship between the average maturity of firms' loans before the depreciation and the liquidity shock in a linear regression. While by construction there is a nonlinear relationship between the maturity of the firms' loans and the liquidity shock, we can rule out that firms that borrow shorter (on average) are also faced with a larger liquidity shock. The absence of a correlation can be explained by the high volatility in the exchange rate during the depreciation and illustrated by the following example.

Imagine two firms that borrow at the maturity of five years and that both firms need to repay $1 million on the day the loan matures. One firm borrows on the 16th of December, 2009, while the other firm borrows on the 21st of December, 2009, such that the only difference across loans is the day of the week each loan was issued. Firm 1, which borrowed on the 16th of December, needs to pay back 2.413 billion pesos, while the other firm needs to pay back 2.294 billion pesos (5% less). This example shows that even small differences in maturity dates (as small as less than a week) can explain a large fraction of the repayment in local currency. It also shows that a shorter maturity structure (Firm 1) is not necessarily correlated with a larger liquidity shock due to the large volatility in the exchange rate during the depreciation period, as we show in Table A3. Therefore, as the day of the week the loan has been issued can be seen as exogenous and because we can control for the maturity of the loans, our regression coefficients can likely be interpreted as causal partial equilibrium effects.

In addition, with the regressions shown in Table A3, we test whether the liquidity shock is correlated with other pre-existing observable characteristics (in 2013) at the firm level, such as their average maturity, their profitability, and their age. In the spirit of Amiti and Weinstein (2018), we also test whether firms with larger liquidity shocks face disproportionately larger credit supply shocks—for instance, because they borrow more from banks that contract credit more. We find that firms that have larger liquidity shocks are balanced in terms of other characteristics, which suggests that unobservable characteristics are also unlikely to be correlated with the liquidity shock. When controlling for these observable characteristics interacted with the post dummy, as well as sector-time fixed effects, we find that our baseline coefficient remains extremely stable, suggesting no substantial bias in the estimated coefficient (see Table A4; Altonji et al., 2005; Oster, 2019). We also find that the results are robust to controlling for firm size, which is a good proxy for strategic complementarities (Amiti et al., 2014, 2019).[16]

3.3 Dynamic Response

Equation 4 relates the average effect of an additional unit of foreign currency exposure to firm-level imports after the depreciation. However, one might expect the effect to build up or decline over time. Hence, in our second set of empirical exercises, we interact the measure with a dummy for each quarter instead of interacting the measure of dominant currency financing with a post-depreciation dummy. We estimate:

$$\ln\left(1 + Y_{ft}\right) = \sum_{t'} \beta_{t'} \times FCE_f \times 1(t = t') + controls_{ft} + \epsilon_{ft}, \tag{5}$$

[16] In unreported results, we also use a measure of revenue total factor productivity as a control and the results remain unchanged. However, due to data constraints, we are only able to estimate productivity for a relatively small sample of firms.

where Y is either the firm-level exports or imports of firm f at time t. This helps us to pin down the timing of the response of exports and imports in response to the interaction between the depreciation and the firms' financing in foreign currency. In addition, we examine the trade activities of firms as a function of their DCF just before the depreciation. For the difference-in-differences estimator to be unbiased, we require the parallel trend assumption to be satisfied—that is, absent a shock, treated and control firms would have evolved the same way. While it is not possible to test this assumption, as the counterfactual post-depreciation is unobservable, we can test for whether treated and control firms exhibit differential pre-trends before the shock. For example, if firms with more foreign currency debt before the depreciation already started reducing their imports, the interaction term in Equation 4 could just reflect a downward trend in the imports of these firms.

4 Results

4.1 Baseline Regression

Table 1 presents the results for Equation 4 for imports. Columns (1)-(3) show the results of using foreign currency leverage as the measure of financial exposure to the exchange rate depreciation. When considering all 21,850 firms, we see a strong negative impact of the interaction between foreign currency leverage in 2014:Q1, just before the depreciation started, and the depreciation dummy. Hence, firms that had a larger share of foreign currency debt before the depreciation imported less after the depreciation than before. Quantitatively, a one standard deviation increase in the share of foreign currency debt (3.2% foreign currency leverage) is associated with an additional 10% decline in imports. However, this effect masks large heterogeneity across different firms. We show the regression for non-exporters (around two-thirds of the firms in our sample) in column (2). The regression coefficient roughly doubles. For non-exporters, a one standard deviation increase in the share of foreign currency debt is associated with a 20% stronger decline in imports. For firms that both import and export (column (3)), the effect is only 1.8% and is not statistically significant.[17]

The remaining columns show the results of the estimations where the increase in leverage due to the depreciation is decomposed into a liquidity shock and a wealth shock. Columns (4)-(6) report the coefficients for the liquidity shock, which captures the increase in debt repayments due to the movements in the exchange rate. The liquidity shock is defined such that it is positive when the firm sees an increase in its debt repayments due to the depreciation and negative if the debt repayments fall. The debt repay-

[17] The effect is qualitatively the same in almost all sectors. Figure A5 displays the number of firms in the regression sample by sector. Figure A6 shows the estimates of the regression in column (1) separately for each broad sector and plots the coefficient. All estimates are negative. Figure A7 shows sector-specific (2-digit NAICS) estimates and plots each coefficient against the share of exporters in the sector. Consistent with the difference between the coefficients in columns (2) and (3), sectors that have a larger share of exporters are more shielded from the negative import effect of foreign currency borrowing.

ments can fall for the firm if it has very short-term maturity debt that matures right before the beginning of the depreciation. The effect of the liquidity shock on imports is around one-half of the foreign currency leverage. In particular, a one standard deviation increase in the liquidity shock leads to a decline in imports relative to the pre-depreciation period of around 5%. As for foreign leverage, the effect is driven by non-exporters for which the response is around 7% and statistically significant. Exporters reduce their imports by 2.5% more if they face a one standard deviation larger liquidity shock, but the coefficient is not statistically significant.

Lastly, columns (7)-(9) show the average response of imports in the depreciation period as a function of a wealth shock, which combines the liquidity shock during the sharp depreciation with the shock to wealth that occurs due to the revaluation of debt maturing in later periods. As above, firms that are financially more exposed to the depreciation of the exchange rate due to a wealth shock compress imports relatively more than other firms. This pattern is significantly stronger for non-exporting firms than for firms that both import and export. In terms of economic significance, a one standard deviation increase in these firsm' exposure to the exchange rate depreciation through DCF (if measured by the wealth shock for non-exporters) is associated with a 12% larger compression of imports. The number reduces to around 1% for exporters and is not statistically significant.

We confirm that this result is robust to focusing exclusively on quantities. Table A5 shows that more exposed firms contracted imported quantities more, regardless of whether imports are measured by the number of units imported or by net kilograms. Table A6 shows that exposed firms also reduce the unique number of products as well as the diversity of countries from which they import. We test formally for the statistical difference between non-exporters and exporters in Table A7. We cannot reject the hypothesis that the effect of being an exporter offsets the effect for non-exporters. This result is also robust to controlling for other potential confounding factors that are correlated with exporter status. Estimates in Table A8 use a variety of export measures to demonstrate the robustness of this result. As an additional robustness exercise, we use imports/exports over assets as an alternative left-hand side variable. Results are presented in Table A9.

We repeat the same exercise for exports and show the results in Table 2. The number of observations significantly drops, as many more firms import than export: Our sample only includes around 7,200 exporting firms. The results for exports differ starkly from the results shown in Table 1. While the coefficients are mostly negative, the estimates are much smaller and are not statistically significant. Neither higher levels of foreign currency leverage nor stronger wealth or liquidity shocks are associated with a larger drop in exports, indicating that dominant currency revenues can serve as a hedge for exporters against the negative financial effects of a currency depreciation.[18]

[18]This result is robust when controlling for other factors associated with firms' exports (see Table A10).

This result is different from the evidence in Paravisini et al. (2014) or Amiti and Weinstein (2011), who show that firms that face financial shocks reduce their exports. Unlike this paper, Paravisini et al. (2014) and Amiti and Weinstein (2011) study shocks to banks that propagate from the financial system to the real sector and against which firms are not easily able to hedge when loans are the main source of external financing. In contrast, in our case, the exchange rate shock directly affects firms that have debt in foreign currency when the domestic currency depreciates, and firms can hedge against it—for instance, this negative shock is offset by an increase in their revenues, as exports are almost exclusively priced in dollars (Casas et al., 2016).

The results raise the question about whether the DCF channel also has domestic macroeconomic implications. While this is not the focus of this paper, we study the response of investment across firms with a differential degree of DCF. Mirroring the results for imports, investment is found to have been reduced for non-exporting firms that face a stronger depreciation-driven reduction in net worth but not for exporters (Table A11). Moreover, our results suggest that firms that only have domestic operations could be affected by a depreciation through the financial channel after a depreciation if they are not financially hedged.

4.2 Placebo

In this section, we conduct a placebo exercise where we replace the *foreign* currency leverage with *domestic* currency leverage. This exercise helps us to rule out that our measures of financial exposure to the depreciation are not simply measures of financial vulnerabilities in general. If our measures captured financial constraints that are not related to foreign currency borrowing, our results would still be indicative of a financial channel of external adjustment but not a *dominant currency* financing channel. Table 3 indeed shows that if we replace our measures of DCF with domestic leverage, we do not find significant negative effects on imports or exports. This evidence strongly suggests that foreign currency borrowing, rather than domestic financial heterogeneity across firms, is driving the import response.

4.3 Dynamics Response

In this subsection, we shed light on the dynamics of the response of imports and exports over time.

As in Table 1, we split the firms into importers that do not export and firms that import and export. Figure 1 shows the evolution of imports as a function of a one standard deviation larger financial exposure to the depreciation and the peso-dollar exchange rate. The behavior of imports across the two groups is not statistically different between 2012:Q3 and 2014:Q2—the difference in imports between treated and control firms fluctuates around zero in the years before the depreciation. At the same time, the peso-dollar exchange rate was relatively stable at around 2,000 pesos per dollar. The fact that imports did not behave differently as a function of DCF in the period before the depreciation provides visual evidence of the absence of differential pre-trends before the shock and is suggestive of the parallel trend assumption holding.

Once the peso starts to depreciate in 2014:Q3, firms with a larger financial exposure to the exchange rate depreciation contract their imports significantly more. The effect of DCF on imports for non-exporters accumulates over time, which stresses the importance of studying the effect in a dynamic setting that allows firms to respond with a lag. Three years after the depreciation, the effect reaches a coefficient of -0.4. This coefficient implies that firms with a one standard deviation larger financial exposure to the exchange rate depreciation contract imports by 40% more.

Figure 2 shows the evolution of exporters' imports in response to a one standard deviation increase in DCF. The estimated coefficient is close to zero both before and after the depreciation period and is not statistically significant. This result suggests that firms that export and import were insulated from the DCF channel due to higher revenues in local currency, as exports are priced in dollars. Figure A8 jointly plots the coefficients for both exporters and non-exporters, highlighting the stark difference in their import responses during the depreciation episode.

Figure 3 plots the estimated effects of the interaction between financial exposure to the exchange rate depreciation and quarter dummies on exports. As is the case with exporters' imports, the difference is exports is not significant and the line is flat. The logic is the same as that for importers that export: While exports can decline in response to a financial shock, as exporters may face difficulties in financing their working capital, this channel is not at work in our setting—firms that export are hedged due to their higher domestic currency revenues given the appreciation of the dollar in which their exports are priced.

4.4 Panel Regression

To complement our dynamic analysis, in this section we aim to generalize our results to a longer time window. While one advantage of the event-study approach is that the causal identification is more credible, our results may not be externally valid outside of large devaluation episodes. We use data between 2008 and 2018 to construct an annual panel dataset with log imports, log exports, foreign currency leverage, and the peso-dollar exchange rate. Although quarterly data is available, we move to an annual panel, as we have seen in Figure 1 that the DCF channel works with a lag to the exchange rate movement. We regress log imports and exports on the lagged foreign currency leverage and the movement in the peso-dollar exchange rate between $t-2$ and $t-1$, controlling for firm and year fixed effects.

Table 4 shows the results. The first row shows that firms that had higher foreign currency leverage in the previous year export and import more in the current year in the absence of exchange rate movements. However, once we see a depreciation of the peso relative to the dollar, only non-exporters (column (2)) shrink their imports significantly in the following year. This is a confirmation of our baseline results shown in Table 1. As in the event-study approach, imports of firms that both export and import do not respond to the interaction between foreign currency leverage and the exchange rate. In contrast to the event-study approach, once we bundle non-exporters and exporters together, we do not find a significant import response.

4.5 Financial Hedging

Firms that borrow in foreign currency can be hedged naturally, through their export revenues in dollars, or through other sources, such as foreign exchange derivatives and through the accumulation of dollar assets. Froot et al. (1993) show that if external sources of funding are more costly to corporations than internally generated funds, there will typically be a benefit to hedging. When firms hold liabilities in foreign currency and experience a debt revaluation in domestic currency due to a depreciation of the domestic exchange rate, holding assets in foreign currency can serve as a hedge as the value of foreign currency assets appreciates at the same time in domestic currency terms and can dampen the negative effects of the increase in the debt burden. Firms that accumulated foreign currency assets before the sharp depreciation of the peso could have drawn down their foreign currency assets to either repay their revalued debt or pay for dollar-priced imports, dampening the negative effect of foreign currency borrowing on imports during and after the depreciation.

Similarly, firms can tap the derivatives markets to hedge their exposure to exchange rate fluctuation by engaging in forward contracts that lock in the exchange rate for the purchase or sale of a currency on a future date. For example, if a firm is expecting to repay debt in dollars at a certain date, it can lock in the current forward exchange rate for the repayment date to hedge against a dollar appreciation. On the agreed date, the counterparts exchange the amounts they had committed to. In case of an unexpected peso depreciation, the firm pays a smaller amount of pesos to obtain the pre-committed amount of dollars than it would in a spot transaction. The firm can then use the gains from the forward contract to repay the increased debt burden or pay the higher peso price for dollar-invoiced imports. For more details on the functioning of over-the-counter foreign exchange derivative markets, see Hau et al. (2021).

Table 5 shows the percentage of firms that held foreign assets and the share of firms that had outstanding foreign exchange derivative positions in 2013. Around 13% of all firms were hedged either through dollar assets or are active in the derivative markets. Derivative markets are relatively infrequently used among Colombian nonfinancial corporations, with only 2.9% of all firms having a foreign exchange derivative contract outstanding in 2013.[19] 11.6% of all firms have outstanding assets in foreign currency.

[19] The vast majority of the foreign exchange rate derivative positions are net forward purchases of dollars, implying that firms mostly hedge against a depreciation of the peso. Due to frequent misreporting issues of the sign of the forward position, we only define a dummy that takes the value 1 if the firm reports the outstanding position in any direction.

These statistics differ largely between exporters and non-exporters. While almost 30% of exporting firms financially hedge, only 5% of non-exporters do so. Both foreign exchange derivative markets and foreign assets are more likely to be used as hedging devices by exporters than by non-exporters.

We complement our baseline regression equation to test whether the usage of foreign exchange derivatives markets or the accumulation of assets in dollars cushions the negative impact of foreign currency borrowing.

We estimate the following equation:

$$\ln\left(1+Y_{ft}\right)=\beta\times FCE_f\times 1(t\geq t_0)+\gamma\times FCE_f\times Hedge_f\times 1(t\geq t_0)+controls_{ft}+\epsilon_{ft}, \tag{6}$$

where Y are firm-level imports of firm f at time t. FCE_f is the foreign currency exposure. $1(t\geq t_0)$ is a dummy that equals 1 in any quarter during or after the depreciation, $(t\geq 2014:Q3)$. $Hedge_f$ is defined as a dummy that equals 1 if the firm: (i) Had FX derivative markets positions outstanding in 2013, (ii) held foreign currency assets in 2013, or (iii) satisfied both those conditions. The set of controls is given by firm and time fixed effects as well as $Hedge_f\times 1(t\geq t_0)$.

We interpret the β coefficient as the effect of foreign currency borrowing on imports during and after the depreciation for firms that do not hedge ($Hedge_f=0$). The coefficient on the triple interaction ($FCE_f\times Hedge_f\times 1(t\geq t_0)$), γ, reflects the differential effect of firms that do hedge ($Hedge_f=1$). A negative coefficient for β shows that firms that do not hedge and have more foreign currency liabilities reduce their imports more relative to firms with fewer foreign currency liabilities. This confirms our baseline result shown in Table 1. The coefficient β is larger in absolute value than in the baseline result, which already suggests a cushioning effect of hedging on import compression due to debt revaluation. A positive coefficient γ shows the effect is weaker (smaller import contraction) for firms that hedge. The sum of the two coefficients reflects the estimated effect of the post-depreciation import contraction due to foreign currency borrowing of hedging firms.

Table 6 shows the results for either type of hedging. The coefficient on the triple interaction between $FCE_f\times Hedge_f\times 1(t\geq t_0)$ is consistently positive across specifications and is close to the estimated effect of foreign currency borrowing on firms that do not hedge (in absolute value). This result shows that once a firm hedges its foreign currency liabilities through either foreign exchange derivatives or foreign currency assets, the contractionary effect of DCF on imports during the depreciation period is absent. This result can be confirmed (in unreported tables) by re-estimating the regression for only firms that hedge. In these results, the double interaction between foreign currency borrowing and the post dummy is statistically insignificant.[20]

[20] Foreign-owned firms may also be hedged to some extent, as foreign headquarters can provide liquidity (Kalemli-Ozcan et al., 2016). When we control for foreign ownership, our results (unreported) remain unchanged. However, we only have

In Table 6, the triple interaction is positive across all specifications, but the magnitude is largest for firms that do not export. As non-exporting firms are driving the negative impact of foreign currency borrowing on imports during the depreciation, the result suggests that non-exporting firms benefit most from hedging compared with firms that are already hedged through their export revenues in dollars. Indeed, columns (3), (6), and (9) show that the triple interaction is not statistically significant for exporting firms, and neither is the double interaction. Exporting firms, which do not hedge either through foreign currency assets or foreign exchange derivatives, do not see a contraction of their imports due to foreign currency borrowing during the depreciation, as they are already naturally hedged through their dollar export revenues. The additional hedging has an insignificant positive effect on imports. The result is graphically illustrated in Figure A9.

Next, we analyze whether both types of hedging, either through derivatives or through foreign currency assets, can protect firms from the adverse effect of foreign currency borrowing on imports during a depreciation. Table 7 shows the results for firms that do borrow through foreign currency assets but not necessarily through the derivatives markets. The dummy $Hedge$ is redefined as 1 if the firm has foreign currency assets outstanding before the depreciation (in 2013). The results closely resemble the results presented in Table 6. Firms that have assets in foreign currency but do not export do not contract their imports due to foreign currency borrowing during the depreciation period.

This is also true for firms that hedge their foreign currency exposure through the foreign exchange derivatives markets (Table 8). We redefine the $Hedge$ dummy to 1 if the firm has outstanding foreign currency derivative positions outstanding before the depreciation (in 2013). For firms that have derivative positions outstanding, the triple interaction offsets the effect of foreign currency borrowing.

4.6 Quantification

This section aims to quantify the effect of DCF on the trade adjustment. Our estimates allow us to calculate the counterfactual trade flows in the absence of foreign currency borrowing, ignoring general equilibrium effects.[21]

Using our estimates from Table 1, we calculate the response of imports and the trade balance due to foreign currency borrowing. The estimated effects can then be used to infer the counterfactual response of trade flows to exchange rate movements for other levels of foreign currency financing. We show the results of our counterfactual exercise in Figure 4 and Figure 5. In the case of Colombia, foreign currency financing was substantial for *many* importing firms, even though the *average* level of dependence on foreign currency loans is moderate. We estimate that if no firms had foreign-currency borrowing the

ownership information for a small subsample of firms.

[21] See Nakamura and Steinsson (2018) for a discussion of extrapolating aggregate effects from cross-sectional regressions.

peak-to-trough import contraction would have been around 17% smaller.

4.7 Lending

In this section we re-estimate Equation 4, replacing exports and imports with the amount borrowed in domestic and foreign currency. This exercise allows us to test whether firms that faced larger financial constraints after the peso depreciation due to a higher value of their foreign currency debt had to delever. Table 9 shows that firms with larger DCF strongly contract their foreign currency borrowing. This result holds when we use either foreign currency leverage, the wealth shock, or the liquidity shock as an independent variable. In contrast, local currency borrowing increases for these firms, as they seem to substitute foreign currency loans with domestic currency loans. Overall, an average firm with non-zero foreign currency borrowing had roughly 20% of its debt denominated in foreign currency. As a result, this firm would see a 3% decline in total borrowing after the shock, taking into account foreign and domestic loans and abstracting from the valuation effects of exchange rate movements. This is consistent with the results of Kalemli-Ozcan et al. (2020), who show that the firms that were more exposed to the negative effect of mismatches on their balance sheets (those operating in countries with higher foreign currency debt) delever more after currency depreciations than firms in less-exposed countries.[22]

4.8 Financial Frictions under the Microscope

In this section we explore the richness of the loan-level dataset to shed light on the exact mechanism through which the revaluation of debt feeds into financial frictions and leads to a contraction in imports.

First, we focus on the interest rates of the loans i that have been issued to firm f at day d by bank b. We regress the interest rate at which the loan is issued on the different measures of foreign currency exposure, as discussed above. The loan-level data allow us to control for bank supply by including bank-time (month) fixed effects. If firms that are financially more exposed to the depreciation borrow more from banks that are more negatively affected by the depreciation, the negative sign in our baseline results could be driven by a spurious correlation between banks' credit supply and firms' foreign currency exposure. The bank-time fixed effect allows us to compare across firms with differential foreign currency exposure that borrow from the same bank in the same month. However, financial regulation imposes several restrictions on the composition of financial agents' balance sheets to limit their exposure to exchange rate movements. For instance, the difference between all assets and liabilities in foreign currency cannot exceed 20% nor be less than -5% of a bank's technical equity and cannot be negative over a three-day average. Therefore, the sudden peso depreciation should have had limited (if any) effect on credit

[22] Table A12 estimates a loan-level regression where we confirm that exposed firms substitute away from foreign currency borrowing and toward local currency borrowing, with overall borrowing remaining statistically not different from zero. This effect is not significantly different for exporters versus non-exporters.

supply.

In particular, we estimate the following regression:

$$r_{ifd(t)b} = \alpha + \beta_1 FCE_f \times 1(t \geq t_0) + \alpha_{bt} + \alpha_f + \epsilon_{fd(t)b}, \tag{7}$$

where r is the interest rate that is charged for loan i to firm f at issuance date $d(t)$ by bank b. FCE are the different measures of foreign currency exposure. $1(t \geq t_0)$ is a dummy that equals 1 after the depreciation and 0 otherwise. α_{bt} are bank-month fixed effects and α_f are firm fixed effects. As before, standard errors are clustered at the firm level.

Table 10 shows the results. On average, firms that are more financially exposed to the depreciation face higher interest rates after the depreciation started, which is reflected in the positive coefficient. However, consistent with our results on imports, this result is entirely driven by firms that do not export. For exporters, the coefficient is statistically insignificant for all types of exposure measures and even negative for the simple foreign currency leverage measure, as well as the wealth shock. The result is graphically illustrated in Figure A10. These results indicate that non-exporting firms that experience a larger appreciation of their debt values are charged higher interest rates, shedding light on the financial frictions that these firms face and providing evidence on a potential channel that helps to explain why they contract imports more than firms without foreign currency debt.

The higher interest rates that are charged by banks are potentially due to higher probabilities of defaults of the non-exporting firms that face a debt revaluation. This is not the case for exporting firms, as they are hedged against the revaluation of their debt due to the appreciation of export revenues. Next, we test whether this debt appreciation due to the currency depreciation actually feeds into delays in loan payments by non-exporting firms. We create a balanced panel for each bank-firm-date combination and define a dummy that equals 1 if firm f is behind on payments on its loans to bank b at time t and estimate the following linear probability model:

$$Delinquent_{fbt} = \alpha + \beta_1 FCE_f * \times 1(t \geq t_0) + \alpha_{bt} + \alpha_f + \epsilon_{fbt}, \tag{8}$$

where $Deliquent_{fbt}$ is equal to 1 if firm f is delinquent on a loan to bank b at time t and 0 otherwise. FCE_f is either the foreign currency leverage just before the depreciation, the liquidity shock, or the wealth shock, as described above. α_{bt} are bank-time fixed effects and α_f are firm fixed effects. The bank-time fixed effects can again control for time-varying bank-specific factors that could lead to a spurious correlation between our foreign currency exposure measures and whether the firm is delinquent on its loans after the depreciation. For instance, certain banks may be better at screening and monitoring borrowers, which leads to lower nonperforming loans during the depreciation. If the better screening and monitoring ability is correlated with the average foreign currency exposure of their borrowers, this could introduce a bias in the estimates. After absorbing bank-time fixed effects, we control for this potential correlation between the error term and the treatment variable.

Table 11 shows the results. On average, firms with larger financial exposure to the exchange rate depreciation are more likely to fall behind on their loan payments than their counterparts. This can be seen in columns (1), (4), and (7). However, this effect is exclusively driven by non-exporting firms. For exporting firms, the effect of a larger debt appreciation due to foreign currency debt is not significantly affecting the probability of falling behind on debt payments. Quantitatively, a one standard deviation increase in foreign currency leverage for non-exporters is associated with an increase of approximately 60 basis points in delinquencies, which is an around a 7% increase. The result is graphically illustrated in Figure A11.

These results provide a financial mechanism for our results on trade and suggest that, because exporters are hedged through higher dollar revenues, they are still able to repay their loans. In the next section, we theoretically model this mechanism.

5 An Illustrative Model of Dominant Currency Financing

In this section we outline a parsimonious model with financial frictions and foreign currency borrowing to further illustrate the DCF mechanism and disentangle its effects from the price effects of a depreciation.[23] We will show how financial frictions affect the firm-level cost of borrowing and, hence, optimal size and imports. A depreciation decreases a firm's net worth and increases the wedge between the risk-free and the firm-level interest rate. Entry into exporting relaxes some of the frictions, reducing the interest rate and increasing imports. In a calibrated model, setting export prices in dominant rather than local currency mitigates the adverse effects caused by depreciation under DCF relative to setting export prices in producer's currency.

5.1 Setup

Consider a simple one-period model (see subsubsection C.1. 1 for a more detailed exposition). A firm starts with a stock of net worth denoted by A, reflecting assets such as cash, minus some stock of debt. A firm may borrow B to finance its production from a bank that only observes firm-level productivity but does not observe the firm's product appeal or demand shock denoted by δ. It is costly for a bank to verify firm-level output, and the cost of verification is equal to γR where R is the firm's revenue. The optimal contract will have the form of a debt contract: The bank will lend B units and require a repayment of

[23] The mechanism in this model is also featured in a number of papers in the macroeconomic and financial literature (see, e.g., Bernanke et al., 1999; Céspedes et al., 2004; Brunnermeier and Sannikov, 2014; Christiano et al., 2014)

$\bar{B}$ whenever the firm does not default; see Townsend (1979) for the proof. If the firm defaults, the bank receives $(1-\gamma)R$, and the firm will get 0.

Assume that revenues take the form:

$$R(\delta, M) = \rho(M/p^M, \varphi)\delta, \tag{9}$$

where M is the firm's import expenditures. To make the model parsimonious, we only assume one input into production, although the model can be generalized to include labor, capital, and other inputs. The revenue function is denoted by ρ and is assumed to have the following properties:

Assumption 1. *The revenue function is increasing in input:* $\rho_M > 0$

Assumption 2. *The revenue as a function of input is increasing at a decreasing rate:* $\rho_M > 0$, $\rho_{MM} < 0$

Assumption 3. *The revenue function elasticity with respect to the input is less than* 1*:* $\frac{\partial \ln \rho}{\partial \ln M} < 1$

The assumptions listed above are standard in the literature and hold for a vast class of revenue functions in settings with different production functions and market structures, such as models with constant or increasing marginal costs of production and downward-sloping demand curves. The production and demand structure in the Melitz (2003) model, for example, satisfies these assumptions.

Let the CDF and PDF of demand shocks be given by $F(\delta)$ and $f(\delta)$ with $\mathbb{E}[\delta] = 1$. Define the hazard rate as

$$h(x) = \frac{f(x)}{1-F(x)}. \tag{10}$$

Assumption 4. *The CDF and PDF of the demand shocks are such that* $xh(x)$ *is increasing with a non-decreasing elasticity. The PDF* $f(x)$ *and its derivative are bounded for all* $\bar{\delta} > 0$, $f(0) = 0$ *and* $\lim_{\bar{\delta}\to 0} \bar{\delta} f'(\bar{\delta}) < \infty$

The previous assumption holds for a variety of different families of distributions, particularly for the lognormal distribution.

At the beginning of the period a firm has net worth $A = a^d + a^f e$, where a^f and a^d are foreign assets and net domestic assets, respectively, and e is the nominal exchange rate (Colombian pesos per foreign currency). For firms that are net borrowers in foreign currency, $a^f < 0$ and $\frac{\partial A}{\partial e} < 0$. The firm can borrow B and spends its resources on a composite input $p^M M = A + B$, where p^M is the price of the imported input.[24]

[24]Even though our main focus is on imported goods, at this point, for parsimonious reasons, we will assume that the price of inputs is not dependent on the exchange rate. Relaxing this assumption will not qualitatively change our main results that focus on the heterogeneous effects across firms with various levels of foreign currency borrowing.

Then the firm payoff is given by:

$$\pi^f = \mathbb{E}\left[\rho(M)\delta - \bar{B}|\delta \geq \bar{\delta}\right]\left(1 - F(\bar{\delta})\right), \tag{11}$$

$$\tag{12}$$

where $\bar{\delta}$ is the cutoff for the demand shock that determines the probability of default, given by $F\left(\bar{\delta}\right)$. If the realized value of the shock is below the cutoff, the firm defaults and the bank extracts all the revenues at some cost. This cutoff is implicitly defined by a condition that equates firm's revenues with fixed payment to the bank:

$$\bar{B} = \rho(M)\bar{\delta}.$$

We can thus express the firm's payoff as:

$$\pi^f = \rho(M)\mathbb{E}\left[\delta|\delta \geq \bar{\delta}\right]\left(1 - F(\bar{\delta})\right) - \rho(M)\bar{\delta}\left(1 - F(\bar{\delta})\right). \tag{13}$$

The bank's payoff is given by:

$$\pi^b = \left(1-\gamma\right)\rho(M)\mathbb{E}\left[\delta|\delta < \bar{\delta}\right]F(\bar{\delta}) + \rho(M)\bar{\delta}\left(1 - F(\bar{\delta})\right), \tag{14}$$

where the bank extracts $(1-\gamma)$ share of average revenues below the cutoff with probability $F(\bar{\delta})$ and gets $\bar{B}$ with probability $\left(1 - F(\bar{\delta})\right)$.

Define the following objects:

$$\Psi\left(\bar{\delta}\right) = \mathbb{E}\left[\delta|\delta < \bar{\delta}\right]]F(\delta) + \bar{\delta}(1 - F(\bar{\delta})) \tag{15}$$

$$\zeta(\bar{\delta}) = \gamma\mathbb{E}\left[\delta|\delta < \bar{\delta}\right]F(\delta) \tag{16}$$

These objects have an intuitive interpretation. $\Psi(\bar{\delta})$ is the share of profits that goes to the bank, inclusive of monitoring costs, and $\zeta(\bar{\delta})$ is the share of revenues that goes to monitoring costs. Firm and bank profits can now be rewritten as:

$$\pi^f = \left(1 - \Psi(\bar{\delta}))\right)\rho(M) \tag{17}$$

$$\pi^b = \left(\Psi(\bar{\delta}) - \zeta(\bar{\delta})\right)\rho(M) \tag{18}$$

We make the following assumption on the market structure of the banking sector:

Assumption 5. *Banks borrow at a rate R to lend to the firms, are risk neutral, and operate under perfect* *competition.*

5.2 Solving the Model

Assumption 5 implies that all banks will earn the same return R on their lending and earn zero profits; in other words, $\pi^b = R(p^M M - A)$. Because banks are competing with each other, each bank will pick lending B and repayment $\bar{B}$ that maximize firms' profits. Note that, conditional on the lending amount, picking the amount of repayment is analogous to picking the cutoff productivity $\bar{\delta}$. We can set the optimization problem of a bank as:

$$\max_{B,\bar{\delta}} \; \rho(M)\left(1-\Psi(\bar{\delta})\right) \tag{19}$$

$$s.t. \;\; \rho(M)\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right) = RB \tag{20}$$

$$p^M M = B + A \tag{21}$$

When solving this model, we are interested in how the amount of imported inputs, borrowing, and repayment depend on changes in the exchange rate. Consider two firms that are identical in all respects except foreign currency leverage. The exchange rate affects those firms through the price of imported inputs p^M and net worth A. The former effect will be common across the two firms, while the latter will depend on the extent of indebtedness in foreign currency. We will now derive several elasticities that will be useful in conveying the intuition of the main results in the model.

Let $\varepsilon_{x,y}$ denote the elasticity of x with respect to y. Denote the nominal interest rate by $1+i = \frac{\bar{B}}{B}$. Finally, let $r \equiv \frac{\frac{1}{p^M}\rho_M(M,\varphi)}{R}$ be the ratio of marginal revenues from a peso spent on imported inputs and a rate of return on a peso to the bank. We can show that, in the optimum, the following comparative statics hold (proofs provided in subsubsection C.1. 3):

$$\varepsilon_{1+i,\bar{\delta}} = 1-\varepsilon_{\Psi-\zeta,\bar{\delta}} > 0, \tag{22}$$

$$\varepsilon_{M,\bar{\delta}} = \frac{\varepsilon_{r,\delta}}{\varepsilon_{\rho_M,M}} < 0, \tag{23}$$

$$\varepsilon_{\bar{\delta},A} = \frac{\varepsilon_{\rho,M}\frac{A}{p^M M}}{\varepsilon_{M,\delta}\left(\frac{p^M M}{p^M M-A}-\varepsilon_{\rho,M}\right)-\varepsilon_{\Psi-\zeta,\delta}} < 0. \tag{24}$$

Equation 22 is the elasticity of the nominal interest rate with respect to the cutoff demand shock. The higher this cutoff is, the more likely the firm is to default and the higher the interest rate is that the bank will charge to compensate for the higher default probability. The elasticity of imported inputs with respect to the demand shock cutoff is given by Equation 23. A higher cutoff implies higher interest rates and thus costlier borrowing for the firm, lower production, and lower demand for imported inputs. Finally, Equation 24 establishes that the elasticity of the demand shock with respect to net worth is negative. Firms with more own resources are less likely to default, as they need to borrow less to produce the same amount as firms with smaller net worth. The last equation is key to understanding the differential effects of an exchange rate depreciation on firms with different foreign currency leverage: The firms with higher foreign currency borrowing will experience a sharper reduction in net worth.

Define the ratio of foreign currency borrowing to equity as $f = -\frac{ea^f}{A}$. The variable f is positive for firms that are net borrowers in foreign currency ($a^f < 0$). It can be shown that:

$$\varepsilon_{1+i,e} = -f\varepsilon_{1+i,\bar{\delta}}\varepsilon_{\bar{\delta},A} > 0, \quad if \quad f > 0, \tag{25}$$

$$\varepsilon_{M,e} = -f\varepsilon_{M,\bar{\delta}}\varepsilon_{\bar{\delta},A} < 0, \quad if \quad f > 0. \tag{26}$$

The nominal interest rate increases with the depreciation of the exchange rate, and the effect is stronger for firms with greater indebtedness in foreign currency. As a result, imports of firms with large debt in dollars contract relatively more.

We thus get the following implications from the model that are consistent with our empirical findings:

Implication 1. *A depreciation decreases imports more for firms that borrow more in foreign currency (Table 1).*

Implication 2. *A depreciation increases interest rates more for firms that borrow more in foreign currency (Table 10).*

These two implications are driven by the fact that firms that borrow more in foreign currency see their net worth contracting after a depreciation (Table 10).

So far, we have only focused on the firms that sell domestically. In subsection C.2 we extend the model to allow for exporting. We model exporting in a parsimonious way, allowing firms to use export profits to reduce borrowing necessary for domestic production. Consider two firms that have the same probability of default before a depreciation, but one of them is an exporter. The exporting firm will face a positive profitability shock (for example, because part of the costs is in local currency) due to the depreciation, making it less likely to default. In the limiting case of the probability of default approaching zero, the balance sheet channel will have no effect on firm's behavior, and thus the reaction of interest rates and imports will be muted. In this case, the exporter faces a lower interest rate than a non-exporting firm. Consequently, we have the following implications for the exporting firms:

Implication 3. *A depreciation does **not** decrease imports more for **exporting** firms that borrow more in foreign currency (Table 2).*

Implication 4. *A depreciation does **not** increase interest rates more for **exporting** firms that borrow more in foreign currency (Table 10).*

Colombian firms invoice most of their exports in dollars (Casas et al., 2016). This behavior can be rationalized by a high import share in production(Chung, 2016), strategic complementarities (Amiti et al., 2014, 2019), and/or capacity constraints (Gopinath et al., 2010; Amiti et al., 2022) that make dollar invoicing a preferred choice over PCP. Although we abstract from the problem of a firm's currency choice and instead take the invoicing currency as given, in the next section we explore quantitatively the interplay between DCP/PCP and the financial frictions generated by foreign currency borrowing. We model DCP/PCP exporters in a stylized fashion. Before the shock, firms are allowed to choose export prices in the same way a firm with flexible prices would. After depreciation, DCP exports have export prices fixed in dollars, and PCP exporters have export prices fixed in pesos. The presence of imported inputs in our calibration leads to higher profitability of DCP firms relative to PCP firms under plausible calibrations of the model.

5.3 Calibration

In this section we calibrate in partial equilibrium the version of the model with dominant and producer currency pricing, keeping aggregate variables (the risk-free interest rate and relative market size) fixed. We first solve for equilibrium prices and quantities, and then simulate the reaction to exchange rate shocks, holding export prices fixed in dollars (DCP) or pesos (PCP).

We assume that δ is distributed lognormally, with dispersion ν and location parameter $\mu = \frac{-\nu^2}{2}$ to preserve $\mathbb{E}\delta = 0$. Table A13 shows the parameter choices and the results on how much the DCF channel contributes to the import compression for exporters and non-exporters. The elasticity of substitution σ takes the value of 5, following Bas et al. (2017). The monitoring cost parameter $\gamma = 0.18$ comes from Fernández-Villaverde and Ohanian (2010) for Spain. R is the real interest rate that we take from the data, as well as the import share, the exchange rate shock $\frac{de}{e}$, the net worth to sales ratio, and the net worth shock $\frac{dA}{A}$. The relative size of the foreign market F and import intensity is calibrated to match export intensity for the top decile of big manufacturing firms.[25] Lognormal distribution parameters are calibrated to match the average nominal interest rate in the data. The net worth shock is calibrated to 15%.

[25] We thank Yipei Zhang for sharing this statistic with us. See Martynov and Zhang (2023) for a description of underlying data. We focus on large firms as they dominate international trade in Colombia, as evidenced, for example, by Eaton et al. (2007) and Bernard et al. (2018).

The calibration allows us to quantify the contribution of the DCF channel relative to the expenditure switching channel. To calculate the contribution of the DCF channel, we first calculate how much more imports contract as a result of the net worth shock by comparing two models with zero and the actual net worth shock. We then divide this difference by a total contraction in imports in the model with the actual net worth shock.

The calibration shows that the DCF channel contributes to a 13.7% import compression for non-exporters, while for exporting firms the contribution of the DCF channel is muted (Table A13). This result is qualitatively in line with our empirical findings in which we find strong effects of DCF on imports during the depreciation for non-exporting firms only, while the effects for exporters ex ante borrowing in dominant currency are statistically and economically insignificant (Table 1). Quantitatively, our reduced-form back-of-the-envelope calculation suggests that the DCF channel accounts for around 17% of the import compression. This value is similar to the contribution of 13.7% attributed by the calibrated model to the compression of imports by non-exporting firms.

DCF may affect the reaction of imports differentially, depending on whether firms price their exports in dollars (DCP) or in domestic currency (PCP). The empirical exercises in this paper are executed with Colombian data, where firms almost exclusively price their exports in dollars (DCP). This raises the question of whether the DCF channel of external adjustment is also valid under PCP, which is an exercise that cannot be tested empirically with our data. In the DCP model, we hold the price of exports fixed in dollars, while in PCP models the price of exports is fixed in pesos. To gauge the effect of the choice of invoicing currency, we compute the changes in imports that are used for domestic production under different values of net worth shocks. We abstract from changes in imports for export production, as these imports do not depend on the net worth shock because the price of exports is fixed.

Figure 6 plots the results conditional on different values of the net worth shock that is driven by heterogeneity in foreign currency leverage. The flat line for DCP shows that when firms price exports in the dominant currency their imports are unaffected by net worth shocks, as DCP exporters are financially unconstrained due to the increase in export prices (in pesos), and they are therefore hedged from the financial channel of exchange rate fluctuations. In contrast, the PCP exporters face a negative export profitability shock, as they are not hedged against the domestic depreciation. Consequently, the adverse net worth shock does affect PCP exporters and induces them to contract domestic production and imports. This can be seen in Figure 6, where a larger net worth shock is associated with a larger reduction in imports for firms pricing their exports in pesos but not for firms pricing them in dollars.

This calibration exercise suggests that our empirical findings on the natural hedging against the financial channel experienced by exporting firms are likely due to firms pricing in the dominant currency. If Colombian exporters were to price in pesos, they would not be naturally hedged. These results suggest that the effect of the financial channel on external adjustment could be even stronger in countries where the share of dominant currency pricing is smaller.

6 Conclusions

In this paper, we provide evidence of a new channel of external adjustment. Traditionally, a depreciation of the domestic currency is thought of as increasing the trade balance thanks to a pricing channel, as exports become cheaper and imports become more expensive. We argue that the dominant currency financing channel plays a significant role for external adjustment in response to exchange rate shocks. DCF leads to a stronger compression of imports, as firms with dollar debt see an increase in default risk and interest rates, making it more difficult for them to finance their imports. This channel operates solely through non-exporting firms, as firms that price their exports in dollars are naturally hedged against the increase in default risk and interest rates through their revenues, which increase when the domestic currency depreciates.

To analyze this channel, we study whether firms with more foreign currency borrowing are affected differently in terms of their trade response compared with firms that borrow mainly in domestic currency around an unexpected depreciation in Colombia. As foreign currency borrowing is an endogenous choice, we implement a novel identification strategy that helps us shed light on the causal impact of DCF on external adjustment.

To isolate the effect of exchange rate movements affecting trade flows through the financial channel, we compute the increase in foreign currency debt payments that is solely due to the depreciation of the currency, as firms have their debt maturing at different points in time. Firms that have the majority of their debt maturing before the start of the depreciation are not affected by the depreciation through their balance sheet. In contrast, firms that have debt repayments scheduled at the height of the depreciation face a large increase in their debt repayment. This foreign currency liquidity shock strongly predicts an additional contraction in imports that is not associated with changes in the prices of imported goods. However, this effect is only present for firms that do not export. Exporters are naturally hedged against these negative balance sheet shocks through their revenues in foreign currency, and they therefore do not reduce their imports or adjust their exports in response to the shock.

To complement our empirical analysis and to further illustrate the role played by the financial channel on external adjustment, we then outline a parsimonious model with financial frictions and foreign currency borrowing, and we calibrate it to match several moments observed in the data. The results of several counterfactual exercises performed using our model corroborate our main empirical findings.

We conclude that the DCF channel contributes significantly to the external adjustment after a currency depreciation, in addition to the traditional expenditure switching channel and valuation effects. These results have important consequences for the stability of countries' net foreign asset positions.

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Table 1: Imports

	ln (imports)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × FCL	-0.106***	-0.215***	-0.018						
	(0.025)	(0.047)	(0.023)						
Post × LS				-0.046**	-0.069*	-0.024			
				(0.020)	(0.034)	(0.021)			
Post × WS							-0.059***	-0.120***	-0.009
							(0.020)	(0.032)	(0.024)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	524,943	350,934	174,009	524,943	350,934	174,009	524,943	350,934	174,009

Notes: The table reports the estimated β coefficient from Equation 4, with $\ln(1 + imports)$ on the left-hand side at the quarterly level. Columns (1)-(3) report the estimated coefficient of the interaction of a *Post* with foreign currency leverage (FCL). In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS) respectively. FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers, columns (2), (5), and (8) report the results for non-exporters, and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 2: Exports

	ln (exports)		
	(1)	(2)	(3)
Post × FCL	-0.010		
	(0.025)		
Post × LS		-0.025	
		(0.023)	
Post × WS			-0.024
			(0.026)
Firm FE	Y	Y	Y
Time FE	Y	Y	Y
N	169,232	169,232	169,232

Notes: The table reports the estimated β coefficient from Equation 4, with $\ln(1+exports)$ on the left-hand side at the quarterly level. Column (1) reports the estimated coefficient of the interaction of a *Post* with foreign currency leverage (FCL). In columns (2) and (3) *Post* is interacted with liquidity (LS) and wealth shocks (WS) respectively. FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively. The sample is limited to the firms that ever exported in our data.

Table 3: Placebo Domestic Leverage

	ln(imports)			ln(exports)
	(1)	(2)	(3)	(4)
Post × Domestic Leverage	-0.006	-0.007	-0.001	0.001
	(0.004)	(0.005)	(0.007)	(0.003)
Sample	All	Non-X	X	All
Firm FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
N	523,719	350,094	173,625	168,848

Notes: The table reports the estimated β coefficient from Equation 4, with $\ln(1+imports)$ on the left-hand side in columns (1)-(3) and $\ln(1+exports)$ in column (4) at the quarterly level. Column (1) reports the estimated coefficient of the interaction of a *Post* with domestic currency leverage. *Domestic Leverage* was normalized to have mean of 0 and a standard deviation of 1. Column (1) reports the results for all firms, column (2) focuses on non-exporters, while the sample in columns (3) and (4) is limited to only exporters. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively. The sample is limited to the firms that ever imported in our data. Exporters are firms that ever exported in our data.

Table 4: Panel Regression

	ln(imports)			ln(exports)
	(1)	(2)	(3)	(4)
$FCL_{i,t-1}$	5.008***	6.715***	3.586***	2.098***
	(0.386)	(0.651)	(0.443)	(0.329)
$FCL_{i,t-1} \times \Delta ER_{t-1}$	-0.737	-5.044**	-0.465	-1.840
	(1.254)	(2.225)	(1.458)	(1.312)
Sample	All	Non-Exporters	Exporters	All
Firm FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
N	230,340	148,590	81,750	230,340

Notes: The table reports the estimated β coefficient from the panel regression discussed in subsection 4.4, with $\ln(1+imports)$ on the left-hand side in columns (1)-(3) and $\ln(1+exports)$ in column (4) at the annual level. See subsection 2.2 for the definition of foreign currency leverage (FCL), which was normalized to have a mean of 0 and a standard deviation of 1. Column (1) reports the results for all firms, column (2) focuses on non-exporters, while the sample in columns (3) and (4) is limited to only exporters. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively. The sample is limited to the firms that ever imported in our data. Exporters are firms that ever exported in our data.

Table 5: Descriptive Statistics, Hedging

	Non-exporters	Exporters	All firms
	Share of firms (2013)		
Hedge Foreign Assets	4.0%	26.9%	11.6%
Hedge FX Derivatives	1.6%	5.6%	2.9%
Hedge (Foreign Assets or FX Derivatives)	5.1%	28.7%	12.9%
Number of firms	14,618	7,232	21,850

Notes: Hedge Foreign Assets is the share of firms that have outstanding foreign assets in 2013. *Hedge FX Derivatives* is the share of firms that have outstanding foreign exchange derivatives in 2013. *Hedge (Foreign Assets or FX Derivatives)* is the share of firms that have either outstanding foreign assets in 2013 or outstanding foreign exchange derivatives in 2013. The sample is limited to firms that ever imported in our data. Exporters are defined as firms that ever exported in our data.

Table 6: Hedging and Imports

	ln(imports)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × FCL	-0.150***	-0.270***	0.002						
	(0.045)	(0.062)	(0.046)						
Post × FCL × Hedge	0.140**	0.246***	0.000						
	(0.051)	(0.079)	(0.054)						
Post × LS				-0.071**	-0.085**	-0.049			
				(0.030)	(0.039)	(0.037)			
Post × LS × Hedge				0.086**	0.105	0.059			
				(0.040)	(0.071)	(0.046)			
Post × WS							-0.084***	-0.131***	-0.020
							(0.029)	(0.036)	(0.042)
Post × WS × Hedge							0.107***	0.140*	0.044
							(0.038)	(0.071)	(0.049)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	524,943	350,934	174,009	524,943	350,934	174,009	524,943	350,934	174,009

Notes: The table reports the estimated β and γ from Equation 6, with $\ln(1+imports)$ on the left-hand side at the quarterly level. Columns (1)-(3) report the estimated coefficient of the interaction of *Post* with foreign currency leverage (FCL) and the interaction of *Post*×FCL×Hedge. In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS) and the hedging dummy, respectively. FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Hedge* is a dummy that equals 1 if the firm has either foreign currency assets outstanding or has foreign currency derivative positions outstanding in 2013 and 0 if not. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers; columns (2), (5), and (8) report the results for non-exporters; and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Foreign Currency Assets Hedging and Imports

	ln(imports)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × FCL	-0.142***	-0.236***	-0.029						
	(0.039)	(0.055)	(0.040)						
Post × FCL × Hedge	0.126**	0.147*	0.045						
	(0.047)	(0.078)	(0.050)						
Post × LS				-0.064**	-0.082**	-0.039			
				(0.027)	(0.038)	(0.033)			
Post × LS × Hedge				0.077*	0.118*	0.042			
				(0.038)	(0.068)	(0.044)			
Post × WS							-0.080***	-0.125***	-0.026
							(0.026)	(0.035)	(0.036)
Post × WS × Hedge							0.104***	0.110	0.057
							(0.036)	(0.072)	(0.046)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	524,943	350,934	174,009	524,943	350,934	174,009	524,943	350,934	174,009

Notes: The table reports the estimated β and γ from Equation 6, with $\ln(1+imports)$ on the left-hand side at the quarterly level. Columns (1)-(3) report the estimated coefficient of the interaction of *Post* with foreign currency leverage (FCL) and the interaction of *Post*×FCL×Hedge. In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS) and the hedging dummy, respectively. FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Hedge* is a dummy that equals 1 if the firm has foreign currency assets outstanding in 2013 and 0 if not. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers; columns (2), (5), and (8) report the results for non-exporters; and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Foreign Exchange Derivative Markets Hedging and Imports

	ln(imports)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × FCL	-0.124***	-0.251***	-0.003						
	(0.033)	(0.054)	(0.028)						
Post × FCL × Hedge	0.127*	0.388***	-0.060						
	(0.062)	(0.114)	(0.058)						
Post × LS				-0.050**	-0.074*	-0.023			
				(0.023)	(0.036)	(0.024)			
Post × LS × Hedge				0.039	0.081	-0.005			
				(0.050)	(0.115)	(0.051)			
Post × WS							-0.066***	-0.134***	-0.003
							(0.023)	(0.034)	(0.028)
Post × WS × Hedge							0.088*	0.226**	-0.020
							(0.048)	(0.103)	(0.049)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	524,943	350,934	174,009	524,943	350,934	174,009	524,943	350,934	174,009

Notes: The table reports the estimated β and γ from Equation 6, with $\ln(1+imports)$ on the left-hand side at the quarterly level. Columns (1)-(3) report the estimated coefficient of the interaction of *Post* with foreign currency leverage (FCL) and the interaction of *Post*×FCL×Hedge. In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS) and the hedging dummy, respectively. FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Hedge* is a dummy that equals 1 if the firm has foreign currency derivative positions outstanding in 2013 and 0 if not. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers; columns (2), (5), and (8) report the results for non-exporters; and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 9: Borrowing

	ln (FC borrowing)			ln (LC borrowing)		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × FCL	-0.587***			0.104***		
	(0.117)			(0.026)		
Post × LS		-0.207***			0.029	
		(0.059)			(0.017)	
Post × WS			-0.391***			0.068***
			(0.097)			(0.020)
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	524,943	524,943	524,943	524,943	524,943	524,943

Notes: The table reports the estimated β coefficient from Equation 4, with $\ln(1+borrowing)$ on the left-hand side at the quarterly level. Columns (1)-(3) report the results for borrowing in foreign currency, and columns (4)-(6) use borrowing in local currency on the left-hand side. Columns (1) and (4) report the estimated coefficient of the interaction of a *Post* with foreign currency leverage (FCL). In columns (2) and (5) and (3) and (6) *Post* is interacted with the liquidity (LS) and wealth shocks (WS), respectively. FCL, WS, and LS were normalized to have a mean of zero and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. See subsection 2.2 for the definition of the independent variables. The sample is limited to the firms that ever imported in our data. Exporters are firms that ever exported in our data. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 10: Interest Rate

	Interest Rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FCL × Post	0.040	0.134***	0.001						
	(0.028)	(0.049)	(0.036)						
LS × Post				0.052*	0.074*	0.043			
				(0.029)	(0.041)	(0.039)			
WS × Post							0.031	0.090*	-0.006
							(0.032)	(0.052)	(0.040)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank × Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	364,928	220,732	143,774	364,928	220,732	143,774	365,286	220,732	143,774

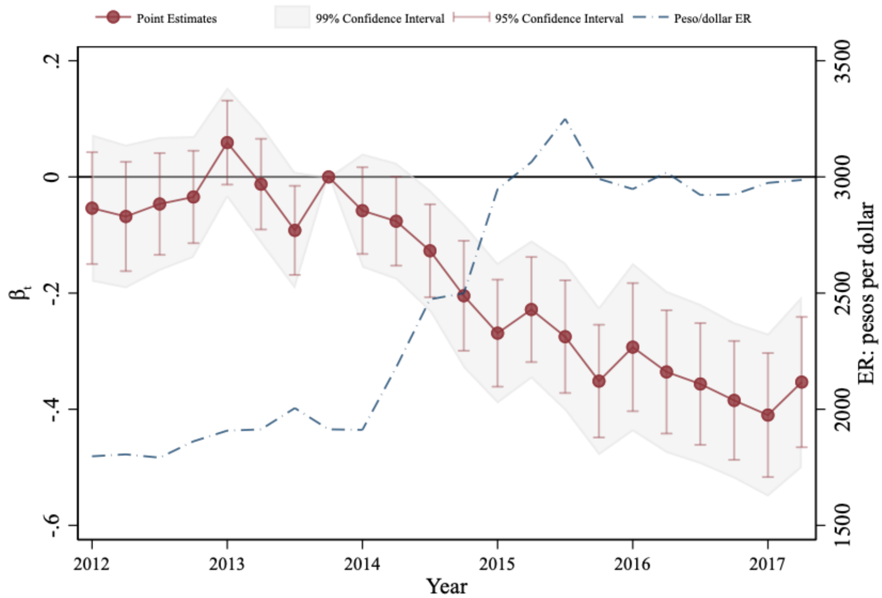
Notes: The table reports the estimated β from Equation 7, with the interest rate r charged by bank b at day d to firm f on the left-hand side. Columns (1)-(3) report the estimated coefficient of the interaction of *Post* with foreign currency leverage (FCL). In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS). FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers; columns (2), (5), and (8) report the results for non-exporters; and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 11: Delinquency

	Delinquent								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × FCL	0.002***	0.006***	0.001						
	(0.001)	(0.002)	(0.001)						
Post × LS				0.001*	0.003**	0.000			
				(0.001)	(0.001)	(0.001)			
Post × WS							0.001**	0.004***	0.001
							(0.001)	(0.001)	(0.001)
Sample	All	Non-X	X	All	Non-X	X	All	Non-X	X
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank × Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3,635,780	2,165,253	1,470,378	3,635,780	2,165,253	1,470,378	3,635,780	2,165,253	1,470,378

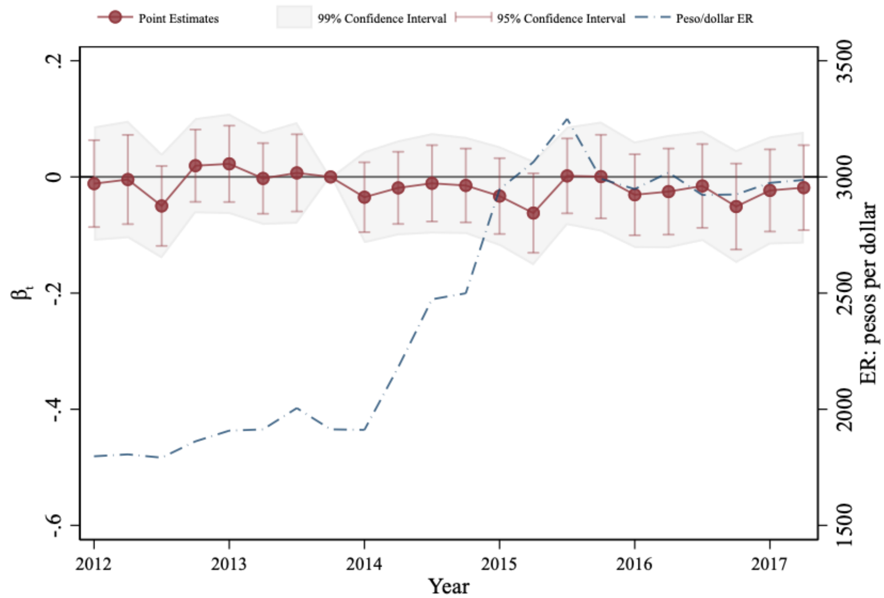
Notes: The table reports the estimated β from Equation 8, with $Delinquent$ as a dummy variable on the left-hand side at the quarterly level that is equal to 1 if the firm is delinquent on a loan to bank b at quarter t. Columns (1)-(3) report the estimated coefficient of the interaction of *Post* with foreign currency leverage (FCL). In columns (4)-(6) and (7)-(9) *Post* is interacted with liquidity (LS) and wealth shocks (WS). FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The sample is limited to the firms that ever imported. Columns (1), (4), and (7) report the results for all importers; columns (2), (5), and (8) report the results for non-exporters; and columns (3), (6), and (9) report the results estimated on the sample of exporters. Exporters are firms that ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Figure 1: Estimated Impact on Non-Exporters' Imports as a Function of Dominant Currency Financing



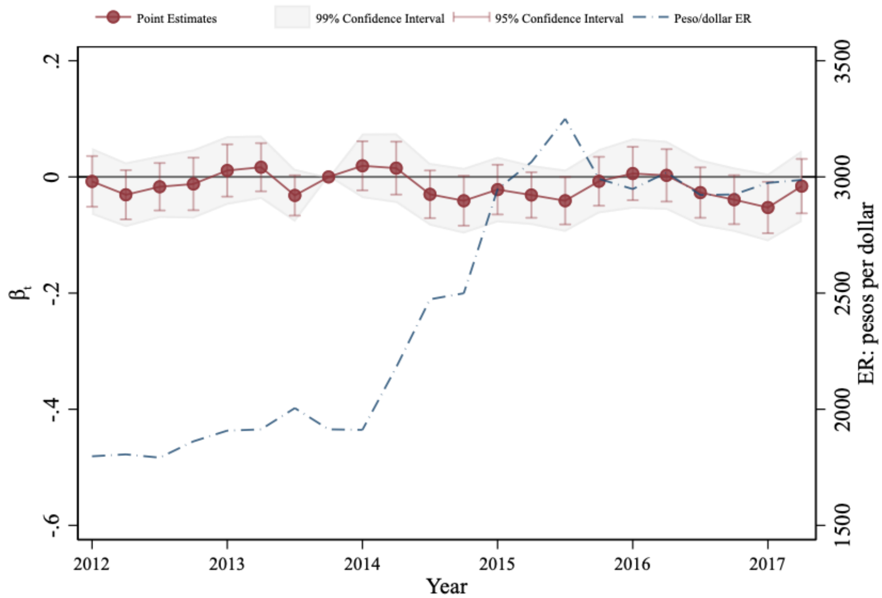
Notes: The figure plots the point estimates (red dots) of the effect of foreign currency leverage on imports, along with the 95% (vertical bars) and 99% (grey shaded area) confidence bands (left vertical axis). See Equation 5 for specification. The thin blue dotted line represents the average peso-dollar exchange rate (right axis). Standard errors are clustered at the firm and quarter levels. The sample is limited to firms that imported at least once and never exported in our data.

Figure 2: Estimated Impact on Exporters' Imports as a Function of Dominant Currency Financing



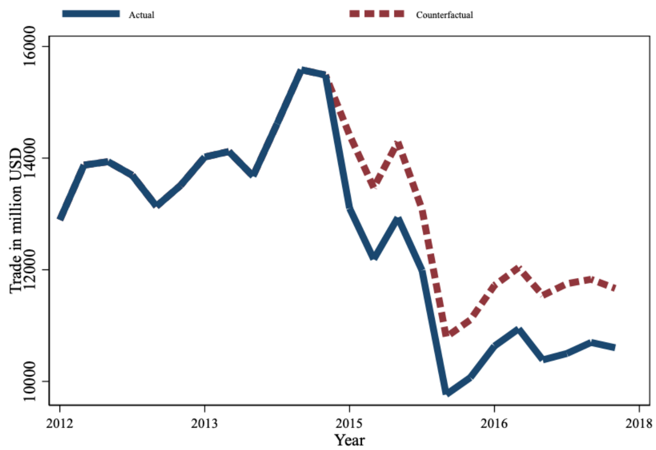
Notes: The figure plots the point estimates (red dots) of the effect of foreign currency leverage on imports, along with the 95% (vertical bars) and 99% (grey shaded area) confidence bands (left vertical axis). See Equation 5 for specification. The thin blue dotted line represents the average peso-dollar exchange rate (right axis). Standard errors are clustered at the firm and quarter levels. The sample is limited to firms that imported and exported at least once in our data.

Figure 3: Estimated Impact on Exports as a Function of Dominant Currency Financing



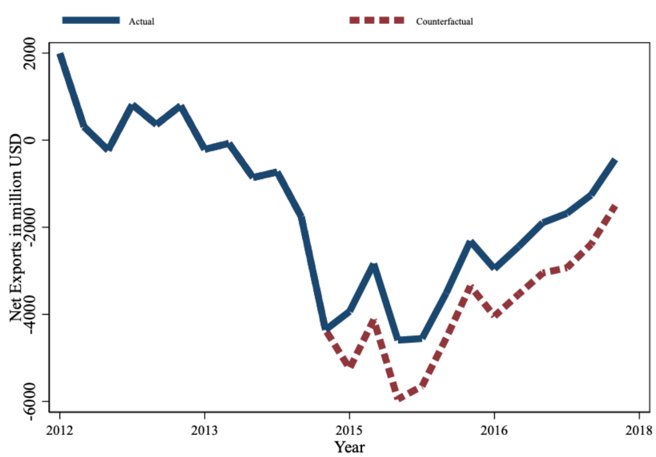
Notes: The figure plots the point estimates (red dots) of the effect of foreign currency leverage on exports, along with the 95% (vertical bars) and 99% (grey shaded area) confidence bands (left vertical axis). See Equation 5 for specification. The thin blue dotted line represents the average peso-dollar exchange rate (right axis). Standard errors are clustered at the firm and quarter levels. The sample is limited to firms that imported and exported at least once in our data.

Figure 4: Counterfactual Imports without Foreign Currency Debt



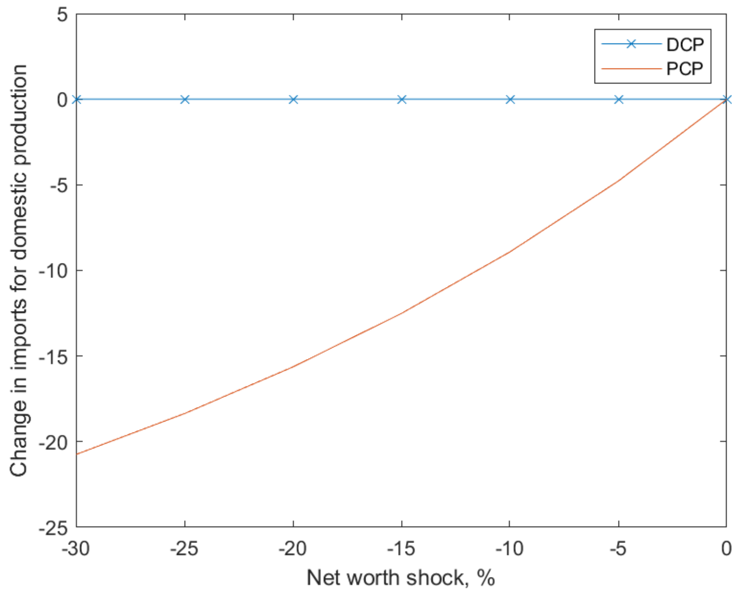
Notes: The figure plots the actual (thick blue line) and counterfactual (dashed red line) values of Colombia's imports. The counterfactual imports are computed assuming firms in 2014:Q2 had zero foreign currency leverage. See subsection 4.6 for the details of the counterfactual exercise.

Figure 5: Counterfactual Net Exports without Foreign Currency Debt



Notes: The figure plots the actual (thick blue line) and counterfactual (dashed red line) values of Colombia's net exports. The counterfactual net exports are computed assuming firms in 2014:Q2 had zero foreign currency leverage. See subsection 4.6 for the details of the counterfactual exercise.

Figure 6: The Effects of Dominant Currency Financing on Imports under Alternative Pricing Paradigms



Notes: The figure plots the change in imports for domestic production in response to net worth shock, as discussed in subsection 5.3. The blue line represents the results from a model with dominant currency pricing (DCP), and the orange line represents the results from a model with producer currency pricing (PCP) firms.

Appendix: For Online Publication

A Additional Tables

Table A1: Descriptive Statistics, Firm Characteristics

	Non-exporters		Exporters		All firms	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Assets	8,810	154,309	19,655	208,475	12,400	174,183
Exports before 2014:Q2	0	0	385	6,959	127	4,007
Exports after 2014:Q2	0	0	326	4,584	108	2,646
Imports before 2014:Q2	55	229	288	642	132	429
Imports after 2014:Q2	48	219	260	615	118	410
Number of firms	14,618		7,232		21,850	

Notes: All variables are reported in thousands of dollars. *Assets* refer to total assets of firms as reported in the Orbis database at the end of 2013. Trade data are taken from DANE and variables are aggregated to the quarterly level. The sample is limited to firms that ever imported in our data. Exporters are defined as firms that ever exported in our data.

Table A2: Descriptive Statistics, Independent Variables

	Mean	Percentiles				
		10	25	50	75	90
Foreign leverage	4.4%	0.2%	0.4%	2.0%	6.3%	11.6%
Liquidity shock	0.1%	-0.2%	0.0%	0.0%	0.0%	0.6%
Wealth shock	0.8%	-0.1%	0.0%	0.2%	0.9%	2.6%

Notes: See subsection 2.2 for the definition of the variables.

Table A3: Balance Table

	(1)	(2)	(3)	(4)	(5)
	Size	Bank credit supply	Age	Profits	Maturity
LS	0.033^{*}	-0.001	0.006	-0.002	0.007
	(0.017)	(0.001)	(0.009)	(0.007)	(0.010)
N	14,680	14,680	14,502	14,566	12,994

Notes: The table reports the estimated β coefficient from a cross-sectional firm-level regression of pre-depreciation (2013) firm-level characteristics on the liquidity shock (LS). *Size* refers to log assets, *Bank credit supply* is the exposure of firms to a bank credit supply shock constructed in the spirit of Amiti and Weinstein (2018), *Age* is the log age of the firm, *Profits* is the ratio of EBITDA to total assets, and *Maturity* is the log of the average maturity of firms' loans. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A4: Baseline with Controls

	ln(imports)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post × LS	-0.068*	-0.071**	-0.069**	-0.069**	-0.069**	-0.069**	-0.070**
	(0.034)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Size × Post			-0.044**	-0.045**	-0.016	-0.011	-0.014
			(0.016)	(0.016)	(0.022)	(0.022)	(0.022)
Bank credit supply × Post				-0.212	-0.269	-0.270	-0.290
				(0.242)	(0.237)	(0.237)	(0.237)
Age × Post					-0.138	-0.141	-0.131
					(0.083)	(0.083)	(0.083)
Profits × Post						0.109**	0.109**
						(0.042)	(0.041)
Maturity × Post							0.080***
							(0.025)
Sample	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X
Sector-Time FE	N	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y
N	350,934	305,518	305,518	305,518	305,518	305,518	305,518

Notes: The table reports the estimated β coefficients from the panel regression discussed in subsection 3.1, complemented with pre-depreciation (2013) firm-level characteristics interacted with the Post dummy and with sector-time fixed effects. *Size* refers to log assets, *Bank credit supply* is the exposure of firms to a bank credit supply shock constructed in the spirit of Amiti and Weinstein (2018), *Age* is the log age of the firm, *Profits* is the ratio of EBITDA to total assets, and *Maturity* is the log of the average maturity of firms' loans. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A5: Imports: Quantities

	Units			Kilograms		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × FCL	-0.338***			-0.317***		
	(0.073)			(0.074)		
Post × LS		-0.099*			-0.105**	
		(0.050)			(0.049)	
Post × WS			-0.154***			-0.161***
			(0.044)			(0.043)
Sample	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	350,934	350,934	350,934	350,934	350,934	350,934

Notes: The table reports the estimated β coefficient from the panel regression discussed in subsection 4.4, where in columns (1)-(3) the left-hand side takes the log of the number units imported, and in columns (4)-(6) it takes the log kilograms imported by firm-quarter. See subsection 2.2 for the definition of FCL, which was normalized to have a mean of 0 and a standard deviation of 1. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A6: Imports: Extensive Margin

	#Countries			#Products		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × FCL	-0.038***			-0.075***		
	(0.009)			(0.017)		
Post × LS		-0.009			-0.026*	
		(0.006)			(0.013)	
Post × WS			-0.018***			-0.041***
			(0.006)			(0.011)
Sample	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
N	350,934	350,934	350,934	350,934	350,934	350,934

Notes: The table reports the estimated β coefficient from the panel regression discussed in subsection 4.4, where in columns (1)-(3) the left-hand side takes the log of the unique number of import country destinations, and in columns (4)-(6) it takes the log number of unique products by firm-quarter. See subsection 2.2 for the definition of FCL, which was normalized to have a mean of 0 and a standard deviation of 1. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A7: Robustness: Exporters

	ln(imports)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × FCL	-0.189***	-0.187***	-0.186***	-0.189***	-0.188***	-0.193***
	(0.043)	(0.044)	(0.045)	(0.043)	(0.043)	(0.043)
Post × FCL × exporter	0.176***	0.151***	0.151***	0.151***	0.150***	0.151***
	(0.049)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)
Controls	No controls	Size	Bank credit supply	Age	Profits	Maturity
$p : \beta_1 + \beta_2 = 0$	0.574	0.289	0.289	0.247	0.244	0.202
N	461,746	461,746	461,746	461,746	461,746	461,746

Notes: The table reports the estimated β coefficients from the panel regression discussed in subsection 3.1, complemented with a triple interaction with an exporter dummy instead of splitting the sample. Columns (2)-(6) introduce sequentially additional triple interactions of pre-depreciation (2013) firm level characteristics with $Post$ and FCL on top of the ones included in the previous columns. *Size* refers to log assets, *Bank credit supply* is the exposure of firms to a bank credit supply shock constructed in the spirit of Amiti and Weinstein (2018), *Age* is the log age of the firm, *Profits* is the ratio of EBITDA to total assets, and *Maturity* is the log of the average maturity of firms' loans. $p : \beta_1 + \beta_2 = 0$ displays the p-value from a t-test that determines whether the sum of $Post \times FCL$ and $Post \times FCL \times exporter$ are equal to 0. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A8: Robustness: Exporters

	ln(imports)					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × FCE	-0.121***		-0.058**		-0.068***	
	(0.029)		(0.023)		(0.022)	
Post × FCE × Exports/Assets	0.499		0.707**		0.142	
	(0.498)		(0.323)		(0.367)	
No Exports × Post × FCE		-0.142***		-0.058**		-0.084***
		(0.032)		(0.025)		(0.024)
Low Exports × Post × FCE		-0.059**		-0.073**		-0.053**
		(0.025)		(0.033)		(0.026)
Medium Exports × Post × FCE		-0.052*		-0.023		-0.004
		(0.026)		(0.022)		(0.027)
High Exports × Post × FCE		-0.039		0.000		-0.008
		(0.040)		(0.029)		(0.033)
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
FCE Measure	FCL	FCL	LS	LS	WS	WS
N	519,674	519,674	519,674	519,674	519,674	519,674

Notes: The table reports the estimated β coefficients from the panel regression discussed in subsection 3.1. *No exports* is a dummy that is equal to 1 if the firm does not have any exports and zero otherwise, and *low*, *medium*, and *high exports* are a dummies that are equal to 1 if the firm is in the bottom-, middle-, and upper-third of the export/asset distribution (conditional on having exports) and 0 otherwise. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A9: Robustness: Imports and Export Shares

	Imports/Assets			Exports/Assets
	(1)	(2)	(3)	(4)
Post × FCL	-0.192***	-0.386***	-0.041	-0.020
	(0.068)	(0.105)	(0.055)	(0.017)
Sample	All	Non-X	X	X
Firm FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
N	519,689	347,278	172,411	168,740

Notes: The table reports the estimated β coefficients from the panel regression discussed in subsection 3.1, with the left-hand side being imports and exports over assets, respectively, instead of their logarithm. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A10: Robustness Controls

	ln(exports)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post × FCL	-0.010	-0.020	-0.009	-0.009	-0.005	-0.005	-0.003
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Size × Post			-0.055**	-0.055**	0.019	0.020	0.019
			(0.020)	(0.019)	(0.020)	(0.020)	(0.020)
Bank credit supply × Post				0.031	-0.048	-0.046	-0.056
				(0.342)	(0.338)	(0.338)	(0.339)
Age × Post					-0.355***	-0.355***	-0.349***
					(0.073)	(0.074)	(0.072)
Profits × Post						0.008	0.007
						(0.017)	(0.017)
Maturity × Post							0.051
							(0.036)
Sample	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X	Non-X
Sector-Time FE	N	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y
N	169,232	151,764	151,764	151,764	151,764	151,764	151,764

Notes: The table reports the estimated β coefficients from the panel regression discussed in subsection 3.1, complemented with pre-depreciation (2013) firm-level characteristics interacted with the *Post* dummy. *Size* refers to log assets, Bank credit supply is the exposure of firms to a bank credit supply shock constructed in the spirit of Amiti and Weinstein (2018), *Age* is the log age of the firm, *Profits* is the ratio of EBITDA to total assets, and *Maturity* is the log of the average maturity of firms' loans. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A11: Investment

	Δ Investment				
	(1)	(2)	(3)	(4)	(5)
FCL	-0.035	-0.101**	-0.062	-0.100*	-0.101**
	(0.027)	(0.045)	(0.041)	(0.057)	(0.043)
Exporter					0.068
					(0.050)
FCL × Exporter					0.102*
					(0.055)
Sample	All	Non-X	Non-Hedge	Non-X,Non-Hedge	All
N	16,924	10,621	14,225	9,956	16,924

Notes: The table reports the estimated β coefficients from a cross-sectional regression of the change in investment between pre-depreciation and 2014 on the foreign currency leverage of the firm before the depreciation. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

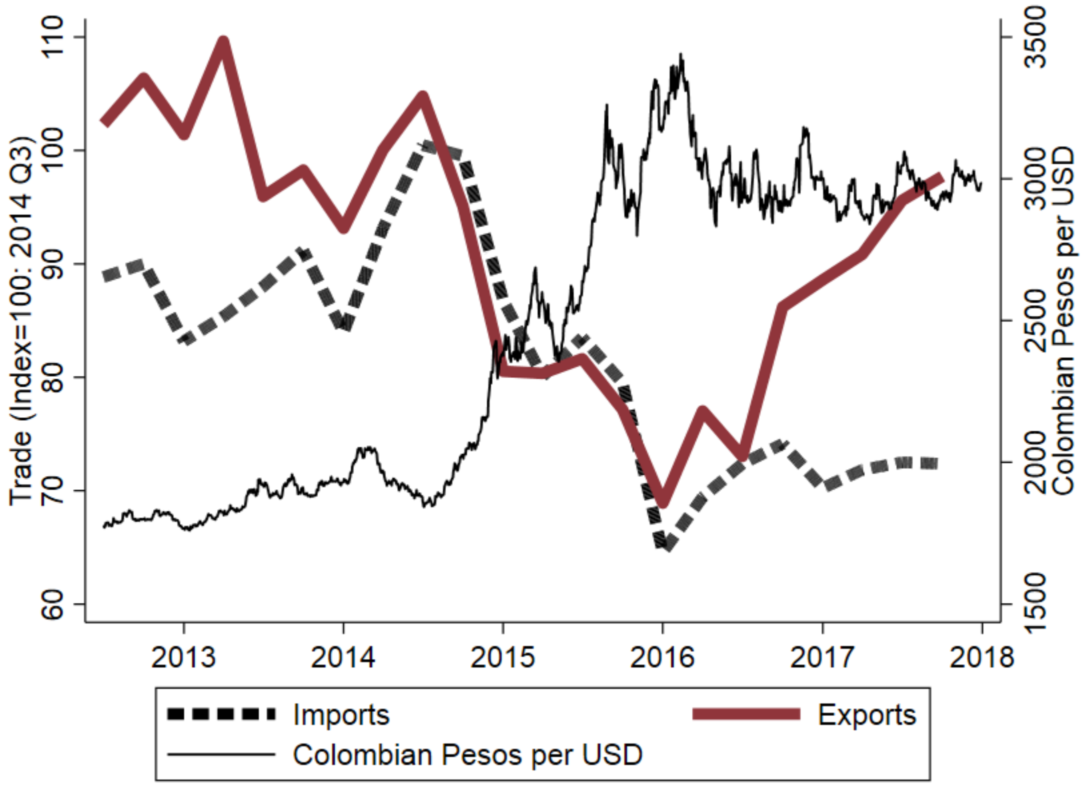
Table A12: New Borrowing

	Foreign Currency								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FCL × Post	-0.284***			0.234***			0.008		
	(0.059)			(0.050)			(0.014)		
FCL × Post × exporter	0.034			-0.048			0.021		
	(0.077)			(0.068)			(0.019)		
LS × Post		-0.100**			0.105***			0.003	
		(0.049)			(0.039)			(0.013)	
LS × Post × exporter		-0.013			-0.058			-0.013	
		(0.069)			(0.057)			(0.018)	
WS × Post			-0.092*			0.124***			0.012
			(0.050)			(0.039)			(0.017)
WS × Post × exporter			-0.032			-0.048			-0.001
			(0.069)			(0.054)			(0.021)
Sample	All	All	All	All	All	All	All	All	All
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank × Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	364,911	364,911	364,911	364,911	364,911	364,911	364,911	364,911	364,911

Notes: The table reports the estimated β from $Loan_{i,f,d(t),b} = \alpha + \beta_1 FCE_f * Post_t + \beta_2 FCE_f * Exporter_f * Post_t + \alpha_{b,t} + \alpha_i + \epsilon_{f,d(t),b}$, where Loan is the log of the loan volume of loan i to firm f at issuance date d by bank b. Columns (1)-(3) report the results for loans in foreign currency, columns (4)-(6) report the results for loans in local currency, and columns (7)-(9) report the results for all loans. *Post* is interacted with liquidity (LS) and wealth shocks (WS). FCL, WS, and LS were normalized to have a mean of 0 and a standard deviation of 1. *Post* is defined as a binary variable equal to 1 for the period after 2014:Q2. The $Exporter$ dummy takes the value 1 if a firm ever exported in our data. See subsection 2.2 for the definition of the independent variables. Standard errors are clustered at the firm and quarter level. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively.

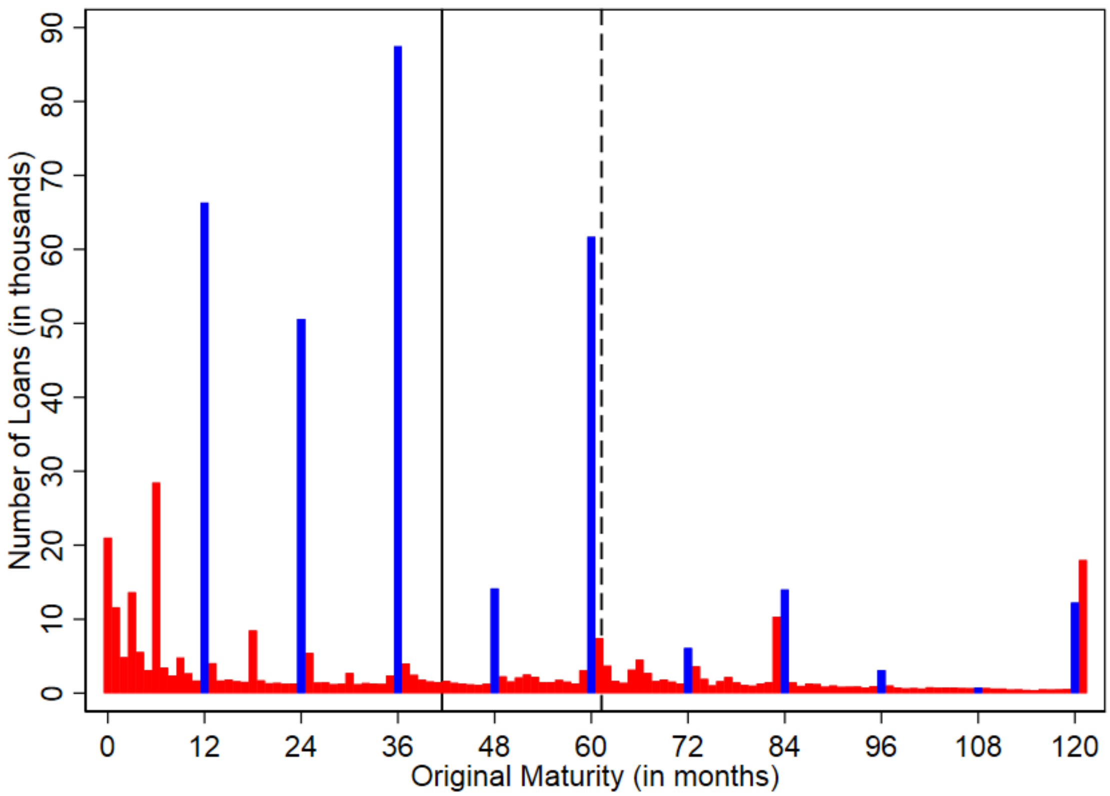
B Additional Figures

Figure A1: Imports, Exports and the Exchange Rate in Colombia



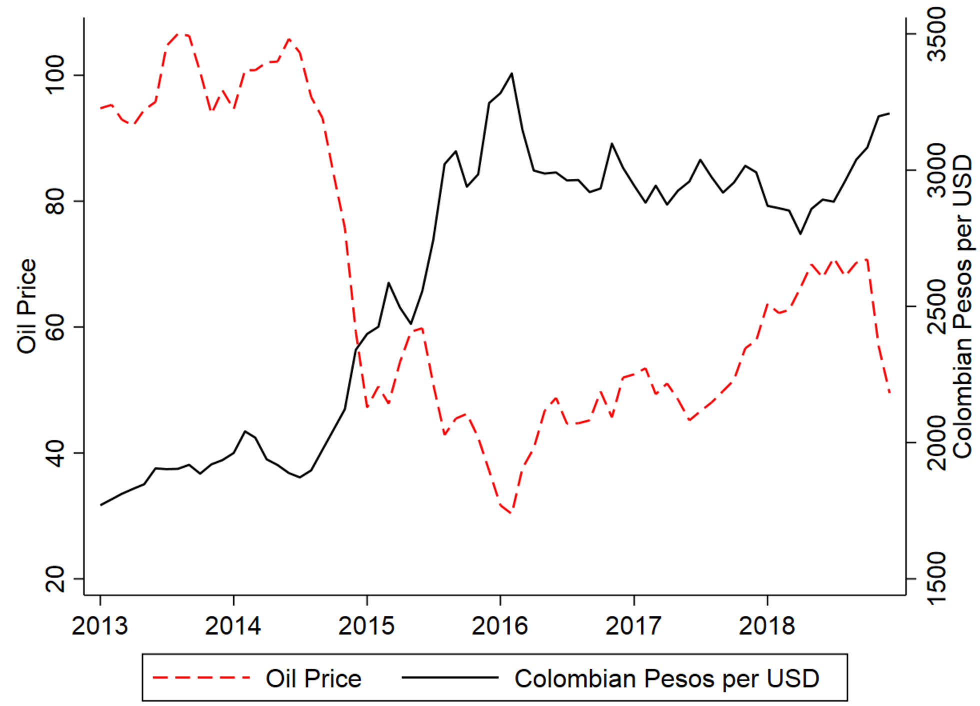
Notes: The thick red line represents aggregate exports, and the dashed black line represents aggregate imports in Colombia (in millions of dollars). Trade variables are plotted on the left vertical axis and are indexed before the depreciation. The thin black line, plotted on the right axis, represents the exchange rate (pesos per dollar).

Figure A2: Maturity Structure of Loans



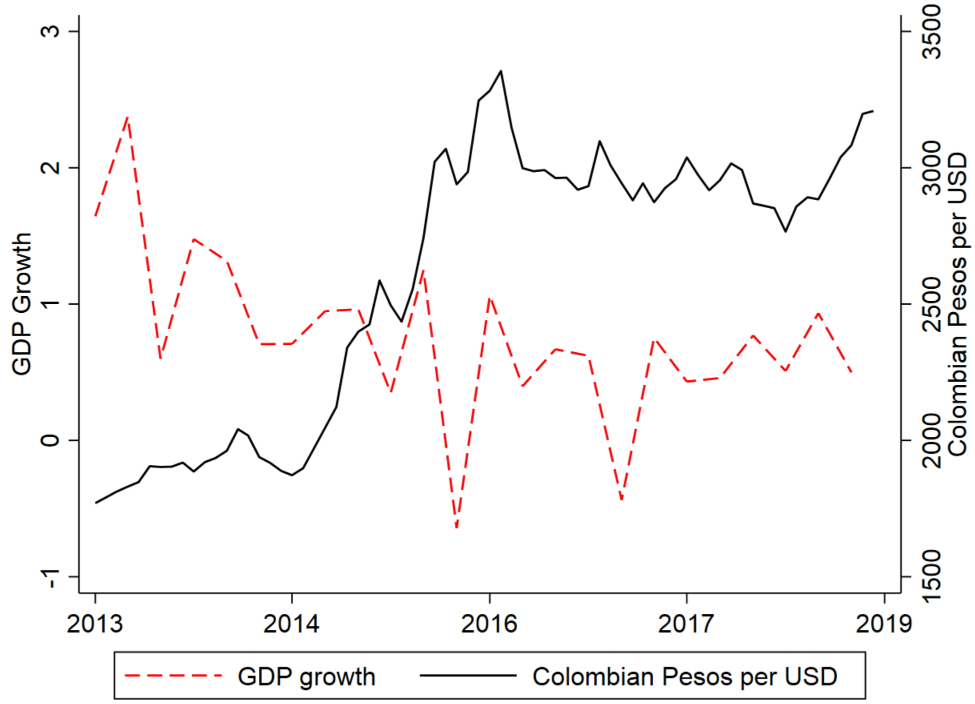
Notes: The figure plots the loan frequency by the original maturity in months. The red (blue) bars reflect loans that have an original maturity of non-whole (whole) years. The black solid (dashed) line represents the average (weighted) maturity. The maturity is winsorized for longer than 120 months.

Figure A3: Oil Price and the Peso



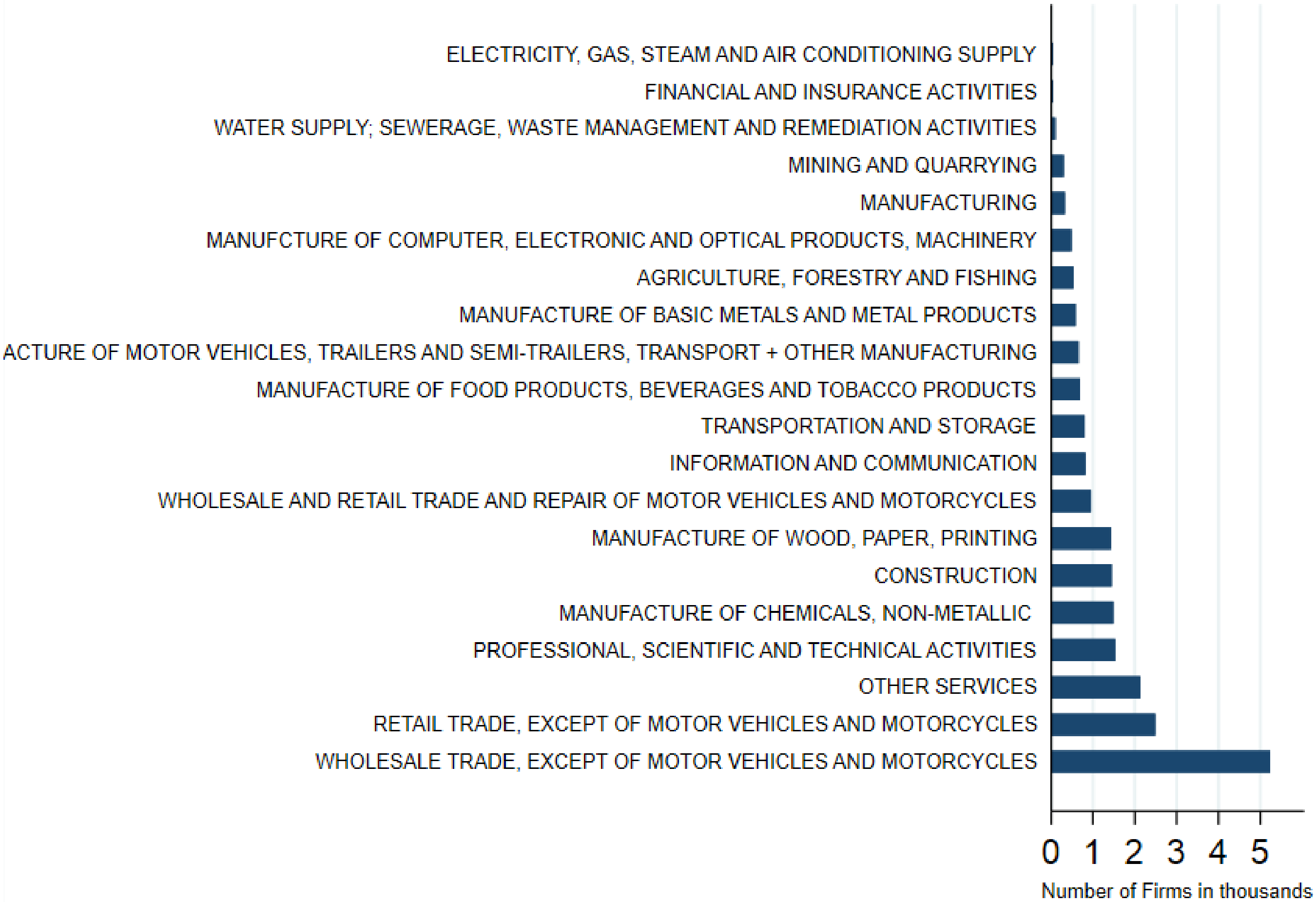
Note: The figure plots the oil price (left axis) and the peso-dollar exchange rate (right axis).

Figure A4: Colombian GDP growth and the Peso



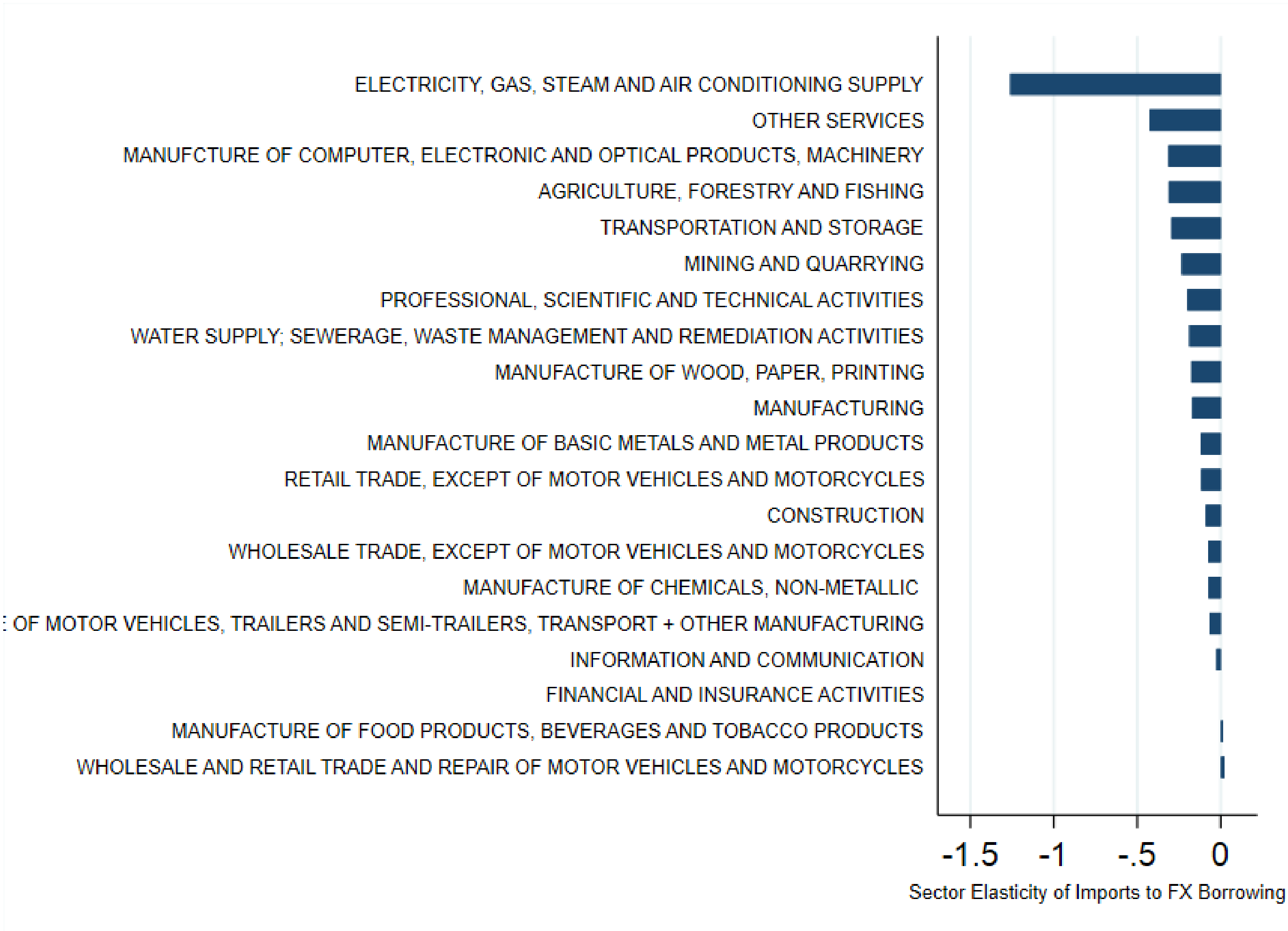
Note: The figure plots the real GDP growth (left axis) and the peso-dollar exchange rate (right axis).

Figure A5: Number of Firms per Sector



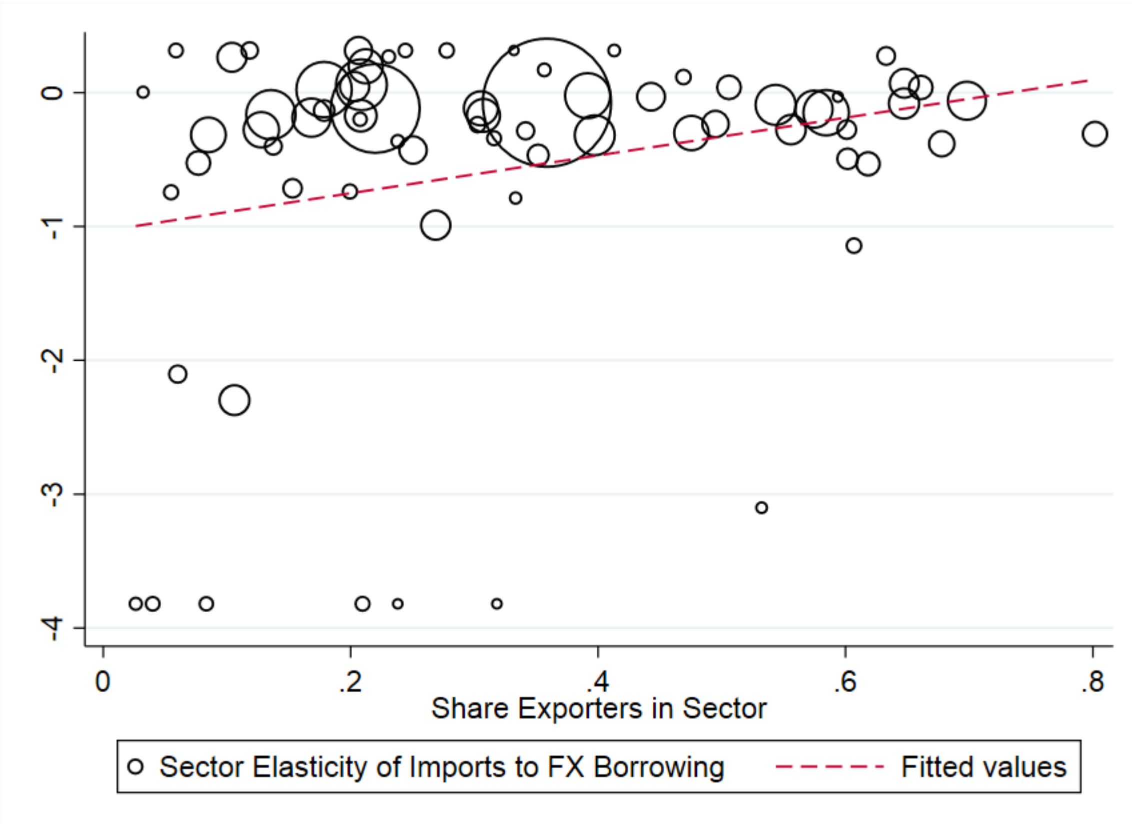
Note: The figure plots the number of firms in each sector considered in our regression sample.

Figure A6: Sector Heterogeneity



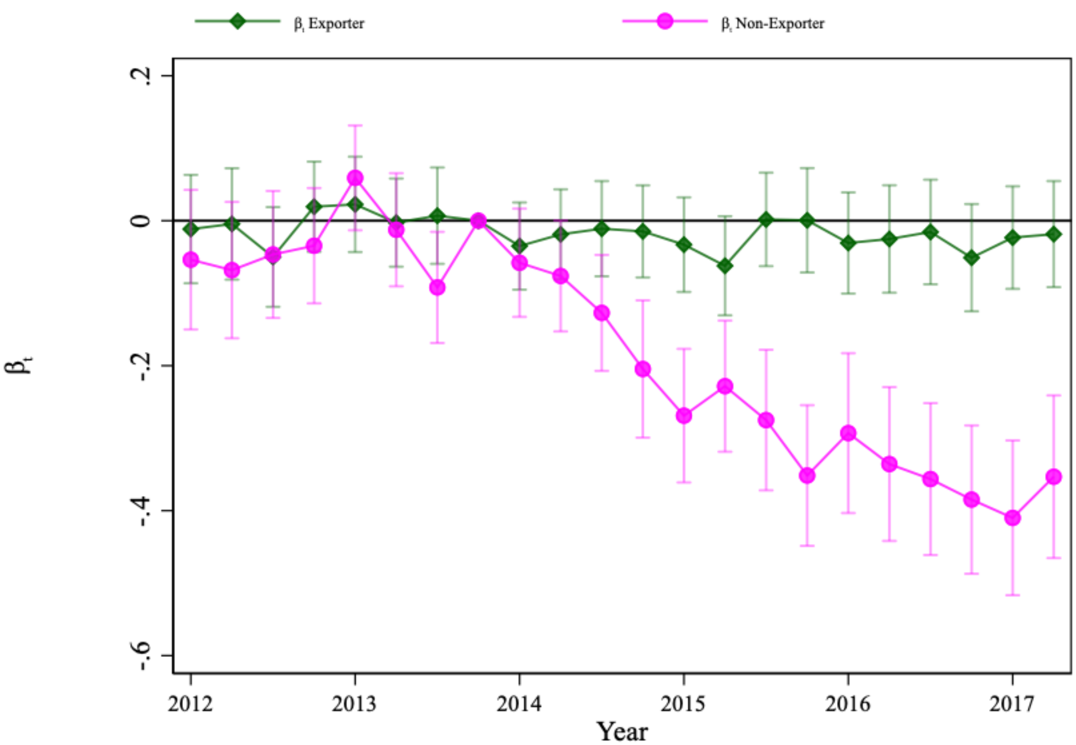
Note: The figure plots the sector-level coefficient of our baseline specification Equation 4 for each sector.

Figure A7: Sector Heterogeneity and Export Share



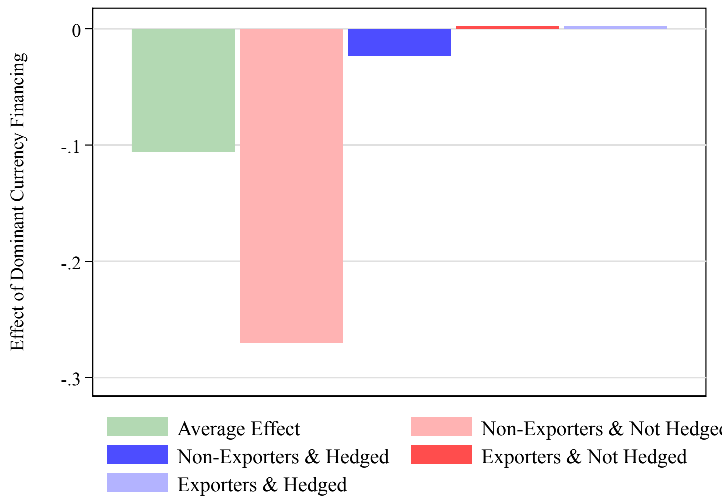
Notes: The figure plots the sector-level (2-digit NAICS) coefficient of our baseline specification Equation 4 estimated for each sector separately against the share of exporters in this sector. The size of the circle represents the number of firms in the sector.

Figure A8: Estimated Impact on Imports of Non-Exporters and Exporters as a Function of Dominant Currency Financing



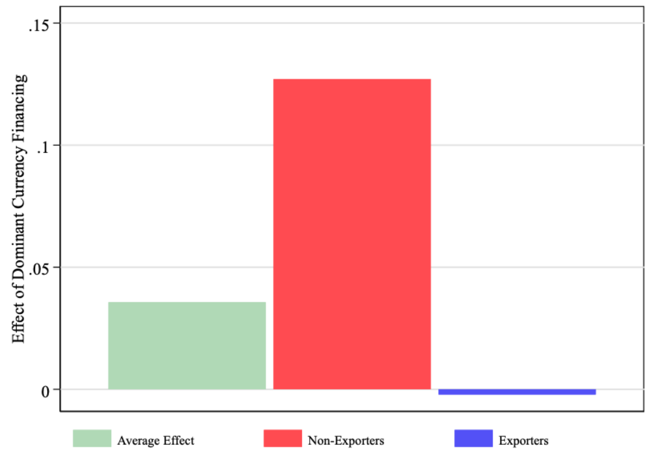
Notes: The figure plots point estimates for exporters (green dots) and non-exporters (pink dots) and their 95% (vertical bars) confidence bands of the effect of foreign currency leverage on imports for exporters and non-exporters. See Equation 5 The sample is limited to firms that imported.

Figure A9: Estimated Impact on Imports as a Function of Dominant Currency Financing



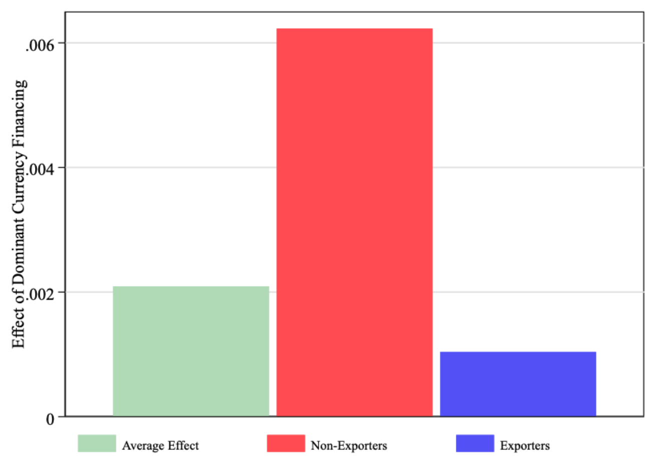
Note: The bars plot the estimated impact of a one standard deviation larger dominant currency financing before the depreciation on imports during and after the depreciation for the average firm, and for non-exporters and exporters that are either financially hedged (through derivatives or foreign assets) or not.

Figure A10: Estimated Impact on Interest Rates as a Function of Dominant Currency Financing



Note: The bars plot the estimated impact of a one standard deviation larger dominant currency financing before the depreciation on interest rates during and after the depreciation for the average firm, non-exporters, and exporters.

Figure A11: Estimated Impact on Delinquencies as a Function of Dominant Currency Financing



Note: The bars plot the estimated impact of a one standard deviation larger dominant currency financing before the depreciation on interest rates during and after the depreciation for the average firm, non-exporters, and exporters.

C Analytical model

This appendix details the proofs used in the paper. We start with a baseline model that follows Bernanke et al. (1999) with imported inputs and foreign currency borrowing. We introduce the exchange rate shock that affects a firm's net worth and later augment the model with exporting.

C.1 Simple model

C.1. 1 Set-up

Define the following objects:

$$\Psi\left(\bar{\delta}\right) = \mathbb{E}\left[\delta|\delta < \bar{\delta}\right]]F(\bar{\delta}) + \bar{\delta}(1 - F(\bar{\delta})), \tag{27}$$

$$\zeta(\bar{\delta}) = \gamma\mathbb{E}\left[\delta|\delta < \bar{\delta}\right]F(\bar{\delta}). \tag{28}$$

Without loss of generality, assume that $\mathbb{E}[\delta] = 1$. Then:

$$\Psi'(\bar{\delta}) = 1 - F(\bar{\delta}), \tag{29}$$

$$\zeta'(\bar{\delta}) = \gamma\bar{\delta}f(\bar{\delta}), \tag{30}$$

and

$$\bar{\delta}(1 - F(\bar{\delta})) = \Psi(\bar{\delta}) - \frac{\zeta(\bar{\delta})}{\gamma}. \tag{31}$$

We can then express firm profits as $\pi^f = \rho(M)\left(1 - \Psi(\bar{\delta})\right)$. Here, $\rho(M)$ are the firm's expected revenues, M are the firm's inputs (imports), $1 - \Psi(\bar{\delta})$ is the share of revenues that goes to the firm, and $\Psi(\bar{\delta})$ is the share of profits that goes to the bank, inclusive of monitoring costs. Note that bank profits can be written as $\pi^b = \left(\Psi(\bar{\delta}) - \zeta(\bar{\delta})\right)\rho(M)$ and, therefore, $\zeta(\bar{\delta})$ is the share of revenues that goes to monitoring costs. M is procured at price p^M and is financed by debt (B) and equity (A)—$p^M M = B + A$. Hence, the problem can be written as:

$$\begin{aligned} &\max_{M,\bar{\delta}} \rho\left(M\right)\left(1 - \Psi(\bar{\delta})\right) \\ &\quad s.t. \quad \rho(M)\left(\Psi(\bar{\delta}) - \zeta(\bar{\delta})\right) = R(p^M M - A), \end{aligned} \tag{32}$$

where the constraint implies that the profits of the bank are equal to the risk-free rate R times the amount lent to the firm $p^M M - A$, as banks are competitive. The properties of functions Ψ and ζ will depend on the functional forms of the distribution of δ.

C.1. 2 Optimization

The Lagrangian is given by:

$$L = \rho(M)\left(1-\Psi(\bar{\delta})\right) + \lambda\left(\rho(M)\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right) - R(p^M M - A)\right) \tag{33}$$

and the FOCs are:

$$M: \ \frac{1}{p^M}\rho_M(M)\left[1-\Psi(\bar{\delta})+\lambda\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)\right] - \lambda R = 0 \tag{34}$$

$$\bar{\delta}: \ -\rho(M)\Psi'(\bar{\delta}) + \lambda\rho(M)\left(\Psi'(\bar{\delta})-\zeta'(\bar{\delta})\right) = 0 \tag{35}$$

$$\lambda: \ \rho(M)\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right) = R(p^M M - A) \tag{36}$$

Assume for now that exchange rate affects only the firm's net worth and that there is an interior solution.[26] Then, from Equation 35 we can express the multiplier as follows:

$$\lambda\left(\bar{\delta}\right) = \frac{\Psi'(\bar{\delta})}{\Psi'(\bar{\delta})-\zeta'(\bar{\delta})}. \tag{37}$$

Let

$$r \equiv \frac{\frac{1}{p^M}\rho_M(M)}{R}. \tag{38}$$

This is the ratio between the marginal revenue from a dollar spent on imported inputs and a rate of return to the bank. From Equation 34 we get:

$$r(\bar{\delta}) = \frac{\lambda(\bar{\delta})}{\left[1-\Psi(\bar{\delta})+\lambda(\bar{\delta})\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)\right]} \tag{39}$$

We can show that $r'(\bar{\delta}) > 0$ and, thus, $\varepsilon_{r,\bar{\delta}} > 0$.[27] In other words, the wedge between cost of funds to the bank and expected return to capital is increasing with the cutoff. Note that we can express the actual interest rate on the loan as:

$$1 + i = \frac{\bar{B}}{B} = \frac{\rho(M)\bar{\delta}}{B}. \tag{40}$$

Because $\bar{B} = \rho(M)\bar{\delta}$ (as revenues at cutoff must be the same as total payments), from Equation 36:

$$\frac{\rho(M)}{B} = \frac{R}{\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)}. \tag{41}$$

[26] See Bernanke et al. (1999) for the conditions under which unique solution exists.
[27] See Bernanke et al. (1999) for the proof.

Plugging Equation 41 into Equation 40 yields

$$1+i=\frac{R\bar{\delta}}{\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)}. \tag{42}$$

C.1. 3 Derivation of elasticities

We can now derive several elasticities of interest.

$$\begin{aligned}\varepsilon_{1+i,\bar{\delta}} &= R\frac{\Psi(\bar{\delta})-\zeta(\bar{\delta})-\bar{\delta}(\Psi'(\bar{\delta})-\zeta'(\bar{\delta}))}{\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)^2}\frac{\bar{\delta}}{\frac{R\bar{\delta}}{\left(\Psi(\bar{\delta})-\zeta(\bar{\delta})\right)}}\\ &= 1-\bar{\delta}\frac{\Psi'(\bar{\delta})-\zeta'(\bar{\delta})}{\Psi(\bar{\delta})-\zeta(\bar{\delta})}\\ &= 1-\varepsilon_{\Psi-\zeta,\delta}\end{aligned} \tag{43}$$

$$\begin{aligned}\varepsilon_{\Psi-\zeta,\delta} &= \bar{\delta}\frac{\Psi'(\bar{\delta})-\zeta'(\bar{\delta})}{\Psi(\bar{\delta})-\zeta(\bar{\delta})}\\ &= \frac{(1-F(\bar{\delta}))\bar{\delta}-\gamma\bar{\delta}^2 f(\bar{\delta})}{(1-F(\bar{\delta}))\bar{\delta}+(1-\gamma)\mathbb{E}[\delta|\delta<\bar{\delta}]F(\bar{\delta})}<1\end{aligned} \tag{44}$$

Because $\gamma\bar{\delta}^2 f(\bar{\delta})>0$ and $(1-\gamma)\mathbb{E}[\delta|\delta<\bar{\delta}]F(\bar{\delta})>0$, the numerator is lower than the denominator (and the denominator is positive). It follows that $\varepsilon_{\Psi-\zeta,\delta}<1$ and, therefore, $\varepsilon_{1+i,\bar{\delta}}>0$.

Consider Equation 38:

$$\begin{aligned}\varepsilon_{r,\bar{\delta}} &= \varepsilon_{\rho_M,M}\varepsilon_{M,\bar{\delta}}\\ \varepsilon_{M,\bar{\delta}} &= \frac{\varepsilon_{r,\bar{\delta}}}{\varepsilon_{\rho_M,M}}<0,\end{aligned}$$

as $\varepsilon_{r,\bar{\delta}}>0$ and $\varepsilon_{\rho_M,M}<0$ by assumption that marginal revenues are decreasing in inputs. Consider the FOC for λ:

$$\varepsilon_{\rho,M}\varepsilon_{M,\bar{\delta}}\varepsilon_{\bar{\delta},A}+\varepsilon_{\Psi-\zeta,\bar{\delta}}\varepsilon_{\bar{\delta},A}=\varepsilon_{p^M M-A,A}$$

$$\varepsilon_{\rho,M}\varepsilon_{M,\bar{\delta}}\varepsilon_{\bar{\delta},A}+\varepsilon_{\Psi-\zeta,\bar{\delta}}\varepsilon_{\bar{\delta},A}=\varepsilon_{p^M M,A}\frac{p^M M}{p^M M-A}+\varepsilon_{A,A}\frac{-A}{p^M M-A}$$

$$\varepsilon_{\rho,M}\varepsilon_{M\bar{\delta}}\varepsilon_{\bar{\delta},A}+\varepsilon_{\Psi-\zeta,\bar{\delta}}\varepsilon_{\bar{\delta},A}=\varepsilon_{M,\bar{\delta}}\varepsilon_{\bar{\delta},A}\frac{p^M M}{p^M M-A}-\frac{A}{p^M M-A}$$

$$\varepsilon_{\bar{\delta},A} = \frac{-\frac{A}{p^M M}}{\varepsilon_{M,\bar{\delta}}\left(\varepsilon_{\rho,M} - \frac{p^M M}{p^M M - A}\right) + \varepsilon_{\Psi-\zeta,\bar{\delta}}} < 0.$$

Note that, by assumption, $\varepsilon_{\rho,M} < 1$. Firms start with non-negative net worth $A > 0$, and those who borrow positive amounts have $p^M M > B = p^M M - A > 0$. Hence, $\frac{p^M M}{p^M M - A} > 1$. Because we proved that $\varepsilon_{M,\bar{\delta}} < 0$, the first term in the denominator is positive as a product of two negative numbers. Bernanke et al. (1999) show that $\varepsilon_{\Psi-\zeta,\bar{\delta}}$ is positive, so the denominator is positive. Therefore, the ratio is negative because the numerator is negative. Hence, the demand shock cutoff for default decreases with net worth (firms with higher net worth have lower probability of default).

C.2 Model with Exporting

To keep the model parsimonious, we allow export revenues to be deterministic—the firms are getting paid for exports in advance and export profits are separable from domestic profits.[28] As a result, the profits from exporting can be used to increase the net worth of the firm and to lower borrowing for domestic production. In this case, denoting profits from exporting by π^e, we can rewrite Equation (33) as

$$L = \rho(M)\left(1 - \Psi(\bar{\delta})\right) + \lambda\left(\rho(M)\left(\Psi(\bar{\delta}) - \zeta(\bar{\delta})\right) - R(p^M M - A - \pi^e)\right), \tag{45}$$

where π^e are profits from exporting. Exporters that have positive profits are isomorphic to firms that sell domestically and have higher net worth, hence the intuition outlined in the preceding part of this section applies.

In this context, exporters that have a probability of default close to zero will not react to the effects of exchange rate through the balance sheet. In addition, there is theoretical evidence that (in some models) firms that price their exports in dominant currency are more profitable. In terms of this model, higher probability implies a lower probability of default, and thus DCP exporters are even more likely than exporters not to react to exchange rate movements through their balance sheets.

[28]These assumption allows us to to drastically simplify the model. However, qualitative results would also hold in a model in which export revenues are subject to the same demand shocks and banks have to incur monitoring costs to verify export revenues.

Table A13: Calibration

Parameter	Value	Source/Target moment
σ	5	Bas et al. (2017)
γ	0.18	Fernández-Villaverde and Ohanian (2010)
R	1.03	Risk-free interest rate of 3%
Import share	64%	Data
F	1.1	Export intensity of 65%
$\delta \sim LN(\nu, -\frac{\nu^2}{2})$	$\nu = 3$	Nominal interest rate of 10.5%
$\frac{de}{e}$	40%	Data
A	0.12	Net worth to sales ratio of 0.5
$\frac{dA}{A}$	15%	Data
Results: Contribution of Dominant Currency Financing Channel		
Exporters	0%	
Non-exporters	13.7%	

Note: The table reports calibrated values of the parameters of the theoretical model discussed in section 5.