Foreign Banks, Exporters, and Global Financial Exposure

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Abstract

What are the benefits and costs of hosting foreign banks for an emerging market economy? Matching Mexico's credit registry to customs records and bank balance sheets, we show that foreign-owned banks lend disproportionately to exporters, raise more of their funding through cross-border and wholesale markets, and cut credit by more than domestic banks when US monetary policy tightens. To analyze the aggregate implications, we build a quantitative small open economy model with two banking sectors, in which foreign banks have a comparative advantage in raising wholesale funding and enhancing the productivity of the exporters they lend to. In the calibrated model, the presence of foreign banks raises steady-state consumption by about 1.2% relative to an economy without them. The gain comes from the enhanced productivity of exporters; cheaper funding alone does not offset the associated interest and dividend payments abroad. The cost is greater exposure to foreign interest rate shocks: the cumulative consumption decline over the two years following a US tightening is less than one tenth larger than in an economy without foreign banks. Regulation that caps banks' net short dollar positions helps contain this exposure by limiting net worth losses when the peso depreciates. Taken together, our results suggest that the trade-off favors hosting foreign banks, particularly when bank regulation is in place.

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International banks sit at the center of modern global finance. Yet from one country to the next, the share of the banking sector accounted for by foreign banks varies sharply. While in China and India foreign banks hold less than 5% of all bank assets, in Mexico, Poland, and Peru they account for more than half (Claessens and Van Horen, 2015). That heterogeneity reflects an ongoing debate about the benefits and costs of hosting international banks. On the one hand, international banks can enhance efficiency, particularly in emerging markets, by delivering cheaper financing, improving capital allocation, and providing specialized services to firms engaged in international trade (Caballero et al., 2018; Claessens and Van Horen, 2021; Niepmann, 2023). On the other hand, the profits foreign banks earn go to shareholders abroad rather than to residents, as they would under domestic ownership. Moreover, foreign banks can amplify the host economy's exposure to foreign financial shocks, especially during times of global financial stress, since they can contract their lending sharply in response to external factors and so become a source of financial vulnerability and propagation (Cetorelli and Goldberg, 2011, 2012a; Schnabl, 2012; Morais et al., 2019; Hale et al., 2020; Aldasoro et al., 2022).

Policymakers have drawn opposite conclusions from this debate. Hungary and Poland pushed for more domestically owned banking systems in the 2010s, and Citigroup's 2022 decision to exit retail banking in Mexico reopened the question there, while the Philippines and Ethiopia lifted restrictions on foreign bank entry in 2014 and 2024, respectively. The benefits and the costs each have some empirical support, but there is no agreement on the exact size or origin of the gains, or under what circumstances the vulnerabilities materialize. It is therefore not clear ex ante how economies should weigh these benefits and costs against each other, and as a result little is known about the net effect of foreign bank presence on host economies or about the scope for policy to make that effect more favorable. The questions remain: what exactly does a country gain from hosting foreign banks? What does it give up? And can bank regulation shift that trade-off? Answering them rigorously requires both detailed data and a model that can quantify the gains and costs jointly.

We address these questions by bringing detailed micro data from Mexico to a quantitative small open economy model with domestic and foreign banks. Our contribution is to use microeconomic evidence on how foreign banks differ from domestic ones (whom they lend to, how they fund themselves, and how they respond to foreign shocks) to discipline general equilibrium counterfactuals that quantify both the gains and the costs of hosting foreign banks, and how bank regulation affects them. We find that the gains in steady-state consumption come primarily from the specialized trade services foreign banks provide to exporters; cheaper foreign funding contributes little. The additional exposure to foreign shocks that foreign banks bring is modest in our calibration: domestic banks retain access to foreign

funding in the counterfactual without foreign banks. A regulatory cap on banks' currency mismatch helps keep that exposure small, but at a cost in steady-state consumption.

Mexico is an ideal setting for this exercise for several reasons. Foreign and domestic banks coexist in a diverse banking sector, which lets us document how their businesses differ, while a large export sector (over 40% of GDP in 2022) makes both the potential gains from facilitating trade and the exposure to foreign shocks salient. Moreover, Mexico's administrative data can be linked across sources, which allows us to study all these margins jointly. We combine a monthly credit registry covering the universe of bank loans to firms, monthly customs records with firm-level values of exports, and bank-level balance sheet data with details about cross-border liabilities, linking lending records to firms' export activity and banks' funding structures. We use these data to establish what exactly foreign banks do, and document three facts.

First, foreign banks disproportionately lend to exporters: in the aggregate, exporters obtain 20 percentage points more of their credit from foreign banks than non-exporters do. This pattern is persistent, holds in firm- and bank-level regressions, and cannot be explained by foreign-currency borrowing or cheaper credit alone. It is instead consistent with foreign banks providing specialized trade services to exporters.

Second, foreign banks fund themselves differently from domestic banks. In the aggregate, they have 2.4 times the cross-border liabilities per unit of capital, with a similar pattern in other nontraditional liabilities (e.g., interbank and other-organization loans). They also report lower funding costs.

Third, foreign banks cut credit more than domestic banks when US monetary policy tightens, consistent with previous work (Morais et al., 2019; Cantú et al., 2022; Bruno and Shin, 2023). Comparing banks' lending to the same type of firm after identified US monetary surprises (Bauer and Swanson, 2023), we find that foreign banks' credit to comparable firms contracts by more, especially on the extensive margin. The estimates draw on a decade of US monetary surprises rather than a single episode.

These empirical results describe differences between bank types and estimate their relative responses to foreign shocks, but cannot speak to what the economy as a whole gains or loses from hosting foreign banks. To translate these facts into aggregate gains and costs, we build a quantitative small open economy macro-finance model with two banking sectors. In the model, exporters and firms producing non-tradable goods finance working capital with bank loans and sort between domestic and foreign-owned banks. Banks fund themselves with different combinations of home deposits and cross-border wholesale funding, subject to both an agency constraint that ties lending to bank net worth, and a cap on their currency mismatch modeled after real-world regulation. Motivated by our descriptive facts, the banks

in the model differ in their ownership, their funding structure and costs, and the services they provide to exporters. A foreign interest rate tightening both raises world rates and lowers foreign demand for home exports, combining financial and demand shocks. We show conditions under which, following a foreign interest rate tightening, foreign banks cut their credit supply more because a larger share of their funding is priced off world rates. Because they lend disproportionately to exporters, that sharper contraction falls disproportionately on the export sector, which is hit at the same time by lower foreign demand.

We calibrate the model using moments from the microdata. The key parameter, the productivity gain exporters obtain from foreign banks' trade services, is disciplined by within-firm variation: for the same firm, borrowing from a specialized foreign bank in the previous year is associated with about 19 percent higher exports. This association is much smaller than the cross-sectional gap, consistent with substantial sorting. Under the model's demand structure and assuming little change in effective financing costs, we use this association to calibrate a productivity advantage of roughly 5 percent. We assess the calibrated model against untargeted moments of the Mexican banking system and estimated aggregate responses to US monetary shocks. We then compare economies with and without foreign banks, both under the existing regulatory cap on currency mismatch and without it. Domestic banks retain access to cross-border wholesale funding in these comparisons. Three main results follow.

First, the gains from hosting foreign banks come primarily from the trade services they provide to exporters. At our preferred calibration, hosting foreign banks raises steady-state consumption by about 1.2 percent relative to an economy without them, after accounting for interest and dividend payments abroad. The gain from cheaper funding alone is smaller than the associated payments abroad, so without trade services hosting foreign banks would lower steady-state consumption.

Second, the additional exposure to foreign interest rate shocks is modest. With the regulatory cap in place, hosting foreign banks amplifies the consumption decline after a US monetary tightening by 4 percent on impact and the cumulative response over two years by 9 percent, relative to an economy without foreign banks. Much of the exposure remains because domestic banks also fund themselves abroad and the economy continues to face the contraction in foreign demand.

Third, bank regulation helps keep this additional exposure small. A cap on banks' net short dollar positions relative to capital limits their net worth losses when the peso depreciates. Without this cap, hosting foreign banks would amplify the impact consumption decline following a US monetary tightening by 13 percent, compared with 4 percent under the cap. This protection comes at a cost: removing the cap would raise steady-state consumption

by 0.4 percent. Taken together, our results suggest that the trade-off favors hosting foreign banks, particularly when regulation already limits banks' exposure to currency risk.

Related literature. The effects of hosting foreign banks in emerging economies were studied after many countries liberalized their financial systems in the 1990s and 2000s (Litan et al., 2001; Moreno and Villar, 2005; Fachada, 2008). These early studies often focused on gains from increased competition and found some evidence that foreign bank entry improved banking-sector efficiency.[1] Our approach considers a different set of gains and costs, particularly productivity gains from foreign banks' trade services and exposure to foreign shocks, using microdata and a quantitative macro-finance model.

A second literature studies the role of global banks in international shock transmission (Cetorelli and Goldberg, 2011, 2012a,b). Related work examines banks' funding structures and their responses to foreign financial and monetary shocks (Avdjiev et al., 2018; Avdjiev and Hale, 2019; Bräuning and Ivashina, 2020; Aldasoro et al., 2023, 2022). Our closest empirical reference is Morais et al. (2019), who use the Mexican credit registry to show that domestic banks react more strongly to Mexican monetary policy, while foreign banks react to conventional and unconventional monetary policy in their home countries. Related Mexican evidence links banks' funding structures to credit supply (Cantú et al., 2022) and connects banks' dollar funding to borrowers' export performance (Bruno and Shin, 2023). Our paper provides a model of this international bank lending channel and quantifies the aggregate implications of foreign-bank presence. Evidence that foreign shocks also transmit through domestically owned banks informs our distinction between foreign ownership and foreign funding (Schnabl, 2012; Di Giovanni et al., 2022).

Our emphasis on the role that foreign banks play in facilitating trade connects to evidence that international bank linkages and foreign-bank presence promote trade (Caballero et al., 2018; Claessens and Van Horen, 2021). It also follows from work on financial development, bank disruptions, and credit constraints in international trade (Leibovici, 2021; Xu, 2022; Chor and Manova, 2012; Amiti and Weinstein, 2011; Minetti and Zhu, 2011; Paravisini et al., 2015). Our choice to characterize foreign banks as providing specialized services to exporters, and to model this effect as a productivity shifter, relates most closely to Paravisini et al. (2023), who study bank specialization in export markets. We add firm- and bank-level evidence on exporter–bank relationships and quantify their aggregate implications.

Our model relates to the literature on the transmission of foreign financial shocks to emerging economies and the global financial cycle (Rey, 2015; Miranda-Agrippino and Rey,

[1] For Mexico, Haber and Musacchio (2013) study the political economy factors that led to the opening up to foreign banks.

2020, 2022). This literature studies transmission through cross-border bank lending and global intermediaries (Bruno and Shin, 2015; Morelli et al., 2022; Acalin, 2022; Kekre and Lenel, 2026), the role of dollar strength (Avdjiev et al., 2019; Obstfeld and Zhou, 2023; Georgiadis et al., 2026; Avdjiev et al., 2019), and foreign-demand and exchange-rate channels, including dollar invoicing (Akinci et al., 2024; Camara et al., 2025; Mendoza-Fernandez and Pelin, 2025; Degasperi et al., 2024). Our closest modeling references are Aoki et al. (2025) and Akinci and Queralto (2024), who develop models with financial frictions to study the effects of US monetary policy on emerging markets. In addition to our use of microdata, our model incorporates two distinguishing features: domestic and foreign banks that fund themselves differently and provide sector-specific services, and a regulatory cap on banks' foreign-currency exposure. The latter allows us to quantify how regulation limits bank net-worth losses and the transmission of foreign shocks.

Methodologically, our empirics connect to the literature studying the real effects of bank credit supply shocks. Our approach builds on Khwaja and Mian (2008), using the demand controls advocated by Degryse et al. (2019) to compare credit growth across similar firms borrowing from different banks. Related work studies the real effects of credit supply shocks in Mexico (Gutierrez et al., 2023; Rivadeneira et al., 2024). We tie these methods to a general equilibrium model of a small open economy with banking heterogeneity. In this sense, our work relates to the agenda proposed by Herreño (2023), imposing structure on cross-sectional evidence of relative credit-supply effects to recover aggregate effects.

Finally, our analysis of the regulation capping banks' currency mismatch connects to the literature on overborrowing, pecuniary externalities, and macroprudential policy (Bianchi, 2011; Bianchi and Mendoza, 2018; Dávila and Korinek, 2018). Related work studies the regulation of debt denominated in different currencies and of multinational banks (Oskolkov and Sorá, 2023; Clayton and Schaab, 2022). We take the currency-exposure limit as given and quantify how it changes the steady-state allocation and the transmission of foreign shocks, rather than characterizing optimal policy.

Roadmap. Section 1 describes the setting, data and descriptive facts. Section 2 presents the model. Section 3 examines the transmission of foreign interest rates and tests the model's predictions in the credit-registry data. Section 4 presents the calibration, including the empirical evidence used to calibrate foreign banks' trade services. Section 5 quantifies the gains and exposure associated with foreign banks and the role of bank currency risk regulation. Section 6 concludes.

1 Setting, Data and Motivating Facts

We should start by acknowledging that in general, the question of whether foreign banks are a net benefit or detriment to an economy will be heavily influenced by the specific context, institutional setting, and factors beyond the scope we consider here. Despite this, we do believe carefully studying a specific case like Mexico's can offer some insight about the forces at play that may be applicable elsewhere. Mexico turns out to be an ideal setting to study the mechanisms and trade-offs we are interested in. First, Mexico's banking system is mature, comprising a substantial number of both domestic and foreign-owned banks from several nationalities, and is representative of other emerging economies (see Appendix A). Second, as an economy with a large trade sector (according to the World Bank in the recent period of 2018 to 2025, exports averaged 39.2% of GDP) the gains from trade services that may accrue to exporters are likely to be meaningful for the aggregate economy. On the other hand, that same trade openness means Mexico is subject not only to foreign financial but also substantial foreign trade demand shocks – which further means understanding how the banking sector affects exposure to foreign shocks (both financial and demand) is of real interest.

The Mexican banking and financial system. Mexico's banking sector comprises around 50 commercial banks,[2] around 20 of which are locally incorporated subsidiaries of foreign banks,[3] which we will refer to as foreign banks for short. Eight large domestic systemically important banks (DSIBs), of which five are foreign, account for over 75% of banking sector assets.[4] Across bank sizes, there is a mix of domestic and foreign banks, including American, European and Asian banks. Figure 14 in the Appendix illustrates the size distribution and country of origin of the banks in the financial system. Relative to its peer economies, the banking system in Mexico is on the smaller side – domestic credit to the private sector stands around 35% of GDP. Despite this, commercial banks are a key source of credit for the private

[2]In addition to the commercial banks, Mexico has a sizable government-owned development banking sector, which comprises around 9% of the total financial sector assets. Because this sector focuses its lending on government and public infrastructure projects, we do not include it in our main analysis. Bancomext, the government development bank tasked with promoting foreign trade, has in the last decades focused its lending on wholesale credit to commercial banks, as well as providing credit guarantees. Although we see this raises interesting questions about the provision of public credit, we leave this to future analysis and in this paper focus on the loans of *private* commercial banks.

[3]The Mexican law requires foreign banks to be incorporated locally in order to operate as a bank. The law also allows for the establishment of representative offices of foreign banks, which do not operate as full banks but can serve as points of contact and advertise for the parent bank. We focus on the former.

[4]In 2024 Citibanamex, the previous subsidiary of Citi, split into Citi Mexico and Banamex, which is in the process of becoming domestically-held. Our period of analysis ends before 2024 so we treat Citi as a foreign bank.

sector: according to the 2024 National Survey of Firm Financing (ENAFIN), 82.4% of the firms that solicited credit between 2022 and 2024 report having done so at a commercial bank, the most important source of credit, above suppliers (28.5%) and family and friends (12.7%). The corporate capital market is in turn relatively small: while the stock market capitalization of the around 130 publicly listed domestic companies in Mexico corresponded to 31% of GDP in 2025, the long-term corporate debt market corresponded to less than 5% of GDP. And although non-bank financial institutions are conceptually interesting they make up less than 5% of the credit to firms.[5] All in all, private commercial local banks are responsible for the majority of credit that firms in Mexico receive (see Appendix A).

The Mexican exporting sector. Over the last two decades Mexico's exporting sector grew very rapidly: exports of goods and services went from representing 25.5% of the economy's GDP to a peak of 42.9% in 2022. These exports are concentrated in manufacturing goods, which makes up close to 90% of exports; oil and oil products hover around 5% of exports, while agricultural goods are close to 4%. These exports are primarily directed to the United States, which represents over 85% of the value of exports of goods by destination – as of 2024 Mexico became the largest source of imports from the perspective of the United States. The second and third destinations for Mexican exports are Canada (3%) and China (2%).[6]

1.1 Data

We use data from two administrative datasets accessed through Banco de Mexico's EconLab, in addition to administrative data on banks from the Comisión Nacional Bancaria y de Valores (CNBV).

Credit data. Our main data source on credit comes from monthly supervisory reports (R04c) from 2009 to 2023 with matched bank–firm loan-level data covering the universe of commercial and corporate loans. The data include identifiers of the issuing bank and the borrowing firm along with selected credit characteristics including loan size, price and

[5] SOFOMEs are small non-bank financial institutions that engage in lending and are sometimes owned by banks. In general we don't include these in our calculations as both are a very small fraction of credit granted, but where applicable, we subsume the SOFOME as part of its parent/affiliated bank – all our results are robust to excluding them.

[6] Although precise numbers on the invoicing currency of these exports are hard to get, it is reasonable to infer that dollar-invoicing is prevalent. However, because most exports go to the US, this is less a case of the dollar being used as a vehicle currency – as in the dominant currency paradigm literature (Gopinath et al., 2020)– and instead consistent with local currency pricing. Since the model we develop has flexible prices, the invoicing currency does not affect its predictions.

repayment status. There are around 1 million credits to roughly 350,000 firms in each period; we focus on active, non-defaulted loans from commercial banks to both private firms and entrepreneurs.[7]

Customs data. We use monthly customs data from 2006 to 2023 which records the dollar and peso value of import and export transactions at the firm-product-destination level. We focus on the data for export transactions, although we use data on imports for robustness checks. There are around 35,000 firms that export every year. Because firms often export under different IDs, in our main empirical description we call a firm an *exporter* if we ever observe it exporting in the customs data, although our findings are robust to refining our definition of exporters to only firms which export in a given year. We match this customs data to our credit data at the firm-level. Although at the beginning of the sample in 2009 we can only match around 30% of the firms in the customs records with their credit registry data (firms might report under different IDs in one database vs the other), by 2015 and onwards we can match over 50% of the currently exporting firms with their credit registry, accounting for over 75% of the total exports of the country. For our micro firm-level regressions needing both customs and credit-registry data we focus on data for the period 2015-2023 where our coverage is both satisfactory and stable.

Bank balance sheet data. We also use bank-level balance sheet data from the CNBV, which details both assets and liabilities of banks, as well as their income and expense statements that allow us to map their different funding costs. Importantly, while we do not observe the currency breakdown of the banks' balance sheets, this source does allow us to separate assets and liabilities with cross-border counterparties,[8] so we can identify the foreign borrowing of the banks directly.

1.2 Descriptive facts

We start by documenting two facts about foreign banks' balance sheets that will inform our model in Section 2, which emphasizes foreign banks' heterogeneity in both customers and funding. We want to answer two key questions: how do these banks fund themselves, and who in turn do they extend their lending to?

[7] Access to this credit registry dataset has allowed researchers to study the mechanisms and effects of credit supply in Mexico in detail (Morais et al., 2019; Cantú et al., 2022; Gutierrez et al., 2023; Rivadeneira et al., 2024).

[8] There is an accounting change on how the balance sheets are reported after 2021. To keep this uniform we limit our main analysis of bank balance sheets to 2009–2021.

Foreign banks disproportionately lend to exporters

We classify banks as domestic or foreign depending on whether they are connected to a foreign parent bank.[9] Combining the credit registry with firm-level exporter flags from customs records lets us classify loans by both firm type and bank ownership. The picture that emerges is stark: foreign banks are responsible for the majority of credit given to exporters, while domestic banks account for the majority of credit to non-exporters. Figure 1 presents the aggregate credit allocation for 2023, which is representative of our sample. On aggregate, exporters obtain about 20 percentage points more of their credit from foreign banks than non-exporters do. Viewed from the lender side, this means exporters account for a larger share of foreign banks' loan portfolios, compared to the portfolios of domestic banks.

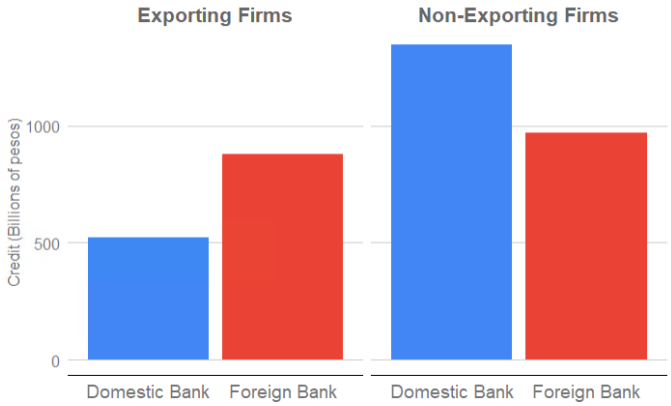


Figure 1: Credit allocation by bank ownership and exporter status: outstanding loan balances, 2023.

As we show in the Appendix, this pattern is persistent and holds in firm- and bank-level regressions controlling for size and sector. Figure 17 shows that across the bank-size distribution foreign banks allocate a larger fraction of their lending to exporters; in fact some of the smaller specialized foreign banks concentrate almost entirely on these clients.[10]

Moreover, this fact cannot be explained by the currency composition of loans alone. Even when looking only at the peso-denominated outstanding credit, foreign banks are responsible for a more than proportional fraction of credit to exporters. The attractiveness of foreign banks to exporters cannot be explained by interest rate differentials either. Within firm and year, foreign banks charge approximately 46 bp less on dollar-denominated loans but 92 bp more on peso-denominated loans; but because most credit is denominated in pesos for both

[9] This indicator is not time-varying in our sample. See Figure 14.

[10] Blickle et al. (2026) report evidence of bank lending specialization in the United States. A similar pattern appears here when we break down lending by firm sectors, although here we focus on the exporter–non-exporter margin, which is the relevant one for our analysis.

exporters and non-exporters, foreign banks are not attracting more exporter clients through lower rates. Appendix A reports the loan-pricing regressions and the currency composition of borrowing.

Other sources of bank-heterogeneity might be important to explain this exporter sorting pattern. Anecdotally, and as illustrated in Figure 18, foreign banks tend to market specialized trade services to exporters and firms engaged in international trade more broadly. These services may provide exporter-specific benefits beyond loan pricing. Section 2.2 presents how we model these benefits, while Section 4.1 uses within-firm and event-study evidence to discipline their magnitude.

Foreign banks rely more on cross-border funding and have lower funding costs

Using bank balance sheet data we can recover the funding structure of individual banks. We can further divide those liabilities between domestic and cross-border liabilities, depending on the counterparty as reported by the banks. Our second observation is that, relative to domestic banks, foreign banks rely more on cross-border funding; Figure 2 shows aggregate measures of banks' liabilities to nonresidents as a fraction of bank capital, which are 2.4 times larger for foreign banks than for domestic banks.

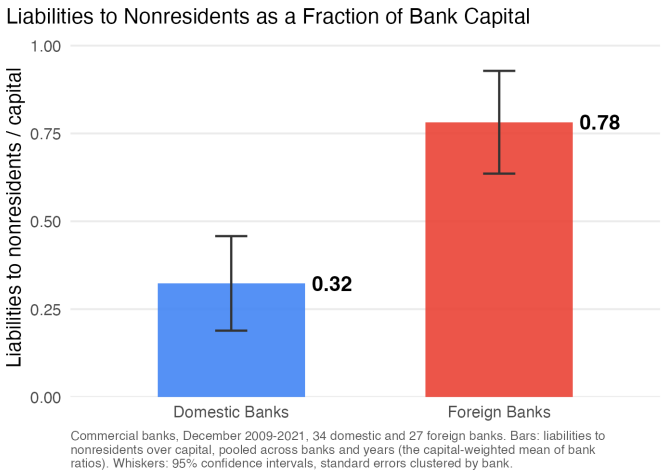


Figure 2: Banks' funding composition.

This difference in funding composition shows up not only in cross-border vs domestic but also in the broader composition of liabilities. Banks' balance sheets split liabilities between traditional funding (which includes demand deposits, public term deposits, money-market funding and issued securities) and nontraditional funding (interbank and other-organization loans, financial-instrument and derivative operations, and other liabilities). Figure 15 in the Appendix shows that foreign banks also rely more on nontraditional liabilities, relative to

domestic banks. This is true within bank size groups: large (DSIB) foreign banks rely more on nontraditional liabilities compared to large (DSIB) domestic banks, and the analogous is also true for smaller (non-DSIB) banks. Moreover, we see a positive correlation between the use of nontraditional and cross-border funding (Figure 16).

Why does this difference in funding composition across foreign and domestic banks matter? There are two related reasons: funding composition determines both banks' funding costs and what those costs are priced off of. Figure 3 compares the bank-level interbank funding costs relative to the reference rate,[11] and shows that while domestic banks' funding costs follow the interbank TIIE rate, foreign banks' funding costs sit around 1.6pp lower.[12] Foreign banks' reliance on cross-border and non-core funding means they fund themselves more cheaply.

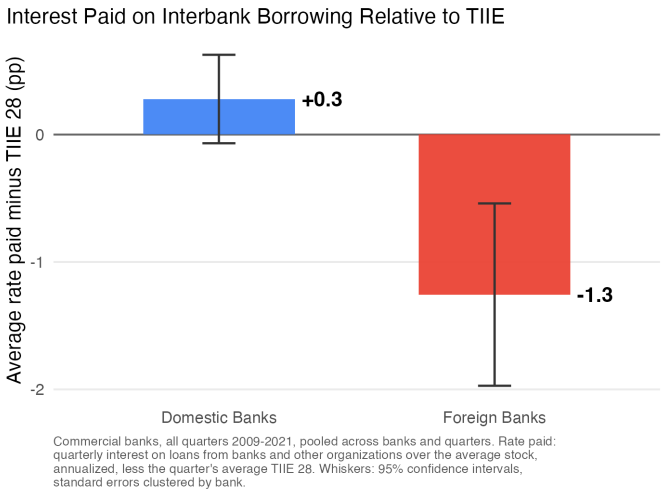


Figure 3: Banks' funding cost relative to TIIE.

Additionally, the funding composition differences matter because they mean foreign banks' funding is also priced off a different rate. In Appendix A.3.1 we use a quarterly panel of bank balance sheets to regress the change in each bank's average funding cost on changes in Mexico's policy rate target rate and in the US federal funds rate, allowing both responses to differ by bank ownership. Over one year, a percentage point of the Mexican policy rate passes 0.57 into domestic banks' funding costs but only 0.23 into foreign banks', while a percentage point of the federal funds rate passes 0.42 into domestic banks' costs and 0.85 into foreign banks'. In other words, while domestic banks' funding costs follow the local

[11] In Mexico this is the 28 day *Tasa de interés interbancaria de equilibrio* (TIIE), the equivalent to the Secured Overnight Financing Rate (SOFR) in the US.

[12] Panel regressions confirm that this funding advantage is stable and persists across bank sizes: the funding-cost gap between the large foreign and large domestic banks averages 1.0 pp, has a standard deviation of 0.3 pp, and is negative in all 56 quarters from 2008 to 2021.

policy rate, foreign banks' funding follow the US rate, consistent with the international bank lending channel of Morais et al. (2019). The tilt follows from the funding structure itself: banks that fund a larger share of their liabilities from abroad price more off the US rate and less off the Mexican one, so that once the cross-border share is accounted for, ownership adds little (specification and details in Appendix A.3.1). Section 3.4 returns to this differential effect of the US rates with the model structure and credit-registry measures of credit supply.

Summing up. Compared with their domestic-owned counterparts, foreign banks fund themselves using more cross-border and nontraditional liabilities, while their lending portfolio is more concentrated in exporters. These comparisons identify relative characteristics of banks operating in the same economy, but they cannot establish the aggregate gain from hosting foreign banks, or how much more exposed the economy becomes when they operate. To address those questions, we go to the model.

2 Model

We develop a real, flexible-price small open economy with two productive sectors, nontradable goods (NT) and exporters (X), and two locally operating banking sectors, domestic (d) and foreign-owned (f). Firms finance working capital with bank loans and sort between banks. Both banking sectors raise home deposits and wholesale (nontraditional) funds from abroad. Foreign banks differ in their ownership (which determines the SDF they use, as well as who receives their profits), their ability to sustain a larger wholesale funding book, and the trade services they can provide to exporters. Figure 4 summarizes the model architecture.

Firms face a working-capital friction but no balance-sheet friction: the input bill at t must be financed with a one-period bank loan, fixed in its own currency and repaid at $t+1$, and the loan enters the firm's decisions through the present value of that repayment. Repayment comes out of receipts that settle through the lending bank, with households residually liable for any shortfall, so bank loans are risk-free, firms never default, and there is no firm net-worth channel. Firms accumulate nothing and hold no open currency position; the obligation inherited from $t-1$ is a sunk lump sum. The financial frictions act primarily on the balance sheets of banks: there is an agency constraint tying their lending to net worth, a funding charge limiting how much wholesale borrowing they can do, and a regulatory cap bounding their short dollar position. As a consequence, financial shocks reach credit through banks' funding costs and net worth rather than through firms' balance sheets.

The home consumption basket is the numeraire. The real exchange rate q_t is the price of the foreign basket in home consumption units, so an increase in q_t is a local depreciation,

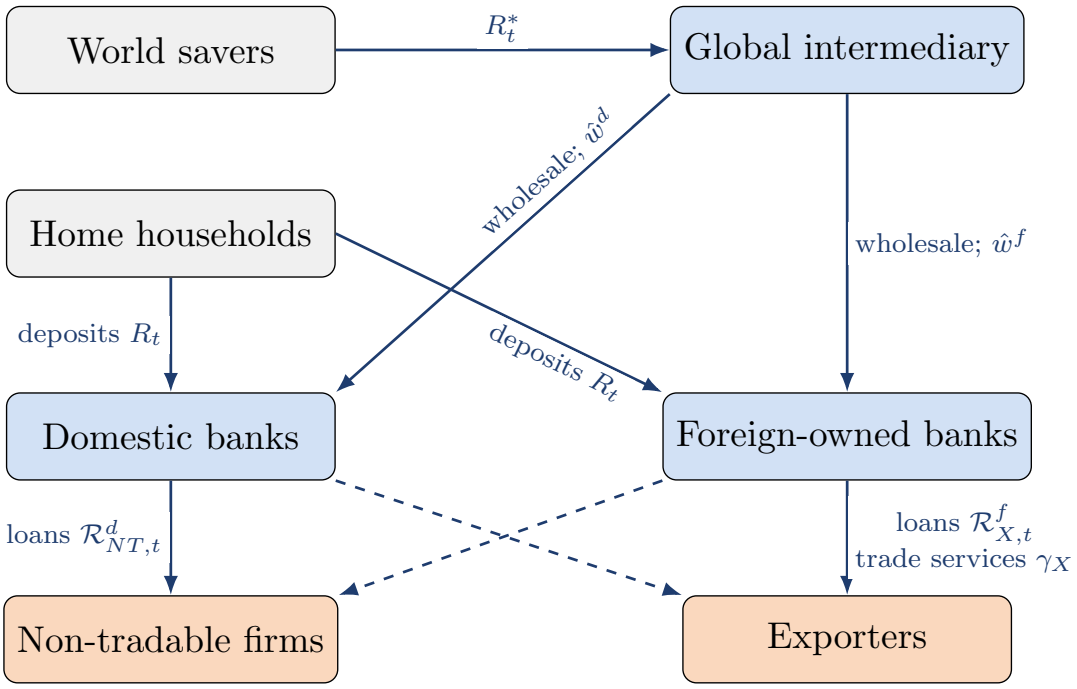


Figure 4: Model architecture. Both bank types lend to both sectors. Global lenders supply peso and dollar wholesale funds.

allowing us to define $\rho_{t+1} = q_{t+1}/q_t$ as a measure of depreciation. The small-open-economy assumption means the price of imported goods is exogenous and normalized to one in terms of the foreign consumption good, giving a home import price of q_t, the real exchange rate.[13] We refer to contracts denominated in home and foreign units as peso and dollar contracts respectively. All interest rates are gross and dated when the contract is signed: a unit of deposits made at t repays R_t at $t+1$.

2.1 Households

Households are fairly standard: the representative household supplies labor H_t at wage w_t, consumes C_t, and saves in deposits at home banks (it is indifferent between the domestic and foreign banks). Preferences are GHH with outer curvature σ^h:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\widetilde{C}_t^{1-\sigma^h} - 1}{1-\sigma^h}, \qquad \widetilde{C}_t = C_t - \frac{\zeta_0}{1+\zeta} H_t^{1+\zeta}. \tag{1}$$

[13] This assumption means we abstract from pure terms-of-trade shocks – the relative price of imports moves only through the endogenous exchange rate.

The budget constraint is

$$C_t + D_t = \mathsf{w}_t H_t + R_{t-1} D_{t-1} + \Pi_t. \tag{2}$$

Here Π_t includes home firms' profits and the net payout of domestic banks: payments by exiting bankers less the equity supplied to entrants, as will be made clear in Section 2.3.

Consumption C_t comes from a nested constant elasticity of substitution aggregator. The outer nest combines non-tradable goods $C_{NT,t}$ and a tradable composite $C_{T,t}$ with elasticity η; the inner tradable composite combines consumption of home tradables (exports) $C_{X,t}$ and imports $C_{M,t}$ with elasticity η_T:

$$C_t = \left[(1-\omega_T)^{1/\eta} C_{NT,t}^{(\eta-1)/\eta} + \omega_T^{1/\eta} C_{T,t}^{(\eta-1)/\eta}\right]^{\eta/(\eta-1)}, \tag{3}$$

$$C_{T,t} = \left[(1-\omega_M)^{1/\eta_T} C_{X,t}^{(\eta_T-1)/\eta_T} + \omega_M^{1/\eta_T} C_{M,t}^{(\eta_T-1)/\eta_T}\right]^{\eta_T/(\eta_T-1)}. \tag{4}$$

where ω_T and ω_M are CES weights. Their price indices hence satisfy:

$$p_{T,t} = \left[(1-\omega_M) p_{X,t}^{1-\eta_T} + \omega_M q_t^{1-\eta_T}\right]^{1/(1-\eta_T)}, \tag{5}$$

$$1 = \left[(1-\omega_T) p_{NT,t}^{1-\eta} + \omega_T p_{T,t}^{1-\eta}\right]^{1/(1-\eta)}. \tag{6}$$

Optimal expenditure allocation gives

$$C_{NT,t} = (1-\omega_T) p_{NT,t}^{-\eta} C_t, \qquad C_{T,t} = \omega_T p_{T,t}^{-\eta} C_t, \tag{7}$$

$$C_{X,t} = (1-\omega_M)\left(\frac{p_{X,t}}{p_{T,t}}\right)^{-\eta_T} C_{T,t}, \qquad C_{M,t} = \omega_M \left(\frac{q_t}{p_{T,t}}\right)^{-\eta_T} C_{T,t}. \tag{8}$$

In turn, the labor-supply condition, Euler equation and home SDF are:

$$\mathsf{w}_t = \zeta_0 H_t^{\zeta}, \qquad R_t \mathbb{E}_t \Lambda^d_{t,t+1} = 1, \qquad \Lambda^d_{t,t+1} = \beta \left(\frac{\widetilde{C}_t}{\widetilde{C}_{t+1}}\right)^{\sigma^h}. \tag{9}$$

2.2 Firms

There are two productive sectors $S \in \{NT, X\}$, the non-tradable and tradable (exporter) sectors, each with a unit continuum of atomistic firms producing varieties with elasticity of substitution ε. Non-tradable firms sell at home only; exporters sell home tradables both domestically and abroad at one common price $p_{X,t}$.[14] Each individual firm is attached to

[14] Prices are flexible and set in home units, so foreign buyers pay $p_{X,t}/q_t$ in dollars. Since this is a real model, the currency in which exports are invoiced plays no role: with flexible prices, dollar invoicing and

one bank type ($b \in \{d, f\}$) such that there are four firm cells – two productive sectors times two possible banks – each of which can be treated as having a representative firm. There are no other sources of firm heterogeneity.[15]

Production by firm j in the non-tradable sector NT uses labor h_j only:

$$y_{j,t}^{NT} = A_{NT,t} h_{j,t} \tag{10}$$

Production by firm j in the exporter sector X uses both labor h_j and imported intermediate goods m_j following a Cobb-Douglas technology.[16] Moreover, the productivity of the exporter firm j depends on what bank b it is banking with:

$$y_{j,t}^{X} = A_{X,t}^{b} m_{j,t}^{\alpha_X} h_{j,t}^{1-\alpha_X}, \qquad A_{X,t}^{b} = \begin{cases} A_{X,t} & \text{if } b = d \\ \gamma_X A_{X,t} & \text{if } b = f \end{cases} \tag{11}$$

The parameter $\gamma_X \geq 1$ represents the productivity benefit to exporters of foreign banks' trade services (Paravisini et al., 2023). Because exporters sell at home and abroad, γ_X is an average cost advantage over all of the firm's sales.[17] It effectively lowers exporters' costs independently of the interest rate charged by the bank. Section 4.1 develops the evidence used to discipline this parameter. Non-tradable firms' productivity is the same with either bank.

Cost minimization gives the input cost per unit of output,

$$MC_{NT,t} = \frac{\mathsf{w}_t}{A_{NT,t}}, \tag{12}$$

$$MC_{X,t}^{b} = \frac{1}{A_{X,t}^{b}} \left(\frac{\mathsf{w}_t}{1-\alpha_X} \right)^{1-\alpha_X} \left(\frac{q_t}{\alpha_X} \right)^{\alpha_X}, \qquad MC_{X,t}^{f} = \frac{MC_{X,t}^{d}}{\gamma_X}. \tag{13}$$

peso invoicing deliver the same allocation.

[15] In particular, firms don't vary in their fundamental productivity and there is no selection into exporting margin. Our focus is on firm heterogeneity arising from financing conditions only; Paravisini et al. (2015) show firm-level financing conditions do not affect the extensive margin of selection into exporting but rather have an effect on the intensive margin of production.

[16] The assumption that the tradable sector uses imported goods but the non-tradable sector does not is a helpful simplification but not crucial to our results. It is only intended to represent the fact that exporters are often part of global value chains such that changes in the real exchange rate also affect them via the price of imports, as shown for instance by Amiti et al. (2014).

[17] One natural interpretation of γ_X is an advantage on the import of intermediates: anecdotally, foreign bankers in Mexico mentioned much of the benefit they provided to their clients was in facilitating their payments to foreign suppliers. γ_X could also be read as the reduced form lower iceberg trade cost on exports, which would give an advantage proportional to the foreign revenue share. Another interpretation lets γ_X stand in for other non-loan inputs into the production function of exporters; letters of credit and related guarantees for exporters that foreign banks can procure are a natural candidate (Niepmann and Schmidt-Eisenlohr, 2017a,b).

Working-capital finance and pricing. At time t, a firm must borrow its entire input bill from its bank b, before it produces and sells. The loan is then repaid at $t+1$. Firms in the non-tradable sector borrow all in pesos, while exporters borrow a fixed fraction $\alpha_{\$}$ in dollars and the remainder in pesos.[18] Let $R^b_{P,t}$ and $R^b_{\$,t}$ be the gross interest rate charged by bank b for peso and dollar loans respectively. Firms are owned by the household and value next period's repayment with its discount factor, so the cost at t of one unit borrowed from bank b, which we call the firm's financing wedge, is

$$\mathcal{R}^b_{NT,t} = \mathbb{E}_t\left[\Lambda^d_{t,t+1}\right] R^b_{P,t} = \frac{R^b_{P,t}}{R_t}, \qquad \mathcal{R}^b_{X,t} = (1-\alpha_{\$})\frac{R^b_{P,t}}{R_t} + \alpha_{\$}\,\mathbb{E}_t\left[\Lambda^d_{t,t+1}\rho_{t+1}\right] R^b_{\$,t}, \tag{14}$$

where the peso terms use the deposit Euler equation and ρ_{t+1} converts the dollar repayment into home units.

Each sector's output is a CES composite of its firms' varieties with elasticity $\varepsilon > 1$, aggregated the same way by buyers at home and abroad, so each variety sells at one price. Sector demand is $Y_{NT,t} = C_{NT,t}$ and $Y_{X,t} = C_{X,t} + C^*_{X,t}$, where $C^*_{X,t}$ is foreign demand for the export composite (Section 2.4), and a firm in sector S faces $y = (p/p_{S,t})^{-\varepsilon} Y_{S,t}$ with $p_{S,t}$ the sector price index.

A firm in sector S attached to bank b takes its financing wedge and marginal cost as given and chooses its price and output to maximize the present value of profits subject to demand for its variety:

$$\max_{p,\,y}\; p\,y - \mathcal{R}^b_{S,t}\,MC^b_{S,t}\,y \quad \text{subject to} \quad y = \left(\frac{p}{p_{S,t}}\right)^{-\varepsilon} Y_{S,t}, \tag{15}$$

The solution is a constant markup over the financed input cost:

$$p^b_{S,t} = \mu\,\mathcal{R}^b_{S,t}\,MC^b_{S,t}, \qquad \mu = \frac{\varepsilon}{\varepsilon - 1}. \tag{16}$$

Firms have no net worth or default margin: households are residually liable for the firms' loans and so banks are always repaid in full.[19]

[18] While this might seem like a strong assumption, we do not see evidence that the currency-composition of loans varies much over time. The feature this assumption is meant to capture is that there is a limit to the amount of dollar-loans the economy can support – banks in the real world are generally unwilling to extend dollar-denominated loans to firms that don't export, while in the aggregate data we see even exporters take out the majority of their loans in pesos. One possibility is that exporters take out loans in dollars only to pay for their imported intermediates, which would link $\alpha_{\$}$ to α_X in our model; we keep the two as separate exogenous parameters in our model.

[19] Furthermore, because firms carry no net worth state, they are also not directly affected by exchange rate movements. While this is a simplification (see for instance the evidence in Aguiar, 2005, Hardy, 2023, and the more recent analysis of Salomao and Varela, 2022), it allows us to concentrate exchange rate risk on

Firm–bank sorting. Within a sector, all firms are identical except for their banking relationships, which are persistent because lending relationships are sticky. We model this by having firms keep their current bank with probability ς; otherwise firms get an opportunity to re-sort and choose again a bank in either banking sector. Let $\text{share}^b_{S,t}$ be the share of firms in sector S banking with bank $b \in \{d, f\}$. Moreover, let $\widehat{\text{share}}^b_{S,t}$ be the share of re-sorting firms that choose bank b. Then, the realized shares evolve according to the law of motion:

$$\text{share}^b_{S,t} = \varsigma \, \text{share}^b_{S,t-1} + (1-\varsigma) \, \widehat{\text{share}}^b_{S,t}, \qquad \text{share}^d_{S,t} = 1 - \text{share}^f_{S,t}. \tag{17}$$

The fraction $1-\varsigma$ of resorting firms compare the current cost of producing with each bank, $\mathcal{R}^b_{S,t} MC^b_{S,t}$, subject to Gumbel taste shocks with dispersion ν and domestic-bank location parameter ξ_S. Hence the share of firms choosing the domestic bank among the firms with a chance to resort is:

$$\widehat{\text{share}}^d_{S,t} = \frac{\xi_S (\mathcal{R}^d_{S,t} MC^d_{S,t})^{-1/\nu}}{\xi_S (\mathcal{R}^d_{S,t} MC^d_{S,t})^{-1/\nu} + (1-\xi_S)(\mathcal{R}^f_{S,t} MC^f_{S,t})^{-1/\nu}}. \tag{18}$$

The choice rule is analogous to firms having CES demand over banks, with elasticity $1/\nu$.[20] A lower loan rate attracts borrowers in either sector. Trade services additionally attract exporters by reducing MC^f_X as per (13), and the sector-specific weights allow different baseline attachments to domestic banks; these features are used to match the facts in Section 1.2. Relationship persistence slows the reallocation of firms following a shock, so contemporaneous loan-rate changes operate largely on inherited borrower portfolios.[21]

2.3 Banks

Two home banking sectors, $b \in \{d, f\}$, provide firms with financing. Each sector consists of a unit measure of identical, atomistic, price-taking bankers who fund loans with their own net worth, home deposits and wholesale borrowing from abroad. Bankers exit and pay their net worth to their owners with probability $1-\sigma$, in which case they get replaced by an equal

the balance sheets of banks.

[20] This can be seen as a special case of the loan-demand models in Paravisini et al. (2023) and Herreño (2023).

[21] For tractability we model the re-sorting firm as myopic in the sense that it compares current effective costs only, even though the banking relationship persists, but this is not essential. A forward-looking firm would sort on the expected discounted profits; because per-period profit is a monotone transform of effective cost under constant markups, that object is a ς- and SDF-weighted sum of current and future differentials. When the cost differential between the two banking sectors follows (approximately) a stationary AR(1), the spell-weighted differential is proportional to the current one, and the forward-looking rule coincides with the static rule up to a rescaling of ν.

mass of new entrants with start-up equity supplied by their owners; otherwise they retain their net worth, which is their relevant state variable.[22]

The two sectors share a general balance-sheet structure but differ in three respects: who owns them and therefore receives their payouts and determines how payouts are valued, how large a wholesale book they can sustain, and the trade services their exporter clients receive.

Bank loans. A bank in banking sector b posts a peso loan rate $R^b_{P,t}$ and a dollar loan rate $R^b_{\$,t}$ and lends a total of L^b_t to the firms attached to it in both productive sectors. As presented in Section 2.2, loans to non-tradable firms $L^b_{NT,t}$ are peso loans and a fraction $\alpha_\$$ of loans to exporters $L^b_{X,t}$ are denominated in dollars while the rest are in pesos. The currency composition of the loan book therefore follows from the sector composition of the bank's borrowers: the dollar share of bank b's assets is

$$a^b_t \equiv \frac{\alpha_\$ L^b_{X,t}}{L^b_t} \in [0, \alpha_\$], \qquad L^b_t = L^b_{NT,t} + L^b_{X,t}. \tag{19}$$

All loans are one-period and their rates are set at t; the home-unit return on the dollar leg at $t+1$ is $\rho_{t+1} R^b_{\$,t}$, which is uncertain because it carries the future level of the real exchange rate q_{t+1}.

Balance sheet and funding. Loans are funded by net worth N^b_t, household deposits D^b_t paying the rate R_t at $t+1$, and by one-period wholesale borrowing from global lenders W^b_t. This wholesale borrowing can be split into a dollar line $W^b_{\$,t}$ measured in foreign units and paying R^W_t, and a peso line $W^b_{P,t}$ measured in home units and paying $R^W_{P,t}$.[23] Wholesale borrowing carries an upfront charge $\mathcal{C}^b_t$, paid to the foreign lenders and deducted from loanable funds, so the balance sheet identity of the banks is:

$$L^b_t = N^b_t + D^b_t + W^b_t - \mathcal{C}^b_t, \qquad W^b_t = q_t W^b_{\$,t} + W^b_{P,t}. \tag{20}$$

The charge $\mathcal{C}^b_t$ is quadratic in total wholesale borrowing relative to the bank's net worth,

$$\mathcal{C}^b_t = \frac{\chi}{2}(w^b_t - \hat{w}^b)^2 N^b_t, \qquad w^b_t = \frac{W^b_t}{N^b_t} \tag{21}$$

[22] This setup is closely related to that in Aoki et al. (2025) and Akinci and Queralto (2024), which in turn build on the basic framework of Gertler and Kiyotaki (2010). As such, our setting features no monopolistic behavior on the side of banks and our analysis abstracts from competition issues in the banking sector.

[23] The wholesale peso line can be thought of as a synthetic peso line: it is equivalent to borrowing in the dollar wholesale line plus buying dollars forward, so the difference between the price of the dollar and peso wholesale lines should be related to the cost of hedging peso risk. Ivashina et al. (2015) present a related model of how global intermediaries turn euro funding into dollar funding. Bush (2019) examines the link between bank foreign currency funding and hedging demand in Mexico.

where $\hat{w}^b$ is the bank-specific wholesale ratio at which the charge is zero and χ is a common curvature.

We interpret $\hat{w}^b$ as the "normal" wholesale book size a bank's relationships with its creditors can carry. Borrowing beyond it means looking for new counterparties at rising spreads, while leaving lines unused still costs their fees. The convexity in the charge away from $\hat{w}^b$ can stand for lenders pricing their additional exposure to one bank, a treasury built for a given funding mix, or any other micro-foundation for an upward-sloping wholesale supply schedule; all the model needs is some limited substitution between deposits and wholesale borrowing. We set $\hat{w}^f > \hat{w}^d$ to reflect that the foreign subsidiary borrows through its parent's internal capital market and international connections, while the domestic bank goes through arm's-length counterparties.[24]

Dollar wholesale funds cost R_t^W in dollars, so their home-unit cost is $\rho_{t+1} R_t^W$ and uncertain. On the other hand, peso wholesale funds repay a fixed peso amount known at t, so the lender – a global intermediary which we don't model directly – bears the currency risk rather than the local banks, and the price of the peso line relative to the dollar line is the cost of that hedge. We write it as expected depreciation plus a wedge:

$$R_{P,t}^W = R_t^W (1 + \text{prem}_t) \mathbb{E}_t \rho_{t+1}, \qquad \text{prem}_t > 0. \tag{22}$$

The wedge $\text{prem}_t > 0$ is the expected excess return on wholesale lending in pesos over lending in dollars, a deviation from uncovered interest parity on the peso line.[25] We treat it as an exogenous process rather than deriving it from the lenders' problem: it is the compensation global intermediaries require for holding peso exposure, as in Gabaix and Maggiori (2015). Under this interpretation, financial shocks to the premium stand for changes in the amount of currency risk that global intermediaries are willing to carry. With a positive premium, dollar borrowing is cheaper in expectation, and a bank that funds peso loans with dollars runs a short dollar position.

However, there is a limit to how much the banks can run this short position: prudential regulation caps each bank's short dollar position.[26] We represent this restriction as a ceiling

[24] The model has no domestic interbank market. Both banking sectors borrow on net and have the same access to deposits, so an interbank loan would move funds between two constrained banks without relaxing either bank's constraint.

[25] See Kalemli-Özcan and Varela (2021) for a relevant description of UIP deviations in EMs.

[26] Mexico tightened its regulation of banks' net foreign-currency positions following the 1994–95 Tequila crisis. Similar limits are common across Latin America (Terrier et al., 2011; Tobal, 2018). Relatedly, although not an outright cap, the Basel II and Basel III frameworks impose additional capital requirements for foreign-exchange risk across both the banking and trading books. This regulation serves a similar purpose.

on each bank's net short dollar position relative to its net worth:[27]

$$q_t W^b_{\$,t} - a^b_t L^b_t \leq \Gamma N^b_t. \tag{23}$$

We refer to this as the Net Open FX Position (NOP) regulation. Note that because the limit is applied on the net currency position, dollar loans offset dollar liabilities, so a bank with more exporters among its borrowers can raise more dollar funding at a given net worth.

Returns and ownership. An incumbent's net worth at $t+1$ is firm loan repayments less repayments to funders. Letting g^b_{t+1} denote the return on net worth of bank b at time $t+1$:

$$N^b_{t+1} = g^b_{t+1} N^b_t = R^b_{P,t}(1 - a^b_t)L^b_t + \rho_{t+1} R^b_{\$,t} a^b_t L^b_t - R_t D^b_t - \rho_{t+1} R^W_t q_t W^b_{\$,t} - R^W_{P,t} W^b_{P,t} \tag{24}$$

Every rate is contracted at t, so the exchange rate is the only surprise in these cash flows: a depreciation (ρ_{t+1}) raises the home value of dollar receipts and of dollar debt service alike, so the cap bounds the net effect.

As mentioned earlier, bankers survive with probability σ; those who exit pay their net worth to their owners, those who continue retain it. Domestic bankers are owned by home households and value home-unit payouts with the household discount factor $\Lambda^d_{t,t+1}$ of (9). Foreign bankers are owned by their parents abroad: an exiting subsidiary's net worth is repatriated and consumed in foreign units, so a home-unit payout at $t+1$ is worth $1/q_{t+1}$ abroad[28] and is discounted at the world rate:

$$\Lambda^f_{t,t+1} = \frac{1}{R^*_t} \frac{q_t}{q_{t+1}}. \tag{25}$$

Exiting bankers are replaced by entrants who receive startup equity from the sector's owners equal to a fraction ι^b of lagged sector net worth. Because the problem is linear, every banker in a sector grows net worth at the common rate g^b_t, and sector net worth $\mathcal{N}^b_t$ follows

$$\mathcal{N}^b_t = (\sigma g^b_t + \iota^b)\mathcal{N}^b_{t-1}. \tag{26}$$

The net payout to owners, $[(1-\sigma)g^b_t - \iota^b]\mathcal{N}^b_{t-1}$, accrues to home households for domestic banks and to parents abroad for foreign banks. The fact that foreign banks' payouts leave the

[27] The regulation limits both long and short positions. We focus on the short-position limit because the lower cost of dollar funding makes it the relevant constraint in the equilibrium we study.

[28] The same home-currency payout is worth less to a foreign owner when the peso is expected to depreciate; while for the domestic bank the dollar legs of the balance sheet are risky, for the foreign bank the peso legs are the risky ones.

country is particularly important for the steady state comparisons in our main counterfactual: without foreign banks, the profits from intermediation remain in the domestic economy.

The banker's problem and solution. Finally, a standard moral-hazard friction limits the leverage of banks: after raising funds a banker can divert a fraction θ of its assets, so creditors lend to the bank only if the banks' franchise value covers what could be diverted, leading to the incentive compatibility constraint $V_t^b \geq \theta L_t^b$. The franchise value discounts payouts with the owner's discount factor, $V_t^b = \mathbb{E}_t[\Lambda_{t,t+1}^b((1-\sigma)N_{t+1}^b + \sigma V_{t+1}^b)]$, and since the problem is linear in net worth it takes the form $V_t^b = \Psi_t^b N_t^b$, where Ψ_t^b is the franchise value of the bank per unit of net worth. Then we can define the owner's shadow value of a unit of next-period net worth:

$$\Omega_{t,t+1}^b = \Lambda_{t,t+1}^b(1 - \sigma + \sigma\Psi_{t+1}^b). \tag{27}$$

We can now state the full problem of the bank per unit of net worth, writing $\phi = L/N$ for leverage, $\delta = D/N$, $w_\$ = qW_\$/N$ and $w_P = W_P/N$. Suppressing b, the banker takes the posted loan rates, the deposit rate, the wholesale rates and the continuation value Ψ_{t+1} as given and solves:

$$\Psi_t = \max_{\phi_t, a_t, \delta_t, w_{\$,t}, w_{P,t}} \mathbb{E}_t[\Omega_{t,t+1} g_{t+1}], \tag{28}$$

subject to the return (24) in ratio form, the balance sheet, the incentive compatibility constraint, the regulation cap and the nonnegativity of each funding line:

$$\begin{aligned} g_{t+1} &= R_{P,t}(1-a_t)\phi_t + \rho_{t+1}R_{\$,t}a_t\phi_t - R_t\delta_t - \rho_{t+1}R_t^W w_{\$,t} - R_{P,t}^W w_{P,t}, \\ \phi_t &= 1 + \delta_t + w_t - \chi/2(w_t - \hat{w})^2, \qquad w_t = w_{\$,t} + w_{P,t}, \\ \mathbb{E}_t[\Omega_{t,t+1}g_{t+1}] &\geq \theta\phi_t, \qquad w_{\$,t} - a_t\phi_t \leq \Gamma, \qquad \delta_t, w_{\$,t}, w_{P,t} \geq 0, \qquad 0 \leq a_t \leq \alpha_\$. \end{aligned} \tag{29}$$

The bank's individual state is its net worth; firm attachments, sector net worth and prices describe the environment it takes as given.

We solve the banker's problem in Appendix B, while limiting ourselves here to stating and discussing the resulting conditions. With both constraints binding and interior funding and borrower composition, optimality gives:

$$L_t^b = \frac{\Psi_t^b}{\theta} N_t^b, \tag{30}$$

$$R_t[1 - \chi(w_t^b - \hat{w}^b)] = R_{P,t}^W, \tag{31}$$

$$q_t W_{\$,t}^b = a_t^b L_t^b + \Gamma N_t^b, \tag{32}$$

$$\mathbb{E}_t[\Omega^b_{t,t+1}(R^b_{P,t} - \rho_{t+1}R^b_{\$,t})] = \mathbb{E}_t[\Omega^b_{t,t+1}(R^W_{P,t} - \rho_{t+1}R^W_t)]. \tag{33}$$

The first condition is binding leverage and it determines the size of the balance sheet: a bank lends as much as its franchise value allows, so anything that raises the value of a unit of bank capital raises lending. The second condition pins the wholesale versus deposit funding composition: swapping a unit of deposits into peso wholesale funding saves the deposit rate, costs the peso wholesale rate (which is the marginal rate because of the regulation cap), and raises the charge by $\chi(w^b_t - \hat{w}^b)$. The third expression is the binding cap, determining the currency composition of the wholesale funding: because peso wholesale funding is dearer than dollar funding in expectation, the bank takes as much dollar funding as the cap allows and funds the rest of its wholesale book in pesos, and the multiplier on the cap is the expected saving forgone on the marginal unit of dollar funding it is denied, $\mathbb{E}_t[\Omega^b_{t,t+1}(R^W_{P,t} - \rho_{t+1}R^W_t)]$. The fourth is the margin on the currency of lending: it equates the extra return on a peso loan with the extra cost of peso funding, so the bank is indifferent at the margin between a matched expansion in either currency, and borrower demand determines the realized asset mix. Note an important result from this condition: the relatively cheaper dollar funding banks get results in cheaper dollar loans, which benefit exporters.[29]

2.4 Rest of the world and shocks

Our small open economy assumption means the home economy does not influence world prices – it experiences lending rates and demand for its products as exogenous processes.

Global lenders supply dollar wholesale funds at a rate R^W_t which is a spread z_t over the foreign funding rate R^*_t

$$R^W_t = R^*_t(1 + z_t), \tag{34}$$

and peso funds at (22) (which again is just a UIP wedge over the dollar funding rate). The spread z_t and premium prem_t summarize time-varying foreign financial conditions.

On the real side, foreign demand for the home export composite is given by:

$$C^*_{X,t} = \omega^*_t C^*_t \left(\frac{p_{X,t}}{q_t}\right)^{-\eta^*}. \tag{35}$$

[29] In this sense, our model explains the findings of Gutierrez et al. (2023), who find that dollar-denominated loans are cheaper in Peru, largely as a result of the dollar deposits banks have access to. However, we also find this is true in Mexico, where there are no widespread dollar deposits – meaning the mechanism translating abundant or cheap dollar bank funding into cheaper dollar loans is more general. Hardy and Saffie (2024) document that this cheaper dollar funding can lead to publicly-listed non-financial firms acting as intermediaries, extending peso trade credit and carrying currency risk. While this is a suggestive finding, our more comprehensive data shows the relatively low prevalence of dollar borrowing, even by exporters. This prompts a different question: why don't more firms borrow in dollars? We leave this for future work.

where C_t^* stands in for foreign absorption and ω_t^* for an Armington demand shifter. Both are exogenous and they move demand at a given relative price;[30] depreciation increases demand through the relative-price term as in the standard competitive channel of the exchange rate.

This leaves us with five (possibly correlated) processes which describe the rest of the world and are exogenous to our home economy: R_t^*, z_t, prem_t, ω_t^* and C_t^*. For our headline exercises we consider the foreign interest rate shocks that move financial conditions and foreign demand C^* jointly, as described in the calibration in Section 4.

2.5 Balance of payments and equilibrium

We close the model with a balance of payments condition, which in equilibrium will pin down the exchange rate. It is helpful to first define the trade balance, exports minus imports, in which we will include the wholesale funding charges $\mathcal{C}_t^b$ as payments for foreign financial services.[31] Then the trade balance and expenditure measure of GDP are:

$$TB_t = p_{X,t}C_{X,t}^* - q_t(C_{M,t} + M_{X,t}) - \sum_b \mathcal{C}_t^b, \qquad Y_t = C_t + TB_t. \tag{36}$$

The balance of payments says the capital and current account must balance each other, which here means new wholesale borrowing is used to finance old debt service net of the trade balance and the net equity inflow from foreign parents:

$$\sum_b W_t^b = q_t R_{t-1}^W \sum_b W_{\$,t-1}^b + R_{P,t-1}^W \sum_b W_{P,t-1}^b - TB_t - \mathcal{F}_t, \tag{37}$$

$$\mathcal{F}_t = [\iota^f - (1-\sigma)g_t^f]\mathcal{N}_{t-1}^f. \tag{38}$$

Dollar debt service is valued at the current exchange rate while peso debt service is fixed in home units. The exchange rate adjusts jointly with trade and new borrowing to clear the balance of payments.

An equilibrium is a sequence of prices and quantities such that households, firms and bankers optimize, firm attachments follow (17), all markets (goods, factors, loans, deposits and wholesale funding) clear, and the balance of payments holds, given the shock processes

[30] In fact only their product $\omega_t^* C_t^*$ matters – to the home economy, a foreign demand shock driven by more demand for specifically its products vs one driven by more demand overall are equivalent. We focus on movements in C_t^* but treat them as two separate variables since under a monetary shock R_t^* should move C_t^* but not ω_t^*. Shocks to ω_t^*, which stand for foreign demand shocks uncorrelated with financial shocks, are examined in the Appendix.

[31] These could be included as either factor payments, reductions in the capital account (net foreign inflows) or in the trade balance as we do here. In practice they are small enough that their allocation does not quantitatively change the trade balance.

and initial balance sheets. The details of these conditions are in Appendix B.2.

We normalize $\bar{q} = \bar{H} = 1$ in the deterministic steady state. In the benchmark,

$$\bar{\mathcal{R}}^b_{NT} > \bar{\mathcal{R}}^b_X > \bar{R} > \bar{R}^W_P > \bar{R}^W > \bar{R}^*. \tag{39}$$

The model is solved to first order around a steady state with binding incentive compatibility and NOP regulatory constraints, as per Equations 30–33. The benchmark responses use this regime; Section 5.5 describes the alternative regime without the NOP limit. The steady-state bank block and accounting identities are developed in Appendix B.

Connection to the descriptive facts. It is now worth pausing to explicitly state how the parameters in our model map to the facts recorded in Section 1.2.

Foreign banks' disproportionate lending to exporters means $\text{share}^f_X > \text{share}^f_{NT}$, which in our model can come from two margins: $\gamma_X > 1$ and $\xi_X < \xi_{NT}$. γ_X is a productivity bonus that embodies the pecuniary non-rate advantages or trade services that banking with a foreign bank provides to exporters. On the other hand, ξ_S are domestic bank weights coming from the Gumbel taste shocks.[32] In the calibration we measure γ_X directly as a productivity bonus, and invert the ξ_S to rationalize the observed shares of each banking sector in the exporter and non-tradable sectors.

Our second fact, that foreign banks fund themselves more through cross-border and nontraditional sources is embedded in the assumption $\hat{w}^f > \hat{w}^d$. Because the steady-state interest rate on deposits is higher than the wholesale peso interest rate $\bar{R} > \bar{R}^W_P$, foreign banks relying more on wholesale funding also explains their lower funding costs.

Finally, we would like to know what these parameters imply for the response of the economy to foreign shocks, which the empirical literature suggests is larger for foreign banks than for domestic banks (Morais et al. 2019; Cantú et al. 2022). We do this in the next section.

3 Shock Transmission

Armed with the model, we can now examine how shocks transmit in our economy, and in particular, determine under what conditions we should expect foreign banks to react more than domestic banks to foreign interest rate shocks. We start by connecting firm financing, bank funding and the relative first order transmission of a foreign interest rate shock to

[32] Consider these as representing factors like whether a firm is physically closer to a foreign or domestic bank, or whether by chance it matches with one bank or the other, unrelated to rates or costs. ξ_S then can be seen as the sector-aggregates of these factors driving firms towards domestic banks.

R^*. All differentials are taken around the deterministic steady state, with the structural parameters fixed. We use $d\log X$ to denote a proportional change in X, whereas dR denotes a change in the level of a gross interest rate.

3.1 From loan rates to output

Our model has no credit rationing, and so prices and quantities move smoothly with each other. Combining CES demand and markup pricing, for a firm in sector S attached to bank b, we then have that the change in firm-level output follows:

$$d\log y_S^b = d\log Y_S + \varepsilon(d\log p_S - d\log MC_S - d\log \mathcal{R}_S^b) \tag{40}$$

which simply means that quantities move with relative price movements according to the elasticity ε. The trade-services foreign bank advantage is fixed, so $d\log MC_S$ does not have a bank index, meaning proportional input-cost changes are common within a sector. Comparing firms in the same sector but different banks eliminates the common terms:

$$d\log y_S^f - d\log y_S^d = -\varepsilon(d\log \mathcal{R}_S^f - d\log \mathcal{R}_S^d) \tag{41}$$

The same expression describes the difference in their individual input bills and hence their working-capital loans. This is a comparison of credit per borrower in the same sector; changes in the number of borrowers at each banking sector are an additional component of total credit. To get some further analytic results we consider the case $\varsigma \to 1$, that is, where firms have completely sticky bank relations and so there are no switches.

Sectoral output. At fixed firm attachments, letting ω_S^b be the bank-b firms' steady-state share of sector revenue, we can define the sector weighted-average change in financing rates by $d\log \mathcal{R}_S = \sum_b \omega_S^b d\log \mathcal{R}_S^b$. The sector price index gives $d\log p_S = d\log MC_S + d\log \mathcal{R}_S$. Then we can decompose changes in the sector-level output between changes in demand and changes in price stemming from production costs and financing costs:

$$d\log Y_S = d\log \text{dem}_S - \eta_S d\log MC_S - \eta_S d\log \mathcal{R}_S. \tag{42}$$

where dem_S is a demand shifter collecting home consumption, foreign absorption and exchange-rate movements at a given sector price. The local elasticity η_S reflects sector demand; for exporters, it combines home and foreign sales.[33] Hence, we can see that sector output will

[33]It should be clear here that our flexible prices assumption means we will get a competitiveness channel of the exchange rate, wherein local currency depreciations boost relative demand; but this is not the only

depend on both average financing conditions as well as the differential between banks.

3.2 From funding costs to loan rates

Next, we explore what determines the bank-level financing rates $\mathcal{R}_S^b$ that were just shown to affect output. We relate these loan rates to funding costs at the bank level: the total funding cost combines interest payments to depositors, wholesale interest payments and the owner's required return. With $\delta^b = D^b/N^b$, $w^b = W^b/N^b$ and $\phi^b = L^b/N^b$, a useful expression for the bank level changes in funding cost $d\mathfrak{c}^b$ is:

$$d\mathfrak{c}^b \approx \frac{\bar{\delta}^b}{\bar{\phi}^b} dR + \frac{\bar{w}^b}{\bar{\phi}^b} dR_P^W + \frac{1}{\bar{\phi}^b} d\log R_O^b, \qquad R_O^b = \begin{cases} R, & b = d, \\ R^* \mathbb{E}(q'/q), & b = f. \end{cases} \tag{43}$$

which essentially follows from a weighted average cost of capital formulation. The first two terms are contractual funding costs (deposits and wholesale); the last term reflects the owners' valuation of future payouts.[34]

Holding net worth, the loan-demand shifter, and continuation effects fixed, we can approximate bank loan supply and firm loan demand by:

$$d\log L^b \approx \bar{\phi}^b (dR_P^b - d\mathfrak{c}^b), \qquad d\log L^b = -\varepsilon dR_P^b. \tag{44}$$

A larger loan margin raises earnings on all loans per unit of net worth, increasing the bank's franchise value and relaxing the incentive constraint, enabling more loans. On the other hand, the demand for loans decreases with their price by the variety elasticity ε. Equating supply and demand gives:

$$\frac{\partial R_P^b}{\partial \mathfrak{c}^b} \approx \frac{\bar{\phi}^b}{\bar{\phi}^b + \varepsilon} < 1, \qquad \frac{\partial R_P^b}{\partial R_P^W} \approx \frac{\bar{w}^b}{\bar{\phi}^b + \varepsilon}. \tag{45}$$

The first expression shows how changes in funding costs translate into changes in loan rates. Borrower substitution limits pass-through: a higher loan rate reduces demand, partly offsetting the increase in the bank's lending capacity. The second expression further relates changes in loan costs to changes in the wholesale peso interest rate. If banks have similar leverage, since we have $\bar{w}^f > \bar{w}^d$, a wholesale funding shock has a larger direct effect on the

channel of the exchange rate, since the exchange rate also moves the financial side of our model (see Appendix for details). Our model is then consistent with the view that following a depreciation, the limit to expansion comes from supply capacity rather than frictions in demand adjustment (McLeay and Tenreyro, 2026)

[34] The precise coefficient on the owner term is $\bar{g}^b/\bar{\phi}^b$, approximated here by $1/\bar{\phi}^b$. q' here represents the future level of the real exchange rate.

foreign bank's loan rate.

3.3 A prediction on relative credit supply transmission

Note however that the wholesale funding cost is not the only cost that moves following a foreign interest rate shock to R^* – the interest rate on local deposits might also respond. With common leverage and funding curvature, the balance sheets of both banks imply $\bar{w}^f - \bar{w}^d = \bar{\delta}^d - \bar{\delta}^f$. Isolating the funding composition channel:

$$\frac{\partial(R_P^f - R_P^d)}{\partial R_P^W} \approx \frac{\bar{w}^f - \bar{w}^d}{\bar{\phi} + \varepsilon} > 0, \tag{46}$$

$$\frac{\partial(R_P^f - R_P^d)}{\partial R} \approx -\frac{\bar{w}^f - \bar{w}^d}{\bar{\phi} + \varepsilon} < 0. \tag{47}$$

Hence, the foreign bank tightens more through external funding when the peso wholesale rate rises by more than the deposit rate, i.e. $dR_P^W > dR$. Empirically, this tends to be the case: real rates in Mexico do not follow world rates one-for-one, whereas wholesale rates do. But it is the relative movement of these two funding prices, rather than a rise in the world rate alone, that determines how banks react.[35]

Differentiating the wholesale condition gives the more precise relationship:

$$dR_P^W - \frac{\bar{R}_P^W}{\bar{R}} dR = -\chi \bar{R}\, dw^b. \tag{48}$$

With funding rates close to one, this becomes $dR_P^W - dR \approx -\chi \bar{R}\, dw^b$. The wedge between the deposit and wholesale peso rate opens as banks reduce wholesale borrowing and substitute toward deposits. Along a regular interior limit, with bounded funding responses, this component vanishes as $\chi \to 0$. This yields an important insight: the gap between foreign and domestic banks' response exists because foreign banks can't perfectly substitute wholesale funding with deposits, i.e., because $\chi > 0$. At the root of our differential transmission mechanism there is a friction in the market for bank funding; otherwise, foreign shocks would transmit perfectly into the deposit market and affect both banks equally.

[35] Note that we have only spoken about the external funding factors affecting the banks' credit supply response. This is enough for us to understand the main mechanism at play, but owner discounting, borrower demand and net-worth dynamics still affect the relative reaction of banks – the full decomposition of these terms is in the Appendix.

3.4 Testing the model's prediction

The preceding analysis predicts that, if a foreign interest rate shock transmits more to the wholesale than the deposit market, foreign banks' interest rates will increase relative to those of domestic banks via the banks' funding channel. Moreover, when the funding and equilibrium forces produce a larger foreign bank loan-rate increase, comparable firms at foreign banks will receive less credit and have correspondingly lower output.

Let $\ell^b_{S,t} = MC^b_{S,t} y^b_{S,t}$ denote credit by bank b per firm in sector S, to distinguish it from total lending to a sector. The same algebra of Equation 41 suggests defining:

$$\beta_{KM,S,t} \equiv d\log \ell^f_{S,t} - d\log \ell^d_{S,t} = -\varepsilon(d\log \mathcal{R}^f_{S,t} - d\log \mathcal{R}^d_{S,t}). \tag{49}$$

As in Equation 41, common sector demand and input-cost changes cancel from this comparison. With gross financing rates close to one, the difference is approximately $-\varepsilon(dR^f_{P,t} - dR^d_{P,t})$. A negative credit differential is thus the quantity counterpart of a positive loan-rate differential. This credit differential β_{KM} between firms in the same sector borrowing from different banks is, in the empirical macro-finance literature, a Khwaja-Mian differential, and can be measured in the micro-data (Khwaja and Mian, 2008).

Note that as usual in empirical macro-finance, total credit growth per bank alone cannot identify the differential effect of a shock: it combines changes in credit supply and demand, and in borrower composition. Instead, following the Khwaja-Mian logic, we use the credit registry to compare banks lending to the same narrow type of firm. Because many firms borrow from only one bank, demand controls based on firm categories allow a broader comparison than a specification restricted to simultaneous multi-bank borrowers (Degryse et al., 2019). This also corresponds to the model's structure, in which each firm is attached to one bank type.

For each horizon h, we estimate the following local-projection regression:

$$g^h_{ib,t} = \alpha^h_b + \alpha^h_{d(i),t} + \beta^h_{KM}(\text{Foreign}_b \times \varepsilon^{MP}_t) + e^h_{ibt}. \tag{50}$$

The outcome $g^h_{ib,t}$ measures growth in firm i's credit from bank b between the month before the shock and month $t+h$, including relationship entries and exits.[36] Foreign_b identifies foreign-owned banks, and ε^{MP}_t is the monthly Bauer–Swanson US monetary surprise. The estimation sample we use is 2007–2019. Bank fixed effects α^h_b absorb persistent differences across lenders, while demand-cell-by-month fixed effects $\alpha^h_{d(i),t}$ interact industry, state, firm

[36] We use a mid-point, otherwise known as arc-elasticity, growth rate. This lets us deal with entries and exits, is symmetric, less sensitive to outliers, and is a standard choice in this literature (Rivadeneira et al., 2024).

size and exporter status with the shock month, absorbing common demand movements.

The coefficient β^h_{KM} measures foreign banks' credit response relative to domestic banks serving the same type of firm. The identifying assumption here is that the demand controls absorb all the relevant differences in borrower demand. Aggregate shocks common to all banks are absorbed by the demand–time fixed effects.

Note that this comparison does not isolate the funding channel from Section 3.3, since there are other transmission channels operating at the bank level. For instance, a shock to the demand of a bank's other borrowers can affect the loan rate it offers to every firm.[37] Appendix C shows how all these portfolio-demand effects, ownership, and bank net worth channel enter the same empirical differential alongside funding costs.

Evidence on credit differentials. Figure 5 shows that foreign banks reduce lending to comparable firms by more after a US monetary tightening. This finding holds for total loans and for peso-denominated loans. The result therefore does not rely solely on the currency denomination of exporters' borrowing.[38]

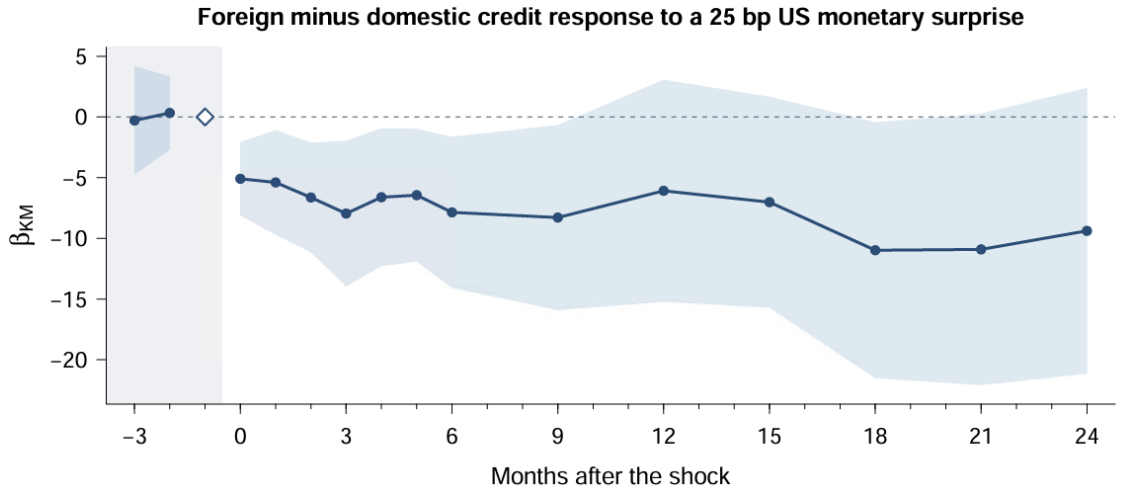


Figure 5: Foreign-minus-domestic credit response to a US monetary tightening. Local projections compare lenders serving the same industry–state–size–exporter cell in the same month, with bank fixed effects.

Loan rates rise by a few basis points more at foreign banks, although these estimates are imprecise. The signs of the price and quantity responses are consistent with a relative contraction in foreign-bank credit supply. Exporters attached to foreign banks also export less than comparable exporters at domestic banks after the tightening. Together, these

[37] Intuitively, if the borrowers of bank A all get hit hard by a shock and their demand is lower, but the borrowers of bank B don't get hit, this will show up as a relative credit "supply" shock to bank B.

[38] The differential is stronger on the extensive margin. We report decompositions in the Appendix.

findings connect the credit response to exporters' real activity and are consistent with the evidence in the literature (Morais et al., 2019; Cantú et al., 2022; Bruno and Shin, 2023).

Of course, this cross-sectional evidence cannot establish what the economy as a whole would have done without foreign banks. It measures the relative responses of firms within an economy in which both bank types operate and share an equilibrium deposit rate, exchange rate and goods demand. To move to our counterfactual economy, which we need to measure the aggregate gains, costs and exposure that international banks bring, we need to calibrate the full model, which we do in the next section.

4 Calibration

We calibrate the model at a quarterly frequency, using supervisory bank balance sheets and the credit registry to discipline banks' funding and lending, and external evidence to set preferences and technology (see Appendix D for details). The US monetary experiment is calibrated to the joint response of foreign rates, spreads and absorption. Trade services are disciplined separately by firm-level evidence on connections to specialized foreign banks; since these are key to our main results, we detail how we estimate them next.

4.1 Estimating the trade-services parameter γ_X

Clients of specialized foreign banks[39] export substantially more than comparable firms in the cross section: the raw cross-sectional gap in exports between firms that bank with a specialized foreign bank and firms that don't is 1.34 log points, but this could reflect exporter sorting rather than any higher productivity benefits supplied by banks. To measure these possible productivity benefits, we need to use the micro-data to get an effect within the same firm i. To begin, we use the annual exports of firms merged to the credit registry to estimate:

$$\ln \text{Exports}_{it} = \beta_{\text{SFB}} \text{SFB}_{i,t-1} + \varphi \text{Foreign}_{i,t-1} + \delta \ln \text{Credit}_{i,t-1} + \alpha_i + \alpha_{s\times r\times t} + \epsilon_{it} \tag{51}$$

The indicator $\text{SFB}_{i,t-1}$ equals one if firm i received credit from a specialized foreign bank in the previous year; $\text{Foreign}_{i,t-1}$ indicates credit from any foreign bank. $\text{Credit}_{i,t-1}$ is the firm's total borrowing from all banks during the previous year. Firm fixed effects α_i remove time-invariant exporter characteristics, and sector–state–year fixed effects $\alpha_{s\times r\times t}$ absorb common

[39] In this section, we refer to foreign banks outside of the five large foreign banks, as specialized foreign banks. Large foreign banks behave more like domestic banks (e.g., they raise a large amount of deposits).

local-sector shocks. The sample consists of positive-export firm-years between 2015 and 2023 (when our matching across databases is satisfactory), with standard errors clustered by firm.

Table 1: Specialized foreign-bank connections and firm exports

	Log exports at t		
	(1)	(2)	(3)
Specialized foreign bank at $t-1$	0.199	0.177	0.176
	(0.069)	(0.069)	(0.069)
Log credit at $t-1$		Yes	Yes
Any foreign bank at $t-1$			Yes
Firm fixed effects	Yes	Yes	Yes
Sector × state × year effects	Yes	Yes	Yes
Observations		88,321	

Firm-clustered standard errors in parentheses. Positive-export years, 2015–2023.

The estimates from Table 1 imply that firm exports are approximately 19% higher in years where the firm is connected to a specialized foreign bank. Adding total credit and an indicator for any foreign-bank relationship changes the estimate only modestly. Although the within-firm association is much smaller than the cross-firm gap we documented, consistent with a substantial role for sorting of export-intensive firms into foreign banks, we still find evidence of a premium at the firm-level. While a causal interpretation of these results would additionally require ruling out all time-varying firm shocks that jointly affect bank connections and exports, we believe this evidence is already suggestive, and we further refine it in an event-study design.

Event study. To examine whether the timing of bank-firm connection supports our interpretation, we replace the connection indicator with event-time dummies around the firm's first connection to a specialized foreign bank in our sample. Let T_i be the year the firm first connects to any specialized foreign bank, and use $k = -1$ as the reference period. We run:

$$\ln \text{Exports}_{it} = \sum_{k \neq -1} \beta_k \mathbf{1}\{t - T_i = k\} + \delta \ln \text{Credit}_{i,t-1} + \varphi \text{Foreign}_{i,t-1} + \alpha_i + \alpha_{s \times r \times t} + \epsilon_{it} \tag{52}$$

which follows the same definitions as Equation 51. Figure 6 plots the estimated coefficients. The estimate for the year before the reference period is close to zero, showing no evidence of a pre-trend. During the connection year exports increase significantly and remain higher in the next two years, although the confidence interval of the effect by the second year

includes zero. Although the event study alone does not remove all selection concerns, the timing does support our interpretation. Even if one considers the possibility that firms get some export opportunity which drives them to switch to a foreign bank, at least some fraction of this increase could be attributed to the new connection with the specialized foreign bank.

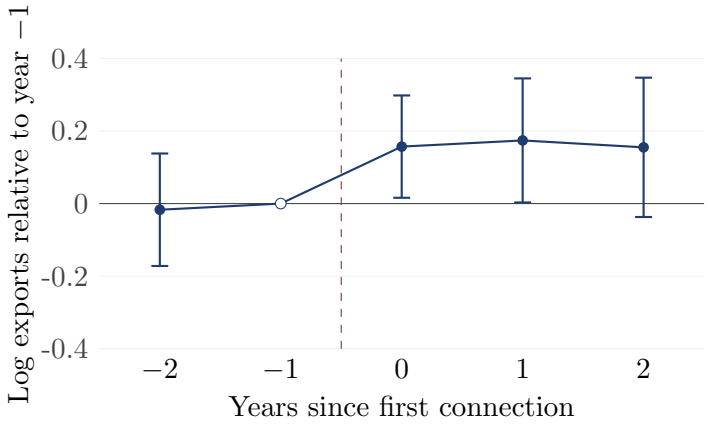


Figure 6: Exports around the first connection to a specialized foreign bank. Controls as in Table 1; reference year −1. Bars report 90% confidence intervals.

We now attempt to map our estimates of export growth into a calibration value for γ_X. Note that our estimate of β_{SFB} comes from the total value of exports, which are affected by substitution across varieties. With fixed demand, CES export revenue is proportional to the price raised to $1-\varepsilon$. In our model, a foreign-bank connection changes the exporter's price through both productivity and borrowing costs:

$$\Delta \ln(py) = (\varepsilon - 1)\left[\ln \gamma^{\text{spec}} - \Delta \ln \mathcal{R}_X\right], \qquad \ln \gamma^{\text{spec}} = \frac{\beta_{\text{SFB}}}{\varepsilon - 1} + \Delta \ln \mathcal{R}_X. \tag{53}$$

With our externally calibrated value $\varepsilon = 5$, the estimates 0.176–0.199 imply $\beta_{\text{SFB}}/(\varepsilon - 1) = 0.044$–$0.050$, or a productivity advantage of roughly 5% if the borrowing-cost change is small.[40]

4.2 Targeted moments and steady-state rates

Table 2 reports the parameter–moment mapping. The bank-specific funding targets match wholesale borrowing per unit of equity. The common diversion parameter θ disciplines

[40] As reported earlier, foreign banks' peso loans are more expensive, motivating the interpretation of this calculation as a lower bound for specialized-bank clients when their effective financing cost does not fall. The relevant restriction concerns the whole financing bundle, including dollar loans, rather than the peso rate alone.

leverage, while entry equity ι^d and ι^f help match the bank-specific peso loan rates through net-worth growth and franchise value. Household patience sets the resident funding rate. The sector-specific choice weights are inverted to match domestic banks' credit shares, and $\alpha_\$$ is used to match the dollar share of all loans.

Table 2: Targeted calibration

Parameter	Value	Target	Data	Source
$\hat{w}^d, \hat{w}^f$	1.11, 3.37	Wholesale/equity, d, f	1.24, 3.51	CNBV
θ	0.268	Risk-weighted bank leverage	6.23	CNBV
ι^d, ι^f	0.043, 0.044	Peso loan rates, d, f	6.0%, 5.4%	Registry
β	0.9896	Resident funding rate	4.2%	CNBV
ξ_{NT}, ξ_X	0.548, 0.353	Domestic-bank credit shares, NT, X	0.545, 0.35	Registry
$\alpha_\$$	0.30	Dollar share of loans	0.30	Registry
$\bar{R}^*, \bar{z}, \overline{\text{prem}}$	1.0%, 0.35%, 2.0%	US real rate, dollar spread, peso premium		FRED, SIE

Notes: Interest rates and spreads are reported in annual units.

The resulting steady-state real interest rates are ordered:

$$\bar{R} = 4.2\% > \bar{R}_P^W = 3.3\% > \bar{R}^W = 1.4\% > \bar{R}^* = 1.0\%, \tag{54}$$

where the displayed values are in annual net rates (the model object is the gross quarterly rate). Dollar wholesale borrowing is cheapest, peso wholesale borrowing is more expensive, and deposits are the most expensive debt funding source at the margin before accounting for the wholesale charge. This ordering supports the binding NOP regulation regime.

4.3 The US shock and other exogenous processes

Consider a US monetary tightening: it jointly moves R_t^*, z_t and C_t^*. We fit a VAR(2) process to the estimated responses to monthly identified, high frequency US monetary policy surprises from Bauer and Swanson (2023). This representation, the details of which are in the Appendix, allows for a persistent demand contraction alongside the funding-rate response. Measuring the UIP premium wedge prem_t, on the other hand, is not easy because it involves an expectation over the exchange rate. When we measure this wedge using survey data on expectations, we find it is volatile, not very persistent and uncorrelated with our other processes, so we model it independently from our VAR.[41]

The joint US block matches the estimated responses of the real world rate, the dollar funding spread and foreign absorption to a monetary surprise. Its low-order representation

[41] Independent foreign-taste ω_t^* and local productivity A_t disturbances also allow us to do additional experiments, which are reported in the Appendix E.

is given by (94); Appendix D reports coefficients and the normalization of the shock. This makes the funding and foreign-demand components of a US tightening mutually consistent without forcing them to have the same persistence.

We use a level AR(1) for the peso premium, with persistence 0.02 and standard deviation 3.5 percentage points, which we estimate from the previously referenced 2015–2019 survey measure on exchange-rate expectations. The independent spread process has persistence approximately 0.50, while foreign taste and productivity use illustrative persistence 0.9.

The Appendix reports untargeted moments and dynamic validation of the model, comparing its output to that from a VAR fitted to the Mexican economy.

5 Quantitative Results

We start by describing the economy's response to a US monetary tightening, separating the financial and the demand leg of the transmission.

5.1 A US monetary tightening

Figure 7 reports a joint US shock normalized to raise the world real interest rate by 25 annual basis points on impact (this is also used as a validation of the model in Appendix D). The dollar wholesale rate rises, and accordingly foreign absorption falls. The peso depreciates, home consumption and bank credit contract, and output falls in both productive sectors, although it does so more in the non-tradable sector. The figure also shows that during the first two years, firms banking with a foreign bank see their output decrease more than the firms banking with a domestic bank.

Both the deposit rate and the peso wholesale rate rise, with the latter increasing more initially. Foreign-bank loan rates rise about 8.2 bp more than domestic-bank rates on impact, and comparable borrowers at foreign banks lose approximately 0.10 percentage points more credit relative to borrowers of the domestic banking sector. This is consistent with the model's conditional funding prediction and the empirical direction of the credit-supply response.

5.2 Financial and demand transmission

As mentioned earlier, a foreign interest rate increase is experienced by the home economy as a simultaneous financial tightening and a negative foreign demand shock. Figure 8 uses our first-order solution to decompose the impact of the two effects, which we refer to as the financial and demand legs of the foreign interest rate shock. The financial component

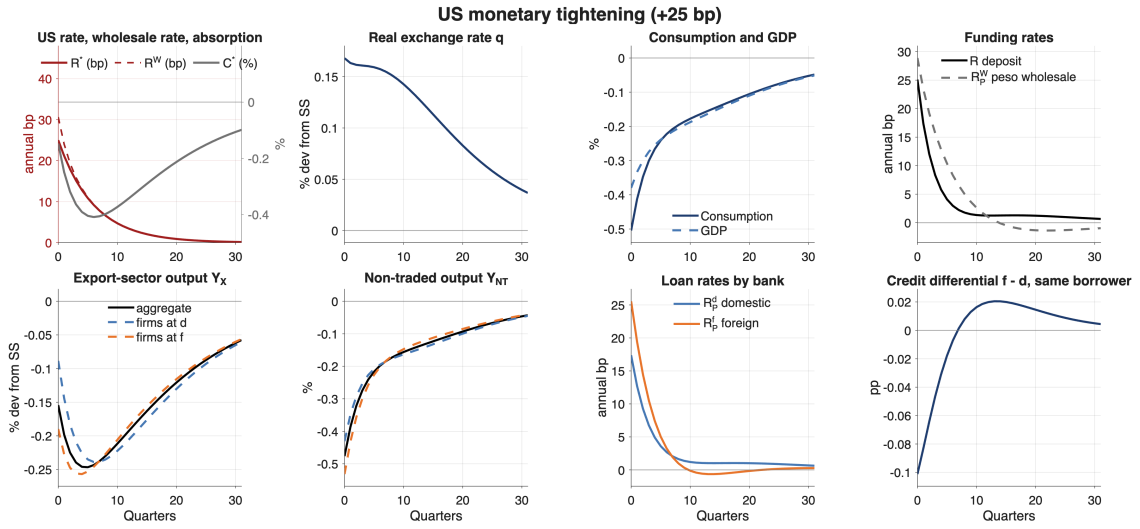


Figure 7: Responses to US monetary tightening. The joint shock raises the US real rate by 25 annual bp on impact and also moves the dollar spread and foreign absorption. Quantity responses are percent deviations from steady state; rate responses are annual bp.

transmits through funding costs, owner discounting, bank equity and loan rates. The demand component lowers export demand while holding the externally supplied financial-rate paths at baseline. Domestic rates, the exchange rate and bank balance sheets all still adjust endogenously in each case. At first order, the two components add to the response to the joint shock.[42]

Both components contribute materially to the initial consumption contraction; on impact, the financial component accounts for almost half of it. However, the demand component is more persistent and accounts for the longer decline in exports and activity. On impact, the real exchange rate q rises (a depreciation) for both channels, but only the demand leg from reduced foreign absorption is persistent and keeps its sign. The path of the credit-differential gap, on the other hand, is negative throughout for the financial leg (which captures the movement in the funding channel we presented in Section 3.3).

Other shocks. In addition the model allows us to run financial-price shocks (the premium prem_t), technology shocks (A_X, A_{NT}) and pure-export demand shocks (ω_t^*). Their full impulse responses appear in Appendix E.

[42] A similar exercise is performed in Camara et al. (2025). They too find that while both demand and financial shocks are important, the former are more persistent.

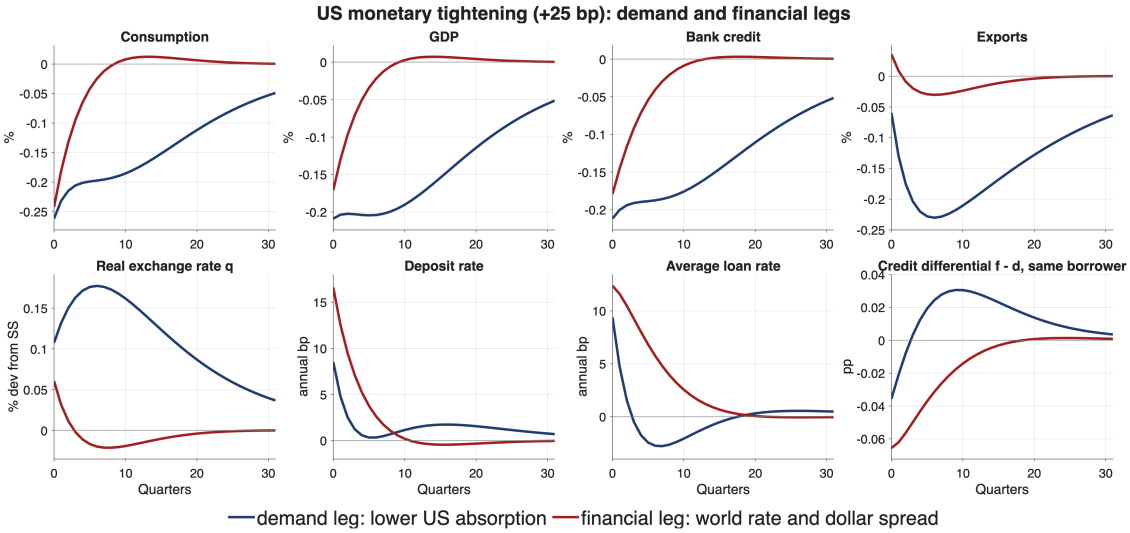


Figure 8: Financial and demand components of the US monetary shock. The financial component moves world rates and the dollar spread; the demand component moves foreign absorption.

5.3 Hosting foreign banks: steady-state gains and costs

We now go to our main exercise where we compare the benchmark economy with foreign banks, to a counterfactual one without them, in which firms obtain their credit from domestic banks.[43] It is a comparison of different equilibria, rather than a transition experiment, as would be the case following an acquisition or an abrupt bank exit.

Figure 9 presents the steady-state gains in the form of consumption in our benchmark relative to the economy without foreign banks. It separates the different factors at play. The contribution of the trade services from foreign banks to exporters γ_X is 2.33% at $\gamma_X = 1.05$, our preferred parameter following the exercise in Section 4.1. These gains would, of course, disappear under $\gamma_X = 1$ – although the rest of the values presented here are quantitatively not affected by the choice of γ_X. Cheaper funding contributes about 0.12% of steady-state consumption, while wholesale interest paid abroad contributes −0.43%. At our preferred services value, these components sum to about 2.02%. However, this ignores the dividends that foreign banks remit to their parents abroad: this component contributes −0.88%, which if we sum across leaves a net gain of about 1.15%.

The principal source of gains stemming from the presence of foreign banks is therefore the exporter service advantage. The price benefit from cheaper credit is small relative to foreign interest payments; without trade services, the displayed funding and interest components

[43] In the numerical implementation, the domestic-bank choice weights in both sectors are set close to one ($\xi_{NT} = \xi_X = 0.999$), with the remaining primitives held fixed and equilibrium recomputed. This approximates removing foreign-bank lending while preserving domestic banks' access to wholesale funding.

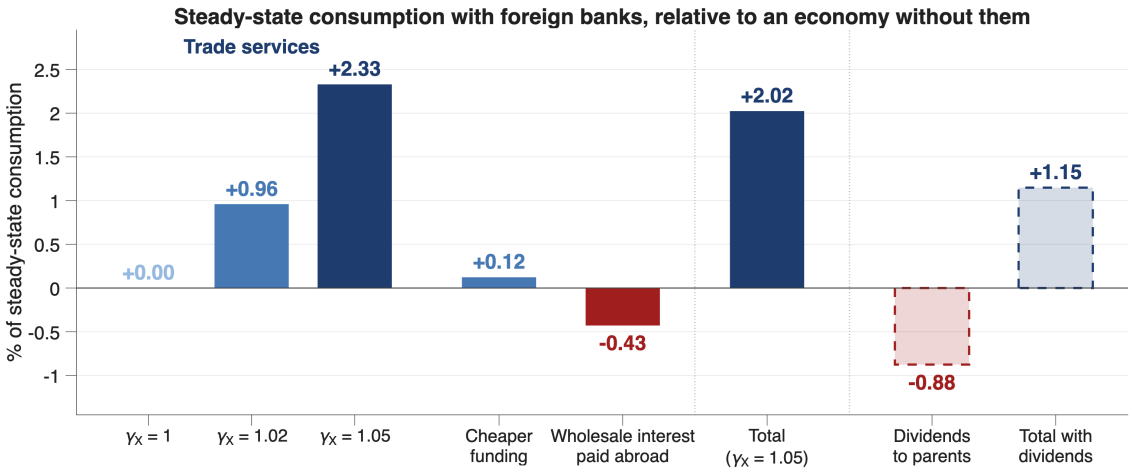


Figure 9: Steady-state consumption with foreign banks relative to an economy without them. Services are evaluated at $\gamma_X = 1$, 1.02 and 1.05. The figure separately reports cheaper funding, wholesale interest and the dividend adjustment.

would imply a negative consumption-level effect. Ownership matters because a part of the banking surplus accrues to nonresidents – in this sense López Obrador's claim about the importance of accounting for foreign banks' profits was not misguided.[44] But there are real reasons to believe the benefits from the exporter services outweigh those lost dividends, which could be interpreted as compensation for the additional productivity. In our calculations, the net level effect of the foreign banks is positive.

5.4 Hosting foreign banks: exposure to foreign interest rates

We now turn to the question of how much additional volatility the presence of the foreign banks brings. We narrowly focus on measuring the amplification in the response to foreign interest rate shocks like the one in Section 5.1. For this, the IRFs are enough. In Figure 10 we compare the response of the two economies (our benchmark with foreign banks and our counterfactual without foreign banks), to the same foreign monetary tightening shock. The economy without foreign banks contracts only slightly less. Consumption falls about 0.50% in the benchmark and 0.48% without foreign banks on impact; the respective cumulative two-year responses are approximately -2.50 and -2.30.

Hence, hosting foreign banks amplifies the impact consumption response by about 4% and the cumulative two-year response by about 9%. These are percentage differences between response magnitudes, not percentage-point declines in consumption. The additional exposure

[44] Of course, this is under our working assumption of "home bias", i.e., fully segmented ownership of the banks. The calculation is less stark if Mexicans own some stock of BBVA or Citi Banamex, which is likely the case. We report the pre-dividend and post-dividend calculations for this reason.

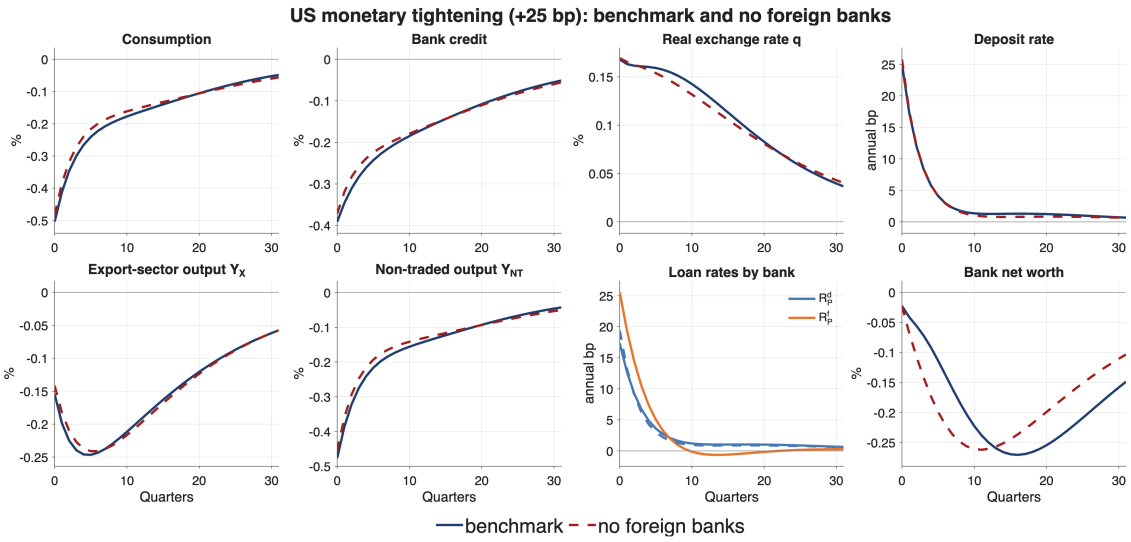


Figure 10: Responses to US tightening in the benchmark and in the economy without foreign banks. Each response is measured relative to that economy's own steady state.

is therefore very modest: domestic banks also borrow abroad (and would keep doing so regardless of the presence of foreign banks) and the economy remains subject to the same foreign-demand contraction. Replacing foreign banks neither insulates domestic funding prices nor eliminates trade exposure – only autarky would.

5.5 NOP regulation and its interaction with foreign banks

We now return to the question of how the bank regulation affects the response of the economy. In particular, we want to think about how the economy would react without it, and how this interacts with the presence of foreign banks. Removing the NOP limit changes the optimal currency composition of funding. At the benchmark premium, banks use the cheaper dollar wholesale line,[45] so in the unregulated economy banks hold no peso wholesale debt and the NOP constraint is slack; we recompute the equilibrium and steady state under that regime.

Without the limit, steady-state consumption is 0.42% higher (the economy has more access to cheaper funding) and the non-tradable sector is relatively larger (in our benchmark, dollar lending relaxes the binding regulation, so dollar loans are priced cheaper, which benefits exporters in equilibrium). The economy also reacts more strongly to a US tightening, particularly through bank net worth. Figure 11 shows that the larger short dollar positions increase the immediate losses from depreciation and deepen the contraction in lending and consumption.

[45] In our calibration, even though they are risk-averse and carry an SDF as shown in the bank problem's solution, banks still go for the corner solution and borrow all wholesale funds in dollars.

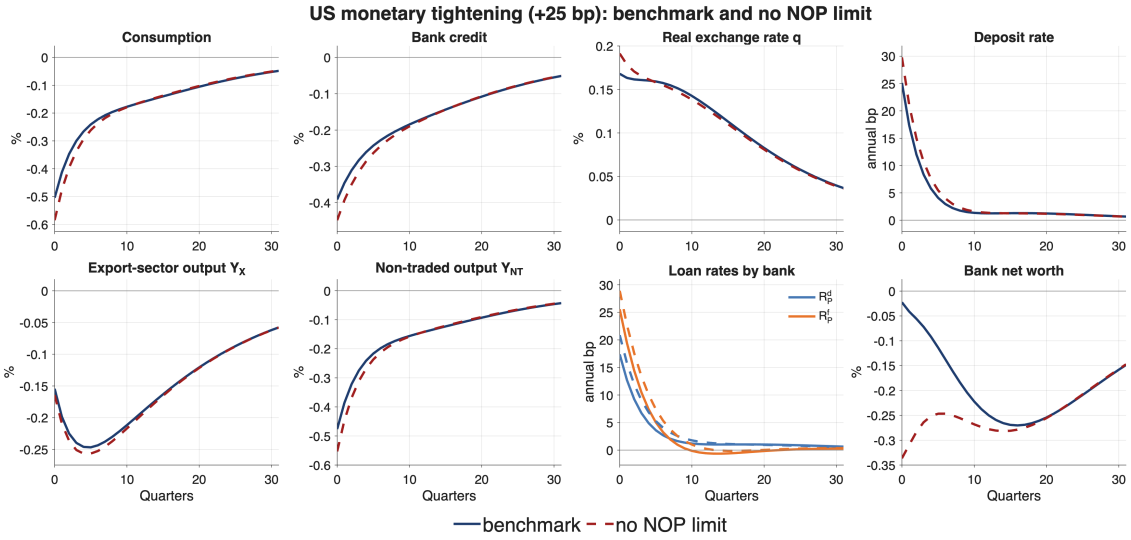


Figure 11: US tightening with and without the NOP limit. Removing the cap increases the immediate net-worth loss and the consumption contraction.

Table 3 combines the ownership and regulatory counterfactuals. Foreign banks increase the consumption decline on impact by about 4% with the NOP limit and 13% without it. The regulation thus helps explain why the additional exposure is small in the benchmark: foreign banks' foreign borrowing is done mostly in pesos and so no additional currency risk is brought on by their introduction. Comparing the four economies shows the interaction of the two features.

Table 3: Consumption responses to a 25 bp US tightening

	Both bank types	No foreign banks
NOP limit	−0.50 / −2.50	−0.48 / −2.30
No limit	−0.59 / −2.80	−0.52 / −2.45

Notes: Entries are the impact / cumulative response over two years. The first is a percent deviation from the economy's steady state; the second sums the quarterly percent deviations over the two-year window.

Figure 12 illustrates these results by computing the additional amplification relative to the economy without foreign banks and with the regulation. It makes clear that the interaction of foreign banks with the regulation removal would result in a much larger amplification of foreign shocks.

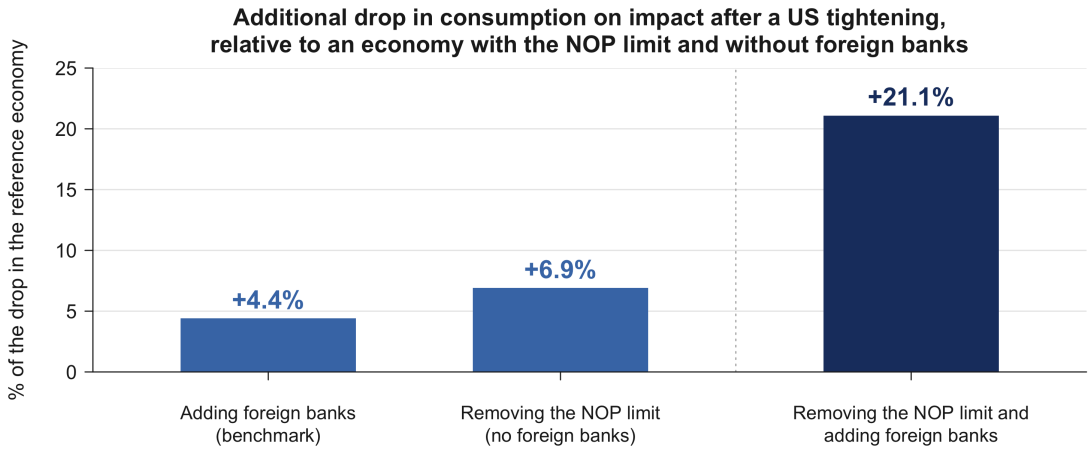


Figure 12: Additional drop in consumption from adding Foreign Banks and Removing the NOP regulation.

6 Conclusion

This paper asked what an emerging market gains and gives up by hosting foreign banks, using Mexico as a case study. We began using micro-data to show that foreign banks differ from domestic ones in two ways: they lend disproportionately to exporters and fund themselves more through cross-border and wholesale sources. A quantitative model built around these two differences links them to credit supply: because foreign banks' funding is priced off world rates, their lending to comparable firms contracts more after a US monetary tightening, as it does in the literature and in the credit registry.

We then use the model to trace the transmission of foreign interest rate shocks, and to construct a counterfactual economy without foreign banks with which to answer our main question. Quantitatively, we find that the gains from hosting foreign banks arise primarily from trade services to exporters. Cheaper loan rates alone contribute little relative to the associated payments abroad. At our benchmark, the steady-state consumption gain is between 1.2% and 2%, depending on how one accounts for the exit of dividends from the economy, and the value of those trade services. In this respect, foreign banks are a net benefit to the economy.

On the other hand, the additional exposure to interest rate shocks that foreign banks bring is modest under existing regulation: about 4% on impact and 9% over two years for consumption. Domestic banks' access to foreign funding means that the economy remains exposed even without foreign banks. Existing bank regulation is one of the reasons why the introduction of foreign banks doesn't drastically increase the exposure of the economy. The regulation, which caps the net short dollar position of banks, limits net-worth losses caused

by depreciation. Without it, foreign banks amplify the impact response by about 13%, while steady-state consumption is 0.42% higher. Hence, foreign banks can be brought into the economy safely, without adding much volatility, if the proper regulation is in place.

Some caveats apply and point towards future work in the subject. Our comparisons quantify levels and responses to a specified shock – a full welfare assessment, in progress, requires transition dynamics in addition to the full distribution of shocks. Moreover, our model is one of an economy with a mature banking sector, for which in steady-state there is no need for additional capital (bank net worth accumulation). For developing economies starved for capital and away from steady state, the benefit of additional bank net worth which can further intermediate lending also needs to be considered. Beyond this, the entrance of foreign banks might also change the degree of financial frictions in the economy (including those that our model captures via θ). How the spreading of foreign banks might interact with a country's financial development – beyond the accumulation of bank net worth – seems to us a productive avenue for future inquiry and modeling. Finally, in addition to ignoring issues of bank competition, our model abstracts from the role of bank monitoring, for which domestic banks might have a relative advantage at monitoring soft-information customers (Detragiache et al., 2008). Taking all these and other related factors into account would be important when applying the framework to other countries.

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A Setting Details and Additional Empirical Evidence

A.1 Global foreign-bank presence

The cross-country comparison illustrates the heterogeneity in foreign-bank presence that motivates the paper.

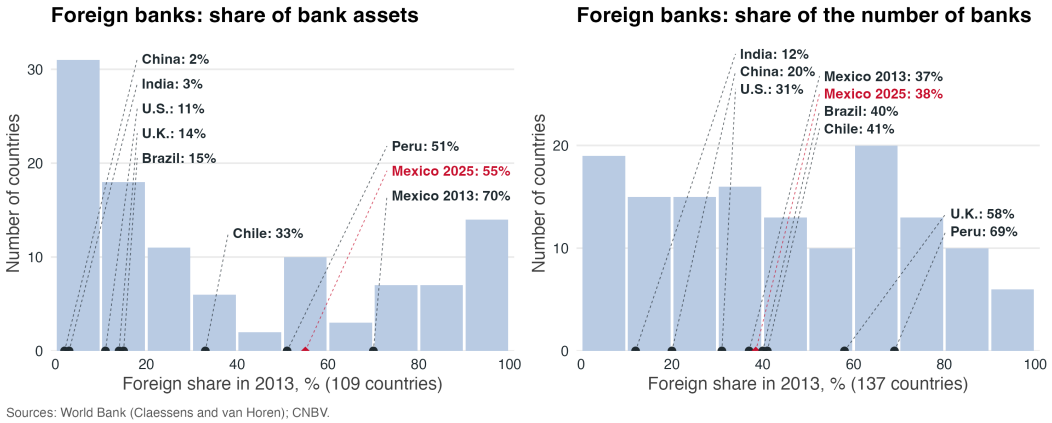


Figure 13: Foreign-bank presence across countries.

When in 2014 the government of Hungary announced a preliminary agreement to acquire Budapest Bank from GE Capital, part of the financial stability argument made rested on the claim that foreign banks made the economy more vulnerable, as shown during the 2008 crisis, when they had withdrawn funds from Central Europe and repatriated them to their home countries.[46] A similar argument was made when Poland made a major push to increase domestic ownership of the banking system in 2017. Then-deputy prime minister, minister of development and minister of finance of Poland, Mateusz Morawiecki was quoted as saying "My next goal is further repolonization [...]. In the case of the acquisition of Bank Pekao SA, the second largest bank in Poland, we are restoring the proper balance of Polish and foreign capital in the financial market, once again—after many years—achieving a 50/50 ratio. For all reasonable thinkers, not ultraliberal doctrinaires, after the 2008 crisis, it became clear that capital has a homeland."[47] This is not to say skepticism of foreign banks has been the

[46] Viktor Orbán candidly summarized this view in a speech: "There were huge debates about whether in the modern era it is at all meaningful to use the term 'national banking system', as 'money has no smell'. My approach is different, and it is that although money indeed has no smell, its owners do. I believe that the 2008 financial crisis supports my belief, because back then it emerged that, although bank capital allegedly has no nationality, when lending opportunities in the world began to shrink, lo and behold, the banks didn't start disinvestment in their own countries, but here in Central Europe, repatriating their money to Austria and Germany. Therefore the truth is that when things are going well money has no smell, but when things are not going well, all of a sudden, it has a nationality. And from this the single responsible conclusion we can draw is that we need a national banking system that is in Hungarian hands."

[47] Mateusz Morawiecki, interview with *Polska The Times*, 5 January 2017.

only perspective; the Philippines and Ethiopia removed their limits on the entry of foreign banks to their financial systems in 2014 and 2024 respectively, but they did so in the midst of debates weighing the "pros" of strengthening the country's links to global financial and trade markets[48] against the costs from expected additional exposure to external shocks.[49]

A.2 The Mexican banking system: details

Figure 14 presents the Mexican banking system in 2025, highlighting banks' size and country of origin. It highlights the coexistence of large and small domestic and foreign-owned banks.

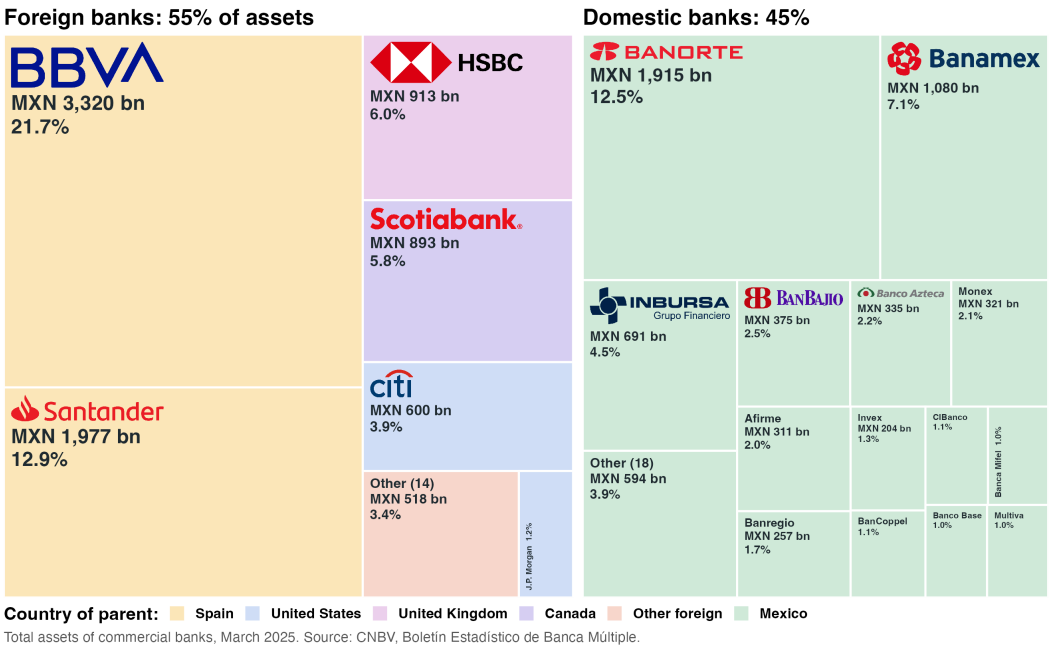


Figure 14: The Mexican banking system. Source: CNBV.

Having nationalized its banking system in the 1980s as a result of the Latin American Debt Crisis, the Mexican government first sold many banks back to Mexican private groups in the 1990s, before the 1994 Tequila crisis required government interventions in the banking sector. In 1997 Mexico liberalized its financial system to allow further entry of foreign banks, most of which happened in the early 2000s (such as the Citi acquisition of Banamex in 2001),

[48] In the Philippines the Monetary Board was explicitly instructed to "consider strategic trade and investment relationships between the Philippines and the country of incorporation of the foreign bank" when considering entry applications. See Republic Act No. 10641, "An Act Allowing the Full Entry of Foreign Banks in the Philippines," 15 July 2014, sec. 2.

[49] Fereja (2024), who surveys bank practitioners in Ethiopia, finds significant support for the entry of foreign banks coexisting with widespread fear foreign banks may lead to capital outflows during banking crises.

before our period of analysis and data availability. A detailed account of the process of foreign bank entry, including a valuable analysis of the political economy factors and institutional constraints that shaped it is provided by Haber and Musacchio (2013). Castellanos et al. (2016) provide a recent analysis of the competition in the Mexican banking sector. A longer history of the subject can be found in Del Ángel and Marichal (2003).

A.3 Foreign banks' funding: details

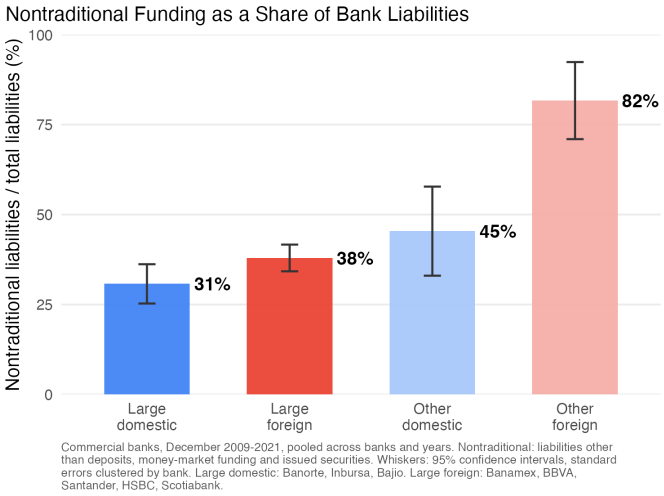


Figure 15: Banks' nontraditional funding composition.

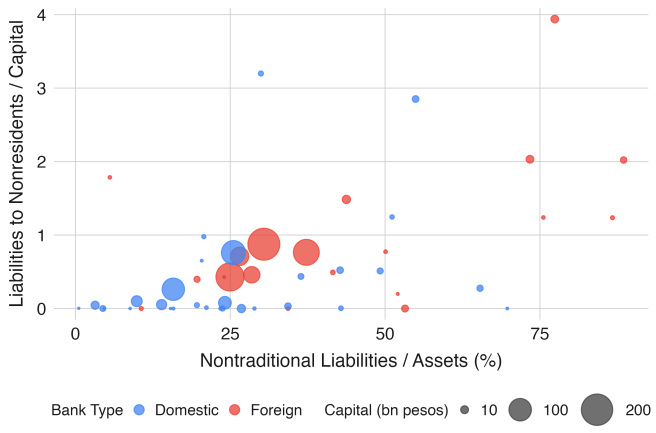


Figure 16: Nontraditional vs. cross-border funding by bank (2021).

A.3.1 Pass-through of policy rates into banks' funding costs

We use a panel of quarterly data, 2008Q1–2021Q4, which covers every commercial bank in CNBV's supervisory balance sheets, consolidated with the bank's SOFOM subsidiaries. A bank's funding cost in a quarter is its interest expense over the quarter divided by its average funding over the same months, annualized, where funding is CNBV's own denominator: deposits, money-market funding, issued securities, loans from banks and other organizations, financial-instrument liabilities and subordinated debt. Quarterly interest expense is obtained by differencing the year-to-date line month by month.[50] Policy rates are the quarterly averages of the Banxico overnight target and the effective federal funds rate.

For bank b in quarter t,

$$\Delta r_{b,t} = \alpha_b + \sum_{k=0}^{3} \left(\beta_k + \beta_k^F \,\text{Foreign}_b\right) \Delta i_{t-k}^{MX} + \sum_{k=0}^{3} \left(\gamma_k + \gamma_k^F \,\text{Foreign}_b\right) \Delta i_{t-k}^{US} + \varepsilon_{b,t}, \tag{55}$$

where $r_{b,t}$ is the funding cost, i^{MX} and i^{US} are the two policy rates and Foreign_b indicates a foreign-controlled bank. Observations are weighted by the bank's average funding, so that the estimates describe the funding of the group balance sheet rather than the average bank, and standard errors are clustered by bank. Table 4 reports the one-year pass-through, $\sum_k \beta_k$ for domestic banks and $\sum_k(\beta_k + \beta_k^F)$ for foreign banks, and likewise for the federal funds rate, for all banks and for the eight largest.

Foreign banks funding costs move comparatively more with the federal funds rate, while domestic banks follow more closely the domestic rate. A percentage point of the Mexican policy rate passes 0.57 into domestic banks' funding costs and 0.23 into foreign banks'; a percentage point of the federal funds rate passes 0.42 into domestic banks' costs and 0.85 into foreign banks'. Among the eight largest banks, where the small banks' volatile costs no longer enter, we get similar estimates: 0.54 against 0.31 for the Mexican rate and 0.23 against 0.68 for the US rate. The pattern is the one the model leads to, with domestic banks' marginal funding priced off the home rate and foreign banks' off the world rate.

Robustness. The exercise is robust to replacing the Banxico target by the 28-day interbank rate (TIIE) which changes no estimate by more than 0.03; TIIE sits a constant 33 basis points above the target and their quarterly changes are correlated at 0.997. The ownership split can also be replaced by the bank's own funding structure: interacting the lags with the share of liabilities owed to nonresidents at the previous December, centered at its

[50] Bank of America's valuation losses, which CNBV books within interest expense, are removed; two derivative dealers whose average cost exceeds 100% of a negligible funding base are dropped.

Table 4: One-year pass-through of policy rates into banks' funding costs

	All banks			Large banks		
	Domestic	Foreign	Difference	Domestic	Foreign	Difference
Banxico target rate	0.57	0.23	-0.34	0.54	0.31	-0.23
	(0.06)	(0.10)	(0.12)	(0.04)	(0.04)	(0.06)
Federal funds	0.42	0.85	0.44	0.23	0.68	0.45
	(0.20)	(0.22)	(0.30)	(0.09)	(0.06)	(0.11)
Bank-quarters		1,678			412	
Banks		54			8	
Bank fixed effects		Yes			Yes	

Quarterly change in the bank's average funding cost (interest expense over average funding, annualized) on the current and three lagged quarterly changes in the Banxico overnight target rate and in the federal funds rate, each interacted with foreign ownership, 2008Q1–2021Q4. Entries are the sums of the four coefficients for each bank type; the difference is the sum of the interaction terms. Weighted by the bank's average funding; standard errors in parentheses, clustered by bank. Large banks: Banorte, Inbursa, Bajío; Banamex, BBVA, Santander, HSBC, Scotiabank.

funding-weighted mean of 7%, each 10 percentage points of cross-border funding shift the one-year pass-through by −0.46 (s.e. 0.22) for the Mexican rate and +0.90 (0.53) for the US rate. With both nonresident liabilities and ownership in the regression the ownership indicator is no longer significant: this means foreign ownership is really picking up the effect of cross-border funding.

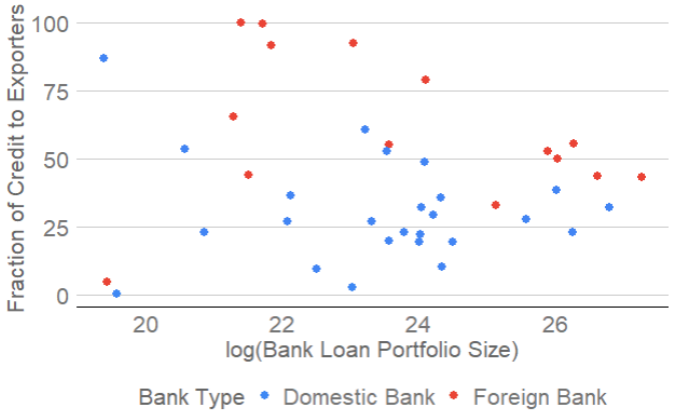


Figure 17: Banks' fraction of lending to exporters vs loan portfolio size, 2023.

A.4 Trade services and foreign banks' lending

Figure 18 illustrates services advertised by foreign banks to exporters. It motivates the distinction between the interest rate on credit and the trade-related services supplied alongside a banking relationship. Many of these trade-related services banks advertise concern letters of credit (Niepmann and Schmidt-Eisenlohr, 2017b,a). The quantitative parameter γ_X is disciplined by the firm evidence in Section 4.1.



Figure 18: Trade services marketed by selected foreign banks in Mexico.

Table 5 reports the loan-pricing comparison conditional on firm–year fixed effects and loan volume. The foreign-bank coefficient is positive for peso loans and negative for dollar loans. Its units are percentage points of the interest rate: 0.918 corresponds to approximately 92 bp, while -0.455 corresponds to approximately -46 bp. Most credit is in pesos for both exporters and non-exporters, as shown in Figure 19. The sorting of exporters toward foreign banks is therefore not a simple consequence of foreign banks charging lower rates in every currency.

B Model: Details

B.1 Solving the banker's problem

We solve the banker's problem, suppressing the bank index b for conciseness. Consider the benchmark branch with a binding incentive constraint, a binding NOP regulatory limit,

Table 5: Loan pricing by bank ownership and currency

	Interest rate (%)	
	Peso	Dollar
Log loan volume	-0.752^{***}	-0.147^{***}
	(0.002)	(0.011)
Foreign bank	0.918^{***}	-0.455^{***}
	(0.008)	(0.030)
Fixed effects	Firm × year	Firm × year
Observations	7,102,149	72,005
Adjusted R^2	0.586	0.941

Standard errors in parentheses. $^{***}p < 0.01$.

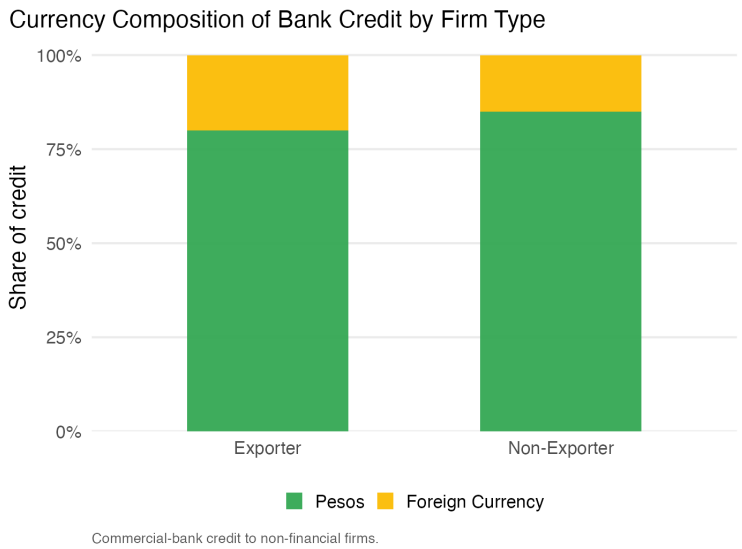


Figure 19: Currency composition of credit to exporters and non-exporters.

positive deposits and both wholesale lines, and an interior borrower mix. The balance sheet and currency cap imply

$$w_{\$,t} = a_t\phi_t + \Gamma, \qquad w_{P,t} = w_t - a_t\phi_t - \Gamma, \qquad \delta_t = \phi_t - 1 - w_t + c(w_t). \tag{56}$$

where $c(w_t) = \chi/2(w_t - \hat{w})^2 = \mathcal{C}_t/N_t$ corresponds to the wholesale funding charge per unit of net worth (which depends only on the wholesale funding ratio w_t).

Substitution into the return on net worth gives

$$\begin{aligned} g_{t+1} = {} & (R_{P,t} - R_t)\phi_t + R_t[1 - c(w_t)] + (R_t - R^W_{P,t})w_t + \Gamma(R^W_{P,t} - \rho_{t+1}R^W_t) \\ & + a_t\phi_t[R^W_{P,t} - R_{P,t} + \rho_{t+1}(R_{\$,t} - R^W_t)]. \end{aligned} \tag{57}$$

Define the expected bank-adjusted discount factor $\mathcal{H}_t = \mathbb{E}_t\Omega_{t,t+1}$ and the value-weighted expected depreciation

$$\rho^\Omega_t = \frac{\mathbb{E}_t[\Omega_{t,t+1}\rho_{t+1}]}{\mathcal{H}_t}. \tag{58}$$

Then the objective can be rewritten as $(S_t + a_tJ_t)\phi_t + B_t(w_t)$, where

$$S_t = \mathcal{H}_t(R_{P,t} - R_t), \tag{59}$$

$$J_t = \mathcal{H}_t[R^W_{P,t} - R_{P,t} + \rho^\Omega_t(R_{\$,t} - R^W_t)], \tag{60}$$

$$B_t(w) = \mathcal{H}_t\{R_t[1 - c(w)] + (R_t - R^W_{P,t})w + \Gamma(R^W_{P,t} - \rho^\Omega_t R^W_t)\}. \tag{61}$$

Binding incentive compatibility therefore gives

$$\phi_t = \frac{B_t(w_t)}{\theta - S_t - a_tJ_t}, \qquad \Psi_t = \frac{\theta B_t(w_t)}{\theta - S_t - a_tJ_t}. \tag{62}$$

At an interior asset mix the currency condition is $J_t = 0$. The funding optimum satisfies $B'_t(w_t) = 0$, or

$$R_t[1 - \chi(w_t - \hat{w})] = R^W_{P,t}, \qquad B''_t(w_t) = -\mathcal{H}_tR_t\chi < 0. \tag{63}$$

This proves the funding condition and loan-rate parity in the main text. The bank's asset composition cannot be pinned down from parity alone; equilibrium implies $a_t = \alpha_\$L_{X,t}/L_t$, the latter of which is pinned down from loan demand and sorting.

The equilibrium must also satisfy positive deposits and wholesale positions, a feasible asset share and a finite leverage limit. On the regular branch, $0 < S_t < \theta$ and $B_t > 0$ give increasing value in lending and finite leverage. The NOP regulatory limit binds when peso funding is more expensive in value-weighted terms, $R^W_{P,t} > \rho^\Omega_t R^W_t$. At first order around the deterministic benchmark, this corresponds to the positive peso premium; under general

uncertainty, the covariance with the bank's discount factor also enters here.

B.2 Market clearing and equilibrium conditions

The markets for nontradable goods, tradable goods, labor and deposits clear:

$$\begin{aligned} Y_{NT,t} &= C_{NT,t}, \qquad Y_{X,t} = C_{X,t} + C^*_{X,t}, \\ H_t &= H_{NT,t} + H_{X,t}, \qquad D_t = D^d_t + D^f_t. \end{aligned} \tag{64}$$

Aggregate input demands are

$$H_{NT,t} = \sum_b \text{share}^b_{NT,t} \frac{y^b_{NT,t}}{A_{NT,t}}, \tag{65}$$

$$H_{X,t} = \sum_b \text{share}^b_{X,t} \frac{(1-\alpha_X) MC^b_{X,t} y^b_{X,t}}{\mathsf{w}_t}, \qquad M_{X,t} = \sum_b \text{share}^b_{X,t} \frac{\alpha_X MC^b_{X,t} y^b_{X,t}}{q_t}. \tag{66}$$

The market for loans also clears. Each bank's sectoral lending is given by:

$$L^b_{S,t} \;=\; \text{share}^b_{S,t} \left(\mu \mathcal{R}^b_{S,t}\right)^{-\varepsilon} \left(MC^b_{S,t}\right)^{1-\varepsilon} p^{\varepsilon}_{S,t} Y_{S,t}. \tag{67}$$

with sector price indices $p_{S,t} \;=\; \left[\sum_{b\in\{d,f\}} \text{share}^b_{S,t} \left(p^b_{S,t}\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$

Global lenders supply the wholesale funds demanded by the banks at the quoted rates.

B.3 Steady-state bank ratios and loan rates

Stationarity of sector net worth requires

$$\bar{g}^b = \frac{1-\iota^b}{\sigma}, \qquad \bar{\Lambda}^d = \frac{1}{\bar{R}}, \quad \bar{\Lambda}^f = \frac{1}{\bar{R}^*}. \tag{68}$$

The value recursion and incentive constraint give

$$\bar{\Psi}^b = \frac{\bar{\Lambda}^b (1-\sigma)\bar{g}^b}{1 - \bar{\Lambda}^b \sigma \bar{g}^b}, \qquad \bar{\phi}^b = \frac{\bar{\Psi}^b}{\theta}. \tag{69}$$

The denominator must be positive for finite franchise value. Funding ratios, charges and dollar borrowing satisfy

$$\bar{w}^b = \hat{w}^b + \frac{1 - \bar{R^W_P}/\bar{R}}{\chi}, \qquad \bar{c}_b = \frac{\chi}{2}(\bar{w}^b - \hat{w}^b)^2, \tag{70}$$

$$\bar{w}^b_{\$} = \bar{a}^b \bar{\phi}^b + \Gamma, \qquad \bar{w}^b_P = \bar{w}^b - \bar{a}^b \bar{\phi}^b - \Gamma, \tag{71}$$

$$\bar{\delta}^b = \bar{\phi}^b - 1 - \bar{w}^b + \bar{c}_b. \tag{72}$$

Define

$$\bar{K}_b = \bar{R}(1 - \bar{c}_b) + (\bar{R} - R_P^{\bar{W}})\bar{w}^b + \Gamma(R_P^{\bar{W}} - \bar{R}^W). \tag{73}$$

The return equation and currency parity then imply

$$\bar{R}_P^b = \bar{R} + \frac{\bar{g}^b - \bar{K}_b}{\bar{\phi}^b}, \qquad \bar{R}_\$^b - \bar{R}_P^b = \bar{R}^W - R_P^{\bar{W}} \tag{74}$$

These equations determine bank ratios and rates conditional on steady-state prices and primitives. Loan demand, household decisions and external balance determine the corresponding aggregate quantities and sector equity.

C First-Order Transmission

C.1 Demand for bank's loans

For the input bill of one firm,

$$d\log(MC_S y_S^b) = d\log Y_S + \varepsilon d\log p_S - (\varepsilon - 1)d\log MC_S - \varepsilon d\log \mathcal{R}_S^b. \tag{75}$$

Let $\pi_S^b = \bar{L}_S^b/\bar{L}^b$ be sector S's share of bank b's portfolio. Adding borrowers and sectors gives

$$\begin{aligned} d\log L^b = \sum_S \pi_S^b \Big[& d\log Y_S + \varepsilon d\log p_S - (\varepsilon - 1)d\log MC_S \\ & + d\log s_S^b - \varepsilon d\log \mathcal{R}_S^b \Big]. \end{aligned} \tag{76}$$

When effective financing changes can be approximated by the peso loan-rate change, this reduces to

$$d\log L^b \approx d\log \mathcal{D}^b - \varepsilon dR_P^b, \tag{77}$$

$$d\log \mathcal{D}^b = \sum_S \pi_S^b \left[d\log Y_S + \varepsilon d\log p_S - (\varepsilon - 1)d\log MC_S + d\log s_S^b \right]. \tag{78}$$

The full expression also allows changes in the common currency funding wedge. Even when firms in the same sector face common demand, banks face different aggregate loan demand because their portfolios contain different proportions of exporters. A contraction in export demand lowers $\mathcal{D}^b$ more at a bank with a larger exporter share.

C.2 Bank margin and credit supply: details

Let $h_t = R^W_{P,t} - R^W_t \mathbb{E}_t \rho_{t+1}$ denote the common currency funding wedge. To first order, expected incumbent returns can be written as:

$$\mathbb{E}_t g^b_{t+1} = (R^b_{P,t} - R_t)\phi^b_t + K^b_t, \quad K^b_t = R_t[1 - c_b(w^b_t)] + (R_t - R^W_{P,t})w^b_t + \Gamma h_t. \tag{79}$$

The funding first-order condition removes the direct change in the optimal wholesale ratio from the envelope derivative:

$$dK^b_t = (\bar{\phi}^b - \bar{\delta}^b)dR_t - \bar{w}^b dR^W_{P,t} + \Gamma dh_t. \tag{80}$$

Define

$$\psi^b_t = d\log \Psi^b_t = d\log \phi^b_t, \quad n^b_t = d\log \mathcal{N}^b_t, \quad \lambda^{\Lambda,b}_t = \mathbb{E}_t d\log \Lambda^b_{t,t+1}, \quad \vartheta_b = \sigma \bar{\Lambda}^b \bar{g}^b. \tag{81}$$

Log differentiation of the value recursion yields

$$\begin{aligned} \bar{K}_b \psi^b_t = \bar{\phi}^b dR^b_{P,t} - \bar{\delta}^b dR_t - \bar{w}^b dR^W_{P,t} + \Gamma dh_t + \bar{g}^b \lambda^{\Lambda,b}_t \\ + \bar{g}^b \vartheta_b \mathbb{E}_t \psi^b_{t+1}, \qquad d\log L^b_t = n^b_t + \psi^b_t. \end{aligned} \tag{82}$$

Here $\lambda^{\Lambda,d}_t = -dR_t/\bar{R}$ and $\lambda^{\Lambda,f}_t = -dR^*_t/\bar{R}^* - \mathbb{E}_t d\log \rho_{t+1}$. The equation separates current loan earnings, debt funding, the currency wedge, owner discounting and continuation value.

To retain the exact local financing-rate coefficients in demand, define $\alpha^{\text{loan}}_{NT} = 0$ and $\alpha^{\text{loan}}_X = \alpha_\$$. Then

$$d\log \mathcal{R}^b_{S,t} = \frac{dR^b_{P,t} - \alpha^{\text{loan}}_S dh_t}{\bar{\mathcal{R}}^b_S}. \tag{83}$$

Substituting this expression into (76) preserves the effects of differing steady-state financing rates and changing currency premia. Approximating these rates and $\bar{K}_b$ by one, and holding continuation and current equity fixed, gives the conditional pass-through formulas in the main text. The simple forward-gap formula additionally uses common bank coefficients and the approximation $\bar{g}\vartheta \approx 1$.

C.3 Exchange rate channels

The exchange rate affects transmission through three distinct margins. First, its level changes imported-input costs and foreign demand. At fixed productivity:

$$d\log MC_X = (1-\alpha_X)d\log \mathsf{w}+\alpha_X d\log q, \qquad d\log C_M^* = d\log \omega^*+d\log C^*-\eta^* d\log p_X+\eta^* d\log q. \tag{84}$$

which means depreciation improves competitiveness but also raises exporters' input costs Amiti et al. (2014)

Second, expected depreciation raises funding costs: the home-currency cost of serving wholesale dollar debt, and the foreign owner's required return. Holding other components fixed, the same approximation gives:

$$\frac{\partial R_P^d}{\partial \mathbb{E}\log(q'/q)} \approx \frac{\bar{w}^d}{\bar{\phi}^d+\varepsilon}, \qquad \frac{\partial R_P^f}{\partial \mathbb{E}\log(q'/q)} \approx \frac{\bar{w}^f+\bar{g}}{\bar{\phi}^f+\varepsilon}. \tag{85}$$

The extra foreign-bank term comes from ownership, in addition to its larger wholesale exposure.

Third, an unexpected depreciation revalues the whole assets and liabilities book of the banks. Holding inherited contracts at their steady-state values, the effect on sector net worth is given by:

$$\frac{\partial \log \mathcal{N}_t^b}{\partial \log q_t} = -\sigma\left[\Gamma \bar{R}^W - \bar{a}^b\bar{\phi}^b(\bar{R}_{\$}^b - \bar{R}^W)\right]. \tag{86}$$

The first term is the loss on dollar debt in excess of dollar principal assets, which is capped by the regulation (Γ). The second term is the offset from the dollar loan spread.

C.4 Cash flows and aggregation

With full input-bill finance, firms' current borrowing pays current labor and intermediate costs. Their cash rebate to home households is current sales less repayment of last period's loans:

$$\begin{aligned}\Pi_t^F = {} & p_{NT,t}Y_{NT,t} + p_{X,t}Y_{X,t} \\ & - \sum_b \Big\{ R_{P,t-1}^b[L_{NT,t-1}^b + (1-\alpha_{\$})L_{X,t-1}^b] + \rho_t R_{\$,t-1}^b \alpha_{\$} L_{X,t-1}^b \Big\}.\end{aligned} \tag{87}$$

The realized exchange rate values dollar repayments. Under the pass-through accounting convention, the residual accrues to households; the firm does not accumulate a balance sheet

or default. Household net payouts are

$$\Pi_t = \Pi_t^F + [(1-\sigma)g_t^d - \iota^d]\mathcal{N}_{t-1}^d. \tag{88}$$

Foreign owners receive the corresponding foreign-bank payout. Summing these flows with household and bank budget constraints gives the balance-of-payments equation (37). Funding charges enter once as service imports, and loan repayments and deposit payments are internal transfers except for the external wholesale and equity components.

The FX loss in (86) follows directly from inherited contracts. Dollar exposure per unit of inherited equity is

$$\bar{R}_{\$}^b \bar{a}^b \bar{\phi}^b - \bar{R}^W \bar{w}_{\$}^b = \bar{a}^b \bar{\phi}^b (\bar{R}_{\$}^b - \bar{R}^W) - \Gamma \bar{R}^W. \tag{89}$$

Multiplying by banker survival σ gives the immediate change in aggregate equity.

C.5 The dynamic loan-rate-gap decomposition

Current loan rates also depend on future bank profits and on current and expected relative demand and equity. Let

$$x_t = d\log\frac{\mathcal{D}_t^f}{\mathcal{D}_t^d} - d\log\frac{\mathcal{N}_t^f}{\mathcal{N}_t^d}, \qquad \kappa = \frac{\varepsilon}{\bar{\phi}+\varepsilon} < 1. \tag{90}$$

Under a common-coefficient approximation, forward iteration of the bank value equation gives

$$\begin{aligned} dR_{P,t}^f - dR_{P,t}^d \approx \frac{1}{\bar{\phi}+\varepsilon}\sum_{j=0}^{\infty}\kappa^j \mathbb{E}_t\Big[&(\bar{w}^f - \bar{w}^d)(dR_P^W - dR)_{t+j} \\ &+ \bar{g}\, d\log\frac{R_{O,t+j}^f}{R_{t+j}} + x_{t+j} - x_{t+j+1}\Big]. \end{aligned} \tag{91}$$

The first term is the funding contribution, the second the owner contribution, and the final difference collects loan demand and net worth. A wholesale funding wedge expected in the future lowers foreign-bank value and lending today. Relatively weak current loan demand lowers the rate needed to clear a bank's loan market; relatively low current net worth raises it. Stronger future demand or scarce future equity can increase the future value of bank capital and support more lending now.

D Calibration details

D.1 Fitted joint US process and normalization

We fit a low-order process to the estimated response to the raw Bauer–Swanson monetary surprise. The monthly source VAR uses the US rate, absorption-related activity and the interbank spread, with the responses converted to quarterly averages. The real-rate response subtracts expected inflation from the nominal two-year rate. The absorption mapping scales industrial production by its estimated relationship with US imports from Mexico. The process is fitted to the response paths, rather than being the estimated VAR itself.

Writing r_t^*, c_t^* and $\widetilde{z}_t$ for log deviations of the three variables, the fitted response has the form

$$r_t^* = a_r r_{t-1}^* + u_t^{MP}, \tag{92}$$

$$\widetilde{z}_t = a_z \widetilde{z}_{t-1} + b_z u_t^{MP} \tag{93}$$

$$c_t^* = a_{c1} c_{t-1}^* + a_{c2} c_{t-2}^* + a_{cr} r_{t-1}^* + b_c u_t^{MP} \tag{94}$$

In the log-deviation convention of (94), the coefficients are

Table 6: Coefficients of the joint US response process

Coefficient	Value	Coefficient	Value
a_r	0.846437	a_z	0.504112
a_{c1}	1.638391	a_{c2}	−0.659504
a_{cr}	−0.133728	b_c	−2.362519
b_z	255.608853		

Notes: The rate, absorption and spread states are log deviations; in particular, b_z maps a log gross-rate innovation into a log deviation of the much smaller spread level.

The impulse-response experiment normalizes the impact real-rate increase to 25 annual bp. For quarterly gross rate $\bar{R}^*$, the first-order innovation is $25/(40{,}000\bar{R}^*)$.

D.2 Preferences, technology and bank adjustment

Table 7 records the remaining parameters. Variety elasticity $\varepsilon = 5$ implies a markup of 1.25 and determines the response of individual borrowers to financing costs. The outer consumption elasticity is 0.5; the home–import and export-demand elasticities are 1.5. Tradable and import weights discipline trade openness, and exporters' imported-input share is 0.50.

Banker survival determines the horizon over which franchise value matters. Borrower retention and taste dispersion determine how quickly firms change banks and how strongly

Table 7: Additional parameters and normalizations

Parameter	Interpretation	Value	Source or discipline
σ^h	Household curvature	0.5	Rate responses
ζ	Inverse Frisch elasticity	0.306	Leyva and Urrutia (2020)
ε	Variety elasticity	5	Markup 1.25
η, η_T, η^*	Outer, inner and export elasticities	0.5, 1.5, 1.5	Uribe and Schmitt-Grohé (2017)
ω_T, ω_M	Tradable and import weights	0.25, 0.45	Exports/GDP about 0.4
α_X	Exporters' imported-input share	0.50	World Bank
σ	Banker survival	0.92	Aoki et al. (2025)
Γ	NOP limit as share of capital	0.15	Banco de México
ς	Borrower retention	0.95	Credit registry
ν	Dispersion in bank choice	0.30	Interest-rate-shock response
χ	Funding curvature, both banks	0.016	Funding responses
γ_X	Trade services	1.05	Section 4.1
$\zeta_0, \bar{C}^*$	Labor scale, foreign absorption	0.685, 0.486	$\bar{H} = \bar{q} = 1$

their choices respond to relative costs. The common funding curvature governs substitution between wholesale borrowing and deposits. These parameters discipline different margins: relationship persistence slows borrower reallocation, whereas the wholesale charge operates on the funding ratio's level.

D.3 Untargeted moments and dynamic validation

Table 8 compares moments not directly targeted in the calibration. The model produces substantial wholesale funding and a large foreign-bank share, but understates aggregate wholesale borrowing per unit of equity and foreign banks' shares of total business credit and equity. It generates cheaper loans at foreign banks; the sign matches dollar loan pricing in the data but not the positive foreign-bank premium on peso loans.

Table 8: Untargeted moments

Moment	Model	Data
Wholesale funding/equity, all banks	2.39	2.79
Foreign banks' share of business credit	0.54	0.63
Foreign banks' share of bank equity	0.51	0.65
Within-firm dollar loan-rate gap, $f - d$	−62 bp	−46 bp
Within-firm peso loan-rate gap, $f - d$	−62 bp	+92 bp

Figure 20 compares the model's dynamic responses with the Mexico VAR and credit-registry estimates. Consumption is compared with retail sales, output with the activity index, and exports with real dollar exports. The figure also reports the real exchange rate,

business credit, lending and deposit rates, and the foreign-minus-domestic loan-rate response. The shaded VAR bands are 68% intervals. The registry panel shows individual horizon estimates and the average loan-rate gap, approximately 3.8 bp in the data versus 2.5 bp in the model.

The model captures several broad response patterns, while the exchange-rate and business-credit responses are smaller than the empirical point estimates. The loan-rate differential is of the right sign and order of magnitude but is imprecisely estimated. These comparisons are useful checks on transmission, rather than additional targets imposed on every outcome. The validation figure is normalized to a 25 bp monetary surprise.

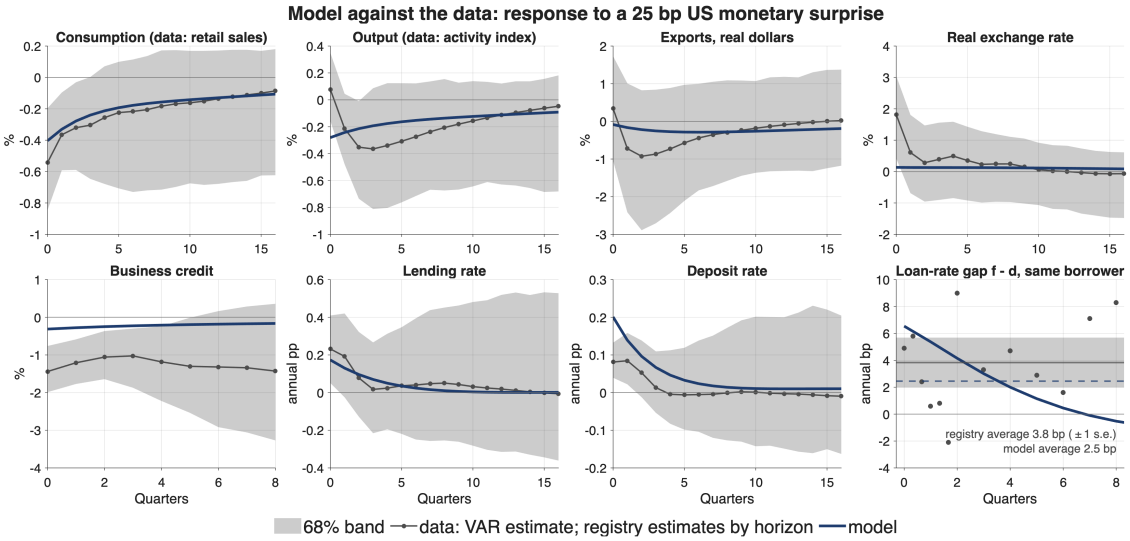


Figure 20: Model responses and empirical estimates after a 25 bp US monetary surprise. The VAR panels show 68% bands; the final panel compares the registry loan-rate differential with the model.

D.4 Independent disturbances

In addition to the joint monetary innovation, the experiments use a level process for the peso premium and log processes for positive spread, taste and productivity variables:

$$\text{prem}_t - \overline{\text{prem}} = \rho_p(\text{prem}_{t-1} - \overline{\text{prem}}) + u_t^p, \tag{95}$$

$$\widetilde{z}_t = \rho_z \widetilde{z}_{t-1} + u_t^z, \tag{96}$$

$$\log \omega_t^* = \rho_\omega \log \omega_{t-1}^* + u_t^\omega, \tag{97}$$

$$\log A_t = \rho_A \log A_{t-1} + u_t^A. \tag{98}$$

For the independent spread experiment, the monetary innovation is set to zero. We set $\rho_p = 0.02$, $\rho_z \approx 0.50$ and $\rho_\omega = \rho_A = 0.9$. The premium standard deviation reported in the calibration is 3.5 percentage points; Figure 22 is a separate 100 bp experiment with $\rho_p = 0.84$.

E More Quantitative Results

E.1 Local productivity

A 1% adverse productivity shock raises production costs, lowers output and consumption, and appreciates the real exchange rate. The difference in credit responses between banks is small relative to the aggregate contraction.

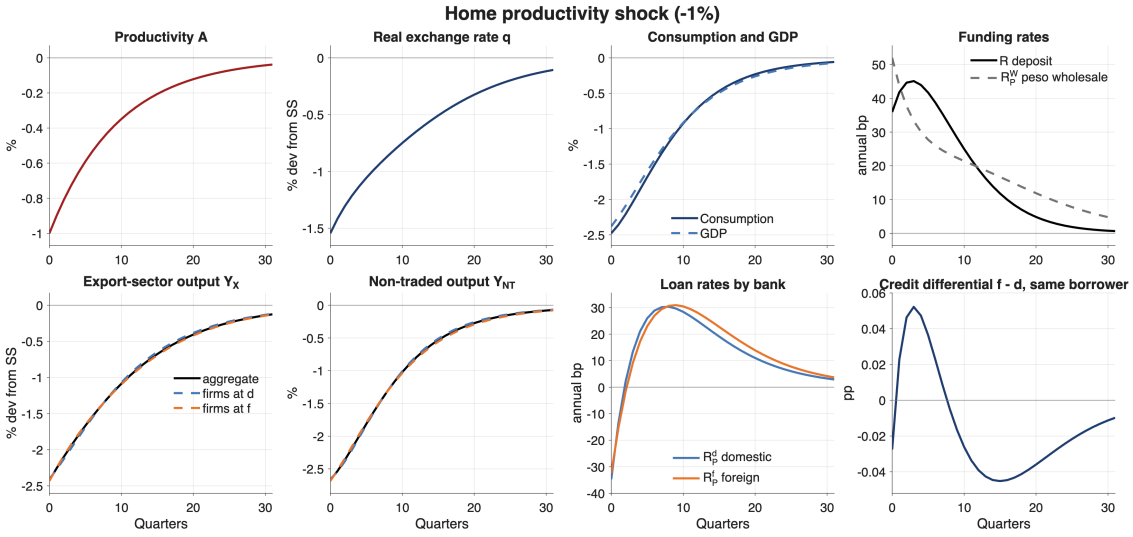


Figure 21: Home productivity shock of -1%.

E.2 Peso premium

The premium shock raises the cost of peso wholesale funding relative to dollars and changes the currency loan-rate wedge. The initial consumption decline is followed by a recovery and a small overshoot in the persistent ($\rho = 0.84$) experiment. The relative bank-credit response changes sign over the horizon, illustrating the role of endogenous rates and balance sheets beyond the impact funding comparison.

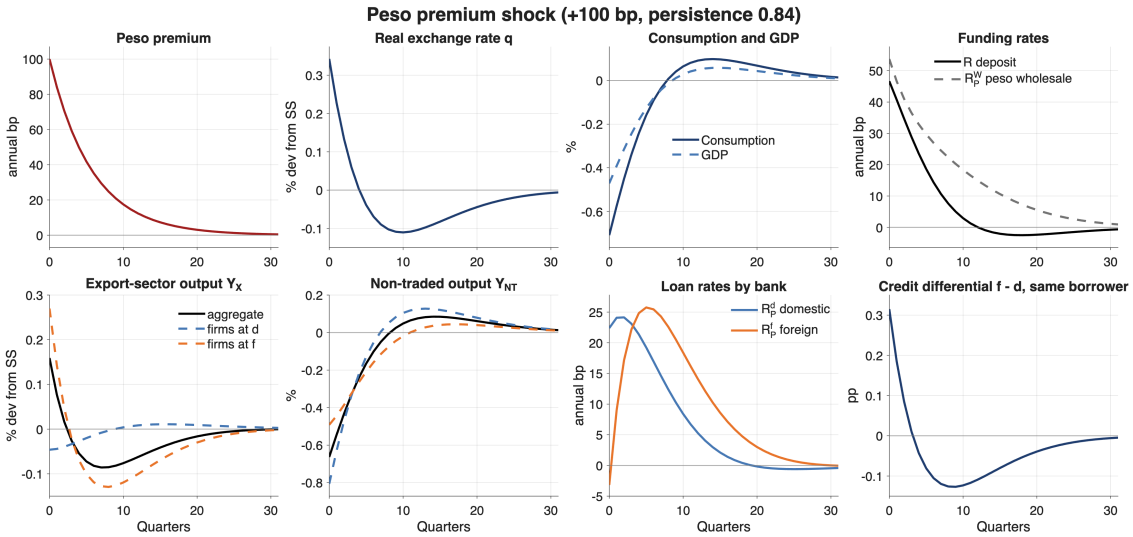


Figure 22: Peso-premium shock of +100 annual bp with persistence 0.84.

E.3 Dollar funding spread

A dollar-spread increase affects the cost of both wholesale funding lines. Without the sustained absorption contraction of the US monetary experiment, the aggregate response is relatively short-lived. The initial depreciation and subsequent reversal also differ from the joint-shock path.

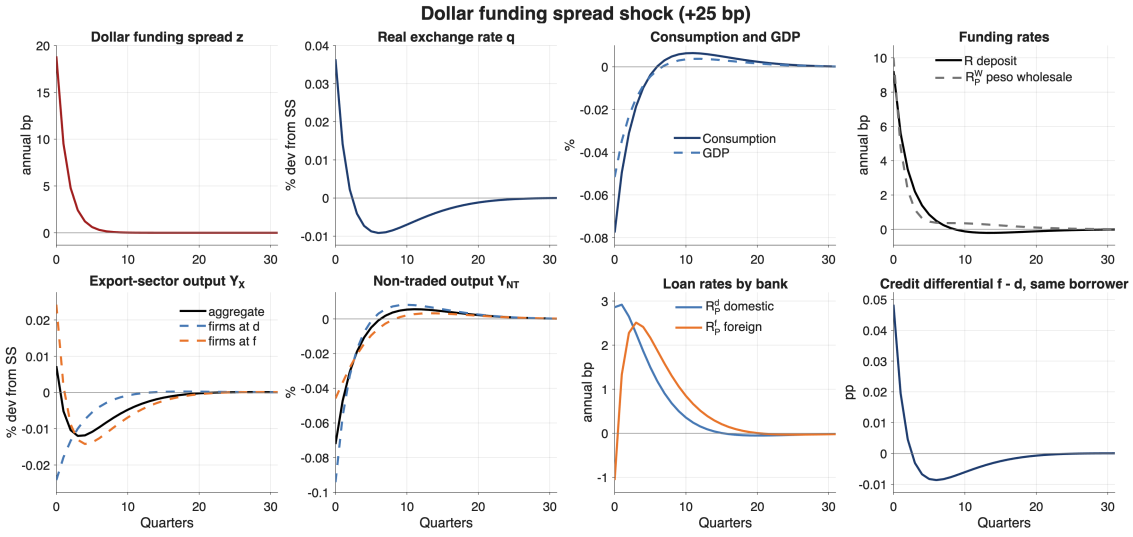


Figure 23: Global dollar-spread shock.

E.4 Foreign demand

A negative export-demand shifter lowers export-sector output and consumption and depreciates the currency. Loan rates initially fall, with a larger decline at foreign banks, which have more exporters among their borrowers. The foreign-minus-domestic credit response is initially positive. This provides a direct comparison with US monetary tightening, under which exports and the exchange rate move in the same broad direction but foreign-bank borrowers initially lose more credit.

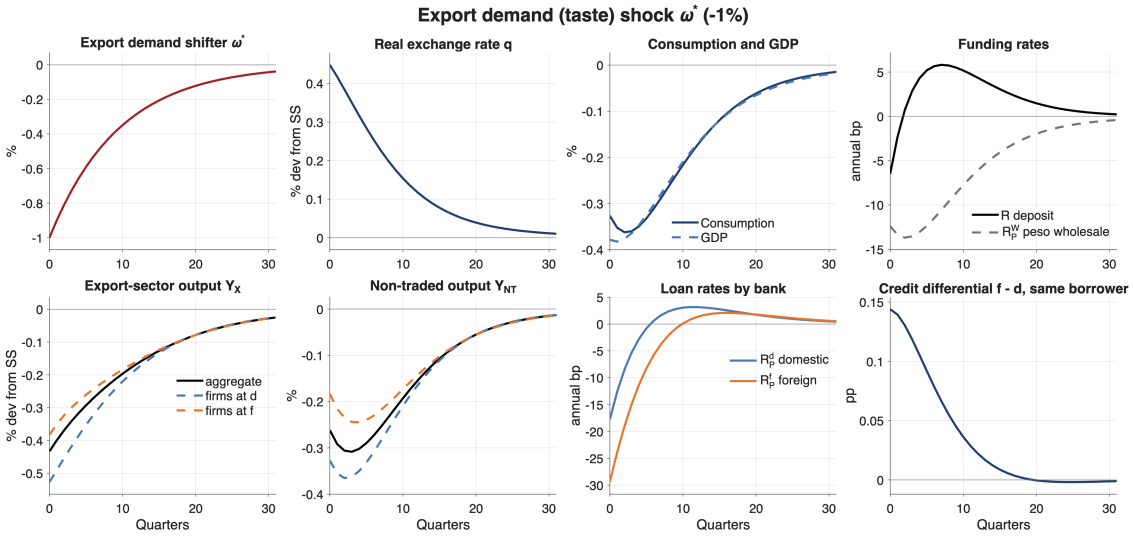


Figure 24: Foreign export-demand shifter shock of -1%.