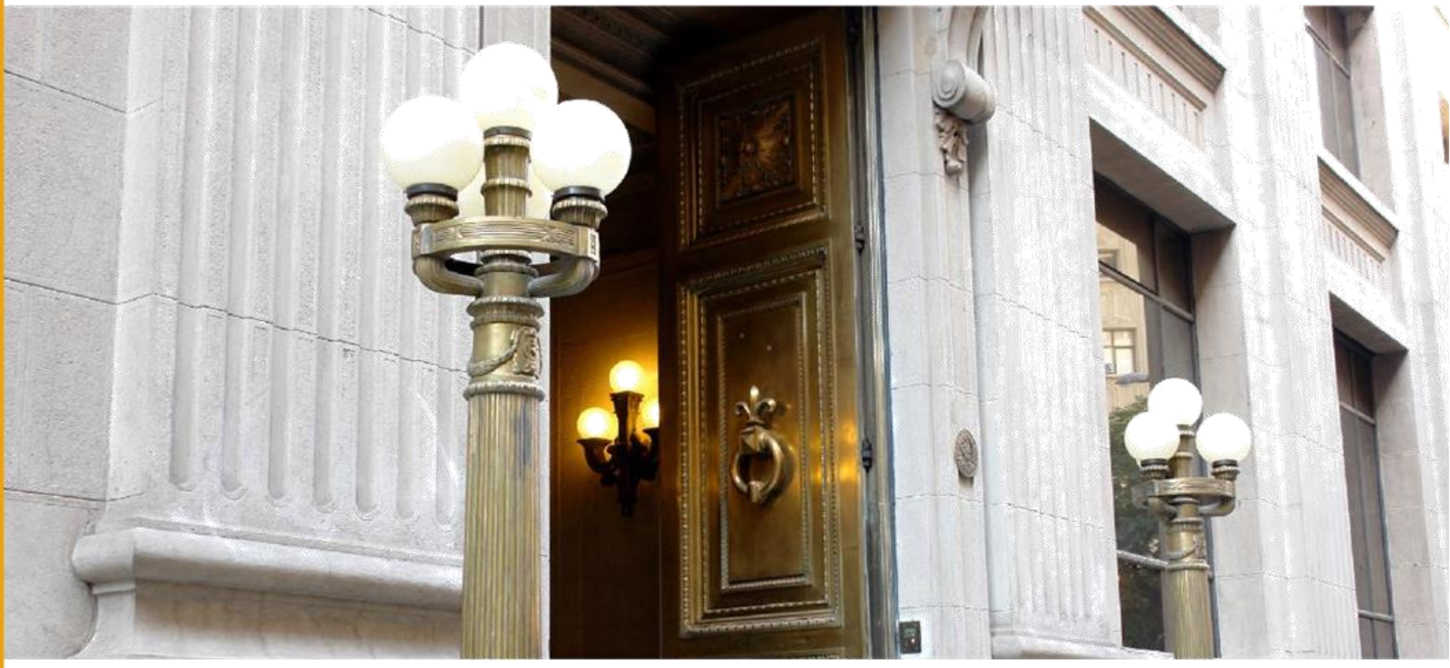
DOCUMENTOS DE TRABAJO

Heterogeneous UIPDs Across Firms: Spillovers from U.S. Monetary Policy Shocks

Miguel Acosta-Henao
Maria Alejandra Amado
Montserrat Martí
David Perez-Reyna

N° 1043 Mayo 2025
BANCO CENTRAL DE CHILE



Documentos de Trabajo del Banco Central de Chile
Working Papers of the Central Bank of Chile
Agustinas 1180, Santiago, Chile
Teléfono: (56-2) 3882475; Fax: (56-2) 38822311

Documento de Trabajo N° 1043

Working Paper N° 1043

Heterogeneous UIPDs Across Firms: Spillovers from U.S. Monetary Policy Shocks*

Miguel Acosta-Henao†
Maria Alejandra Amado‡
Montserrat Martí§
David Perez-Reyna¶

Resumen

Este artículo investiga la transmisión granular de los shocks de la política monetaria de Estados Unidos sobre las desviaciones de la paridad descubierta de tasas de interés (UIPDs) en economías emergentes. Utilizando una base de datos comprensiva de Chile que contempla las relaciones entre empresas y bancos, así como las características variables en el tiempo de ambas, identificamos lo siguiente: (1) Los shocks a la tasa de fondos federales de Estados Unidos (FFR) aumentan los costos de financiamiento externo para los bancos. (2) Estos mayores costos crediticios afectan desproporcionadamente a las empresas pequeñas, elevando sus UIPDs más que las de las empresas grandes. (3) Este impacto diferenciado por tamaño se debe a las tasas de interés relativamente más altas de los préstamos en moneda local que enfrentan las empresas pequeñas. (4) En contraste, las tasas de interés de los préstamos denominados en dólares responden de manera homogénea en todas las empresas. (5) No encontramos efectos diferenciales en las cantidades de préstamo, lo que sugiere un rol activo de la oferta y demanda de crédito. Racionalizamos estos hallazgos mediante un modelo de economía pequeña y abierta con riesgo de default corporativo, que incorpora empresas heterogéneas que se financian con bancos domésticos tanto en moneda extranjera como en moneda local. En nuestro modelo, un aumento en la FFR reduce el costo marginal de default en moneda local más para las empresas pequeñas que para las grandes.

Abstract

This paper investigates the granular transmission of U.S. monetary policy shocks to deviations from the uncovered interest rate parity (UIPDs) in emerging economies. Using a comprehensive dataset from Chile that accounts for firm-bank relationships and the time-variant characteristics of both firms and banks, we uncover several key findings: (1) Shocks to the federal funds rate (FFR) increase banks' costs of foreign borrowing. (2) These higher credit costs disproportionately affect small firms, raising their UIPDs more than for large firms. (3) This size-differentiated impact stems from the relatively higher interest rates on domestic currency loans faced by small firms. (4) In contrast, interest rates on dollar-denominated loans respond homogeneously across all firms. (5) We find no differential effect on loan quantities, suggesting an active role of credit supply and demand. We rationalize these findings with a small open economy model of corporate default that incorporates heterogeneous firms borrowing from domestic banks in both foreign and domestic currencies. In our model, a higher FFR reduces the marginal cost of defaulting on domestic-currency debt for small firms more than for large firms.

---

* We thank Javier Bianchi, Saki Bigio, Sofia Bauducco, Pierre De Leo, Carlos Esquivel, Lorena Keller, Andrea Ferrero, Andres Fernandez, José Fillat, Juan Guerra-Salas, José Gutierrez, Pablo Guerron, Guillermo Ordonez, Walker Ray, Lucciano Villacorta, Chenzi Xu, Vivian Yue, and an anonyms commissioned by the Bank of Spain, as well as those from seminar participants at the Central Bank of Chile, Bank of Spain, 31st Finance Forum (AEFIN 2024), Winter SED (2024), the Santiago Macro Workshop (2024) and the CEPR-ASB Workshop on Macroeconomic Policy in Emerging Markets (2025), Midwest Macro Meetings (2025). The views expressed in this paper are those of the authors and do not represent those of the Central Bank of Chile or its Board, nor those of the the Bank of Spain or the Eurosystem.

†Central Bank of Chile. E-mail: macosta@bcentral.cl

‡Bank of Spain. E-mail: alejandra.amado@bde.es

§Central Bank of Chile. E-mail: mmarti@bcentral.cl

¶Universidad de Los Andes. E-mail: d.perez-reyna@uniandes.edu.co

1 Introduction

Emerging market economies (EMEs) are particularly vulnerable to shifts in global financial conditions, especially those driven by changes in U.S. monetary policy. These shocks can propagate through financial channels, affecting domestic interest rates, exchange rates, and capital flows. While the international bank lending channel of U.S. monetary policy and its aggregate implications for EMEs have been widely studied (Cetorelli and Goldberg 2012a,b; Brauning and Ivashina 2020; Buch et al. 2019; Temesvary et al. 2018; Morais et al. 2019), much less is known about the micro-level transmission mechanisms through domestic banks' exposure to international financial markets. Moreover, how these shocks differentially affect firms within an economy remains largely unexplored. This paper contributes to filling this gap by documenting and explaining systematic heterogeneity in the transmission of U.S. monetary policy shocks to firm-level borrowing costs and deviations from uncovered interest parity (UIPDs) in Chile, an EME with partial financial dollarization.[1]

Our central finding is that monetary tightening in the U.S.[2] increases the cost of dollar funding for domestic banks in Chile, which in turn disproportionately raises the cost of borrowing in domestic currency (Chilean pesos) for small firms relative to large firms. While interest rates on U.S. dollar-denominated loans rise uniformly across firms, the rates on peso-denominated loans increase significantly more for small firms. As a result, deviations from uncovered interest parity—measured as the excess cost of peso loans relative to dollar loans after accounting for expected exchange rate depreciation—increase significantly more for small firms. We show that this heterogeneity is not driven by compositional changes or selection into borrowing currencies, but instead reflects a price-based channel operating through bank lending behavior and firms' optimal debt-currency choice.

To uncover this mechanism, we exploit a unique dataset that links Chilean banks' foreign borrowing (both loans and bonds) with loan-level domestic credit registry data and firm-level tax records. This comprehensive dataset allows us to track the currency composition, terms, and timing of loans at the firm-bank level and to estimate how shocks to the Federal Funds Rate (FFR) affect bank funding costs and, subsequently, firm borrowing costs. Our identification strategy leverages

[1] Disclaimer: This study was developed within the scope of the research agenda conducted by the Central Bank of Chile (CBC) in economic and financial affairs of its competence. The CBC has access to anonymized information from various public and private entities, by virtue of collaboration agreements signed with these institutions.

[2] We use a measure of Taylor rule-type shocks that accounts for variations in U.S. monetary policy unrelated to its business cycle.

high-dimensional fixed effects, in the spirit of Khwaja and Mian (2008) and Amiti and Weinstein (2018), including firm-bank-time fixed effects, to isolate variation within firm-bank relationships over time. This approach enables us to control for unobserved heterogeneity in firm creditworthiness, bank-specific pricing policies, and endogenous sorting across currencies and lenders. Furthermore, we complement our empirical analysis by developing a small open economy model with heterogeneous firms and corporate default, where firms borrow from domestic banks in both foreign and domestic currencies. The model provides a rationale for our main results and allows us to study the underlying mechanisms driving them. Using our rich dataset, we provide suggestive evidence supporting the model's mechanisms.

In contrast to previous studies, where the foreign shock is directly used to estimate its effects on domestic credit conditions,[3] our detailed data on foreign borrowing allow us to estimate, in a first stage, the effects of U.S. monetary policy shocks on the cost of foreign funding for domestic banks. And, in a second stage, granular loan-level data allow us to assess the impact of the first-stage estimates on firms' credit conditions through the bank lending channel.

The main result of the first stage is that a 1 percentage point increase in the FFR raises the average interest rate on banks' foreign debt by approximately 0.33 percentage points. In the second stage, we examine how these foreign funding costs pass through to the interest rates faced by firms on both dollar and peso loans. We find that, while the average firm-level UIPD is approximately 6 percentage points,[4] it becomes significantly more pronounced for small firms during periods of U.S. monetary tightening. Our preferred specification—which controls for firm-bank-time fixed effects—shows that a 1 percentage point increase in the FFR-induced cost of bank foreign funding widens the UIPD gap between small and large firms by 2.1 percentage points.[5] This implies that, on average, about 89% of the observed UIPD differential can be attributed to fluctuations in the FFR over the sample period.

[3]See, for example, Di Giovanni et al. (2022), who study the impact of the Global Financial Cycle—captured by the VIX—on domestic credit conditions using data from Turkey.

[4]For comparison, Di Giovanni et al. (2022) find an average UIPD of 7 percentage points using loan interest rates from Turkey's credit registry, while Ivashina et al. (2023) report a UIPD of 2 percentage points for Peru, based on data from medium and large firms.

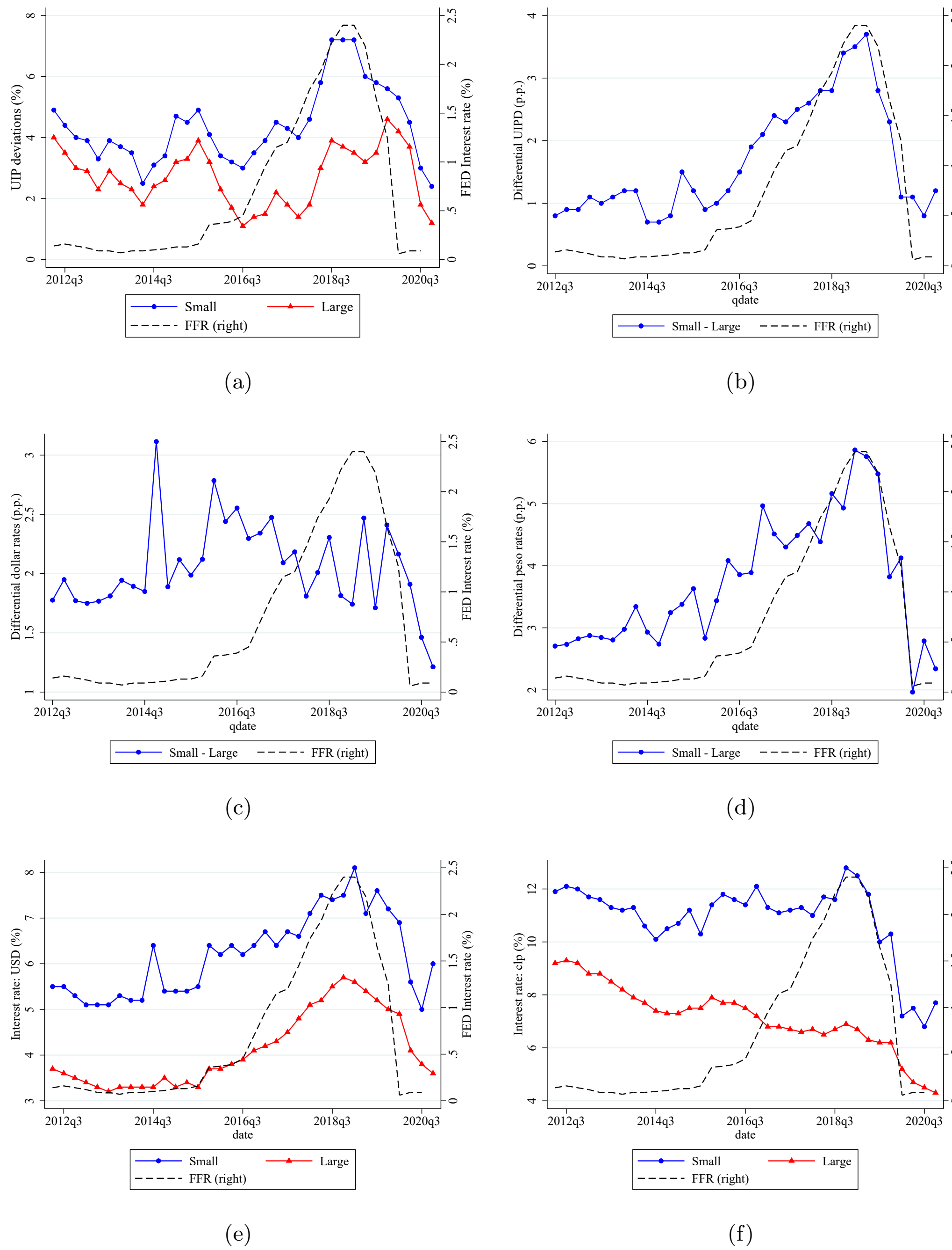
[5]We classify firms with annual sales between 0 and 1 million USD as small, and those with sales above 1 million USD as large. The first group corresponds to what the Chilean IRS defines as micro and small firms, while the second group includes medium and large firms. Further details are provided in section 2.

Next, we verify that the source of the size heterogeneity in UIPDs is related to a differential response of peso interest rates to the FFR shock. After accounting for selection, we find no significant size-differentiated response in the interest rates of dollar-denominated debt to FFR shocks. Therefore, as previously mentioned, the size-related effect in UIPDs is entirely driven by the differential response of peso rates across firm sizes.

Since these results hold after controlling for both firm- and bank-level time-varying fixed effects, as well as unobserved bank-firm relationships, our findings are arguably not driven by selection bias, but instead reflect shifts in credit supply and/or demand. To further investigate this, we examine the effects on loan amounts. Our results suggest that, for both small and large firms, a negative shift in the supply of dollar loans is the primary driver of the observed patterns in dollar lending and interest rates. In contrast, the dynamics of peso credit for small firms are driven by shifts in both credit supply and demand. Specifically, a positive shock to the FFR leads banks to restrict the supply of peso loans to small firms, while these firms simultaneously shift away from dollar loans toward peso loans, as the former become relatively more expensive after the shock. As a result, the currency composition of small firms' debt shifts toward peso-denominated loans. Meanwhile, peso credit dynamics for large firms appear disconnected from changes in the international cost of banks' funding.

To further illustrate our empirical findings, Figure 1 presents time-series evidence that aligns with our main results. Panel (a) displays average firm-level UIPDs based on loan interest rates from domestic banks, distinguishing between small and large firms. Intuitively, the figure illustrates how much cheaper it is, on average, to obtain a loan denominated in dollars rather than in pesos, separately for small and large firms. This average relative cost advantage of dollar loans is consistently higher for small firms (4.4 percentage points) than for large firms (2.7 percentage points) over time, and it becomes even more pronounced during periods of U.S. monetary policy tightening. As noted earlier, once we account for selection, this difference becomes statistically significant only as a result of the FFR shock. Panel (b) shows that the *difference* between the UIPDs of small and large firms is strongly correlated with the U.S. federal funds rate (FFR). Although this gap is not driven by differential movements in dollar interest rates, as shown in Panel (c), Panel (d) suggests it is primarily driven by differences in domestic-currency interest rates. This differential behavior in UIPDs, particularly for small firms, is arguably a puzzle.

Figure 1: Average Firm-Level UIPDs in Chile and the Fed Funds Rate



Note: Firm-Level UIPDs are calculated as: $UIPD_{i,t} = i_{i,t} - i^*_{i,t} - \frac{E_t(e_{t+1}) - e_t}{e_t}$. Where $i_{i,t}$ and $i^*_{i,t}$ are average firm interest rates for loans denominated in Chilean pesos and U.S. dollars, respectively. e_t and $E[e_{t+1}]$ are the dollars per peso exchange rates and the year ahead expected exchange rate obtained from the Central Bank of Chile survey of financial operators, respectively. Each line is the moving average of the UIPD of three quarters.

On one hand, we would expect that increases in the FFR raise borrowing costs through higher dollar interest rates, via the international bank lending channel. This pass-through should be stronger for small firms, which are typically riskier than large firms. However, consistent with our estimates, Panel (e) in Figure 1 shows that during periods of U.S. monetary policy tightening, dollar interest rates increase similarly for both small and large firms. Panel (c) reinforces this finding by showing that the differential in dollar interest rates across firm sizes does not widen with increases in the FFR.

On the other hand, it is well known that domestic banks must have currency-matched balance sheets due to regulation or risk management motives (Brown et al. 2014, Tobal 2018, Keller 2019). This implies that when banks face an increase in the cost of foreign funding—denominated mostly in U.S. dollars—they must adjust their liabilities accordingly. They can do so either by increasing domestic dollar liabilities or by increasing domestic currency liabilities, which would require a corresponding increase in domestic currency assets. While the former adjustment would not directly affect interest rates on domestic currency loans, the latter would likely lead to a decline in those rates. Panel (f) suggests that this may be the case for large firms, but not for small firms, whose peso loan rates remain positively correlated with the FFR—consistent with our empirical estimates.

The channel we identify—through which shocks to the FFR affect firms via banks' cost of foreign borrowing—is not necessarily the only one through which U.S. monetary policy shocks may affect domestic credit markets in EMEs. For example, dollar deposit rates may also respond directly to such shocks, potentially making banks' core funding an important transmission channel (Ivashina et al., 2023). Nevertheless, we demonstrate that our channel is highly relevant. In Chile, foreign debt accounts for an average of 37% of banks' dollar-denominated liabilities, compared to 43% held in dollar deposits. More importantly, we extend our first-stage analysis by incorporating each bank's exposure to non-core dollar funding. We find that banks with high exposure experience a significantly larger increase in their cost of foreign financing—by 0.44 percentage points—following an FFR shock, relative to banks with low exposure. This evidence highlights the importance of our proposed transmission channel and complements other channels documented in the literature.

We verify the robustness of our results through several checks. First, we incorporate alternative measures of U.S. monetary policy shocks, including those from Bu et al. (2021) and Wu and Xia (2016), which account for unconventional policies at the zero lower bound. Then, we address concerns about firms' natural hedging against exchange rate risk by analyzing subgroups of exporting/importing and non-tradable firms, finding consistent size-differentiated effects.[6]

Additionally, we test for the impact of FFR shocks on domestic credit conditions beyond the cost of banks' borrowing (e.g. the country risk premium Kalemli-Özcan 2019, Di Giovanni et al. 2022, Rey 2013, Miranda-Agrippino and Rey 2020), by introducing the FFR shocks directly into the bank-firm-level regressions. Our main results remain qualitatively unchanged, suggesting that this transmission channel is not strong enough to offset the previously documented size-differentiated dynamics in the UIPDs. We also introduce lagged macroeconomic controls interacted with firm size and currency dummies to account for potential confounding effects. Finally, by adjusting for currency premiums and aligning exchange rate expectations with loan maturities, we confirm that our findings are not driven by mismeasured exchange rate adjustments. These robustness tests affirm that our key results hold across a range of specifications and empirical adjustments.

As previously mentioned, we further investigate the mechanisms behind our empirical findings by developing a theoretical model with firm default risk and currency choice. The model demonstrates that smaller firms face greater financial risk, making them more sensitive to shifts in global funding costs. Unlike existing macro-finance models that focus on aggregate UIPDs (Salomao and Varela, 2022), our framework offers a micro-level perspective, highlighting how heterogeneity in firm productivity—which maps directly into firm size—drives the differential increase in domestic default risk for small firms following a foreign shock. This mechanism, in turn, generates a larger UIPD for these firms relative to larger ones. Our approach builds on recent advances in the study of international monetary policy spillovers, while emphasizing the role of firm-level heterogeneity in shaping financial vulnerabilities.

The environment is a two-period small open economy model in which firms are heterogeneous in productivity and borrow in both foreign and domestic currency from a domestic bank. The bank funds its lending in each currency at a currency-specific risk-free rate, while firms face productivity and exchange rate shocks, with the possibility of defaulting in either currency.

When the FFR increases—modeled as a rise in the foreign risk-free interest rate—high-productivity

[6] This is a natural concern as firms engaged in international trade are typically large (Melitz 2003, Eaton et al. 2011).

firms optimally continue to repay their debt in both currencies. These large firms face higher foreign currency interest rates but experience no change in their domestic currency borrowing costs, consistent with the data. In contrast, smaller firms, which previously repaid their debt in full, may now partially default on domestic currency loans. Given that their productivity is insufficient to justify full repayment in domestic currency, their default probability increases, resulting in higher domestic currency interest rates. As a result of the differential increase in domestic currency rates, UIPDs rise more for small firms than for large firms, in line with our empirical findings.

From this theoretical framework, three underlying mechanisms in the model are key to explaining our empirical findings. First, following the FFR shock, the probability of default on dollar-denominated debt remains unchanged across all firms, while the probability of default on peso debt varies with firm size. Second, this result is driven by the fact that, in the model, the marginal cost of defaulting on dollar debt is lower than that of defaulting on peso debt. Third, smaller firms–i.e., those with lower productivity–are more likely to default in the model. Finally, to evaluate the plausibility of these mechanisms, we turn to the data and provide suggestive evidence consistent with these model implications.

This micro-level mechanism has important macroeconomic and policy implications. First, it implies that U.S. monetary policy tightening not only affects aggregate financial conditions, but also distorts the relative cost of capital across firms within an EME. Small firms, which are often less diversified and more credit-constrained, face a disproportionately larger increase in domestic currency financing costs, potentially exacerbating resource misallocation and financial fragility. Second, the results suggest that the benefits of financial dollarization—in terms of lower interest rates on dollar loans—may be offset by heightened vulnerability for certain types of firms during periods of global monetary tightening. Third, the findings highlight a potential stabilizing role for domestic monetary policy: by adjusting the domestic policy rate, central banks may be able to partially counteract the tightening effects of global shocks, particularly for financially constrained firms.

Relationship with the literature. Our paper relates to several strands of the literature. First, it contributes to the growing body of work on the international bank lending channel of U.S. monetary policy in EMEs. One widely documented transmission channel operates through global banks (Cetorelli and Goldberg, 2012a,b; Brauning and Ivashina, 2020; Buch et al., 2019; Temesvary et al., 2018). More recently, the availability of credit registry data from individual countries has enabled the identification of foreign monetary policy effects on local credit supply through the foreign subsidiaries of global banks operating domestically, as shown by Morais et al. (2019) using data from Mexico. We complement these studies by delving into the relatively unexplored firm-level heterogeneity in the transmission of foreign shocks. In particular, we provide evidence that in emerging economies with some degree of financial dollarization, the international bank lending channel through domestic banks is operative—even in the absence of a significant domestic presence of global banks or direct lending from foreign banks to local firms. Our results are also consistent with the findings of Kalemli-Özcan (2019) and De Leo et al. (2023), who use aggregate data for a group of emerging economies and show that short-term market rates rise following an exogenous tightening of U.S. monetary policy.

Second, this paper also contributes to the recent literature studying the drivers of the UIP premium using bank-loan rates. Ivashina et al. (2023) documents the existence of this UIP premium for *large* Peruvian firms.[7] They found that this interest rate differential is mostly explained by the interest rate differential in the deposit market, while there is little connection with macro interest rates (i.e., Peruvian central bank rate over US Fed Funds rate). Conversely, we use the universe of Chilean bank loans and find a significant connection between macro rates and *micro* loan-level UIPDs. Specifically, a U.S. monetary policy tightening does contribute to explain the size-differential relative cheapness of dollar loans in the Chilean banking system. Moreover, we find that this connection is significantly larger for *small* firms, a novel relationship that is absent in previous studies. This sheds lights on the specific vulnerability of small firms to fluctuations in global financial conditions and their relatively larger incentives to take on exchange rate risk.

Similarly, Di Giovanni et al. (2022) use data from the Turkish credit registry and find that UIPDs are present at the loan level on average. Moreover, their magnitude comoves with the VIX, with a stronger correlation observed in banks that rely more heavily on non-core FX liabilities. In contrast, our paper adopts a different identification strategy. Rather than estimating the direct effect of a macroeconomic variable on local credit conditions—interacted with an indicator for

[7] Those firms with annual sales above 6.5 million dollars.

high versus low non-core liability exposure—we implement a two-stage approach. This method more precisely captures the transmission channel through which fluctuations in global financial conditions affect local bank lending rates, by leveraging granular data on the cost of bank loans in international financial markets.

Third, we add to the theoretical literature on macro-finance in open economies. Our findings can be related to the prediction of macro-finance models that endogenize macro UIPDs over time to external shocks (Akinci and Queralto 2019; Basu et al. 2023; Salomao and Varela 2022; De Leo et al. 2024). We complement these theoretical frameworks by developing a model of heterogeneous firms and default risk in both domestic and foreign currency, in the spirit of Arellano (2008), Arellano et al. (2019), and Salomao and Varela (2022). To our knowledge, the theoretical mechanism in the model, which leads to heterogeneous UIPDs, is novel and had not been developed before in the literature. For example, in the framework proposed by Salomao and Varela (2022), macro UIPDs are transmitted from banks to heterogeneous firms. These firms then arbitrage the dollar premium at varying levels of dollarization, depending on their idiosyncratic credit risk. In our model, heterogeneous firms endogenously end up with different UIPDs, even under common macroeconomic shocks, which is consistent with the empirical evidence.

The rest of the paper is organized as follows: The second section describes our data and their sources. The third section develops the empirical analysis and documents our main findings. The fourth section develops a theoretical model and analyzes its mechanisms, the fifth and last section concludes.

2 Data and Descriptive Statistics

We use three confidential administrative datasets from Chile: (1) Deudex – a dataset from the Central Bank of Chile that includes the universe of foreign debt transactions of banks operating in Chile, including debt stocks and flows, debt type (e.g., loans, bonds, FDI, trade credit), currency, credit conditions (i.e., interest rate, loan amount, and maturity), and the type of foreign lender. (2) Chilean Credit Registry (D32) – a dataset from the Chilean Financial Markets Commission that records the universe of credit flows between firms and banks, including credit conditions, types, and currency. (3) Tax Records – data from the Chilean IRS that document firm-level sales, value added, and capital expenditures. These are complemented with yearly data of firms' balance sheets.[8] We merge these datasets using unique anonymized firm-level identifiers. Our sample is at a monthly frequency and spans from April 2012 to December 2019.[9]

From the Deudex database, we keep only banks' foreign borrowing in the form of loans from foreign lenders or bonds issued abroad, excluding transactions that do not represent direct financial contracts, such as FDI. Loans in the dataset are recorded with a benchmark interest rate (typically the LIBOR) and a spread. We keep only loans with a positive credit spread, as those without a spread correspond to loans from a parent company abroad to its domestic counterpart. Additionally, we restrict our sample to loans denominated in either domestic currency (pesos), or U.S. dollars (USD), with the latter accounting for 96% of all corporate foreign debt in the database. From the credit registry, we keep loans in pesos or USD, which together account for 95% of total loan volume between firms and banks in Chile. We exclude interbank loans, focusing solely on lending relationships between banks and non-bank firms. From the tax records data, we include only firms with reported positive sales. All loan amounts and firm sales data are converted to real values using 2018 prices and adjusted for currency valuation effects using the 2018 nominal exchange rate of 640 pesos per dollar.

We complement our merged dataset with foreign macroeconomic data from various sources. The Federal Funds Rate (FFR) is obtained from Federal Reserve Economic Database (FRED), and aggregated at a monthly frequency. To identify monetary policy shocks, we estimate a standard Taylor rule in which the FFR is modeled as a function of real GDP growth and CPI inflation, using the residuals as our primary FFR shock measure. Additionally, we incorporate alternative U.S. monetary policy shock measures for robustness checks: the shocks estimated by Bu et al. (2021) and the Taylor residuals using shadow rates estimated by Wu and Xia (2016).

[8]Disclaimer: Officials of the Central Bank of Chile processed the disaggregated data from the Chilean IRS and the Chilean Financial Markets Commission. The information contained in the databases of the Chilean IRS is of a tax nature originating in self-declarations of taxpayers presented to the Service; therefore, the data's veracity is not the Service's responsibility.

[9]Disclaimer: To secure the privacy of workers and firms, the CBC mandates that the development, extraction and publication of the results should not allow the identification, directly, indirectly, of natural or legal persons. Officials of the Central Bank of Chile processed the disaggregated data. All the analysis was implemented by the authors and did not involve, nor compromise the Chilean IRS or the Chilean Financial Markets Commission.

We also include a set of relevant domestic macroeconomic variables from the Central Bank of Chile. These variables are the monetary policy rate, the yearly growth rate of a monthly real GDP indicator, the year-on-year monthly inflation rate, the nominal exchange rate of the Chilean peso against the U.S. dollar, and the 1-year ahead nominal exchange rate expectations. These last two variables allow us to construct the one-year ahead expected rate of currency depreciation.

Finally, we also use aggregate banking system data to provide additional evidence on the mechanisms underlying our empirical findings. We obtain data on dollar deposits and foreign debt of the banking system from the Central Bank of Chile. Data on dollar deposit rates and commercial credit dollarization are sourced from the Chilean Financial Markets Commission. The share of banks' liabilities denominated in dollars is obtained from the IMF's Financial Soundness Indicators.

Banks, foreign debt, and domestic lending. Table 1 shows in the first row that, for all banks in Chile during the sample period, 97% of foreign debt is denominated in U.S. dollars (USD), which further motivates the study of how Federal Funds Rate (FFR) shocks affect firms' financial conditions through the banking sector. The second row of the table shows that all banks borrow abroad. Finally, the last two rows of the table show that banks borrow at an average interest rate of 1.44% in U.S. dollars and 4.66% in Chilean pesos.[10] As such, banks—being the primary source of domestic lending in emerging markets like Chile—act as transmitters of global economic shocks.

Table 1: Banks and Foreign Debt

	All banks
USD Foreign Debt/Foreign Debt	0.97
N. of banks borrowing abroad/Total N. of banks	1
N. of banks borrowing abroad in USD/N. of banks	0.98
Average interest rate on foreign loans in USD (%)	1.44
Average interest rate on foreign loans in domestic currency (%)	4.66

Notes: The moments presented in the table were computed using data from the Deudex dataset, covering the period from April 2012 to December 2019.

Table 2 illustrates the significance of the banking system in Chile. On average, during the 2012-2019 period, banks' assets were 25% larger than the annual GDP. Among banks' assets, commercial loans—i.e., credit extended to firms—constitute a significant share of 41.6%, which is equivalent

[10] These averages are weighted by loan size.

to 52% of GDP. Furthermore, credit to firms represents 61% of the total loans provided by banks. On average, banks have a leverage ratio of approximately 1.1. This table thus highlights the dominant role of bank credit in the economy, with the majority of this credit directed toward firms. Consequently, the effects of global shocks that affect firms via banks are of primary importance.

Table 2: Banks' Balance Sheet Statistics

	Average 2012-2019
Banks' Assets to GDP	1.25
Banks' Comercial Loans to GDP	0.52
Comercial Credits/Total Loans	0.61
Banks' Average Leverage (Assets/Liabilities)	1.09

Notes: The moments presented in the table were computed using public data of banks' balance sheets from the Chilean Financial Markets Comission (CMF).

Loans to firms in domestic and foreign currencies. Using our tax records data, we follow the Chilean IRS size-classification system to define micro firms as those with yearly sales of up to 70,000 USD, small firms as those with sales between 70,000 and 1 million USD, medium-sized firms as those with sales between 1 and 4 million USD, and large firms as those with sales exceeding 4 million USD. Table 3 presents the share of loans in U.S. dollars for all firms, as well as for micro, small, medium, and large firms. The first column shows the total share, while the second column displays the mean share across firms. The last two columns present the standard deviation and the median of these shares. Loans in USD represent 21% of all loans to firms, this share is 11% for micro and small firms, 20% and 25% for medium-sized and large firms, respectively.

Table 3: Domestic Lending to Firms in USD

	Total	Mean	SD	P50
USD loan/ Total loans–All firms	0.21	0.22	0.06	0.20
USD loan/ Total loans–Micro	0.11	0.11	0.07	0.09
USD loan/ Total loans–Small	0.11	0.11	0.04	0.10
USD loan/ Total loans–Medium	0.20	0.21	0.07	0.19
USD loan/ Total loans–Large	0.25	0.26	0.08	0.23

Notes: The moments presented in this table were computed using data from the domestic credit registry, D32, covering the period from April 2012 to December 2019.

The first column in the upper panel of Table 4 shows the total number of firms in our sample—446,426—and the breakdown by firm size. The second column shows the total number of loans, and the last column reports the average number of bank relationships. Although medium and large firms are fewer in number compared to micro and small firms, they collectively account for about 70% of all loans. Bank relationships increase with firm size; specifically, micro and small firms have an average of 1.16 and 1.44 bank relationships, respectively, while medium and large firms have 2.08 and 3.29. This characteristic is an important feature of our data. Having firms with multiple bank relationships allows us to better identify the effects of Federal Funds Rate (FFR) shocks on firms' credit conditions via banks, as discussed in the next section.

The lower panel of Table 4 shows that micro and small firms represent about 22% of total loans, while medium and large firms account for about 78%. In domestic currency, micro and small firms represent 26% of loans, with medium and large firms representing 74%. In USD, the share of loans for micro and small firms is lower than in domestic currency, at 12%, while medium and large firms account for 88%. On average, larger firms borrow more in dollars relative to smaller firms.

Table 4: Firms and Loans by Currency

	N. of Firms	N. of Loans	Average Bank Relationships
All	446,426	6,603,133	1.28
Micro	342,953	1,209,957	1.16
Small	78,587	724,229	1.44
Medium	16,347	705,473	2.08
Large	8,539	3,963,474	3.29

		Share of loans relative to	
	Total loans	Domestic Currency Loans	USD Loans
All	1	1	1
Micro	0.17	0.20	0.09
Small	0.05	0.06	0.03
Medium	0.05	0.06	0.05
Large	0.72	0.69	0.84

Notes: The moments presented in this table were computed using data from the domestic credit registry, D32, covering the period from April 2012 to December 2019.

Table 5 presents five panels, each containing three rows. The first panel includes all firms in the sample, while the remaining panels correspond to each firm size group. Within each group we define three subgroups of firms based on their borrowing behavior: firms that borrow only in domestic currency, firms that borrow only in USD, and firms that borrow in both currencies. Additionally, each panel displays three columns: the share of total firms represented by each subgroup (column

1), the share of total loans accounted for by each subgroup (column 2), and the average yearly share of sales for each subgroup relative to GDP (column 3).

While firms that borrow only in domestic currency represent 96% of the sample, they account for just 54% of the loans, as shown in the first row of Table 5. In contrast, firms borrowing only in foreign currency make up 1% of the sample but hold 5% of the total loans. Firms borrowing in both currencies represent 3% of the sample, yet they account for 40% of all loans, with their sales-to-GDP ratio at 80%, the highest among the three subgroups.

The second and third panels show that, while the majority of micro and small firms borrow only in pesos, a significant share of their loans are represented by firms borrowing in both currencies—15% and 31%, respectively. For medium and large firms, both the number of firms borrowing in both currencies and their share of total loans is higher. Specifically, 38% of loans taken by medium firms, and 47% by large firms, are from firms that borrow in both currencies, with a combined sales-to-GDP ratio of 77%.

In sum, all firm sizes include firms borrowing in both currencies, which represent a substantial share of total loans and a significant portion of aggregate economic activity, as reflected by the sales-to-GDP ratio.

Table 5: Firms' Debt by Currency and the Economy

	Share of Total Firms	Loans/Total Loans	Sales/GDP
Firms borrowing only in domestic currency	0.96	0.54	0.35
Firms borrowing only in USD	0.01	0.05	0.08
Firms borrowing in both currencies	0.03	0.40	0.80
Micro Firms borrowing only in domestic currency	0.99	0.81	0.05
Micro Firms borrowing only in USD	0.00	0.03	0.00
Micro Firms borrowing in both currencies	0.01	0.15	0.03
Small Firms borrowing only in domestic currency	0.94	0.67	0.03
Small Firms borrowing only in USD	0.01	0.02	0.00
Small Firms borrowing in both currencies	0.04	0.31	0.01
Medium Firms borrowing only in domestic currency	0.78	0.56	0.04
Medium Firms borrowing only in USD	0.04	0.06	0.00
Medium Firms borrowing in both currencies	0.18	0.38	0.02
Large Firms borrowing only in domestic currency	0.55	0.47	0.23
Large Firms borrowing only in USD	0.09	0.06	0.07
Large Firms borrowing in both currencies	0.36	0.47	0.75

Notes: The moments presented in this table were computed using data from the domestic credit registry, D32, covering the period from April 2012 to December 2019.

Firm loans and terms of credit by currency. A key aspect of our analysis is understanding how credit contracts respond to changes in banks' foreign funding costs due to FFR shocks. Specifically, we examine how these shocks transmit to domestic interest rates and loan amounts for both dollar- and peso-denominated loans. We begin by characterizing these credit contracts in Table 6 and Table 7. Table 6 presents the mean (weighted by loan size), median, and standard deviation of interest rates for peso-denominated loans (first three columns) and USD-denominated loans (columns 6 to 8). It also reports the mean UIPD, calculated as the difference between the average domestic and foreign currency interest rates minus the expected exchange rate depreciation rate. The first row of Table 6 shows that the mean (median) interest rate across all firms is 4.67% (7.19%) in pesos and 2.53% (3.29%) in USD. Across firm sizes, larger firms tend to have lower average interest rates in both currencies. The average UIPD is highest for micro (3.63%) and small (4.74%) firms, compared to medium (3.43%) and large (2.51%) firms. This indicates that, on average, peso-denominated loans are more expensive than dollar-denominated loans after adjusting for expected depreciation, with some variation across firm size groups which we explore below.

Finally, Table 7 reports the same summary statistics for loan amounts in domestic and foreign currencies, with all values converted to USD using the 2018 exchange rate. The last row shows that the average loan size in USD is $289,657, while the average peso-denominated loan, expressed in dollars, is $147,802. Across all firm sizes, both the mean and median loan amounts are larger for foreign-currency loans than for domestic-currency loans. Additionally, dollar-denominated loans exhibit greater volatility than peso-denominated loans, in contrast to interest rates, where the opposite is observed, as indicated by the standard deviations reported in Table 6.

The data characterization in this section underscores the critical role of banks in the financial system and the extent to which firms depend on bank funding in both currencies to sustain their economic activities. Regardless of size, all firms actively engage in borrowing, and firms with loans denominated in both currencies exist across the entire firm-size distribution. These firms play a significant role in the economy, as their sales constitute a substantial share of GDP, further motivating our analysis. By leveraging detailed administrative data, we examine the impact of foreign shocks on firms' financial conditions by currency. Beyond its firm-level implications, our study

Table 6: Loan Interest Rates by Currency

	Interest Rate Peso loans (%)			Interest Rate USD loans (%)			UIPD (%)
	Mean	Median	SD	Mean	Median	SD	Mean
All	4.67	7.19	6.67	2.53	3.29	2.27	2.99
Micro	5.29	13.89	9.68	2.87	3.96	2.83	3.63
Small	7.22	12.82	6.02	4.19	6.04	2.63	4.74
Medium	6.54	8.80	4.39	4.13	5.00	2.16	3.43
Large	4.12	6.04	3.45	2.34	2.78	1.76	2.51

Notes: The moments presented in this table were computed using data from the domestic credit registry, covering the period from April 2012 to December 2019. The calculation of the mean interest rate is weighted by the loan amount. The UIPD is simply the difference between mean interest rates in dollars and in pesos minus the one-year ahead expected exchange rate depreciation: $UIPD_{i,t} = i_{i,t} - i^*_{i,t} - \frac{E_t(e_{t+1})-e_t}{e_t}$.

Table 7: Loan Amounts by Currency

	Peso loans			USD loans		
	Mean	SD	Median	Mean	SD	Median
Micro	148,288	1,269,424	8,035	292,219	1,927,825	64,653
Small	78,427	591,842	12,051	115,365	818,570	27,771
Medium	80,214	508,923	6,169	104,244	750,295	35,390
Large	173,068	1,958,441	871	343,712	3,763,779	51,934
All	147,802	1,622,425	2,411	289,657	3,228,885	47,649

Notes: The moments presented in this table were computed using data from the domestic credit registry, D32, covering the period from April 2012 to December 2019. Loan amounts are adjusted for exchange rates and are expressed in terms of 2018 USD. The exchange rate used is 640 CLP per USD.

holds macroeconomic relevance, as it captures a significant portion of overall economic activity.

For the rest of the paper, we pool micro and small firms into one group, namely *small* firms, and medium and large firms into another group, namely *large* firms.[11]

3 Empirical Analysis

In this section, we document our main findings. Our rich dataset allows us to evaluate how shocks to the Federal Funds Rate (FFR) impact loan-level UIPDs of domestic firms by affecting the cost of foreign funding for domestic banks. By controlling for a set of lagged domestic macroeconomic variables, as well as observed bank and firm-level characteristics, we can identify the direct impact of U.S. monetary policy shocks on domestic firms' borrowing conditions through

[11] This classification ensures compliance with our data confidentiality agreements, which require that at least 25 firms borrow in both pesos and dollars in each period. While this condition is not met for every individual firm size in every period, it holds for the pooled categories.

the bank-lending channel.

We implement a panel two-stage least squares identification strategy. In the first stage, we estimate how shocks to the U.S. FFR affect the interest rates faced by local banks in foreign credit markets. In the second stage, we estimate how shocks to these interest rates–vis-a-vis shocks to the FFR–distinctively affect firms' UIPD for small firms compared to large firms. This framework also allows us to separately analyze their impact on both domestic- and foreign-currency interest rates. Furthermore, we incorporate a set of time-varying fixed effects to address selection concerns in our estimation.

3.1 U.S. Monetary Policy and Banks' Cost of Foreign Credit

To estimate the effect of U.S. monetary policy shocks on the cost of credit faced by banks in foreign markets, we employ the following specification:

$$i^{\star}_{b,l,m} = \alpha_b + \lambda Trend_m + \Psi FFR_{m-1} + \delta FX_{b,l,m} + \theta_1 i_{m-1} + \theta_2 \Delta log(GDP_{m-1}) + \theta_3 Inflation_{m-1} + \Theta_4 \Delta log(XR_{m-1}) + \Theta_5 Bank_{b,m-1} + \epsilon_{b,l,m} \quad (1)$$

where $i^{\star}_{b,l,m}$ is the interest rate faced by domestic bank b on credit l–denominated either in U.S. dollars or Chilean peso–in month m. Credits could be either bonds issued in foreign financial markets or loans taken directly from foreign financial institutions located abroad. The variable FFR_{m-1} represents the lagged U.S. monetary policy shock, estimated as a Taylor residual that accounts for variations in the Federal Funds Rate (FFR) not explained by the U.S. real GDP growth and the U.S. inflation rate.[12] In this first stage, we are primarily interested in the estimate of the coefficient of this variable, Ψ, which captures the pass-through of U.S. monetary policy shocks to the cost of foreign credit for local banks. The variable $FX_{b,l,m}$ takes the value of one if the credit is denominated in dollars and zero otherwise. Therefore, its coefficient δ represents the average UIPD faced by domestic banks in foreign credit markets.

Additionally, we control for bank-level fixed effects, α_b, a time trend, and a set of lagged relevant macroeconomic controls which are the domestic monetary policy rate, i_{m-1}, a monthly leading

[12] See, for example, Morais et al. 2019, who estimate FFR Taylor residuals to assess their impact on firm loans granted by Mexican banks.

indicator of yearly GDP growth, $\Delta log(GDP_{m-1})$, the inflation rate, $Inflation_{m-1}$, and the year-on-year monthly expected exchange rate depreciation obtained from survey data,[13] $\Delta log(XR_{m-1})$. We also control for a set of lagged bank-level controls, represented by the vector $Bank_{b,m-1}$, which are the bank's value added, market share, and leverage. The disturbance $\epsilon_{b,l,m}$ is a mean-zero $i.i.d$ process.

Column 1 in Table 8 shows the regression results for the specification in Equation 1. The first three rows correspond to the coefficients of the FFR Taylor residual, the $FX_{b,l,m}$ dummy and the time trend. The main coefficient of interest indicates that a 1 percentage point shock to the FFR significantly increases the average interest rate of credits taken by banks abroad by 0.32 percentage points.

Table 8: First Stage – Effect of U.S. Monetary Policy Shocks on Domestic Banks' Cost of Foreign Credit

	Interest Rate on foreign debt	
	(1)	(2)
FFR $Taylor\ Residual_{m-1}$	0.326**	0.327**
	(0.118)	(0.120)
$FX_{b,l,m}$	-2.584***	-2.599***
	(0.132)	(0.132)
$Trend_m$	0.0207***	0.0204***
	(0.00556)	(0.00557)
Bank F.E.	Yes	No
Bank×Creditor F.E.	No	Yes
Bank Characteristics	Yes	Yes
Macro controls	Yes	Yes
Observations	5,258	5,256
R-squared	0.649	0.653

Notes: This table presents results for OLS regression in (1). The dependent variable is calculated as $i_{b,l,m} = \left(\left(\frac{spread_{b,l,m}}{100}+1\right) \times \left(\frac{libor_m}{100}+1\right) - 1\right) \times 100$. FFR $Taylor\ Residual_{m-1}$ represents the lagged U.S. monetary policy shock, estimated as a Taylor residual that accounts for variations in the Federal Funds Rate (FFR) not explained by the U.S. real GDP growth and the U.S. inflation rate. FX takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Creditor* is an identifier of the type-of-foreign-lender. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are clustered at the bank-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

While our foreign debt dataset does not include individual identifiers for foreign lenders, it

[13] See Central Bank of Chile survey of financial operators.

classifies them into distinct categories, including *foreign private banks*, *foreign companies*, *multilateral organizations*, and others. Thus, in column 2 of Table 8 we include bank-creditor fixed effects to control for unobserved heterogeneity in the relationship between banks and the type of foreign lender. Estimates remain virtually unchanged.

The coefficients of the $FX_{b,l,m}$ dummy in Table 8 show a quantitatively relevant and statistically significant UIPD. Columns 1 and 2 indicate that foreign credit in dollars is, on average, approximately 2.5 percentage points cheaper than foreign credit in domestic currency. This UIPD provides evidence of a motive for banks to borrow abroad in dollars.[14]

Using the estimated coefficients in Table 8, we compute the predicted costs of banks' foreign funding, which are then used in the second stage to estimate their impact on the interest rates charged by domestic banks to domestic firms. We explore this further in the next section.

3.2 FFR Shocks, Banks Cost of Foreign Credit and Heterogeneous UIPDs

We now turn to estimate the effects of shocks to the FFR on small and large firms' UIPDs, through the bank lending channel. For this purpose, we use as our main explanatory variable the predicted value of the interest rate on foreign debt faced by banks each month, obtained from the first stage described in the previous section. We estimate the following specification:

$$\begin{aligned} i_{f,b,l,m} = \alpha_{f,b} &+ \lambda Trend_m + \beta_1 \hat{i^\star}_{b,m} + \beta_2 DX_{f,b,l,m} + \beta_3 \hat{i^\star}_{b,m} \cdot DX_{f,b,l,m} + \beta_4 \hat{i^\star}_{b,m} \cdot MS_f \\ &+ \beta_5 \hat{i^\star}_{b,m} \cdot MS_f \cdot DX_{f,b,l,m} + \beta_6 MS_f \cdot DX_{f,b,l,m} + \gamma_1 i_{m-1} + \gamma_2 \Delta log(GDP_{m-1}) \\ &+ \gamma_3 Inflation_{m-1} + \gamma_4 \Delta log(XR_{m-1}) + \Gamma_5 Firm_{f,m-1} + \Gamma_6 Bank_{b,m-1} + \epsilon_{f,b,l,m} \end{aligned} \quad (2)$$

The dependent variable $i_{f,b,l,m}$ is the interest rate of a loan l granted to firm f by bank b during month m. $\alpha_{f,b}$ is a bank-firm fixed effect that controls for unobserved time-invariant heterogeneity of bank-firm pairs, which the literature shows to be an important factor determining the terms of credit contracts (Petersen and Rajan 1994; Degryse and Van Cayseele 2000; Santos and Winton

[14] Keller (2024) finds evidence that when there are CIP deviations, banks attempt to arbitrage them. While we do not take a stance on the motive for banks to borrow abroad, the UIP premium for banks in foreign credit markets that we observe likely reflects these institutions' incentives to continually fund themselves in foreign currency.

2008; Duqi et al. 2018; among others).[15] $Trend_m$ is a linear monthly trend. The variable $\hat{i^{\star}}_{b,m}$ is the interest rate on foreign credit taken by bank b at month m and predicted from the first stage regression. Notice that in order to include this variable as a regressor in Equation 2, where the dependent variable is at the firm, bank and loan level, we had to aggregate it across different types of loans. Specifically, we first obtain $\hat{i^{\star}}_{b,l,m}$ using the estimates in column 2 of Table 8, and then aggregate it across loans for each bank and month to obtain $\hat{i^{\star}}_{b,m}$. This is, $\hat{i^{\star}}_{b,m} = \sum_l w_l \hat{i^{\star}}_{b,l,m}$, where w_l is the share of each loan l in bank's b total loans at month m.[16] Lagged macroeconomic controls and bank controls are the same as those in the first stage. Notice that we also account for local credit market conditions by including the lagged domestic monetary policy rate, i_{m-1}.

Additionally, we incorporate time-varying firm-level controls, such as value added, market share within its sector, and leverage. These features are relevant in the presence of financial frictions, which directly affect loan interest rates and financially constrained firms (Moll 2014; Buera et al. 2015). We also include a currency dummy, $DX_{f,b,l,m}$, which equals one if the loan is denominated in domestic currency and zero if it is in dollars. This variable is crucial, as its coefficient captures the average deviation from the UIP condition using loan interest rates. Another key dummy in our specification is MS_f, which equals one if the firm is (micro or) small and zero if it is (medium or) large. Our primary coefficient of interest, β_5, corresponds to the triple interaction term $\hat{i^{\star}}_{b,m} \cdot MS_f \cdot DX_{f,b,l,m}$. This coefficient captures the size-differential effect of the shock to banks' cost of foreign credit on the relative cost of domestic-currency loans vis-a-vis dollar loans–i.e., UIPD using firms' loan rates.

The specification in Equation 2 closely follows that of Di Giovanni et al. (2022), who use Turkish credit-registry data to examine how shocks to the global financial cycle—proxied by the VIX index—affect domestic credit conditions. We differ from their approach in three key aspects. First, while they use the VIX as an exogenous shock, we use shocks to the FFR. Although both variables are arguably exogenous to emerging small open economies like Chile or Turkey, we focus on the U.S. monetary policy rate given its role as benchmark rate for policy-making decisions across central banks worldwide. Second, our dataset on banks' foreign debt allows us to map shocks to

[15] In the case of Chile, Acosta-Henao et al. (2023) show that relationship lending is a relevant determinant of the cost of credit taken by firms.

[16] To calculate this share, all loans are expressed in U.S. dollars.

the FFR directly into the cost of foreign borrowing faced by domestic banks in the first stage, and ultimately on interest rates charged to domestic firms in a second stage. In other words, we can precisely estimate the specific bank-lending channel of U.S. monetary policy, through domestic banks. Third, our firm-level data allow us to study how firm size plays a crucial role in the transmission of such shocks while controlling for other relevant characteristics of the firm.

Column 1 in Table 9 shows the estimates of our baseline specification in Equation 2. First, the estimated coefficient of the currency dummy, $DX_{f,b,l,m}$, shows that, on average, loans in domestic currency are 5.9 percentage points more expensive than loans denominated in dollars. This average firm-level UIPD is statistically significant at the 1% level and is consistent with estimates for other emerging economies.[17] The estimated coefficient on the interaction between firm size and loan currency dummies, $MS_f \cdot DX_{f,b,l,m}$, shows that, on average, the relative cheapness of dollar loans is not statistically different for small firms than for large firms. These results hold even when controlling for time-varying firm and bank effects in the next columns.

The second row of the table presents the estimate of β_5. We find that a 1 percentage point increase in the interest rate faced by banks when borrowing abroad, driven by an FFR shock, leads to a 1.16 percentage points increase in the UIPD gap between small and large firms. This estimate is statistically significant at the 1% level and indicates that FFR shocks pass through heterogeneously to the UIPD across the firm size distribution. It also uncovers a new feature previously absent from the literature that helps to better understand the spillovers of foreign shocks to emerging partially dollarized economies.

A major concern regarding our estimates of Equation 2 is selection bias. In other words, we may not be fully accounting for the endogenous sorting of certain types of firms into dollar or domestic currency financing. For example, if less risky firms are more likely to choose dollar-denominated loans while riskier firms opt for peso financing, an increase in loan rates charged by domestic banks could be higher for riskier firms. This would imply that, on average, the UIPD might increase because the average idiosyncratic risk of firms borrowing in pesos is higher than that of firms borrowing in dollars. Moreover, if firm size correlates with performance or productivity, then the

[17] See Di Giovanni et al. 2022 for evidence using loan level data for Turkey, Ivashina et al. 2023 for evidence using loan level data for Peru, and Acosta-Henao et al. (2024) for additional evidence using Chilean data.

observed size-differentiated impact on UIPDs could be purely driven by sorting.

Endogenous sorting of firms across banks may also play a role. For example, if large firms borrow more intensively in pesos from well-capitalized banks that are better able to absorb increases in the cost of foreign funding, they may face a smaller rise in the cost of peso financing than small firms borrowing from more vulnerable banks. Additionally, if small and large firms borrow in dollars from the same type of banks, this could also contribute to the previously documented size-differentiated impact on UIPDs.

To address these potential selection concerns, in Table 9, we introduce time-varying fixed effects at the firm level (column 2). That is, we track each firm over time while also accounting for time-invariant firm-bank unobserved characteristics. This reduces our sample to firms with more than one observation per period, leading to a 12% reduction in sample size compared to column 1. The estimated coefficients remain highly significant and qualitatively robust. The estimate for β_5 increases to 1.9 percentage points and remains statistically significant at the 1% level. However, this specification is still subject to the aforementioned selection concerns, as we may also be tracking firms borrowing in only one currency from different banks. To further mitigate this concern, we introduce bank-time fixed effects (column 3), and our main findings remain virtually unchanged.

Additionally, in order to address the endogenous sorting of firms across currencies, in column 4 we introduce even more restrictive fixed effects at the firm-bank-time level. This specification leaves variation only at the loan level (pesos vs. dollars), meaning we track the same firm-bank pair over time while analyzing the loan-level UIPD, fully accounting for any idiosyncratic characteristics of the firm, bank, and their relationship. Notably, our main result remains robust and statistically significant at the 1% level— the UIPD gap increases by 2.1 percentage points in response to a rise in the cost of foreign funding for domestic banks, driven by FFR shocks. This specification restricts our sample to firms that borrow in multiple currencies from the same bank over time, resulting in an additional 3% reduction in observations.

An additional concern is that the reduction in observations due to the introduction of fixed effects in columns 2-4 may result in a sample of firms that behave differently from those in the full sample used in the baseline specification of column 1. To verify that this is not the case, in column 5, we re-estimate the baseline specification from column 1, using only the firms that remain in column 4. The coefficients in column 5 are similar in magnitude and statistical significance to those in column 1, providing evidence that the behavior of firms in the preferred specification of column 4 is representative of the full sample.

In the next section, we verify which specific rates—domestic currency or dollar loan rates—are differentially affected in order to drive the heterogeneous response of firm-level UIPDs.

Table 9: Second Stage – Effect of First-Stage Estimates on Interest Rates of Firm-bank Loans

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	2.478***	1.982***			2.263***
	(0.256)	(0.324)			(0.343)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	1.160***	1.943***	1.934***	2.102***	1.371***
	(0.166)	(0.382)	(0.356)	(0.349)	(0.222)
$Rate_{b,m} \times MS_f$	-0.781***	-0.986**	-0.479		-0.951***
	(0.111)	(0.428)	(0.364)		(0.164)
$Rate_{b,m} \times DX_{f,l,b,m}$	-1.920***	-2.320***	-2.362***	-2.647***	-1.927***
	(0.155)	(0.234)	(0.257)	(0.301)	(0.169)
$MS_f \times DX_{f,l,b,m}$	0.588	-1.187	-1.214	-1.533	0.008
	(0.471)	(0.834)	(0.865)	(1.008)	(0.599)
$DX_{f,l,b,m}$	5.959***	6.761***	6.850***	7.404***	5.774***
	(0.432)	(0.553)	(0.603)	(0.703)	(0.497)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.871	0.927	0.927	0.932	0.871
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

3.3 Heterogeneous UIPDs: The Role of U.S. Dollar and Domestic Currency Rates

To understand the size-differentiated response of the UIPD to fluctuations in the cost of banks' foreign funding driven by FFR shocks, we must first examine separately the impact on firms' interest rates on loans denominated in both dollars and domestic currency.

From the first-stage estimates, we know that a shock to the FFR directly increases the cost of foreign credit for banks. Naturally, this is expected to lead to higher interest rates on dollar-denominated loans that banks extend to domestic firms.[18] However, given the results from the previous section, it is unclear whether this pass-through is uniform across firm sizes.

Panels (e) and (f) in Figure 1 illustrate the behavior of average firm-level domestic loan rates in dollars and pesos, respectively, alongside the FFR. Panel (e) suggests that, on average, dollar interest rates move in tandem with the FFR, with no apparent differentiation by firm size. In contrast, panel (f) shows that, while mean peso interest rates exhibit a general downward trend across all firms, this pattern appears to break once the FFR begins to rise. Specifically, the average peso rate for small firms increases after the FFR tightening begins in the first quarter of 2015, whereas the rate for large firms continues its downward trend. This suggest that the size-differentiated response of the UIPD stems from a heterogeneous reaction in domestic currency interest rates.

Table 9 column 1 shows that an increase in the first-stage estimates of banks' cost of foreign credit leads to a 2.4 percentage points increase in the dollar interest rates of loans extended to large firms–β_1 in Equation 2. This estimate is statistically significant at the 1% level and remains robust when firm-time fixed effects are included.

To test a size-differentiated effect on dollar loan interest rates, we examine the estimate of β_4 associated with $\hat{i^\star}_{b,m} \cdot MS_f$ in Equation 2. This is -0.78 percentage points and statistically significant at the 1% level. This suggests that, accounting for time-invariant firm-bank unobservables, interest rates on dollar loans for small firms are significantly less affected than those for large firms.

[18] Banks in Chile typically match the currency denomination of their assets and liabilities, avoiding FX exposure on their balance sheets. This practice is common in emerging economies due to regulatory requirements or risk management considerations (see Brown et al. 2014, Tobal 2018, Keller 2019).

This result remains robust to the inclusion of firm-time fixed effects, as shown in Column 2. However, once time-varying bank fixed effects are accounted for, the size-differentiated effect on dollar loan interest rates becomes statistically insignificant. This suggests that the lower impact on small firms' dollar loan interest rates–as observed in columns 1 and 2–may stem from the endogenous sorting of firms across banks. After fully addressing selection concerns in column 3, the results indicate that interest rates on dollar-denominated loans respond homogeneously across firm sizes to changes in banks' foreign funding costs driven by FFR shocks.

To verify the size-unconditional effect of an FFR shock on the interest rates of peso-denominated loans, the relevant coefficient is the sum of the effect on dollar-denominated loan interest rates plus the differential effect on peso-denominated loan interest rates: $\beta_1+\beta_3$. Table 9 reports the estimates of each coefficient in the first and fourth rows, respectively. In column 1, the sum of these coefficients is 0.55 percentage points, which is statistically significant at the 1% level.[19] This result implies that, when accounting for time-invariant firm-bank unobserved characteristics, interest rates on peso loans to large firms increase in response to changes in banks' foreign funding costs driven by FFR shocks. However, after controlling for firm-time fixed effects in column 2, the sum of these coefficients is no longer statistically significant. This suggests that there is no significant effect of the shock on domestic loan rates for large firms (omitted category)—a result consistent with panel (e) in Figure 1. Furthermore, the estimated coefficient of the triple interaction term, $\hat{i^{\star}}_{b,m} \cdot MS_f \cdot DX_{f,l,b,m}$, indicates that the increase in peso loan interest rates in response to the shock is exclusive to small firms. In other words, the size-differential response of the UIPD is entirely driven by an heterogeneous response of peso loan interest rates.

We summarize the findings in this section as an intriguing puzzle: Spillovers from U.S. monetary policy shocks have a heterogeneous effect on firm-level UIPDs in an emerging market, such as Chile, driven by a differential pass-through to loans denominated in domestic currency–despite a uniform effect on dollar-denominated loans.

[19] Based on the F-test of the sum of the estimated coefficients $\hat{\beta}_1 + \hat{\beta}_3$.

3.4 Credit Supply and Demand

In light of the puzzle documented in the previous section, we aim to identify whether domestic credit supply or demand shocks play an active role in explaining our results. This allows to direct the theoretical analysis in the model in order to untangle the mechanisms behind our findings.

Our main empirical result—the size-differentiated response of UIPDs to changes in the cost of banks' foreign funding driven by shocks to the FFR—holds even after controlling for time-varying idiosyncratic characteristics at both the firm and bank levels, as well as unobserved bank-firm relationships. In other words, it remains robust when tracking the same bank-firm pair over time and analyzing the evolution of the loan-level UIPD related to the predicted changes in banks' cost of foreign funding. Therefore, it is likely that our findings are not driven by selection bias but rather reflect shifts in credit supply and/or demand. To determine whether supply or demand factors predominantly drive our results, we estimate Equation 2 but now with the (log of) loan amounts as the dependent variable. Table 10, which has the same structure as Table 9, shows the results of this exercise.

We focus on column 5, which keeps the same sample of firms as our preferred specification in column 4 while allowing us to analyze the coefficient β_1 in Equation 2. This coefficient would otherwise be absorbed by the inclusion of bank-time fixed effects. Its estimate captures the effect of the cost of banks' foreign funding, $\hat{i^{\star}}_{b,m}$, on the amount of dollar-denominated loans granted to large firms (the omitted category).

The estimate in the first row of Table 10 is negative but only significant at the 10% level, suggesting that an increase in the cost of banks' foreign funding, driven by shocks to the FFR, may reduce the amount of dollar-denominated loans granted to large firms. Moreover, the estimate of β_4 in Equation 2 suggests that while this effect could be more negative for small firms, it is not statistically different from that for large firms.

These results provide suggestive evidence that, for both small and large firms, shocks to the FFR have a negative impact on the amount of dollar-denominated loans. Combined with the significant positive effect on dollar loan interest rates for both firm sizes, as documented in the previous section, this suggests that a negative shift in the supply of dollar loans is the *primary* *driver* of the observed patterns in dollar lending and interest rates. It is worth noting that this does not exclude the possibility of a simultaneous negative shift in the demand for dollar loans, as peso loans may have become relatively more attractive.

The impact on the amount of peso loans granted to large firms is given by the sum of coefficients $\beta_1 + \beta_3$. As shown in Table 10, the sum of the first and fourth row estimates suggests that these coefficients offset each other. The F-test of joint significance confirms that there is no statistically significant effect on the amount of peso loans granted to large firms. Combined with the absence of an effect on their peso loan rates, this suggests that the dynamics of peso credit for large firms appear to be disconnected from changes in the foreign cost of banks' funding driven by shocks to the FFR.

Finally, the impact on the amount of peso loans granted to small firms is captured by the sum of coefficients $\beta_1 + \beta_3 + \beta_4 + \beta_5$. As Table 10 shows, this estimate corresponds to the sum of the first fourth rows. Once again, the F-test of joint significance indicates that there is no statistically significant effect on the amount of peso loans granted to small firms. However, given the significant and positive effect on their peso loan rates documented above, this suggests that both credit supply and demand shifts drive the dynamics of peso credit for small firms. Specifically, a positive shock to the FFR leads banks to restrict the supply of peso loans to small firms, while these firms simultaneously shift their demand from dollar loans to peso loans, as the former become relatively more expensive after the shock. As a result, the currency composition of small firms' debt tilts toward peso loans.

3.5 Core vs Non-Core Financing of Banks

So far, we have emphasized foreign debt as a relevant channel through which shocks to the FFR affect the cost of banks' financing in dollars and generate spillovers on domestic lending conditions. Indeed, the share of USD-denominated debt within banks' liabilities is significant. For the analyzed period–April 2012 to December 2019–, the dollarization of banks' liabilities is on average 22% (Figure 2 panel (a)). While the literature emphasizes the role of core funding (i.e., deposits in dollars) within dollar-denominated liabilities as an important source of transmission of

Table 10: **Second Stage – Effect of First-Stage Estimates on Loan Amounts**

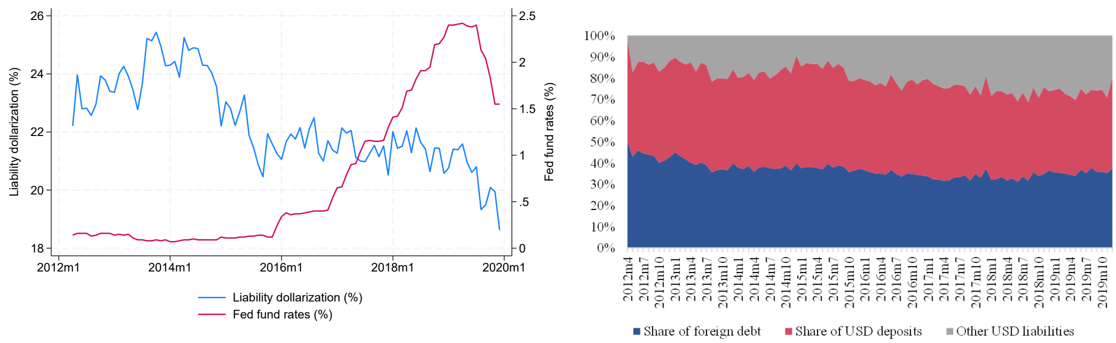
	Log(loan amounts)				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	-0.123	-0.227			-0.157*
	(0.0808)	(0.203)			(0.0942)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	-0.0227	-0.0681	-0.0978	-0.177	-0.0268
	(0.0656)	(0.320)	(0.264)	(0.304)	(0.0854)
$Rate_{b,m} \times MS_f$	-0.00288	-0.157	-0.0855		-0.0580
	(0.0586)	(0.336)	(0.282)		(0.0700)
$Rate_{b,m} \times DX_{f,l,b,m}$	0.125**	0.461*	0.401*	0.467*	0.130*
	(0.0562)	(0.255)	(0.207)	(0.243)	(0.0577)
$MS_f \times DX_{f,l,b,m}$	0.708	0.975	0.926	1.205	0.820
	(0.444)	(0.901)	(0.774)	(0.906)	(0.528)
$DX_{f,l,b,m}$	-0.833***	-1.358**	-1.242**	-1.578***	-0.960***
	(0.258)	(0.606)	(0.507)	(0.583)	(0.280)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.806	0.827	0.828	0.823	0.780
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2) with the $log(loan\ amount)_{f,b,l,m}$ as dependent variable. *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

foreign shocks (Ivashina et al., 2023), the share of foreign debt within banks' dollar liabilities is also significant. Figure 2 panel (b) shows that, within USD-denominated bank liabilities, foreign debt represents, on average, 37%, while core funding (deposits) accounts for around 43%.

However, it is important to note that shocks to the FFR could also influence the cost of USD funding through their impact on dollar deposit rates. Figure 3 panel (a) shows that the average cost of foreign debt faced by domestic banks, as well as the average dollar deposit rates charged by Chilean banks, comove nearly 1-to-1 with the FFR. Moreover, in Chile, as in most partially dollarized small open economies, banks match the currency denomination of their assets and liabilities (see, e.g., Tobal 2018, and Keller 2019). Figure 3 panel (b) shows that the evolution of commercial credit dollarization comoves with the dollarization of banks' liabilities. Then, it

Figure 2: Banks' Dollar Liabilities and Composition

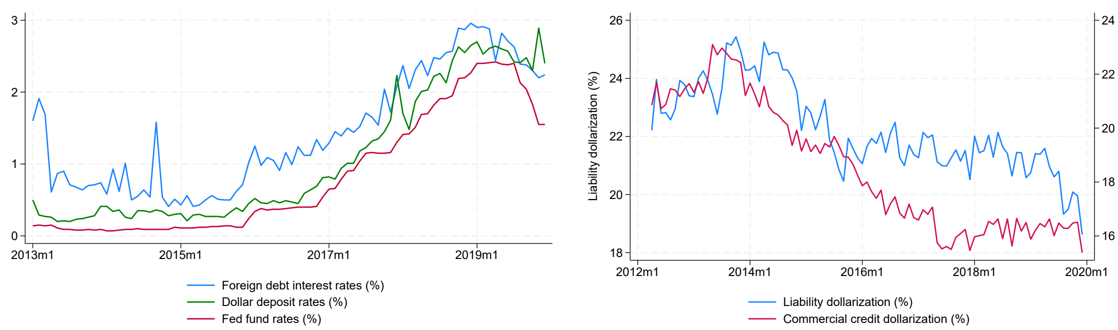


(a) (b)

Notes: Panel (a) in this figure plots the evolution of the dollarization ratio of total liabilities of Chilean banks jointly with the Fed Fund rates (FFR). Panel (b) plots de evolution of the composition of banks' dollar liabilities, identifying three categories: foreign debt, dollar deposits, and other dollar liabilities. All values are expressed at constant exchange rates. *Source:* Liability dollarization is obtained from the IMF's Financial soundness indicators, data on dollar deposits and foreign debt of the banking system are obtained from Central Bank of Chile's website.

could be the case that a deposit channel, in addition to a foreign debt channel, contributes to our findings on bank credit interest rates for domestic firms.

Figure 3: Interest Rates on Banks' Foreign debt, Deposits and Credit Dollarization



(a) (b)

Notes: Panel (a) in this figure plots the loan-weighted average of banks' foreign debt interest rates, dollar deposit interest rates and the Fed Fund Rates (FFR). Panel (b) plots the evolution of banks' liability dollarization and the dollarization of commercial credit loans granted by Chilean banks. *Source:* data on dollar deposit rates and commercial credit dollarization are obtained from the website of Chile's Financial Markets Commission. Foreign debt interest rates are obtained from Deudex.

Therefore, in addition to illustrating the significance of non-core dollar funding in the liabilities of Chilean banks (Figure 2), we provide further evidence supporting the relevance of our foreign-debt channel by estimating the following first-stage specification, as in Di Giovanni et al. (2022):

$$i^{\star}_{b,l,m} = \alpha_b + \lambda Trend_m + \Psi_0 FFR_{m-1} + \Psi_1 FFR_{m-1} \cdot NC_b + \delta FX_{b,l,m} + \theta_1 i_{m-1} + \theta_2 \Delta log(GDP_{m-1})$$
$$+ \theta_3 Inflation_{m-1} + \Theta_4 \Delta log(XR_{m-1}) + \Theta_5 Bank_{b,m-1} + \epsilon_{b,l,m} \quad (3)$$

Where NC_b is a dummy variable that takes the value of 1 if the bank's average share of non-core funding is greater than the cross-sectional average, and 0 otherwise. This variable captures the differential exposure of banks to non-deposit dollar liabilities. If our proposed channel is relevant, we expect the coefficient on the interaction between FFR_{m-1} and NC_b, Ψ_1, to be positive and statistically significant. In other words, banks that rely more heavily on non-core funding in dollars should be more affected by shocks to the FFR than banks with lower reliance on such funding.

Table 11: First Stage – Foreign Exposure

	Interest Rate on foreign debt			
	(1)	(2)	(3)	(4)
FFR $Taylor\ Residual_{m-1}$	0.313**	0.314**	0.365***	0.365***
	(0.125)	(0.126)	(0.110)	(0.111)
FFR $Taylor\ Residual_{m-1} \times NC_b$	0.441***	0.438***	0.467**	0.463**
	(0.0798)	(0.0787)	(0.161)	(0.163)
$Trend_m$	0.0212***	0.0212***	0.0187***	0.0187***
	(0.00587)	(0.00588)	(0.00505)	(0.00506)
Bank F.E.	Yes	No	Yes	No
Bank×Creditor F.E.	No	Yes	No	Yes
Bank Characteristics	No	No	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes
Observations	4,720	4,719	4,568	4,567
R-squared	0.659	0.661	0.686	0.687

Notes: This table presents results for OLS regression in (3). The dependent variable is calculated as $i_{b,l,m} = \left(\left(\frac{spread_{b,l,m}}{100} + 1\right) \times \left(\frac{libor_m}{100} + 1\right) - 1\right) \times 100$. FFR $Taylor\ Residual_{m-1}$ represents the lagged U.S. monetary policy shock, estimated as a Taylor residual that accounts for variations in the Federal Funds Rate (FFR) not explained by the U.S. real GDP growth and the U.S. inflation rate. NC_b is a binary variable that equals 1 if the bank's average share of non-core funding is greater than the cross-sectional average, and 0 otherwise. *Creditor* is an identifier of the type-of-foreign-lender. *Bank characteristics* include assets to liabilities share and market share. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are clustered at the bank-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table 11 presents the results of this estimation. The second row shows that, indeed, banks more exposed to non-core funding in dollars are more affected by FFR shocks in terms of their foreign-debt costs. This result underscores the importance of the transmission of foreign shocks through the cost of foreign borrowing faced by banks. However, this channel is not a substitute for the potential effect through an increase in dollar deposit rates; rather, it represents a complementary mechanism, which we focus on in this work using our rich administrative data.

3.6 Robustness

In this section, we verify the robustness of our main results by considering: (1) alternative measures of U.S. monetary policy shocks, (2) separate analyses of exporting/importing firms and non-tradable firms, (3) a departure from the two-stage analysis, (4) the inclusion of lagged macroeconomic controls interacted with firm size and currency dummies, and (5) adjusting for currency premium. We report the estimates of these exercises in Appendix A.

3.6.1 Alternative Shocks to the FFR

U.S. monetary policy surprises. It is possible that our Taylor residual measure, based on the Federal Funds Rate (FFR), may still be influenced by anticipated economic conditions or financial stability concerns, making it less exogenous than high-frequency identified shocks. To assess the robustness of our main results to these alternative shock measures, we turn to the estimated series of U.S. monetary policy shocks by Bu et al. (2021), aggregated at the monthly level. We refer to this variable as BRW. This measure is a single-factor summary of monetary policy actions on FOMC announcement days, and it has been shown to be highly unpredictable, containing no significant central bank information effect. Therefore, it is arguably a well-identified monetary policy surprise that is not correlated with any control variables in our regression.

Table A.1, shows the first stage estimates of Equation 1 using the BRW variable instead of the FFR Taylor residual. The first row of the table indicates that our results for the first stage hold. Specifically, there is a positive pass-through of U.S. monetary policy shocks to the interest rates faced by banks abroad, although the marginal estimated impact is larger in magnitude but less precisely estimated.

Table A.2 presents the results for the second stage estimation of loan-level interest rates in Equation 2. Our main results hold. Specifically, there is a positive, size-differentiated response of UIPDs to changes in the cost of banks' foreign funding driven by U.S. monetary policy shocks.

And, in turn, this effect is attributed to a relative increase in the rate in pesos rather than in dollars. Furthermore, despite the difference in the magnitude of the first-stage estimates compared to the specification using Taylor residuals, the estimated coefficient of the triple interaction in the second stage is similar in magnitude, at 1.7 percentage points and significant at the 1% level.

Shadow rate shocks. We also check robustness to another alternative measure of U.S. monetary policy shocks: Taylor residuals using shadow rates, as estimated by Wu and Xia (2016). This measure of monetary policy accounts for additional monetary easing through unconventional policies when the Federal Funds Rate (FFR) reached the zero lower bound. Similar to the case with U.S. monetary policy surprises, using the shadow rate instead of the FFR yields consistent results, and our conclusions remain unchanged. We present these results in Table A.3 for the first stage and Table A.4 for the second stage.

3.6.2 Tradable and Non-Tradable Sectors

Since firms engaged in international trade are typically large (Melitz 2003, Eaton et al. 2011), one might argue that their natural hedging against exchange rate risk—rather than firm size—could be driving the differential pricing of loans.[20] To address this concern, we break the sample into two sub samples. One, for tradable-sector firms, defined as those firms with a share of total trade–exports plus imports–larger than 30% of their sales, and other with non-tradable sector firms.[21] Table A.5 shows the estimates for the tradable sector. After accounting for selection concerns, our main results remain robust. Likewise, Table A.6 shows that our results hold for the non-tradable sector and the estimated effect of the size-differential UIPD response is arguably larger than that for firms in the tradable sector.

3.6.3 Two-Stage Analysis

There may be additional channels through which shocks to the FFR affect domestic credit conditions beyond the cost of banks' foreign funding. For example, they can directly influence the

[20] Although Alfaro et al. (2023), using Chilean census data, show that exporters have a limited degree of natural hedging. Moreover, while large tradable firms are more likely to use FX derivative instruments, they can only hedge a limited portion of their positions.

[21] Our results are robust to defining the tradable sector with different thresholds ranging from 10% to 30% of total trade as a share of total sales.

country risk premium (Kalemli-Özcan 2019, Di Giovanni et al. 2022, Rey 2013, Miranda-Agrippino and Rey 2020). This ends up affecting the cost of bank funding in domestic currency, the interest rates on peso-denominated bank loans, and ultimately the UIPDs. To test for the presence of this channel, we depart from the two-stage analysis and introduce FFR shocks directly into the bank-firm-level regressions. Table A.7 reports the estimated coefficients and show that our main results remain qualitatively unchanged. This suggests that this transmission channel is not strong enough to offset the previously documented size-differentiated dynamics in the UIPDs.

3.6.4 Macroeconomic Interactions

We also verify the robustness of our main results by including lagged macroeconomic controls interacted with size and currency dummies. This allows us to account for a possible size-differentiated impact of macroeconomic variables (e.g., the domestic monetary policy rate, exchange rate, inflation, real GDP) on firm loans, which could otherwise be confounded with the size-differentiated impact of shocks to the FFR. Table A.8 shows the second stage estimates on loan interest rates, which remain mostly unchanged relative to our initial specification in Equation 2.

3.6.5 Adjustment for Currency Premium

When including macroeconomic controls in the specifications given by Equation 1 and Equation 2, note that the (lagged) expected depreciation rate—$\Delta \log(XR_{m-1})$—is the year-on-year monthly expected depreciation rate, which does not vary by loan maturity. This could be problematic if small firms have, on average, different loan maturities than large firms. Consequently, the observed size-differentiated effect on the UIPD from a shock to the FFR could merely reflect an incorrect adjustment for currency depreciation[22]

To verify that our results are robust to adjustments for the currency premium, we follow Di Giovanni et al. (2022) and control for a maturity-adjusted expected depreciation rate. Specifically, we replace $\Delta \log(XR_{m-1})$ in Equation 1 and Equation 2 with the loan-level currency depreciation rate, $\Delta \log(XR_{m-1}^{f,b,l,m})$, as a control.[23] Table A.9 and Table A.10 present the results for the first and

[22] See, e.g., Ivashina et al. (2023), who calculate loan rates adjusted by currency premium.

[23] We do not have expected currency depreciation data at the firm-level for each loan. Therefore, we use the Central Bank of Chile's aggregate survey data at various horizons (3 months, 1 year, 2 years) and match loan maturity to the closest-term available expected depreciation rate, adjusting it to match, in percentage change, the maturity of

second stage regressions on loan interest rates, respectively. Table A.11 reports the second-stage results for loan amounts. As the tables indicate, our results remain robust, suggesting they are not driven by an incorrect currency depreciation adjustment.

4 Model

In the previous section, we documented that a shock to the FFR positively impacts the UIPD of small firms relative to large firms. Though this shock has no differential effect over the interest rate of dollar-denominated loans, it does over peso-denominated loans. Consequently, the differential increase in the UIPD of small firms relative to large firms in response to an FFR shock is due to a differential increase in domestic currency rates. We also showed that this differentiated effect is arguably due to a simultaneous decrease (increase) in the supply (demand) for credit in pesos by small firms. As a result, these firms' share of peso-denominated debt increases after the shock.

To rationalize these findings, we posit a two-period partial equilibrium model with endogenous default, in the spirit of Arellano (2008), Arellano et al. (2019), and Salomao and Varela (2022). In our model, heterogeneous firms borrow from risk-neutral banks, which consider firms' credit risk and lend in domestic currency (pesos) and foreign currency (dollars). Firms consider the optimal bank interest rate schedule and choose how much to borrow in both currencies. Firms use dollar and peso funding to finance their production inputs, capital, and labor. In the second period, firms are subject to productivity and foreign exchange rate shocks. After observing the realization of these shocks, firms endogenously choose whether to repay their debts or to default–in either one currency or both–and are subject to a productivity cost if they default. Below, we develop the model in detail, provide conditions under which the model explains our empirical findings, explore the mechanisms behind them, and provide suggestive evidence supporting those mechanisms.

4.1 Environment

Consider a two-period economy with firms that have heterogeneous productivities. A firm with productivity z borrows at $t = 1$ to accumulate capital, pay its wage bill, and produce at $t = 2$. In the second period, the firm observes the realized shock of z, Δ–such that productivity

the loan.

in $t = 2$ is Δz–and the realized shock of the exchange rate, e, and chooses whether to repay its debt. We assume that the distribution of the productivity shock is the same for all firms. Thus, the only source of firm heterogeneity is the initial level of productivity, z. Denote the distributions of productivity and exchange rate shocks by G_Δ and G_e, which we assume are independent.

The firm borrows at $t = 1$ from a representative domestic bank and chooses how much to borrow in domestic currency, l^d, and in foreign currency, l^*. The firm uses loans in dollars to pay for capital, k, and loans in pesos to pay for the wage bill, wn. Both, capital and labor, are the firm's production inputs. Loans have an endogenous price, q^d for loans in pesos, and q^* for loans in dollars, which depend on the firm's probability of default in each currency. At $t = 2$, the firm produces and either pays back its debt or chooses to default. The productivity of the firm decreases by $1 - h^d$ if it defaults on domestic currency debt, by $1 - h^*$ if it defaults on foreign currency debt, and by $1 - h^T$ if it defaults in both.

We assume that the bank is risk-neutral, funds its loans in foreign currency at a risk-free rate r^*, and funds its loans in domestic currency at a risk-free rate r. We normalize to 1 the exchange rate in $t = 1$.

4.2 Domestic Bank

To maximize profits, the representative domestic bank chooses how much to lend in both pesos, l^d, and dollars, l^*. Thus, the bank solves the following problem

$$\begin{aligned} \max_{l,l^*} \quad & (1-\delta^*)\mathbb{E}_e[e]l^* + (1-\delta^d)l^d - \left(l^* + l^d\right) \\ \text{s. t.} \quad & \frac{l^d}{1+r} = q^d l^d \\ & \frac{l^*}{1+r^*} = q^* l^*, \end{aligned} \tag{4}$$

where δ^d and δ^* are the endogenous default probability for domestic and foreign currency debt. The constraint states that the bank must raise enough money to lend in each currency. The bank pays interest rates r and r^* on its peso and dollar funding, respectively. We assume that $r > r^*$, such that there is an exogenous aggregate UIPD>0, as in Salomao and Varela (2022). When the bank optimizes, we obtain

$$q^d = \frac{1-\delta^d}{1+r}$$
$$q^* = \mathbb{E}_e[e]\frac{1-\delta^*}{1+r^*}, \tag{5}$$

which determine the interest rate schedules that firms face.

4.3 Firms

A firm with productivity z chooses how much to borrow in pesos, l^d, and in dollars, l^*, to maximize the difference between its production and the repayment of loans, taking the interest rate schedules in Equation 5 as given. As mentioned before, we assume that loans in dollars finance capital expenditures, k, and loans in pesos the wage bill, wn.[24]

The firm's production function depends on both capital and labor,

$$y = k^\alpha n^{1-\alpha}.$$

The firm endogenously chooses whether to repay both loans fully (full repayment, FR), default only in domestic currency (PD), default only in foreign currency (PF), or default in both loans (FD).

We assume that there is a cost in terms of productivity if the firm defaults, which we model by assuming that in case of default, the realized productivity is lower than z. Specifically, we assume that if the firm chooses FR, its realized productivity is Δz, under PD it is $h^d\Delta z$, under PF it observes $h^*\Delta$z and, if the firm fully defaults, $h^T\Delta z$. We assume that

$$1 > h^d \geq h^* > h^T$$
$$1 - h^d = h^* - h^T.$$

The first assumption implies that the cost of PF is, at least, the cost of PD, which is smaller than

[24]This assumption is without loss of generality, and we make it for better tractability. Notwithstanding this, the data show that the share of credits in dollars used to finance capital goods is considerably larger than in pesos. Likewise, the share of credit in pesos used to finance working capital is larger than that in dollars.

the cost of FD. The second assumption implies that the marginal cost of defaulting in domestic currency is the same, regardless of whether the firm is defaulting in foreign currency or not–i.e., the cost of going from FR to PD is the same as that of going from PF to FD.

The problem of the firm is

$$\begin{aligned} \max_{l^d, l^*} \quad & \mathbb{E}\left[\max\left\{\Delta zy - l^d - el^*, h^d \Delta zy - el^*, h^* \Delta zy - l^d, h^T \Delta zy\right\}\right] \\ \text{s. t. } \; & y = k^\alpha n^{1-\alpha} \\ & k = q^* l^* \\ & wn = q^d l^d. \end{aligned} \tag{6}$$

We solve the problem in Equation 6 by recursively fixing l^d and l^* at $t = 2$ and finding the optimal choice for each possible realization of e and Δ, which then allows us to find the optimal values of l^d and l^* at $t = 1$.[25]

4.4 Optimal Choice and Firm's Repayment

Figure 4 shows the areas in the $e - \Delta$ space where each of the combinations of loan repayment are optimal.

Intuitively, high realizations of Δ make defaulting in either currency costly because forgone production is too high. When the exchange rate realization is high enough, i.e., a significant depreciation, firms default in dollars. Specifically,

$$(\bar{e}, \bar{\Delta}) \equiv \left(\frac{l^d}{l^*}\frac{1-h^*}{1-h^d}, \frac{l^d}{zy}\frac{1}{1-h^d}\right).$$

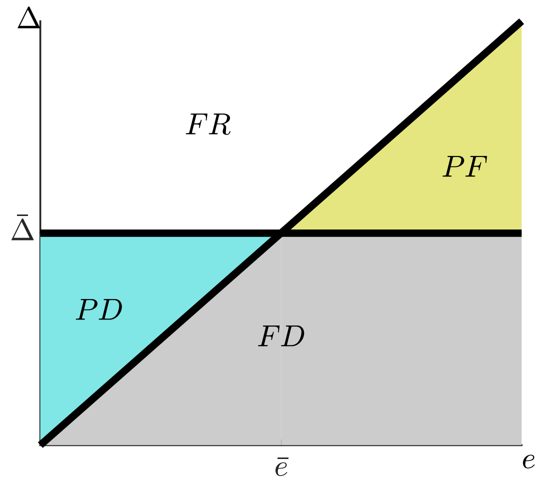
and the slanted line is given by

$$\Delta = e\frac{l^*}{zy}\frac{1}{1-h^*}.$$

On the one hand, δ^d, the probability of default in pesos, is given by the areas PD and FD. On the other hand, δ^*, the probability of defaulting in dollars, is given by the areas PF and FD.

[25] We focus on qualitatively analyzing the model's implications in light of the data. To obtain quantitative results, aside from providing a parametrization, we would need to set a grid for l^d and l^* to obtain the model's solution.

Figure 4: Optimal Repayment Areas



Notes: The figure shows the optimal repayment areas for a given firm solving the problem described by Equation 6. The vertical axis corresponds to the support of the productivity shock, Δ, and the horizontal axis to the support of the exchange rate shock, e. FR is the full-repayment area, PD the partial default in domestic currency area, PF the partial default in foreign currency area, and FD the full default area.

Solving for δ^d and δ^* implies solving a fixed-point problem. Formally, if $\Delta \sim G_\Delta$ and $e \sim G_e$ then

$$\delta^d = G_\Delta\left(\frac{l^d}{zy}\frac{1}{1-h^d}\right) \tag{7}$$
$$\delta^* = \int G_\Delta\left(e\frac{l^*}{zy}\frac{1}{1-h^*}\right)dG_e.$$

4.5 Characterization

We consider particular functional forms for G_Δ and G_e for which we derive theoretical results. Assume that

$$G_\Delta(\Delta) = \begin{cases} 1 & \Delta \geq \Delta^u \\ \frac{1}{2} & \Delta^d \leq \Delta < \Delta^u \\ 0 & \Delta < \Delta^d, \end{cases} \tag{8}$$

and assume that the distribution for e has support on $[e^d, e^u]$.

We posit and prove two propositions that characterize when firms find it optimal to repay fully (FR) or to default in domestic currency (PD).

Proposition 1. *Given the distribution of* Δ, $G_\Delta(\Delta)$, *described by Equation 8, and a distribution of* e *with support* $[e^d, e^u]$, *if*

$$\begin{aligned}\frac{z}{(1+r^*)^\alpha} &> \frac{1}{\Delta^d}(w(1+r))^{1-\alpha}\left(\frac{1-\alpha}{\alpha}\right)^\alpha \frac{1}{1-h^d} \\ \frac{z}{(1+r^*)^\alpha} &> \frac{e^u}{\Delta^d}\frac{(w(1+r))^{1-\alpha}}{\mathbb{E}_e[e]}\left(\frac{\alpha}{1-\alpha}\right)^{1-\alpha}\frac{1}{1-h^*}.\end{aligned} \tag{9}$$

Then, firm z *finds it optimal to fully repay its debts in both currencies (FR).*

Proof. First, from the case of full repayment in Equation 6, notice that

$$y = \left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^\alpha \left(\frac{1}{(1+r)w}\right)^{1-\alpha}(1-\delta^*)^\alpha(1-\delta^d)^{1-\alpha}(l^*)^\alpha(l^d)^{1-\alpha}. \tag{10}$$

Firm z finds it optimal not to default when

$$\begin{aligned}\Delta^d >& \frac{l^d}{zy}\frac{1}{1-h^d} \\ \Delta^d >& e^u\frac{l^*}{zy}\frac{1}{1-h^*}.\end{aligned} \tag{11}$$

The first condition guarantees that $\Delta^d > \bar{\Delta}$ so that there is no default in domestic currency; the second one guarantees that all realizations of Δ and e are to the left of the diagonal line in Figure 4.

Now, we guess and verify that the conditions in (11) are met. If the firm does not default, then $\delta^d = \delta^* = 0$, so we can write Equation 10 in the firm's problem as

$$\max_{l^d,l^*} z\mathbb{E}_\Delta[\Delta]\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^\alpha\left(\frac{1}{(1+r)w}\right)^{1-\alpha}(l^*)^\alpha(l^d)^{1-\alpha} - l^d - \mathbb{E}_e[e]l^*,$$

whose first-order conditions are

$$\begin{aligned}\alpha z\mathbb{E}_\Delta[\Delta]\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^\alpha\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\left(\frac{l^d}{l^*}\right)^{1-\alpha} &= \mathbb{E}_e[e] \\ (1-\alpha)z\mathbb{E}_\Delta[\Delta]\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^\alpha\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\left(\frac{l^*}{l^d}\right)^\alpha &= 1.\end{aligned}$$

Therefore, the optimal loan ratio satisfies

$$\frac{\alpha}{1-\alpha}\frac{l^d}{l^*} = \mathbb{E}_e[e]. \tag{12}$$

Plugging Equation 12 into (11) implies that this scenario holds when the conditions in (9) hold.

■

Proposition 2. *Given the distribution of* Δ, $G_\Delta(\Delta)$, *described by Equation 8, and a distribution of* e *with support* $[e^d, e^u]$, *if*

$$\begin{aligned} \frac{1}{\Delta^d}\left(w(1+r)\right)^{1-\alpha}\left(\frac{1-\alpha}{\alpha}\right)^{\alpha}\frac{4^\alpha}{1-h^d} > \frac{z}{(1+r^*)^\alpha} > \frac{1}{\Delta^u}\left(w(1+r)\right)^{1-\alpha}\left(\frac{1-\alpha}{\alpha}\right)^{\alpha}\frac{4^\alpha}{1-h^d} \\ \frac{z}{(1+r^*)^\alpha} > \frac{e^u}{\Delta^d}\frac{(w(1+r))^{1-\alpha}}{\mathbb{E}_e[e]}\left(\frac{\alpha}{1-\alpha}\right)^{1-\alpha}\frac{2^{2\alpha-1}}{1-h^*}. \end{aligned} \tag{13}$$

Then, it is optimal for firm z *to default only in domestic currency (PD).*

Proof. First, notice that it is optimal for firm z to default only in domestic currency when

$$\begin{aligned} \Delta^u &> \frac{l^d}{zy}\frac{1}{1-h^d} > \Delta^d \\ \Delta^d &> e^u\frac{l^*}{zy}\frac{1}{1-h^*}. \end{aligned} \tag{14}$$

The first condition guarantees that $\Delta^u > \bar{\Delta} > \Delta^d$ so that there is a default in domestic currency for the low realization of Δ. The second condition guarantees that all realizations of Δ and e are to the left of the diagonal line in Figure 4.

Now, we guess and verify that the conditions in (14) are met. If the firm only defaults in domestic currency, then $\delta^d = \frac{1}{2}$ and $\delta^* = 0$, so we can write Equation 6 as

$$\begin{aligned} \max_{l^d,^*} \frac{1}{2}\left[\Delta^u z\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^{\alpha}\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\frac{1}{2^\alpha}(l^*)^\alpha(l^d)^{1-\alpha} - l^d - \mathbb{E}_e[e]l^*\right] \\ + \frac{1}{2}\left[h^d\Delta^d z\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^{\alpha}\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\frac{1}{2^\alpha}(l^*)^\alpha(l^d)^{1-\alpha} - \mathbb{E}_e[e]l^*\right] \end{aligned}$$

whose first-order conditions are

$$\alpha\left[\Delta^u + h^d\Delta^d\right] z\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^{\alpha}\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\left(\frac{l^d}{l^*}\right)^{1-\alpha} = \mathbb{E}_e[e]$$
$$(1-\alpha)\left[\Delta^u + h^d\Delta^d\right] z\left(\frac{\mathbb{E}_e[e]}{1+r^*}\right)^{\alpha}\left(\frac{1}{(1+r)w}\right)^{1-\alpha}\left(\frac{l^*}{l^d}\right)^{\alpha} = \frac{1}{2}.$$

Therefore, the optimal loan ratio satisfies

$$\frac{\alpha}{1-\alpha}\frac{l^d}{l^*} = 2\mathbb{E}_e[e]. \tag{15}$$

Plugging Equation 15 into (14) implies that this scenario holds when the conditions in (13) hold.

■

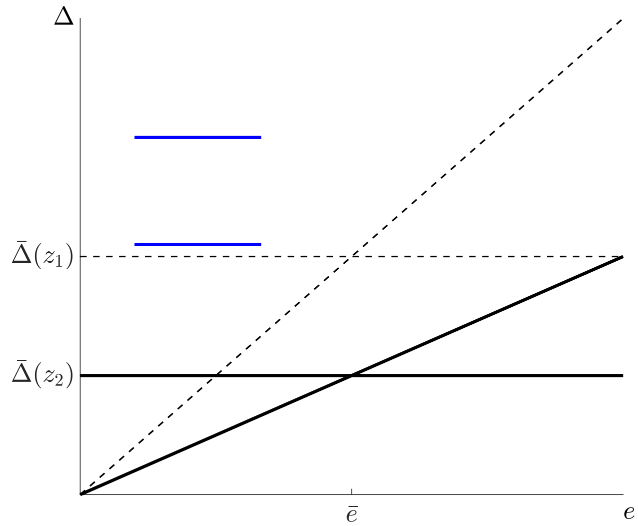
Propositions 1 and 2 show that there are plausible conditions under which firms in the economy are either in a full-repayment scenario or in the partial-default in the domestic currency scenario. When, after an increase in the foreign interest rate, large firms are governed by Proposition 1 (FR), and small firms by Proposition 2 (PD), our model provides a rationale to our main empirical findings. We discuss this below.

4.6 Mechanism - Shocks to $r^\star$ and Heterogeneous UIPDs

In our empirical results, a shock to the federal funds rate increases the UIPD of small firms by increasing their domestic-currency loan interest rates relative to those of large firms. To understand how our model can rationalize these results, consider two firms with $z_1 < z_2$, respectively. Given our production function technology, firm size is proportional to productivity. Thus, we can define the firm with productivity z_1 as the small firm, and the other as the large firm. Assume that, for both firms, z_i is sufficiently large to meet the conditions in Proposition 1. In this case, both firms have zero probability of default.

Figure 5 graphically illustrates this point. The dashed lines represent the boundaries for the repayment areas for firm with productivity z_1, and the continuous lines represent the corresponding areas for the firm with productivity z_2. Consider distributions G_Δ and G_e such that, given a low value of r^*, the blue lines represent the possible values of Δ and e. In this scenario, both firms find it optimal to repay fully.

Figure 5: Optimal Repayment Areas for Low z and High z and $G_\Delta \times G_e$



Notes: The figure shows the optimal repayment areas for a firm with low productivity (dashed lines), z_1, and a firm with high productivity (solid lines), z_2. The blue lines represent the possible values of Δ and e in this scenario. The vertical axis corresponds to the support of the productivity shock, Δ, and the horizontal axis to the support of the exchange rate shock, e.

Now, we can define the (gross) UIPD of a firm with productivity z_i in the model as

$$UIPD(z_i) = \frac{q^\star(z_i)}{q^d(z_i)} = \frac{(1+r)(1-\delta^*)\mathbb{E}_e(e)}{(1+r^*)(1-\delta^d)} \tag{16}$$

Notice from the optimality condition of banks, Equation 5, that both $q^d(z_i)$ and $q^\star(z_i)$ are respectively decreasing in the domestic- and foreign-currency default probability. Now, assume that $\mathbb{E}_e(e) = e_0 = 1$. In this scenario, where $\delta^* = \delta^d = 0$, $UIPD(z_1) = UIPD(z_2) = \frac{1+r}{1+r^*} > 1$. Thus, there is a positive UIP deviation that, on average, is the same for small and large firms, as in the data.

Now, consider a firm with productivity z_i under two scenarios: $r_1^* < r_2^*$. This corresponds to an increase in the FFR in the data from r_1^* to r_2^*. Due to this increase in the foreign interest rate, the condition described by (9) in Proposition 1 is less likely to hold. Assuming that z_2 is sufficiently high for the large firm to remain in the full-repayment region, the UIP deviation of this firm falls to $UIPD(z_2, r_2^*) = \frac{1+r}{1+r_2^*} < \frac{1+r}{1+r_1^*}$. This result is aligned with the empirical findings, where the shock to the FFR, via the increase in banks' cost of foreign debt and no change in the domestic interest rate, leads to a fall in the UIPD of large firms. This implies that large firms are sufficiently productive, such that for any possible state of the exchange rate, an increase in the foreign interest rate does not affect their probability of repayment. In other words, after this increase, the benefits of full repayment remain higher than those accrued by defaulting and giving up a share of output.

For the low-productivity (z_1) firm, assume that, after the increase in r^*, it falls into the condition described by (13) in Proposition 2. In this case, the probability of default in domestic currency, δ^d, now increases from 0 to 1/2, and the probability of default in foreign currency remains equal to 0. As a result, the UIP deviation of this firm is now $UIPD(z_1, r_2^*) = \frac{(1+r)}{(1+r_2^*)(1-\delta^d)} > UIPD(z_2, r_2^*)$. Therefore, we have that:

$$UIPD(z_1, r_2^*) - UIPD(z_1, r_1^*) > UIPD(z_2, r_2^*) - UIPD(z_2, r_1^*)$$

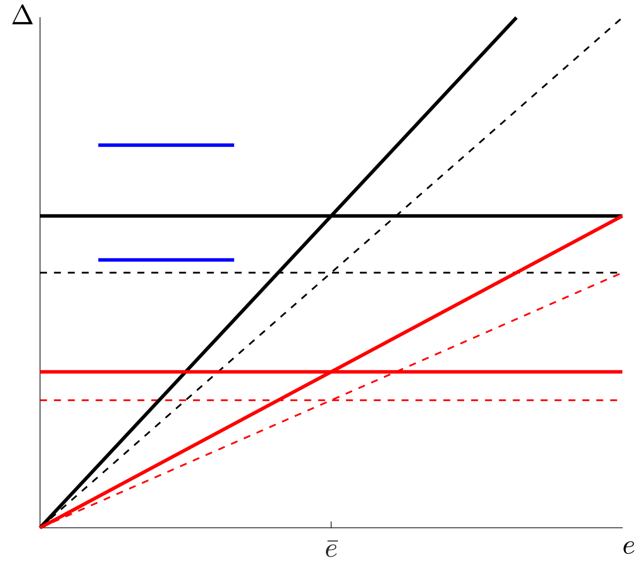
In words, the differentiated increase in the UIP deviation is larger for the small firm than for the large firm, rationalizing our main empirical finding.

To illustrate this point further, consider Figure 6. The continuous lines determine optimal repayment areas for r_2^*, while the dashed lines do the equivalent for r_1^*. Under the assumed distributions for G_Δ and G_e, Proposition 2 establishes the conditions under which firm z_1–i.e., the small firm–finds it optimal to default in domestic currency under r_2^*, resulting now in a larger UIP deviation compared to that large firms–i.e., those with high productivity, z_2.

Additionally, for this firm, moving from the world of total repayment to the world of partial default in domestic currency implies a change in the ratio of debt in pesos to debt in dollars. Initially, in the case of full repayment, this ratio was determined by Equation 12. However, the increase in r^* implies that it now follows Equation 15, a ratio twice as large as the full-repayment case. Hence, small firms increase their domestic debt relative to total debt more than large firms, in line with our empirical findings.

Our current analysis does not imply that there are not other possible scenarios where there could be partial default in dollars as well. Instead, we pose a scenario under which our model provides a rationale to our empirical finding. In this scenario, sufficiently productive firms–i.e.,

Figure 6: Optimal Repayment Areas for Low z and High z for Different Values of r^*



Notes: The figure shows, for r_1 (dashed lines) and r_2 (solid line), the optimal repayment areas for a firm with low productivity (black), z_1, and a firm with high productivity (red), z_2. The blue lines represent the possible values of Δ and e in this scenario. The vertical axis corresponds to the support of the productivity shock, Δ, and the horizontal axis to the support of the exchange rate shock, e.

large firms–maintain a zero probability of default in all currencies after an increase in the foreign interest rate, facing now larger interest rates in foreign currency, leading their UIPD to fall, as in the data. Conversely, amid an increase in the foreign interest rate, small firms have a lower productivity, hence a lower marginal benefit of repayment relative to the one of defaulting. On one hand, their productivity is still sufficiently high to find it optimal to repay their foreign currency debt for any state of the exchange rate. On the other hand, it is not high enough to fully repay in domestic currency, on which it now partially defaults. This implies that the differentiated response in the UIPD, which indeed comes from a differential change in the domestic interest rates of small firms, is due to a differential increase in domestic-currency risk.

Behind our results, it is important that the maximum level of the exchange rate relative to the mean is low enough to have a higher likelihood of not falling into a state of defaulting in dollars. This is, to fulfill the conditions of either one of the two propositions. For instance, an increase in exchange rate volatility jeopardizes meeting these conditions by increasing e^u, implying that our findings are likely to hold in economies where the nominal exchange rate does not exhibit very high volatility.[26]

A crucial mechanism behind these results, is the cost of default. For the small firm to fall into the partial default in pesos area while keeping repayment in dollars, it must be that initially the marginal benefit of defaulting in dollars is lower than the marginal benefit of defaulting in pesos. This implies that, $1 - h^{*} > 1 - h^{d}$, meaning that the cost of defaulting in dollars should be larger than the cost of defaulting in pesos. Thus, when r^{*} increases, the low productivity firm still finds it optimal to repay in dollars as defaulting in dollars is still costly.

Finally, our model underscores, albeit in partial equilibrium, a potential relevant role for the domestic risk-free interest rate. If, as a result of the increase in the foreign interest rate, the domestic interest rate, r, falls (for instance, due to a central bank response), then it is more likely that all firms remain in the full-repayment area. In turn, this could deter, to some extent, small firms from defaulting in domestic currency debt amid the foreign shock, curbing the increase in the cost of domestic credit for those firms.

4.7 Evidence of the Model's Mechanisms

The previous section underscores three underlying results from the model that are key in explaining our empirical findings. First, the probability of default in dollars is always zero for all firms, and the probability of default in pesos varies with firm size after the shock to $r^{\star}$. Second, the previous result implies that the marginal cost of defaulting in dollars is lower than the one in pesos, $1 - h^{\star} > 1 - h^{d}$. Third, smaller firms–i.e., those with lower productivity, z_i–are those more likely to the default in the model. In this section, we now turn to support these theoretical results with suggestive evidence using our data.

Default in domestic vs foreign currency. We have data of non-performing loans (NPLs) at the firm level. This means we observe whether a firm has at least one active non-performing loan in a given period, as well as the (maximum) number of days of delinquency across loans. Unfortunately, we do not have data at the individual loan level. Therefore, we construct a proxy for firm-level loan dollarization, defined as the firm's share of the amount of (new) loans denominated in dollars

[26] In line with the literature that documents a negative relationship between dollarization and exchange rate volatility (e.g., Drenik and Perez 2021, Christiano et al. 2022)

relative to its total amount of (new) loans in each month.[27] Specifically, we define:

$$USDLoansShare_{f,m} = \frac{\sum_N loan^{usd}_{n,f}}{\sum_K loan^{peso}_{k,f} + \sum_N loan^{usd}_{n,f}}$$

Where the left-hand side variable is the share of dollar loans of firm f in month m, and K and N are, respectively, the total number of loans in pesos and in dollars. We estimate,

$$NPL_{f,m} = \alpha_m + \alpha_f + \beta \cdot USDLoansShare_{f,m} + \epsilon_{f.t}$$

The first two terms on the right-hand side represent month and firm fixed effects, respectively. The variable $NPL_{f,m}$ is the default measure, defined either as a binary indicator–equal to 1 if the firm is in non-performing status with at least one loan in month m, and 0 otherwise–or as the (maximum) number of delinquency days. Table 12 reports the estimates from this regression.

Table 12: Firm Loan Dollarization and Default

	(1) NPL status (0/1)	(2) Delinquency Days	(3) NPL status (0/1)	(4) Delinquency Days
$USD\ Loans\ Share_{f,m}$	-0.00513** (0.00253)	-0.287*** (0.0570)	-0.00513* (0.00302)	-0.287*** (0.0714)
Firm FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Cluster	No	No	Yes	Yes
Observations	266,116	266,116	266,116	266,116
R-squared	0.206	0.225	0.206	0.225
Cluster obs.			23,303	23,303

Notes: This table reports the results of panel OLS regressions where the dependent variables are either the NPL status dummy (columns 1 and 3) or the number of delinquency days (columns 2 and 4). In columns 1 and 2, standard errors are reported in parenthesis and are not clustered, while in columns 3 and 4, standard errors are clustered at the firm level and reported in parenthesis. The main explanatory variable is $USD\ Loans\ Share_{f,m}$, which is firm f's share of the amount of (new) loans denominated in dollars relative to its total amount of (new) loans in month m. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

The first two columns of Table 12 correspond to regressions where the dependent variables are, respectively, the dummy for firm in NPL status and the number of delinquency days. The last two columns present the same specifications, but with standard errors clustered at the firm level. Our estimates indicate that, within firms over time, a higher share of dollar-denominated loans is associated with a statistically significant lower probability of being in non-performing loan (NPL) status and a statistically significant decrease in the number of delinquency days per month.

[27] Unlike the case of new loans, we do not have data on the stock of debt by currency at the firm level.

Specifically, a 10 percentage points increase in a firm's dollarization share is associated with a 0.05 percentage points decrease in the probability that the firm has at least one non-performing loan in a given month, controlling for firm and time effects (columns 1 and 3). Also, a 10 percentage points increase in the share of dollar-denominated loans is associated with a 0.028-day decrease in the number of delinquency days per month (columns 2 and 4).

Although we do not have a direct measure of default by currency at the firm level, the results in Table 12 show that firms that shift toward greater dollarization in their new loans tend to experience slightly lower default risk, on average, over time. We interpret this finding as suggestive evidence that firms, on average, are less likely to default on dollar-denominated loans than on peso-denominated loans, consistent with the first mechanism proposed in the model.

Cost of default in domestic vs foreign currency. As mentioned earlier, the model implies a higher marginal cost of defaulting on dollar-denominated loans for firms. To test this implication empirically, we examine the relationship between firm's loan dollarization and its assets and investment—both of which serve as proxies for loan-level collateralization. The greater the collateral, the higher the marginal cost of default for the firm.

First, we estimate a cross-sectional regression that relates total loan dollarization of a firm, aggregated over time, to the (log of) total investment of the firm, also aggregated over time:[28]

$$log(Investment_f) = \beta_0 + \beta_1 \times \sum_y w_y \cdot USDLoansShare_{f,y} + \epsilon_f$$

Where w_y is the yearly weight, defined as the share of firm f's loan amount in year y relative to the total amount borrowed by the firm across all years (2012-2019). Second, we also estimate a panel fixed-effects specification that relates the (log of) firms' fixed assets—obtained from their annual balance sheet data at the end of each year—to their dollar loan share. This is,

$$log(Assets_{f,y}) = \alpha_y + \alpha_f + \beta_1 \cdot USDLoansShare_{f,y} + \epsilon_{f,m}$$

[28]Due to the volatile nature of investment—which frequently includes zeros in a given period for many firms—we conduct this analysis as a cross-section regression at the firm level, aggregated over time. All variables are converted to real terms using 2018 prices.

This estimation includes year and firm fixed effects. Table 13 reports the results from both specifications in the first and second columns, respectively. In the latter, standard errors are clustered at the firm level. In both cases, we find a positive and statistically significant relationship (at the 1% level) between firms' loan dollarization and firm-level capital outcomes. Specifically, column 1 estimates show that a 10 percentage points increase in the loan dollarization ratio is associated with an approximate 31.5% increase in total investment over the period 2012-2019.[29] Column 2 shows that a 10 percentage points increase in loan dollarization is associated with an approximate 0.8% increase in assets, on average, within a firm over time.

This implies that firms with a larger share of dollar-denominated loans tend to have higher levels of fixed capital, which can be interpreted as a greater degree of collateralization. These results suggest that, consistent with the model, defaulting on dollar-denominated loans is likely to entail greater asset losses for firms compared to defaulting on peso-denominated loans.

Table 13: Firm loan Dollarization and capital outcomes

	(1) Log(Investment)	(2) Log(Assets)
USD Loans Share	2.724***	0.0837***
	(0.0593)	(0.00869)
Constant	16.17***	19.35***
	(0.0171)	(0.000751)
	Firm level	Firm-Year Level
Firm FE	No	Yes
Observations	30,982	346,631
R-squared	0.064	0.967
Cluster obs.		102,621

Notes: This table reports OLS regression results relating firm loan dollarization to investment and asset holdings. The dependent variable in column (1) is the log of total firm investment aggregated over the period 2012–2019, and the regression is estimated in cross-section. The dependent variable in column (2) is the log of firm assets at the monthly level, and the regression is estimated as a panel with firm fixed effects. The main explanatory variable in both columns is the loan dollarization ratio, *USD Loans Share*. Standard errors are clustered at the firm level in column (2). $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Default rates by firm size. In the model, a consequence of the higher default probability in pesos for less productive firms is that small firms are more likely to default than large firms. We

[29] Because the dependent variable is in logs and the independent variable is in levels (bounded between 0 and 1), the coefficient is interpreted semi-elastically: a 0.1 increase in the dollarization ratio implies a change in investment of approximately $\exp(0.274) - 1 \approx 0.315$, or 31.5%.

test this implication in the data by estimating the following specification:

$$NPL_{f,m} = \alpha_m + \alpha_f + \beta \cdot MS_f + \epsilon_{f,t}$$

where MS_f is a dummy that takes the value of 1 if the firm is classified as micro or small, and 0 otherwise. The dependent variable, $NPL_{f,m}$, is defined as before, either as an indicator for having at least one active non-performing loan in a given period or as the (maximum) number of delinquency days across loans. Table 14 presents the results of this estimation. The last two columns include 2-digit sector FE. Columns 1 and 3 show that small firms are approximately 6 percentage points more likely to have at least one non-performing loan in a given month, compared to large firms, controlling for common time effects (or sector effects). Columns 2 and 4 show that small firms have, on average, 15.78 and 17.73 more delinquency days than large firms in a given month, conditional on time and sector fixed effects, respectively.

Consistent with the model, our estimates show that small firms are significantly more likely to default and remain delinquent longer than larger firms, even after accounting for general time trends or broad sectoral differences.[30]

Table 14: Firm size and Default

	(1) NPL status (0/1)	(2) Delinquency Days	(3) NPL status (0/1)	(4) Delinquency Days
MS_f	0.0651***	15.78***	0.0693***	17.73***
	(9.62e-05)	(0.0164)	(9.94e-05)	(0.0189)
Constant	0.0309***	0.752***	0.0270***	-1.022***
	(8.65e-05)	(0.0107)	(8.90e-05)	(0.0125)
Date FE	Yes	Yes	Yes	Yes
Sector FE	No	No	Yes	Yes
Observations	53,222,694	53,222,694	53,222,694	53,222,694
R-squared	0.093	0.035	0.095	0.037

Notes: This table reports the results of panel OLS regressions where the dependent variables are either the NPL status dummy (columns 1 and 3) or the number of delinquency days (columns 2 and 4). In columns 1 and 2, the regressions do not control for sector fixed effects, while in columns 3 and 4, 2-digit sector fixed effects are included. The main explanatory variable is a dummy variable, MS_f, that takes the value of 1 if the firm is classified as small and 0 otherwise. Standard errors are clustered at the firm level and reported in parenthesis. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Altogether, our data provides evidence consistent with the underlying mechanisms driving

[30] Note that, unlike the previous two exercises, this specification does not require restricting the sample to firms with debt in both currencies. Therefore, we estimate this regression using the full universe of firms in our dataset, which results in a considerably larger number of observations.

the model's ability to rationalize our empirical findings. Nonetheless, due to limitations in the availability of default data—specifically, the absence of loan-level information—this evidence should be interpreted as suggestive rather than causal. Yet, within the constraints of the available data, the results allow us to meaningfully connect the empirics with the theoretical framework.

5 Conclusion

We document a novel role for firm-level heterogeneity in the transmission of foreign shocks, which had not been previously explored in the literature. Using a rich administrative dataset from Chile, we study the transmission of U.S. monetary policy shocks to firms' UIPDs in emerging markets through local banks that borrow abroad. We find that a positive shock to the U.S. FFR raises banks' cost of credit in foreign debt markets, which is then passed on to firms heterogeneously. Specifically, the cost of domestic-currency-denominated debt rises for small firms but remains unchanged for large firms. Since the cost of dollar-denominated debt increases uniformly across firms, the shock results in a heterogeneous increase in the UIPDs. We show that both supply and demand for domestic credit in local currency contribute to these dynamics. In response to the shock, small firms adjust their debt composition by increasing their share of domestic-currency-denominated debt.

We analyze our findings through the lens of a two-period small open economy model with heterogeneous firms that borrow in foreign and domestic currency from a domestic bank. The bank funds its lending in each currency at a currency-specific risk-free rate. Firms can default in both currencies, and face productivity and exchange rate shocks. When there is a shock to the FFR–mapped as an increase in the risk-free foreign interest rate–firms with sufficiently large productivity find it optimal to fully repay their debt in both currencies. These are large firms, which end up facing a higher interest rate in foreign currency, and see no change in their domestic-currency interest rate. In contrast, small firms, which had incentives to fully repay their debt in both currencies before the FFR shock, now may fall into a partial default equilibrium in domestic currency. In other words, the productivity of these firms is not large enough to consider it optimal to always repay their domestic-currency debt. A crucial driver of this result is the fact that, in the model, there is a lower penalty for defaulting in domestic currency than in foreign currency, providing larger incentives to default in the former than in the latter. This leads to an increase in their domestic-currency interest rate due to the increase in their default probability in domestic currency. As a result, the UIP deviation differentially increases for small firms with respect to large firms, in line with our main empirical result. Aditionally, we provide suggestive empirical evidence in line with the model's mechanisms.

Our findings have important policy implications. The heterogeneous response of domestic credit rates suggests that the negative spillovers from U.S. monetary tightening may be larger than previously estimated. The disproportionate impact on small firms could lead to both a static efficiency loss—due to credit misallocation—and a dynamic one, as productive firms may be forced to exit. Consequently, our model does not support a domestic monetary policy that moves in tandem with the U.S. monetary policy. Tightening domestic interest rates in response to an FFR shock exacerbates the negative effects on firms' borrowing costs by increasing the marginal benefit of defaulting on domestic-currency debt.

In the case of a crisis triggered by a tightening in U.S. monetary policy, unconventional policies such as domestic-credit guarantees implemented by governments during the COVID-19 crisis could help to differentially relax credit constraints of small firms. This could ameliorate systemic risk pressures (Huneeus et al., 2023), while relieving the costs of domestic-currency denominated credit (Acosta-Henao et al., 2024). In the model, such policies would reduce the marginal benefit of defaulting in domestic currency after the FFR shock.

Although this paper documents novel facts about the spillover effects of U.S. monetary policy shocks in emerging small open economies, and provides a theoretical framework to explain them, it remains a positive analysis. Normative implications are beyond the scope of this work, and should result from further research that considers a general equilibrium framework. This study lays the groundwork for such future research, including deeper analyses of how different sources of firm-level heterogeneity shape the transmission of foreign shocks.

References

Acosta-Henao, Miguel, Andrés Fernández, Patricia Gomez-Gonzalez and Şebnem Kalemli-Özcan. (2024). "Firm Financing During Sudden Stops: Can Governments Substitute Markets?" *NBER Working Papers*, 33283.
https://doi.org/10.5089/9798229005128.001

Acosta-Henao, Miguel, Sangeeta Pratap and Manuel Taboada. (2023). "Four Facts about Relationship Lending: The Case of Chile 2012-2019". *Journal of Corporate Finance*, 80, p. 102415.
https://doi.org/10.1016/j.jcorpfin.2023.102415

Akinci, Ozge, and Albert Queralto. (2019). "Exchange Rate Dynamics and Monetary Spillovers with Imperfect Financial Markets". *Federal Reserve Bank of New York Staff Reports*, 849.
https://doi.org/10.1093/rfs/hhad078

Alfaro, Laura, Mauricio Calani and Liliana Varela. (2023). "Granular Corporate Hedging under Dominant Currency". *NBER Working Paper*, 28910.
https://doi.org/10.3386/w28910

Amiti, Mary, and David E Weinstein. (2018). "How Much Do Idiosyncratic Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data". *Journal of Political Economy*, 126(2), pp. 525–587.
https://doi.org/10.1086/696272

Arellano, Cristina. (2008). "Default Risk and Income Fluctuations in Emerging Economies". *American Economic Review*, 98(3), pp. 690–712.
https://doi.org/10.1257/aer.98.3.690

Arellano, Cristina, Yan Bai and Patrick J Kehoe. (2019). "Financial Frictions and Fluctuations in Volatility". *Journal of Political Economy*, 127(5), pp. 2049–2103.
https://doi.org/10.1086/701792

Basu, Suman, Emine Boz, Gita Gopinath, Francisco Roth and Filiz Unsal. (2023). "Integrated Monetary and Financial Policies for Small Open Economies". *IMF Working Paper*, 2023/161.
https://www.imf.org/en/Publications/WP/Issues/2023/08/04/Integrated-Monetary-and-Financial-Policies-for-Small-Open-Economies-537587

Brauning, Falk, and Victoria Ivashina. (2020). "U.S. Monetary Policy and Emerging Market Credit Cycles". *Journal of Monetary Economics*, 112, pp. 57–76.
https://doi.org/10.1016/j.jmoneco.2019.02.005

Brown, Martin, Karolin Kirschenmann and Steven Ongena. (2014). "Bank Funding, Securitization, and Loan Terms: Evidence from Foreign Currency Lending". *Journal of Money, Credit and Banking*, 46(7), pp. 1501–1534.
https://doi.org/10.1111/jmcb.12147

Bu, Chunya, John Rogers and Wenbin Wu. (2021). "A Unified Measure of Fed Monetary Policy Shocks". *Journal of Monetary Economics*, 118, pp. 331–349.
https://doi.org/10.1016/j.jmoneco.2020.11.002

Buch, Claudia, Matthieu Bussiere, Linda Goldberg and Robert Hills. (2019). "The International Transmission of Monetary Policy". *Journal of International Money and Finance*, 91, pp. 29–48.
https://doi.org/10.1016/j.jimonfin.2018.08.005

Buera, Francisco J., Joseph P. Kaboski and Yongseok Shin. (2015). “Entrepreneurship and Financial Frictions: A Macrodevelopment Perspective”. *Annual Review of Economics*, 7(1), pp. 409-436.
https://doi.org/10.1146/annurev-economics-080614-115348

Cetorelli, Nicola, and Linda Goldberg. (2012a). “Banking Globalization and Monetary Transmission”. *Journal of Finance*, 67(6), pp. 1811–1843.
https://doi.org/10.1111/j.1540-6261.2012.01773.x

Cetorelli, Nicolas, and Linda Goldberg. (2012b). “Liquidity Management of U.S. Global Banks: Internal Capital Markets in the Great Recession”. *Journal of International Economics*, 88, pp. 299–311.
https://doi.org/10.1016/j.jinteco.2012.05.001

Christiano, Lawrence, Husnu Dalgic and Nurbekyan Armen. (2022). “Financial Dollarization: Efficient Intranational Risk Sharing or Prescription for Disaster?” *NBER Working Papers*, 29034.
https://doi.org/10.3386/w29034

De Leo, Pierre, Gita Gopinath and Şebnem Kalemli-Özcan. (2023). “Monetary Policy Cyclicality in Emerging Economies”. *NBER Working Paper*, 30458.
https://doi.org/10.3386/w30458

De Leo, Pierre, Lorena Keller and Dongchen Zou. (2024). “Speculation, Forward Exchange Demand, and CIP Deviations in Emerging Economies”. The Wharton School Research Paper.
https://doi.org/10.2139/ssrn.4949594

Degryse, Hans, and Patrick Van Cayseele. (2000). “Relationship Lending within a Bank-Based System: Evidence from European Small Business Data”. *Journal of Financial Intermediation*, 9(1), pp. 90–109.
https://doi.org/10.1006/jfin.1999.0278

Di Giovanni, Julian, Şebnem Kalemli-Özcan, Mehmet F. Ulu and Yusuf S. Baskaya. (2022). “International Spillovers and Local Credit Cycles”. *Review of Economic Studies*, 89(2), pp. 733–773.
https://doi.org/10.1093/restud/rdab044

Drenik, Andrés, and Diego Perez. (2021). “Domestic Price Dollarization in Emerging Economies”. *Journal of Monetary Economics*, 122, pp. 38–55.
https://doi.org/10.1016/j.jmoneco.2021.07.002

Duqi, Andi, Angelo Tomaselli and Guiseppe Torluccio. (2018). “Is Relationship Lending still a Mixed Blessing? A Review of Advantages and Disadvantages for Lenders and Borrowers”. *Journal of Economic Surveys*, 32, pp. 1446–1482.
https://doi.org/10.1111/joes.12251

Eaton, Jonathan, Samuel Kortum and Francis Kramarz. (2011). “An Anatomy of International Trade: Evidence from French Firms”. *Econometrica*, 79(5), pp. 1453–1498.
https://doi.org/10.3982/ECTA8318

Huneeus, Federico, Joseph P. Kaboski, Mauricio Larrain, Sergio L. Schmukler and Mario Vera. (2023). “The Distribution of Crisis Credit: Effects on Firm Indebtedness and Aggregate Risk”. *NBER Working Paper*, 29774.
https://doi.org/10.3386/w29774

Ivashina, Victoria, Juliana Salomao and Bryan Gutierrez. (2023). "Why is Dollar Debt Cheaper? Evidence from Peru". *Journal of Financial Economics*, 148, pp. 245–272.
https://doi.org/10.1016/j.jfineco.2023.04.003

Kalemli-Özcan, Şebnem. (2019). "U.S. Monetary Policy and International Risk Spillovers". *NBER Working Papers*, 26297.
https://doi.org/10.3386/w26297

Keller, Lorena. (2019). "Capital Controls and Risk Misallocation: Evidence From a Natural Experiment". Jacobs Levy Equity Management Center for Quantitative Financial Research Paper.
https://ssrn.com/abstract=3099680

Keller, Lorena. (2024). "Arbitraging Covered Interest Rate Parity Deviations and Bank Lending". *American Economic Review*, 114(9), pp. 2633–2676.
https://doi.org/10.1257/aer.20230425

Khwaja, Asim Ijaz, and Atif Mian. (2008). "Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market". *American Economic Review*, 98(4), pp. 1413–1442.
https://doi.org/10.1257/aer.98.4.1413

Melitz, Marc J. (2003). "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity". *Econometrica, Vol. 71, No. 6.*
https://doi.org/10.1111/1468-0262.00467

Miranda-Agrippino, Silvia, and Hélène Rey. (2020). "U.S. Monetary Policy and the Global Financial Cycle". *Review of Economic Studies*, 87(6), pp. 2754–2776.
https://doi.org/10.1093/restud/rdaa019

Moll, Benjamin. (2014). "Productivity Losses from Financial Frictions: Can Self-Financing Undo Capital Misallocation?" *American Economic Review*, 104(10), pp. 3186–3221.
https://doi.org/10.1257/aer.104.10.3186

Morais, Bernardo, Jose-Luis Peydro, Jessica Roldan-Pena and Claudia Ruiz-Ortega. (2019). "The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach-For-Yield, and Real Effects". *Journal of Finance*, 74(1), pp. 55–90.
https://doi.org/10.1111/jofi.12735

Petersen, Mitchell A., and Raghuram G. Rajan. (1994). "The Benefits of Lending Relationships: Evidence from Small Business Data". *Journal of Finance*, 49(1), pp. 3–37.
https://doi.org/10.1111/j.1540-6261.1994.tb04418.x

Rey, Hélène. (2013). "Dilemma not Trilemma: The Global Cycle and Monetary Policy Independence". *Proceedings - Economic Policy Symposium - Jackson Hole*, pp. 1-2.
https://doi.org/10.3386/w21162

Salomao, Juliana, and Liliana Varela. (2022). "Exchange Rate Exposure and Firm Dynamics". *Review of Economic Studies*, 89(1), pp. 481–514.
https://doi.org/10.1093/restud/rdab032

Santos, Joao AC, and Andrew Winton. (2008). "Bank Loans, Bonds, and Information Monopolies across the Business Cycle". *Journal of Finance*, 63(3), pp. 1315–1359.
https://doi.org/10.1111/j.1540-6261.2008.01359.x

Temesvary, Judit, Steven Ongena and Ann L. Owen. (2018). "A Global Lending Channel Unplugged? Does U.S. Monetary Policy Affect Cross-Border and Affiliate Lending by Global U.S. Banks?" *Journal of International Economics*, 112, pp. 50–69.
https://doi.org/10.1016/j.jinteco.2018.02.004

Tobal, Martin. (2018). "Currency Mismatch in the Banking Sector in Latin America and the Caribbean". *International Journal of Central Banking*, 14(1), pp. 317-364.
https://doi.org/10.36095/banxico/di.2017.05

Wu, Jing Cynthia, and Fan Dora Xia. (2016). "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound". *Journal of Money, Credit and Banking*, 48(2-3), pp. 253–291.
https://doi.org/10.1111/jmcb.12300

Appendix

A. Additional Tables

Table A.1: First Stage With Alternative U.S. Monetary Policy Shock

	Interest Rate on foreign debt	
	(1)	(2)
BRW $Shock_{m-1}$	1.812*	1.819*
	(1.006)	(0.991)
$FX_{b,l,m}$	-2.489***	-2.505***
	(0.121)	(0.114)
$Trend_m$	0.0340***	0.0338***
	(0.00355)	(0.00349)
Bank F.E.	Yes	No
Bank×Creditor F.E.	No	Yes
Bank Characteristics	Yes	Yes
Macro controls	Yes	Yes
Observations	5,043	5,041
R-squared	0.650	0.654

Notes: This table presents results for OLS regression in (1). The dependent variable is calculated as $i_{b,l,m} = \left(\left(\frac{spread_{b,l,m}}{100}+1\right)\times\left(\frac{libor_m}{100}+1\right)-1\right)\times 100$. BRW $Shock_{m-1}$ is an estimated series of U.S. monetary policy shocks by Bu et al. (2021) aggregated at the monthly level. FX takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Creditor* is an identifier of the type-of-foreign-lender. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are clustered at the bank-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.2: Second Stage With Alternative U.S. Monetary Policy Shock - Effect on Interest Rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	0.882***	-7.492***			0.817***
	(0.284)	(2.844)			(0.271)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	0.968***	1.593***	1.584***	1.770***	0.725**
	(0.169)	(0.423)	(0.387)	(0.364)	(0.289)
$Rate_{b,m} \times MS_f$	-0.447***	-0.732	-0.278		-0.566***
	(0.168)	(0.441)	(0.379)		(0.212)
$Rate_{b,m} \times DX_{f,l,b,m}$	-1.092***	-1.696***	-1.738***	-2.032***	-1.075***
	(0.311)	(0.324)	(0.333)	(0.380)	(0.318)
$MS_f \times DX_{f,l,b,m}$	1.070**	-0.502	-0.520	-0.862	1.063
	(0.494)	(0.910)	(0.918)	(1.051)	(0.692)
$DX_{f,l,b,m}$	4.596***	5.684***	5.763***	6.305***	4.348***
	(0.664)	(0.675)	(0.702)	(0.808)	(0.727)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.869	0.926	0.926	0.932	0.868
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1) using BRW shock as in Bu et al. 2021. MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.3: First Stage - Shadow Rate Residual

	Interest Rate on foreign debt	
	(1)	(2)
$Shadow\ rate\ Resid_{m-1}$	0.0914*	0.0899*
	(0.0529)	(0.0524)
$FX_{b,l,m}$	-2.496***	-2.512***
	(0.120)	(0.118)
$Trend_m$	0.0270***	0.0268***
	(0.00515)	(0.00512)
Bank F.E.	Yes	No
Bank×Creditor F.E.	No	Yes
Bank Characteristics	Yes	Yes
Macro controls	Yes	Yes
Observations	5,258	5,256
R-squared	0.645	0.649

Notes: This table presents results for OLS regression in (1). The dependent variable is calculated as $i_{b,l,m} = \left(\left(\frac{spread_{b,l,m}}{100}+1\right) \times \left(\frac{libor_m}{100}+1\right) - 1\right) \times 100$. $Shadow\ rate\ Resid_{m-1}$ represents the lagged U.S. monetary policy shock, estimated as a Taylor residual using shadow rates estimated by Wu and Xia (2016). FX takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Creditor* is an identifier of the type-of-foreign-lender. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are clustered at the bank-month level and reported in parentheses.$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.4: Second Stage With Shadow Rate Residuals - Effect on Interest rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	2.653***	2.035***			2.442***
	(0.430)	(0.333)			(0.487)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	1.189***	2.034***	2.015***	2.151***	1.432***
	(0.178)	(0.411)	(0.373)	(0.341)	(0.228)
$Rate_{b,m} \times MS_f$	-0.870***	-1.160**	-0.584		-1.048***
	(0.117)	(0.494)	(0.384)		(0.174)
$Rate_{b,m} \times DX_{f,l,b,m}$	-1.953***	-2.371***	-2.410***	-2.701***	-1.966***
	(0.171)	(0.248)	(0.270)	(0.302)	(0.184)
$MS_f \times DX_{f,l,b,m}$	0.544	-1.304	-1.317	-1.589	-0.0796
	(0.481)	(0.850)	(0.870)	(0.977)	(0.605)
$DX_{f,l,b,m}$	6.023***	6.835***	6.920***	7.474***	5.852***
	(0.440)	(0.571)	(0.618)	(0.698)	(0.501)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.869	0.926	0.926	0.932	0.871
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1) using Shadow rates Taylor residuals. MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.5: Second Stage With Tradable Sector Firms - Effect on Interest Rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	1.386***	0.823***			1.393***
	(0.203)	(0.177)			(0.214)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	0.625	1.473***	1.463***	1.626***	0.468
	(0.420)	(0.265)	(0.262)	(0.307)	(0.756)
$Rate_{b,m} \times MS_f$	-0.476***	-0.582*	-0.162		-0.591***
	(0.0833)	(0.322)	(0.291)		(0.136)
$Rate_{b,m} \times DX_{f,l,b,m}$	-1.702***	-1.901***	-1.904***	-1.952***	-1.696***
	(0.0957)	(0.106)	(0.105)	(0.133)	(0.0996)
$MS_f \times DX_{f,l,b,m}$	1.404**	0.192	0.194	0.0785	1.506
	(0.589)	(0.384)	(0.379)	(0.442)	(1.001)
$DX_{f,l,b,m}$	5.858***	5.846***	5.861***	5.972***	5.784***
	(0.308)	(0.266)	(0.264)	(0.345)	(0.377)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	1,239,707	1,164,746	1,164,746	1,104,267	1,104,267
R-squared	0.856	0.932	0.932	0.942	0.865
Cluster obs.	8000	5208	5208	5156	5156

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). The sample of firms include Tradable sector firms defined as those with $\frac{Exports_t + Imports_t}{Sales_t} \geq 0.3$. MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.6: Second Stage With Non-Tradable Sector Firms - Effect on Interest rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	2.874***	2.663***			2.643***
	(0.294)	(0.470)			(0.393)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	1.416***	2.132***	2.116***	2.213***	1.744***
	(0.223)	(0.514)	(0.415)	(0.291)	(0.305)
$Rate_{b,m} \times MS_f$	-1.032***	-1.484**	-1.106**		-1.320***
	(0.172)	(0.632)	(0.428)		(0.258)
$Rate_{b,m} \times DX_{f,l,b,m}$	-2.032***	-2.407***	-2.497***	-2.785***	-2.063***
	(0.187)	(0.172)	(0.207)	(0.197)	(0.192)
$MS_f \times DX_{f,l,b,m}$	0.180	-1.866**	-1.935**	-2.088**	-0.658
	(0.634)	(0.897)	(0.927)	(0.896)	(0.750)
$DX_{f,l,b,m}$	5.899***	7.061***	7.258***	7.797***	5.560***
	(0.614)	(0.451)	(0.557)	(0.529)	(0.657)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	4,592,823	3,965,490	3,965,489	3,876,876	3,876,876
R-squared	0.865	0.922	0.922	0.927	0.866
Cluster obs.	140842	37578	37578	37169	37169

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). The sample of firms include Non-tradable sector firms defined as those with $\frac{Exports_t + Imports_t}{Sales_t} < 0.3$. MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.7: Impact of Taylor Residuals on Loan Level Interest Rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{m-1}$	1.761***				1.703***
	(0.175)				(0.214)
$Rate_{m-1} \times MS_f \times DX_{f,l,b,m}$	0.911***	1.549***	1.572***	1.847***	1.103***
	(0.153)	(0.351)	(0.363)	(0.419)	(0.201)
$Rate_{m-1} \times MS_f$	-0.587***				-0.660***
	(0.0954)				(0.131)
$Rate_{m-1} \times DX_{f,l,b,m}$	-1.757***	-2.216***	-2.251***	-2.526***	-1.760***
	(0.164)	(0.310)	(0.328)	(0.384)	(0.178)
$MS_f \times DX_{f,l,b,m}$	3.532***	3.728***	3.732***	4.109***	3.519***
	(0.250)	(0.426)	(0.404)	(0.395)	(0.360)
$DX_{f,l,b,m}$	0.658*	0.264	0.242	-0.0128	0.446
	(0.394)	(0.327)	(0.335)	(0.410)	(0.464)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.871	0.927	0.927	0.932	0.871
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is the lagged Taylor Residual using FFR. MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.8: Second Stage With Interacted Macroeconomic Controls: Effect on Interest rates

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	2.104***	1.492***			1.948***
	(0.233)	(0.322)			(0.303)
$Rate_{b,m} \times MS_f \times DX_{f,l,b,m}$	1.270***	2.107***	2.028***	2.075***	1.119***
	(0.184)	(0.317)	(0.258)	(0.297)	(0.211)
$Rate_{b,m} \times MS_f$	-0.558***	-1.100***	-0.592*		-0.650***
	(0.0862)	(0.409)	(0.300)		(0.122)
$Rate_{b,m} \times DX_{f,l,b,m}$	-1.450***	-1.668***	-1.690***	-1.767***	-1.485***
	(0.132)	(0.114)	(0.123)	(0.124)	(0.146)
$MS_f \times DX_{f,l,b,m}$	-0.308	-0.408	0.0470	1.113	1.559**
	(0.631)	(1.276)	(1.127)	(1.358)	(0.620)
$DX_{f,l,b,m}$	1.375**	0.755	0.781	0.318	1.197**
	(0.539)	(0.879)	(0.817)	(0.930)	(0.596)
Macro controls $\times MS_f$	Yes	Yes	Yes	Yes	Yes
Macro controls $\times DX_{f,l,b,m}$	Yes	Yes	Yes	Yes	Yes
Macro controls $\times MS_f \times DX_{f,l,b,m}$	Yes	Yes	Yes	Yes	Yes
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.874	0.928	0.928	0.933	0.875
Cluster obs.	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and year-on-year expected exchange rate depreciation obtained from survey data. Standard errors are double-clustered at the firm-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.9: First Stage – Exchange Rate Expectations by term

	Interest Rate on foreign debt	
	(1)	(2)
FFR $Taylor\ Residual_{m-1}$	0.466***	0.465***
	(0.117)	(0.118)
$FX_{b,l,m}$	-2.581***	-2.597***
	(0.132)	(0.132)
$Trend_m$	0.0186***	0.0183***
	(0.00556)	(0.00559)
Bank F.E.	Yes	No
Bank×Creditor F.E.	No	Yes
Bank Characteristics	Yes	Yes
Macro controls	Yes	Yes
Observations	5,258	5,256
R-squared	0.641	0.645

Notes: This table presents results for OLS regression in (1). The dependent variable is calculated as $i_{b,l,m} = \left(\left(\frac{spread_{b,l,m}}{100}+1\right) \times \left(\frac{libor_m}{100}+1\right) - 1\right) \times 100$. FFR $Taylor\ Residual_{m-1}$ represents the lagged U.S. monetary policy shock, estimated as a Taylor residual that accounts for variations in the Federal Funds Rate (FFR) not explained by the U.S. real GDP growth and the U.S. inflation rate. FX takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Creditor* is an identifier of the type-of-foreign-lender. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and maturity-adjusted expected depreciation rate using survey data according to the term of the loan. Standard errors are clustered at the bank-month level and reported in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.10: Second Stage – Exchange Rate Expectations by term – Interest Rate

	Nominal loan-level Interest Rate				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	2.242***	-2.202			2.162***
	(0.226)	(1.627)			(0.283)
$Rate_{b,m} \times MS_f \times DX_{f,t,b,m}$	1.223***	1.977***	1.979***	2.144***	1.392***
	(0.169)	(0.375)	(0.361)	(0.365)	(0.230)
$Rate_{b,m} \times MS_f$	-0.779***	-0.985**	-0.528		-0.958***
	(0.113)	(0.399)	(0.351)		(0.164)
$Rate_{b,m} \times DX_{f,t,b,m}$	-1.948***	-2.376***	-2.418***	-2.706***	-1.953***
	(0.158)	(0.245)	(0.269)	(0.318)	(0.173)
$MS_f \times DX_{f,t,b,m}$	0.511	-1.244	-1.284	-1.603	-0.0139
	(0.474)	(0.842)	(0.884)	(1.035)	(0.610)
$DX_{f,t,b,m}$	5.987***	6.846***	6.934***	7.494***	5.793***
	(0.444)	(0.570)	(0.619)	(0.729)	(0.512)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.871	0.927	0.927	0.932	0.871
Cluster obs	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2). *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. Standard errors are clustered at the bank level, and reported in parentheses. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and nominal exchange rate depreciation rate. Standard errors are double-clustered at the firm-month level, and reported in parentheses. We also control for exchange rate expectation according to the term of the loan. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Table A.11: Second Stage – Exchange Rate Expectations by term – Loan Amounts

	Log(loan amounts)				
	(1)	(2)	(3)	(4)	(5)
$Rate_{b,m}$	-0.130**	1.523			-0.149**
	(0.0582)	(1.228)			(0.0661)
$Rate_{b,m} \times MS_f \times DX_{f,t,b,m}$	-0.0132	-0.0796	-0.0932	-0.154	-0.0160
	(0.0662)	(0.313)	(0.265)	(0.312)	(0.0879)
$Rate_{b,m} \times MS_f$	-0.00687	-0.159	-0.0921		-0.0672
	(0.0592)	(0.311)	(0.273)		(0.0713)
$Rate_{b,m} \times DX_{f,t,b,m}$	0.123**	0.457*	0.397*	0.469*	0.128**
	(0.0558)	(0.259)	(0.213)	(0.251)	(0.0572)
$MS_f \times DX_{f,t,b,m}$	0.695	0.987	0.919	1.179	0.806
	(0.444)	(0.904)	(0.780)	(0.919)	(0.530)
$DX_{f,t,b,m}$	-0.830***	-1.352**	-1.237**	-1.583***	-0.956***
	(0.259)	(0.613)	(0.516)	(0.594)	(0.280)
Firm×bank F.E.	Yes	Yes	Yes	No	Yes
Firm×month F.E.	No	Yes	Yes	No	No
Bank×month F.E.	No	No	Yes	No	No
Firm×bank×month F.E.	No	No	No	Yes	No
Firm Characteristics	Yes	No	No	No	Yes
Bank Characteristics	Yes	Yes	No	No	Yes
Macro controls	Yes	No	No	No	Yes
Observations	5,832,530	5,130,236	5,130,236	4,981,143	4,981,143
R-squared	0.806	0.827	0.828	0.823	0.780
Cluster obs	148842	42786	42786	42325	42325

Notes: This table presents results for OLS regression in (2) with the $log(loan\ amount)_{f,b,l,m}$ as dependent variable. *Rate* is predicted bank-level interest rate on foreign funding in month m obtained from first stage estimates in (1). MS_f takes the value of one if the firm is classified as small and one if it is classified as large. $DX_{f,l,b,m}$ takes the value of 1 if the loan is denominated in foreign currency and 0 otherwise. *Firm characteristics* include lagged value added, market share within its sector, and leverage. *Bank characteristics* include lagged bank's value added, market share and leverage. *Macro controls* include lagged domestic monetary policy rate, GDP growth, inflation rate and nominal exchange rate depreciation rate. Standard errors are double-clustered at the firm-month level, and reported in parentheses. We also control for exchange rate expectation according to the term of the loan. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

Documentos de Trabajo **Banco Central de Chile**	**Working Papers** **Central Bank of Chile**
NÚMEROS ANTERIORES	PAST ISSUES
La serie de Documentos de Trabajo en versión PDF puede obtenerse gratis en la dirección electrónica: www.bcentral.cl/esp/estpub/estudios/dtbc. Existe la posibilidad de solicitar una copia impresa con un costo de Ch$500 si es dentro de Chile y US$12 si es fuera de Chile. Las solicitudes se pueden hacer por fax: +56 2 26702231 o a través del correo electrónico: bcch@bcentral.cl.	Working Papers in PDF format can be downloaded free of charge from: www.bcentral.cl/eng/stdpub/studies/workingpaper. Printed versions can be ordered individually for US$12 per copy (for order inside Chile the charge is Ch$500.) Orders can be placed by fax: +56 2 26702231 or by email: bcch@bcentral.cl.

DTBC – 1043
Heterogeneous UIPDs Across Firms: Spillovers from U.S. Monetary Policy Shocks
Miguel Acosta-Henao, Maria Alejandra Amado, Montserrat Marti, David Perez-Reyna

DTBC – 1042
Bank Competition and Investment Costs across Space
Olivia Bordeu, Gustavo González, Marcos Sorá

DTBC – 982*
Freight Costs and Substitution Among Import Regions: Implications for Domestic Prices Gustavo González, Emiliano Luttini, Marco Rojas

DTBC – 1041
Tail-Risk Indicators with Time-Variant Volatility Models: the case of the Chilean Peso
Rodrigo Alfaro, Catalina Estefó

DTBC – 1040
Exposición de la Banca en Chile a los Riesgos Financieros relacionados al Clima: Riesgos Físicos y de Transición
Luis Gonzales, Cristian Rojas

DTBC – 971*
Production Network Formation, Trade, and Welfare
Costas Arkolakis, Federico Huneeus, Yuhei Miyauchi

DTBC – 1011*
Macro Implications of Inequality-driven Political Polarization
Alvaro Aguirre

DTBC – 967*
Firm Financing During Sudden Stops: Can Governments Substitute Markets?
Miguel Acosta-Henao, Andrés Fernández, Patricia Gomez-Gonzalez, Sebnem Kalemli-Ozcan

DTBC – 1039
The Effects of Educated Leaders on Policy and Politics: Quasi-Experimental Evidence from Brazil
Paulo Bastos, Cristián Sánchez

DTBC – 1038
Equilibrium Consequences of Vouchers Under Simultaneous Extensive and Intensive Margins Competition
Cristián Sánchez

DTBC – 1037
Dinámicas del Mercado Laboral Formal en Chile: Evidencia desde los Microdatos
Roberto Gillmore, Gustavo González, Nicolás Rivera

DTBC – 1036
Micro-Evidence on the Consumption Impact of Income-Support Policies During COVID-19
Metodij Hadzi-Vaskov, Emiliano Luttini, Luca Antonio Ricci

DOCUMENTOS DE TRABAJO Mayo 2025