Bank Branches and the Allocation of Capital across Cities*

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Abstract

We study how bank market structure shapes the spatial allocation of capital. Using public and administrative loan-level data from Chile, we show that deposit shocks propagate through bank branch networks. Exposed banks increase lending and reduce interest rates, with stronger pass-through in cities where they have smaller market shares. We develop a quantitative spatial model with national banks operating in many cities, oligopolistic competition in local credit markets, and interbank lending frictions. Spatial variation in markups reduces steady-state GDP by 0.52 percent, an order of magnitude larger than the effect of interbank frictions. We use the model to study bank mergers. Bank mergers improve financial integration between cities but reduce competition, generating heterogeneous welfare effects that depend on the merging banks' geographic overlap.

Key words: banks, local credit markets, economic geography.

JEL codes: D43, G21, O16.

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1 Introduction

In modern economies, savings are held largely as digital money and can be transferred across locations at virtually no cost. It is therefore natural to conjecture that savings flow toward cities with high loan demand, arbitraging away differences in the return to capital across locations. We study how banking market structure limits such arbitrage and, therefore, the efficient allocation of capital across cities.

The benchmark of interest rate equalization across cities underlies classic studies of the spatial distribution of economic activity (Henderson, 1974) and remains standard in more recent work (Acemoglu and Dell, 2010; Desmet and Rossi-Hansberg, 2013; Kleinman et al., 2023). This assumption, however, is at odds with empirical evidence showing that local credit supply depends on the presence and degree of competition between local bank branches (Petersen and Rajan, 2002; Degryse and Ongena, 2005; Ashcraft, 2005; Garmaise and Moskowitz, 2006; Becker, 2007; Gilje et al., 2016; Nguyen, 2019; Bustos et al., 2020; Aguirregabiria et al., 2025). We first corroborate and extend the results from the strand of the literature highlighting the importance of local bank branches. Then, we build a quantitative model that can replicate these reduced-form estimate and be used to study the role of bank branches in general equilibrium.

Using data from Chile, we first show that bank-level deposit inflows lead to more loan issuance and reductions in lending rates relative to other banks. We construct exogenous bank-level deposit shocks by leveraging changes in the world price of salmon interacted with banks' presence in areas specialized in fishing. We estimate that a 1% increase in deposits leads to an increase in loans of 0.11% and a reduction in interest rates of 0.008% at the bank level, indicating that the boundary of the bank matters. Our results align with Gilje et al. (2016) and Bustos et al. (2020), who study commodity shocks in the U.S. and Brazil but do not examine interest rates due to data constraints. We overcome this limitation by exploiting administrative loan-level data, which includes information on the interest rate. The data allows us to control for changes in the composition of loans across time and isolate the effect of deposit shocks on interest rates.

We document heterogeneous responses to deposit shocks across cities. The estimated positive impact of deposit shocks on loans and the negative impact on interest rates does not decay with distance from the shocked area, suggesting that within-bank capital flows are independent from geography. By contrast, the effect of deposit shocks on loans and interest rates is substantially stronger in cities where the exposed bank held a small market share. The intuition for this result is that when costs of funds go down following a deposit inflow markups increase in cities where banks have a high market share. These results align with studies in industrial organization and finance highlighting the local nature of credit markets (Aguirregabiria et al., 2025) and motivate our focus on local market power as a determinant of differences in credit supply across cities in the remainder of the paper.

In the second part of the paper, we build a quantitative spatial model with banks that allows us to quantify how bank branches affect interest rates across space and the spatial allocation of capital in Chile. We extend the framework of Kleinman et al. (2023), which includes trade, migration, and local investment decisions by introducing a set of nationally chartered banks. These banks operate branches across cities, where they offer savings and lending instruments to the local population. Loans are used by capitalists to finance local investment. We incorporate an interbank market in which banks can lend to each other, subject to frictions. Local branches compete oligopolistically in each credit market as in Atkeson and Burstein (2008). Through this mechanism, cities with stronger competition have lower interest rates in equilibrium. While each bank's loan pricing decisions are interdependent, the steady state computation of the model remains tractable.

One of the crucial elements in the model is the elasticity of loan demand with respect to interest rates. This elasticity, which varies across cities and banks, captures two margins of adjustment available to capitalists when a bank raises interest rates: capitalists can substitute and borrow from other banks without changing how much they invest in physical capital, or they can reduce investment and rely more on deposits. This second elasticity —which we call the outer elasticity — plays the role of the outer-nest elasticity in the well-known model of variable markups developed in Atkeson and Burstein (2008). Importantly, the outer elasticity is an endogenous object in our model and depends on capitalist's demand for deposits.

We estimate the model to match the elasticity of loan issuance and interest rate reductions to deposit shocks from our empirical analysis, as well as employment, wages, and loans across cities and banks in 2015. In the model, the effect of deposit shocks on loan issuance is closely linked to the size of interbank frictions, while interest rate reductions are closely linked to firms' elasticity of substitution between banks. We estimate that interbank frictions raise borrowing costs by approximately 13 basis points for the average bank, i.e: a bank borrowing in the interbank market for a rate of 1% would act as if the interest rate was approximately 1.13%. We estimate an elasticity of substitution of 14.1, which leads to modest markups for loan interest rates.

In the model, interest rates differ across cities due to two channels. Frictions in the interbank market imply that banks with better access to deposits have a lower cost of raising funds. Differences in interest rates across banks translate into differences in interest rates across cities due to banks' heterogeneous geographic presence. Furthermore, the interest rate charged by any bank may differ across cities due to differences in markups driven by the extent of local competition. Banks set lower markups in markets where they face more competition. As a result, interest rates are lower in cities with more banks. In the quantified version of the model, the standard deviation in interest rate across cities is 170 basis points, while the gap between the 25th and 75th percentiles is 168 basis points. While local interest rates in levels are not a target of our estimation, these magnitudes align with the empirical findings in Bordeu et al. (2025).

Equipped with the quantified version of the model, we solve for the equilibrium of this economy with no interbank frictions, which leads to an equalization in the cost of raising funds across banks. Productivity in the economy increases by 0.02%. Using subsidies to correct banks' local market power has substantially larger implications for GDP. Eliminating markups completely would lead to an increase in aggregate productivity of 3.55%, while equalizing markups in space would lead to an increase in productivity of 0.52%. In both cases, the increase in productivity reflects lower dispersion in the marginal productivity of capital across cities as well as more investment overall, reflected in lower average marginal productivity of capital.

The model also serves as a laboratory for an ex-ante analysis of bank mergers, a frequent challenge for policy makers — in Chile alone, there were four large mergers during 2000-2020 (Marivil et al., 2021). We compute all possible two-bank mergers and find welfare effects ranging between -1.7% and 0%. Welfare effects are larger when the merging banks have limited geographic overlap, which reduces the effect of the merger on markups, and when the two merging banks have different positions in the interbank market. In such cases, the merged entity can exploit internal capital markets, reducing the cost of relying on the interbank market.

This paper contributes to the literature on economic linkages across space by characterizing financial linkages driven by the branch network. The literature has emphasized mechanisms such as trade, migration, and commuting, through which local shocks affect nearby locations via market access or labor flows (Caliendo et al., 2017; Monte et al., 2018; Allen and Arkolakis, 2025). By contrast, the mechanism we highlight operates independently of geographic proximity: through the banking network, distant cities can become linked when they share branches of the same banks (Gilje et al., 2016; Bustos et al., 2020; Maingi, 2026; D'Amico and Alekseev, 2024; Quincy and Xu, 2025). Kleinman et al. (2023) incorporates capital into a quantitative spatial model, but does not model financial linkages between cities.[1]

Recent work has incorporated banks into quantitative spatial models to study the effects of U.S. branching deregulation and deposit reallocation (D'Amico and Alekseev, 2024; Oberfield et al., 2024; Maingi, 2026). A closely related paper is Maingi (2026), which analyzes how deposit reallocation across banks shapes lending across cities. In contrast to these studies, we focus on how the geographic distribution of branches

[1] A vast literature, including Lucas (1990), study frictions to international investment. See Pellegrino et al. (2025) for a recent framework to analyze frictions in an international context.

affects steady-state outcomes, including productivity and welfare, using a model with endogenous investment and migration decisions. The financial block of our model is different in two dimensions: We incorporate oligopolistic competition in local credit markets and market-clearing in the interbank market. After laying out the model, in Section 4.3 we discuss the role of each of these channels. The focus of our policy analysis, bank mergers, is also different. Corbae and D'Erasmo (2025) build a quantitative model of bank dynamics with imperfect competition but where the fully-fledged spatial component is absent.

Finally, we contribute to the literature in industrial organization and finance that studies the role of geography in lending. Petersen and Rajan (2002) documents how advances in information technology allowed U.S. borrowers to access more distant lenders. Ashcraft (2005), Garmaise and Moskowitz (2006) and Nguyen (2019) show that bank branch closures led to declines in lending, while Becker (2007) and Gilje et al. (2016) show that local bank-level deposit shocks lead to loan growth by affected banks. Taken together, these papers suggest that, despite technological change, credit markets remain local to some extent. In line with this definition of the market, a series of papers has examined banks' local market power in segmented credit markets (Degryse and Ongena, 2005; Scharfstein and Sunderam, 2016; Drechsler et al., 2017; Crawford et al., 2018; Wang et al., 2020; Aguirregabiria et al., 2025; Bordeu et al., 2025). We contribute to this literature by quantifying the general equilibrium effects of local market power in a spatial model.

The rest of the paper is organized as follows. In Section 2, we overview the banking sector and its geographic footprint in Chile and describe our data sources. In Section 3, we analyze localized deposit shocks and trace their impact on loans and interest rates across cities. Section 4 presents our quantitative model and Section 5 our estimation procedure. In Section 6, we use the model to explore the economic effects of interbank frictions and market power, while in Section 7 we simulate all possible two-bank mergers in Chile. Section 8 concludes.

2 Context and data sources

Chile has a well-developed financial system in which banks play a central role. Between 2012 and 2018, the period we analyze, credit to the private sector increased from 104% to 118% of GDP. Banks account for roughly 78% of credit, and survey data show that firms of all sizes rely heavily on banks for financing.[2] Despite the overall depth of Chile's financial system, financial development varies markedly across Chilean regions. Figure 1a illustrates this by showing outstanding bank loans in 2015, scaled by regional GDP.[3]

[2]See Appendix Section A.1 and Section A.2 for a discussion of the empirical results in this paragraph.

[3]Regions are the finest level of disaggregation at which GDP data are available. This measure of financial development excludes credit from non-bank financial institutions and instruments other than loans, so the resulting ratios are lower than

The Chilean banking industry is highly concentrated at the national level. Panel A in Table 1 reports loan market shares for the ten largest banks. The two largest banks each held approximately 18% of the loan market, the top four accounted for just over 60%, and the ten largest banks together cover nearly the entire market. Omitting *BancoEstado*, the main state-owned retail bank, the Herfindahl–Hirschman Index (HHI) in 2015 was 1,600.

Banks in Chile are chartered nationally, headquartered in Santiago, and operate branches across the country. The first column of Panel A of Table 1 shows the number of cities served by each bank. We find no evidence of spatial correlation between a bank's activity on the extensive margin (presence in a city) or on the intensive margin (local market share) across city pairs at varying distances. Following Conley and Topa (2002), we interpret this as evidence that branches are not geographically clustered.[4] This pattern stands in contrast to the U.S., where historical restrictions on interstate expansion have led banks to concentrate regionally (Oberfield et al., 2024). The absence of geographic clustering in Chilean banking makes this an ideal setting to disentangle the role of financial linkages from that of physical proximity.

Cities tend to be served by a small number of banks. The average number of banks per city was 4.4 and the median was 3. Figure 1b plots, for each region, the median number of banks per city. There is a positive correlation (0.38) between the median number of banks per city and regional financial development, discussed before. The small number of banks translates into an average HHI across cities of 3,300 and a median of 2,700.[5] Figure 1c displays the distribution of local HHI across regions, and the second column in Panel B in Table 1 shows summary statistics at the city-level.

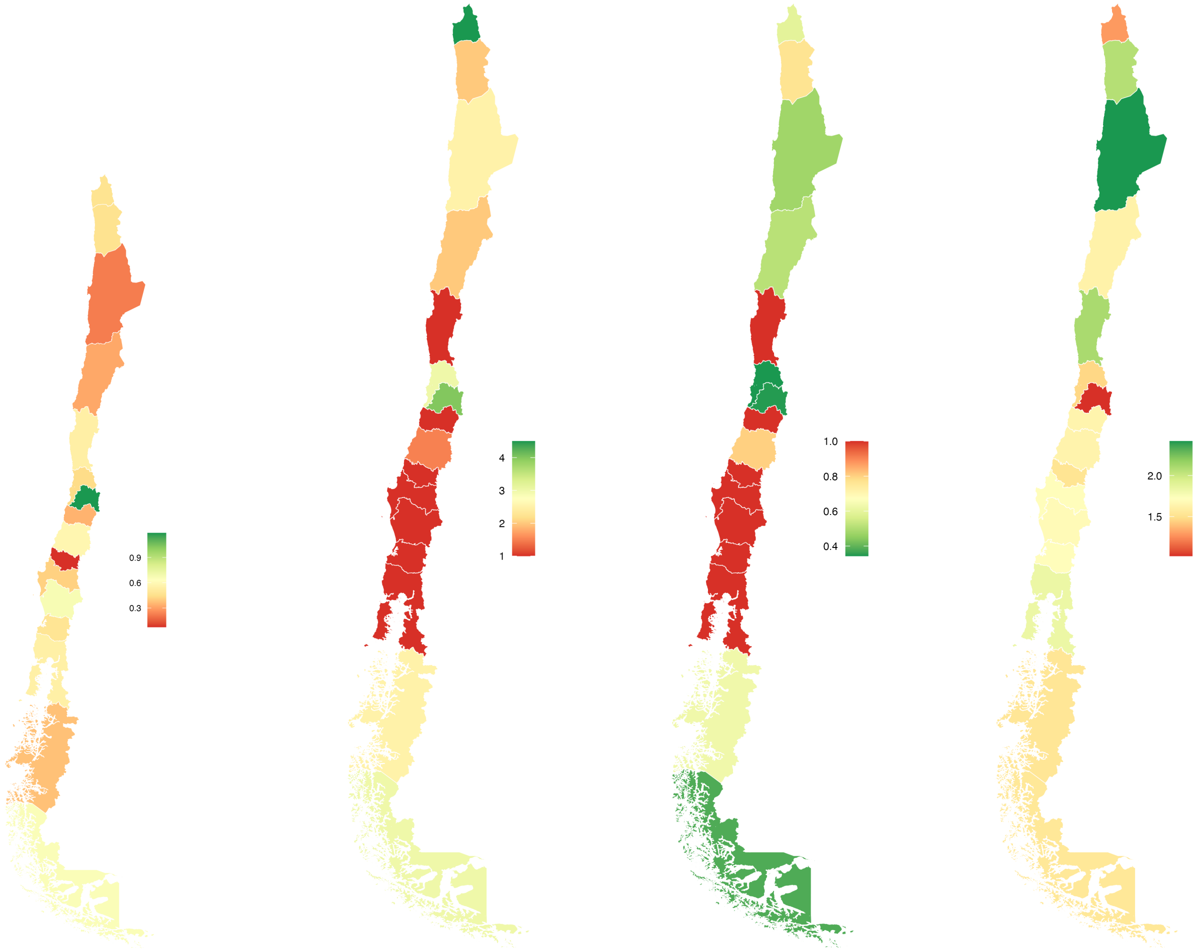
Banks shift resources across cities by using deposits collected in one location to finance loans elsewhere. To measure the extent of domestic capital flows, we calculate the loan-to-deposit ratio for each city based on the stock of outstanding loans and deposits in December 2015. Figure 1d shows the resulting pattern at the regional level and the third column in Panel B of Table 1 at the city level. There is substantial variation in the relative importance of deposits and loans across cities.

Although banks' liabilities also include bonds, external credit, and Central Bank borrowing through credit lines, deposits remain banks' primary funding source, while loans account for the majority of their assets (Marivil et al., 2021). As of December 2015, the system-wide loan-to-deposit ratio stood at 1.14. Panel A of Table 1 documents how this ratio varies across banks. In our subsequent analysis we abstract from alternative instruments and allow banks to lend to each other to capture dispersion in loan-to-deposit

those quoted nationally.

[4] See Section A.4 in the Appendix for a detailed description of these results.

[5] These indices exclude very small cities with only one bank, typically *BancoEstado*.



(a) Financial Development (b) Banks per City (c) HHI in Loans (d) Loans-to-Deposits

Figure 1: Spatial Financial Development and the Network of Bank Branches

Notes: Authors' calculations using public data from the CMF on loans and deposits and Regional GDP data from the Central Bank of Chile. The first panel shows the value of loans issued during 2015 in each region over regional GDP, both in current prices. For the third and fourth panels, we use the stock of outstanding loans and deposits in December 2015.

ratios.

2.1 Data sources

Our first source of data is publicly available data on the total deposits and loans at the city-bank level from the Financial Market Commission (henceforth CMF), the agency responsible for supervising the stability and development of Chile's financial markets. The CMF collects detailed reports from financial institutions, including the stock of loans and deposits by type, currency, bank, and city. We construct city-bank aggregates by summing instruments denominated in local currency, inflation-adjusted units, and foreign currency, combining both commercial and mortgage loans, as well as deposits with varying liquidity. The value of loans and deposits at the city-bank level in 2015 forms the basis of descriptive statistics in Section 2, and

Table 1: Summary Statistics: The Spatial Distribution of Banks in 2015

A. Top banks	City Coverage	National Loan Share	Loans-to-Deposits
Santander	97	0.18	1.18
de Chile	111	0.18	1.27
BancoEstado	223	0.14	0.89
de Credito e Inversiones	93	0.12	1.11
BBVA	61	0.06	1.21
Corpbanca	47	0.06	1.17
Scotiabank	51	0.06	1.54
Itau	38	0.05	1.33
Security	17	0.03	1.12
BICE	16	0.02	1.03
B. Cities	Banks per City	HHI in Loans	Loans-to-Deposits
Average	4.4	3,300	0.92
Percentile 25	2	1,900	0.40
Median	3	2,700	0.66
Percentile 75	7	4,100	1.36

Notes: Authors' calculations using public data from the CMF. We use the stock of outstanding loans and deposits in December 2015 for the second and third columns of panel B.

are part of our estimation targets in Section 5. The data covers 2012-2018 and is reported monthly.

To analyze the effect of deposit shocks on interest rates we complement this data with administrative loan-level data for the same period, also collected by the CMF. One advantage of this data is that we can focus on loans taken by firms, while the value of loans reported in the publicly available data includes loans for all types of purposes such as mortgages or consumer loans. The richness of the administrative data allows us to control for a rich set of characteristics of the borrowing firm and the loan, which is crucial for interpreting changes in average interest rates across time.

The administrative dataset includes, for each loan, the size and sector of the borrowing firm, the type of loan, its maturity, and amount. Moreover, the dataset includes two measures of risk at the loan level. The first is a categorical risk rating assigned by banks when a firm applies for a loan. For large firms, banks conduct individual assessments, classifying them into one of 16 risk categories: A1–A6 (low risk), B1–B4, and C1–C6 (high risk). For smaller firms, the risk is assessed after the banks classify firms with similar characteristics together. The second measure of risk is the expected loss on each loan, reflecting the bank's projection of potential default costs.[6] We restrict the sample to loans denominated in Chilean pesos and

[6]This study was developed within the scope of the research agenda conducted by the Central Bank of Chile (CBC) in economic and financial affairs of its competence. The CBC has access to anonymized information from various public and private entities, by virtue of collaboration agreements signed with these institutions. To secure the privacy of workers and firms, the CBC mandates that the development, extraction and publication of the results should not allow the identification, directly or indirectly, of natural or legal persons. Officials of the Central Bank of Chile processed the disaggregated data. All the analysis was implemented by the authors and did not involve nor compromise the SII, the CMF, and AFC. The information contained in the databases of the Chilean IRS is of a tax nature originating in self-declarations of taxpayers presented to the Service;

not associated with any public guarantee. We keep fixed-interest rate loans and exclude loans issued by *BancoEstado*. We drop the first loan in a firm-bank relationship.

In Section 5, we estimate a subset of parameters from our quantitative model by matching the spatial distribution of employment and wages. We measure private-sector employment and average wages by city in 2015 using administrative data from the Unemployment Fund Administrator (henceforth AFC). The AFC is a regulated private entity that manages unemployment insurance contributions made jointly by formal private-sector workers and their employers.[7]

Our last data are travel times between cities, which we compute using the Google Maps API. We use these data to estimate transport costs between cities.

3 The spatial propagation of local deposit shocks

We begin by studying empirically the elasticity of bank lending with respect to deposits. This elasticity governs how deposit shocks propagate through bank networks and affect credit supply across space. We provide direct evidence on this elasticity using an instrumental variables strategy that exploits exogenous variation in commodity prices.

3.1 Empirical Strategy

We exploit variation in the world price of salmon, which disproportionately affects deposits in southern coastal cities with salmon production. We construct bank-level deposit shocks by interacting movements in salmon prices with banks' exposure to fishing cities. Our estimating equation is

$$\log L_{nbt} = \beta_1 \log D_{bt} + \beta_2 \log L_{nb,t-4} + \gamma_{nb} + \gamma_{nt} + \varepsilon_{nbt}, \tag{1}$$

where L_{nbt} is the outstanding stock of loans held by bank b in city n at month t, and D_{bt} is the aggregate stock of deposits held by bank b. We include city-bank fixed effects γ_{nb} to absorb time-invariant differences across city-bank pairs, month-city fixed effects γ_{nt} to control for aggregate local shocks, and a four-month lag of the dependent variable to account for persistence in lending relationships. We weight observations by the value of loans in the previous month for each bank. The coefficient of interest, β_1, captures the elasticity of lending with respect to deposits.

therefore, the veracity of the data is not the responsibility of the Service.

[7]These contributions are a fixed share of monthly wages, capped at approximately USD 5,000. We impose two additional filters on the sample. We restrict the sample to firms that appear in the Firms' Directory used by Chile's National Accounts and that employ, on average, at least three workers throughout the sample period. The final dataset includes 160,482 firms.

The error term in equation (1) may be correlated with deposits if unobserved bank-level factors jointly affect a bank's ability to attract deposits and extend credit. We address this concern using two instruments. The first is lagged deposits $D_{b,t-4}$, which captures persistent differences in bank funding that are predetermined relative to current lending conditions. The second exploits variation in world salmon prices interacted with banks' exposure to fishing cities,

$$Z_{bt} = \underbrace{\sum_n \omega_{nb}^D \cdot \alpha_n^{\mathcal{F}}}_{\text{Exposure to fishing cities}} \times p_{t-3}^{\text{salmon}}, \tag{2}$$

where $\omega_{nb}^D \equiv D_{nb,2011} / \sum_{n'} D_{n'b,2011}$ is the share of bank b's 2011 deposits originating in city n, $\alpha_n^{\mathcal{F}} \equiv \ell_n^{\mathcal{F}} / \ell_n$ is the local employment share in fishing industries, and p_{t-3}^{salmon} is the world price of salmon lagged one quarter. Measuring banks' geographic exposure in 2011, before the start of our sample, alleviates concerns that banks endogenously enter markets in response to salmon price movements.

The salmon industry is well-suited for constructing localized deposit shocks in Chile. Salmon prices exhibited substantial variation during 2012–2018, the industry accounts for nearly 10 percent of non-copper exports, and salmon firms are headquartered locally in southern Chile, so that profits flow to local bank branches rather than to corporate offices in Santiago.[8]

The exclusion restriction requires that salmon prices and lagged deposits affect lending only through their effect on bank-level deposits. To address the plausibility of the first condition, we exclude all cities with any fishing employment from the estimation sample. To address the second condition, we include lagged loans in the estimating equation.

We also examine how deposit shocks affect loan pricing using administrative data on individual loans. We estimate

$$\log(1 + i_{\ell f t}^b) = \alpha_1 \log D_{bt} + \gamma_{nb} + \gamma_{nt} + \alpha_2 X_{ft} + \alpha_4 X_{\ell t} + \epsilon_{\ell f t}^b, \tag{3}$$

where $i_{\ell f t}^b$ is the interest rate charged by bank b on loan ℓ to firm f located in city n during month t. We restrict attention to single-city firms, for which the interest rate is arguably shaped by local conditions. We control for time fixed effects, firm characteristics X_{ft} including employment and risk ratings, and loan characteristics $X_{\ell t}$ including amount, maturity, type, and expected loss. City-bank fixed effects capture persistent differences in local competition, and city-month fixed effects absorb changes in local economic conditions. We instrument for deposits using the same strategy as above and weight observations by loan

[8] Figure 13 in Appendix A.5 plots the evolution of world salmon prices. Figure 14 displays the geographic concentration of the fishing industry.

amount.[9]

3.2 Results

Table 2 presents the first-stage regression of log deposits on both instruments. Banks with greater exposure to fishing cities experience significantly larger deposit inflows when salmon prices rise. The first-stage F-statistic is around 38, above conventional thresholds for weak instruments.

Our baseline estimate of the elasticity of lending with respect to deposits, shown in the column (1) of Table 2, is 0.11. This estimate is statistically significant and similar in magnitude to the elasticity of 0.16 at the city level estimated by Bustos et al. (2020) using the adoption of genetically engineered soy in Brazil as an agricultural productivity shock. Becker (2007) and Gilje et al. (2016) find positive effects on lending and the number of establishments and mortgage loans, but their results are not directly comparable to our elasticity.

As shown in the column (2) of Table 2, lending responses do not attenuate with distance from fishing cities. We compute each city's average travel time to fishing cities and interact this measure with instrumented deposits; the interaction term is small and statistically insignificant. This absence of distance decay contrasts with the spatial frictions typically observed for trade and migration flows, and suggests that banks' internal capital markets effectively integrate distant locations. Moreover, this result supports the exclusion restriction for our instrument in the sample of non-fishing cities.

Lending responses are concentrated in cities where banks hold small market shares. Column (3) shows that the interaction between instrumented deposits and bank market share is negative and highly significant. This pattern is consistent with oligopolistic competition between local branches, whereby banks internalize the price impact of expanded lending and thus respond less in cities where they hold large market shares.

We leverage the richness of our data to study the effects of deposit shocks on interest rates. We find that deposit inflows reduce interest rates: our baseline elasticity is -0.008, meaning that a 1% increase in deposits lowers interest rates by approximately 0.8 percentage points. Consistent with the lending results, interest rate pass-through does not depend on distance but is weaker in cities where banks hold large market shares, reinforcing the role of endogenous markup responses that depend on banks' local market shares.

Columns (4) and (8) of Table 2 explore additional heterogeneity by interacting deposit shocks, market share, and the local deposit-to-loan ratio. We expand on why this ratio matters for quantity and price responses after introducing the model in Section 4, but the broad intuition is as follows. In cities where

[9] This specification uses the subset of banks that issued loans in every year during 2012–2018 and appear in both the deposit and loan-level administrative data, leaving us with six banks, all among the largest in the country.

deposits are large relative to loans, borrowers have a viable alternative to bank lending for transferring resources across periods; they can reduce investment and save more through deposits instead. This outside option makes loan demand more elastic and limits banks' ability to exercise market power. Consistent with this logic, we find that loans respond by more in cities with higher deposit-to-loan ratios. The sign of the effect on interest rates aligns with this interpretation, but it is not statistically significant.

We study the robustness of our results to changing the structure of fixed effects, clustering at different levels, and using new loans rather than the stock of loans as the outcome variable. We discuss these extensions in Appendix A.6. Our main estimate of the elasticity of loan demand to deposit shocks remains robust across specifications.

Our empirical results align with Becker (2007), Gilje et al. (2016), and Bustos et al. (2020), who study localized deposit shocks in the US and Brazil, and extend their findings in two directions. The detail of our data allows us to study the effect on interest rates while controlling for changes in the composition of loans across time. We find that interest rates decline following shocks to deposits. Moreover, we study heterogeneous responses in lending and interest rates across cities where banks hold different market shares. Our results on heterogeneous responses across cities are consistent with the role of market power highlighted by studies at the intersection of industrial organization and finance (Aguirregabiria et al., 2025).

We conclude by discussing banks' substitutability between deposits and other funding sources at a conceptual level in light of our empirical results. This mechanism will be central to our treatment of the interbank market in the rest of our analysis.

3.3 Banks' substitutability between deposits and other sources of funding

Our empirical results suggest that deposits and other sources of funding are not perfect substitutes. This argument can be illustrated simply by focusing on the two sides of the balance sheet, and distinguishing between two alternative sources of funds, deposits and an alternative, which we label wholesale funds in this discussion. With market power in deposits, banks need to pay more in order to attract more deposits. With market power in lending, the marginal revenue is decreasing in total loans issued. Figure 2 illustrates this basic setting and banks' responses to a shock to deposits in partial equilibrium.

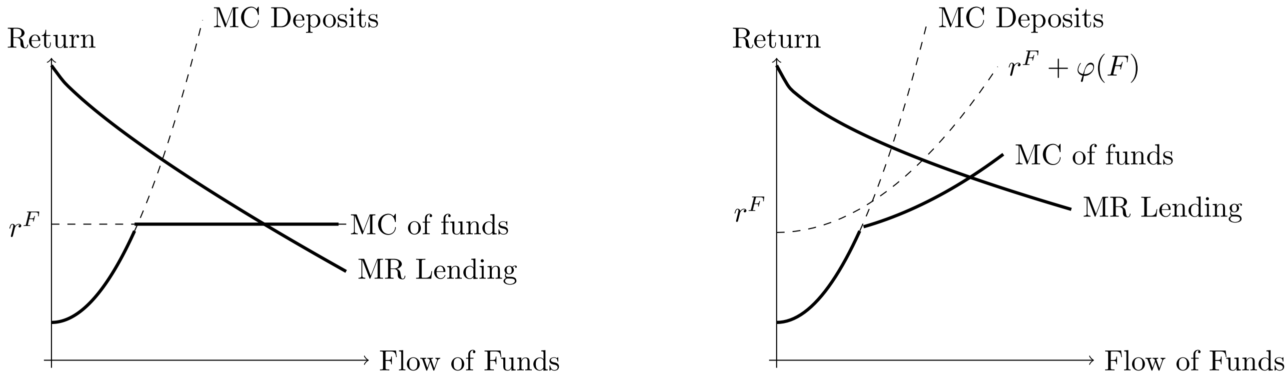
In both panels, the size of banks' balance sheet is determined by equating the marginal revenue of lending with the marginal cost of funds from either retail deposits or wholesale funding. In panel (a), we assume the marginal cost in the wholesale market is constant at r^F. A positive shock to deposits (captured by an outward shift of the MC Deposits curve) alters the funding composition but not the size of the balance sheet.

Table 2: The Effect of Deposit Shocks on Lending and Interest Rates

		Loans				*Interest Rates*			
	First Stage	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deposits		0.111**	0.092*	0.172***	0.162***	−0.008***	−0.007**	−0.009***	−0.012***
		(0.049)	(0.054)	(0.038)	(0.038)	(0.001)	(0.003)	(0.001)	(0.001)
× Distance			0.014				−0.0009		
			(0.017)				(0.0023)		
× Mkt Share				−1.518***	−1.457***			0.021***	0.031***
				(0.210)	(0.210)			(0.007)	(0.007)
× D-L Ratio					0.004***				-0.0958
					(0.002)				(0.514)
× Mkt Share × D-L Ratio					−0.001***				−0.008
					(0.000)				(0.468)
Loans_{t-4}		0.684***	0.684***	0.517***	0.517***				
		(0.029)	(0.029)	(0.037)	(0.036)				
Deposits_{t-4}	1.213***								
	(0.023)								
Instrument Z_{bt}	173.1***								
	(56.0)								
City × Bank FE	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City × Month FE	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Controls	–	–	–	–	–	Yes	Yes	Yes	Yes
Observations	1,480	28,439	28,439	28,127	28,127	257,495	236,782	257,495	231,498
Banks	21	15	15	15	15	6	6	6	6
First-stage F	37.78								

Notes: This table reports estimates of the effect of deposit shocks on bank lending (columns 1–4) and interest rates (columns 5–8). Columns 1-8 are estimated by 2SLS using the instrument defined in equation (2). The sample excludes cities with any employment in fishing industries. Distance is average travel time to fishing cities, in thousand kms. Market share is bank b's share of local lending in city n. D-L Ratio is the local deposit-to-loan ratio divided by 1000. Observations in columns 1–4 weighted by total bank-level loan volume. Standard errors clustered at the bank-month level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

In panel (b), where we assume that the marginal interbank costs are increasing in volume, a positive shocks to deposits reduces funding costs at the margin, enabling higher lending and lower interest rates on loans. Our empirical results align with this latter case.



(a) Constant wholesale cost r^F

(b) Increasing wholesale cost $r^F + \psi(F)$

Figure 2: Balance sheet effects of deposit shocks

As illustrated in panel (b), the effects of deposit shocks on lending and interest rates depend on the extent of interbank frictions $\varphi(F)$, which affects the share of deposits in total funding before the shock, and the slope of the marginal revenue of lending curve. Following this intuition, we use the results in Table 2 as targets to calibrate the degree of interbank frictions and market power in the quantitative version of the model.

Why are deposits and wholesale funding not perfect substitutes? A large literature argues that deposits are banks' preferred funding source due to their low cost and stability (Kashyap et al., 2002; Hanson et al., 2015). Deposits provide liquidity services to customers and are often insured, which enhances their resilience relative to market-based funding. In Chile, as in many countries, deposits are insured up to a legal threshold, further strengthening this channel. In our quantitative model, we capture these frictions parsimoniously by assuming that banks face non-pecuniary costs when borrowing on the wholesale market. Following Oberfield et al. (2024), we assume this cost to be increasing and convex in the volume borrowed.[10]

In our model we will assume that the wholesale market is an interbank market in which banks lend funds to each other. As we showed in Section 2, this approximates the banking sector in Chile where the aggregate ratio of loans to deposits is close to one. Integrating the mechanisms we study in this paper with alternative sources of funds for banks in the wholesale market is an interesting avenue in which to extend our analysis.

[10]One possible interpretation for this functional form assumption are debt overhang costs associated with wholesale funding in a risky environment, as in Andersen et al. (2019).

4 Model

We build a model that can match our empirical results quantitatively and be used to study the effects of bank branches on productivity and welfare, as well as specific policies aimed at improving financial linkages between cities. We borrow the basic structure of the model from Kleinman et al. (2023), which includes trade and migration linkages between cities as well as endogenous investment in physical capital. Tractability comes from assuming mobile, hand-to-mouth workers and immobile capitalists. We embed the network of bank branches (which we take as given) into this structure for the rest of the economy. In line with studies at the intersection of industrial organization and finance, we assume that credit markets are local and banks have market power when setting local interest rates (Aguirregabiria et al., 2025).

4.1 Setup

The economy consists of N cities, indexed by n, and B banks, indexed by b. Time is discrete. There are three types of agents: workers, capitalists, and bank owners. Workers are homogeneous, do not save or borrow and are freely mobile across cities. Capitalists are immobile and reside permanently in one city, where they own the local physical capital. Capitalists rely on local bank branches for their saving and borrowing decisions. We denote the set of banks with branch presence in city n as $\mathcal{B}^n$.

We begin by specifying local production technologies and workers' migration decision. We then turn to the problem of capitalists, deriving their supply of savings and demand for loans. Finally, we introduce bank owners, their objective function, and constraints when setting interest rates.

4.1.1 Production and trade

Each location produces a differentiated good. The representative firm in location n hires labor, ℓ_{nt}, and capital, k_{nt}, from workers and capitalists, respectively, and makes production decisions in a perfectly competitive environment. The firm produces according to a Cobb-Douglas technology given by

$$y_{nt} = z_n \left(\frac{\ell_{nt}}{\mu}\right)^{\mu} \left(\frac{k_{nt}}{1-\mu}\right)^{1-\mu},$$

where z_n denotes productivity.

Trade is costly. For one unit to arrive in location n, $\tau_{ni} \geq 1$ units must be shipped from location i. The price of a good of variety i for a consumer located in n is given by

$$p_{nit} = \tau_{ni} p_{iit} = \frac{\tau_{ni} w_{it}^{\mu} r_{it}^{1-\mu}}{z_i},$$

where p_{iit} denotes the free-on-board price for the good produced in city i.

4.1.2 Workers

There is a unit mass of identical and infinitely-lived hand-to-mouth workers. The problem of a worker located in city n is as follows. First, she decides how much to consume of each of the N goods in the economy, aggregating goods from all origins with a constant elasticity of substitution,

$$C_{nt}^{w} = \left(\sum_{i=1}^{N} (c_{it}^{w})^{\frac{\sigma_c - 1}{\sigma_c}} \right)^{\frac{\sigma_c}{\sigma_c - 1}}. \tag{4}$$

The consumption price index in city n, P_{nt}, and the fraction of expenditure of city n in goods from city i, π_{nit}, are

$$P_{nt} \equiv \left(\sum_{i} (\tau_{ni} p_{iit})^{1-\sigma_c} \right)^{\frac{1}{1-\sigma_c}} \quad \text{and} \quad \pi_{nit} = \left(\frac{\tau_{ni} p_{iit}}{P_{nt}} \right)^{1-\sigma_c}. \tag{5}$$

The budget constraint of a worker is given by

$$P_{nt} C_{nt}^{w} = w_{nt}(1 - \tau)$$

where τ is a labor income tax. While the tax is zero in our baseline scenario, it will play a role in the policies we study in Section 6. After consuming in period t, the worker faces idiosyncratic utility shocks of moving to each destination city d, ϵ_{dt}, and makes her moving decision at the end of the period. Given our focus on steady state outcomes, we assume there are no migration costs.

All things considered, workers' value of living in city n at t combines an amenity value b_n, consumption utility, and the continuation value of moving

$$v_{nt}^{w} = \log(b_n C_{nt}^{w}) + \max_{d} \{ \beta \mathbb{E}_t [v_{dt+1}^{w}] + \rho \epsilon_{dt} \}. \tag{6}$$

We assume that idiosyncratic shocks ϵ are drawn from an extreme value distribution, $F(\epsilon) = e^{-(\epsilon - \bar{\gamma})}$. The parameter ρ captures the relative importance of idiosyncratic reasons for migration that are not captured by amenities or real income in a city. The expectation is taken with respect to future realizations of idiosyncratic shocks ϵ_{dt+1}.

4.1.3 Capitalists

There is one infinitely-lived immobile capitalist per city. The capitalist owns the local stock of physical capital and rents it to the producers of the final good. To transfer resources inter-temporally, the capitalist can either invest in physical capital or save using deposits from the local bank branches available. Both deposits and loans are one-period, risk-free claims.

Banks' role in financing local investment. In order to finance investment in physical capital, the capitalist needs to borrow from local banks. Moreover, loans from different banks are imperfect substitutes when funding new investments. A unit of investment good is produced by borrowing from different banks and using the borrowed amounts to buy the final good,

$$i_{nt} = \left[\sum_{b \in \mathcal{B}^n} (\gamma_n^b \frac{L_{nt+1}^b}{P_{nt}})^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \tag{7}$$

where L_{nt+1}^b denotes loans issued in period t and maturing at $t+1$, and the price index in the denominator is the same as the one in equation (5).

Equation (7) captures, in a parsimonious way, heterogeneity between banks which, in practice, are specialized in funding different types of businesses. While we abstract from firm heterogeneity in the model, banks specialize in firms of different size, sector, or exporting status. In the same direction, our parameters γ_n^b capture the fit of a bank to the activities conducted in city n. The elasticity of substitution between banks σ is a key parameter in the model, underlying banks' ability to exploit local market power in interest rate setting.

The cost of investment for the capitalist in city n comes from solving

$$\mathcal{L}_{nt}(i_{nt}) = \min_{\{L_{nt+1}^b\}_b} \sum_{b \in \mathcal{B}^n} L_{nt+1}^b (1 + r_{nt+1}^b) \text{ s.t. equation (7).}$$

Manipulating the first-order conditions from this problem, we can express the equilibrium demand of loans from bank b in period t as

$$\frac{L^b_{nt+1}}{P_{nt}} = (\gamma^b)^{\sigma-1}\left(\frac{R_{nt+1}}{1+r^b_{nt+1}}\right)^{\sigma} i_{nt} \tag{8}$$

$$\text{where } R_{nt+1} \equiv \left[\sum_{b\in\mathcal{B}}\left(\frac{1+r^b_{nt+1}}{\gamma^b_n}\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}. \tag{9}$$

From equation (7) and equation (8) it follows that

$$\mathcal{L}_{nt}(i_{nt}) = i_{nt}R_{nt+1}P_{nt}. \tag{10}$$

Capitalist's full problem. Capitalists decide how much to consume, save using deposits, and invest. Following the finance literature, we assume that capitalists derive utility from consumption and the liquidity services provided by deposits (Drechsler et al., 2017; Morelli et al., 2024). The parameter α controls how much liquidity benefits capitalists derive from deposits. The parameters κ^b_n capture differences in the utility associated with deposits from bank b in city n, associated for example with a bank having more branches in the city. Using C^c_{nt} to denote capitalists' consumption, the full problem of a capitalist in city n is[11]

$$\max_{\{C^c_{nt},D^b_{nt+1},k_{nt+1}\}^{\infty}_{t=0}} \sum_{t=0}^{\infty}\beta^t\left[\log C^c_{nt} + \alpha\log D_{nt+1}\right] \text{ with } D_{nt+1} = \left[\sum_b(\kappa^b_n D^b_{nt+1})^{1-\frac{1}{\eta}}\right]^{\frac{\eta}{\eta-1}},$$
$$\underline{\text{s.t}}\ P_{nt}C^c_{nt} + \sum_b D^b_{nt+1} + i_{nt-1}R_{nt}P_{nt-1} = \hat{r}_{nt}k_{nt} + \sum_b D^b_{nt}(1+\tilde{r}^b_{nt}) + T^c_{nt} \tag{11}$$
$$k_{nt+1} = k_{nt}(1-\delta) + i_{tn} \text{ and } k_{n0}, \{D^b_{n0}, L^b_{n0}\}_b.$$

The budget constraint, equation (11), is expressed in nominal terms: capitalists' income comes from renting out capital at rental rate $\hat{r}_{nt}$, the payout of her previous deposits, and a transfer from the government T^c_{nt} which we specify below. Income is spent on consumption, new deposits, and repaying loans maturing at t. Manipulating the first-order conditions of this problem, the demand for deposits from bank b is

$$D^b_{nt+1} = (\kappa^b_n)^{\eta-1}\left(\frac{Q_{nt+1}}{q^b_{nt+1}}\right)^{\eta} D_{nt+1}, \tag{12}$$

[11] We assume that the intra-temporal consumption problem of a capitalist is equivalent to the workers' with the same elasticity of substitution across goods.

where

$$q_{nt+1}^{b} \equiv 1 - \underbrace{\left(1 + \tilde{r}_{nt+1}^{b}\right)}_{\text{Return on deposits}} / \underbrace{\left(\frac{(1-\delta)R_{nt+1}P_{nt}}{R_{nt}P_{nt-1} - \hat{r}_{nt}}\right)}_{\text{Return on investment}} \text{ and } Q_{nt+1} \equiv \left(\sum_{b} (\frac{q_{nt+1}^{b}}{\kappa_{n}^{b}})^{1-\eta}\right)^{\frac{1}{1-\eta}}. \tag{13}$$

From the capitalist's perspective, the total price of a deposit with bank b is q_{nt+1}^{b}. This cost captures the dollar that she gives up when making a deposit, net of the interest income accruing tomorrow. The pecuniary cost is adjusted by the marginal rate of substitution between periods. Moreover, the latter is linked to the rate at which resources can be transferred by investing in physical capital. Thus, the return on investment in physical capital can be used to adjust the future pecuniary benefit of a deposit in the definition of q_{nt+1}^{b}.

Deposits demand and consumption are given by

$$D_{nt+1} = \frac{\alpha M_{nt}}{Q_{nt+1} +_{nt+1}^{\eta} \tilde{Q}_{nt+1}}, \tag{14}$$

$$\text{and } P_{nt}C_{nt}^{c} = \frac{Q_{nt+1}M_{nt}}{Q_{nt+1} +_{nt+1}^{\eta} \tilde{Q}_{nt+1}}, \tag{15}$$

where we have used the definition of income $M_{nt} \equiv \hat{r}_{nt}k_{nt} + \sum_{b}(1 + \tilde{r}_{nt}^{b})D_{nt}^{b} - i_{nt-1}R_{nt}P_{nt-1}$ and $\tilde{Q}_{t+1}$ is an alternative index of q_{nt+1}^{b}, defined in the Appendix Section B.2.

From equation (8), equation (12) and equation (14) the demand for deposits and loans from each bank b are

$$D_{nt+1}^{b} = (\kappa_{n}^{b})^{\eta-1}\left(\frac{Q_{nt+1}}{q_{nt+1}^{b}}\right)^{\eta} \frac{\alpha M_{nt}}{Q_{nt+1} + \alpha Q_{nt+1}^{\eta}\tilde{Q}_{nt+1}} \tag{16}$$

$$\text{and } L_{nt+1}^{b} = (\gamma_{n}^{b})^{\sigma-1}\left(\frac{R_{nt+1}}{1 + r_{nt+1}^{b}}\right)^{\sigma} i_{nt}P_{nt}. \tag{17}$$

By increasing the interest rate on deposits $\tilde{r}_{t+1}^{b}$ (which translates into a decrease in q_{t+1}^{b}), the demand for deposits from bank b increases. By increasing the interest rate on loans r_{t+1}^{b}, the demand for loans from bank b decreases. We now turn to banks' problem of setting interest rates, taking these two functions as given.

4.1.4 Banks

The owner of bank b operates branches in a set of cities denoted by $\mathcal{C}^b$. The cash flow of bank b at time t is

$$\Pi_t^b \equiv \left\{ \sum_{n\in\mathcal{C}^b} \overbrace{L_{nt}^b(1+r_{nt}^b)(1-\tau_n^b) + D_{nt+1}^b}^{\text{Retail inflow}} - \overbrace{L_{nt+1}^b - D_{nt}^b(1+\tilde{r}_{nt}^b)}^{\text{Retail outflow}} \right\} + F_{t+1}^b - (1+r_t^F)F_t^b - T_t^b.$$

Retail inflows at time t consist of loans maturing at t and new deposits issued at t in all cities where the bank has branches. Retail outflows consist of loans issued at t and deposits maturing at t. The term τ_n^b represents city–bank–specific taxes on loans ($\tau_n^b < 0$ for subsidies). These taxes are zero in our baseline scenario, but they play a role in the policy analysis in Section 6, where we study policies that correct market power. The position of each bank in the interbank market is denoted by F_{t+1}^b. All banks have access to the same interbank interest rate r_t^F, and a positive value of F_{t+1}^b indicates that the bank borrows from other banks. The term T_t^b is a bank-specific lump-sum tax, defined below.

The bank owner chooses city-specific nominal interest rates on loans r_{nt+1}^b and the cost of deposits q_{nt+1}^b to maximize the discounted sum of cash flows net of a nonpecuniary cost of tapping into the interbank market.[12] Banks must satisfy the balance sheet constraint equation (19). Finally, we assume that bank owners face a nonpecuniary cost of tapping into the interbank market, which captures the forces discussed in subsection 3.3. These nonpecuniary costs are assumed to be increasing in the amount borrowed or lent in the interbank market, as in Oberfield et al. (2024). The parameter ϕ governs the elasticity of nonpecuniary costs with respect to volume.

The problem of a bank owner is therefore

$$\max_{\{\{r_{nt}^b, q_{nt}^b\}, F_t^b\}_{t=0}^\infty} \sum_{t=0}^{\infty} \beta^t \left\{ \Pi_t^b - \big(\exp(\phi\omega^b) - 1\big)(1+r_t^F)F_t^b \right\} \tag{18}$$

$$\underline{\text{s.t.}}\ [\mu_t^b] \sum_{n\in\mathcal{C}^b} L_{nt+1}^b = \sum_{n\in\mathcal{C}^b} D_{nt+1}^b + F_{t+1}^b \quad \forall t, \tag{19}$$

$$\text{equation (9), equation (16), equation (17)} \quad \forall t, \forall n \in \mathcal{C}^b.$$

where we define

$$\omega^b \equiv \frac{F_t^b}{\sum_{n\in\mathcal{C}^b} D_{nt}^b}.$$

We assume oligopolistic competition in the loan market and monopolistic competition in the market for

[12] We write the bank's problem in terms of the deposit cost q_{nt+1} instead of $\tilde{r}_{nt+1}$ for simplicity; the interest rate can be recovered from equation (13).

deposits. That is, the bank owner takes the demand for deposits and loans given by equation (16) and equation (17) as given and internalizes its own effect on the interest rate index R_{nt}, but not on Q_{nt} or $\tilde{Q}_{nt}$.[13]

From the first-order conditions of this problem, the marginal cost of issuing loans for bank b is

$$\mathcal{MC}_t^b \equiv \left(\tfrac{1}{\beta} + \mu_t^b\right) = \exp(\phi\omega^b)(1 + r_{t+1}^F)\big(1 + \phi\omega^b\big). \tag{20}$$

From the perspective of a bank, the marginal cost of issuing a loan includes the dollar the bank must give up today in exchange for a dollar tomorrow, in addition to the value of balance sheet space, captured by μ_t^b. The latter depends on who much the bank is currently tapping into the interbank market, as shown in the last expression in equation (20).

Optimal local interest rates satisfy

$$(1 + r_{nt+1}^{b*})(1 - \tau_n^b) = \frac{\varepsilon_{nt}^{Lb}}{\varepsilon_{nt}^{Lb} - 1}\mathcal{MC}_t^b, \tag{21}$$

$$q_{nt+1}^b = -\frac{\eta}{\eta - 1}\beta\left\{\exp(\phi\omega^b)(1 + r_{t+1}^F)\phi(\omega^b)^2 + \mathcal{MC}_t^b - \frac{1}{\beta}\right\}. \tag{22}$$

where $\varepsilon_{nt}^{Lb} \equiv -\frac{\partial L_{nt}^b}{\partial r_{nt}^b}\frac{(1+r_{nt}^b)}{L_{nt}^b}$ is the demand elasticity of loans. Equation (21) shows how loan markups vary across cities depending on the local sensitivity of loan demand to interest rates. The local elasticity for a particular bank is is given by

$$\varepsilon_{nt}^{Lb} \equiv -\frac{\partial L_{nt}^b}{\partial r_{nt}^b}\frac{(1 + r_{nt}^b)}{L_{nt}^b} = \sigma\big(1 - s_{nt+1}^b\big) + s_{nt+1}^b \times \varepsilon_{nt+1}^i, \tag{23}$$

$$\text{where } \varepsilon_n^{i,R} \equiv -\frac{\partial i_{nt}}{\partial R_{nt+1}}\frac{R_{nt+1}}{i_{nt}} \overbrace{=}^{\text{at the steady state}} \frac{1}{\beta(1-\delta)}\left[1 + \frac{D_n Q_n}{\alpha i_n R_n P_n}\right]. \tag{24}$$

and $s_{nt+1}^b \equiv \frac{(1+r_{nt+1}^b)L_{nt+1}^b}{i_{nt}R_{nt+1}P_{nt}}$ is bank b's local revenue share.

As in Atkeson and Burstein (2008), the local elasticity is a revenue-share-weighted average of the local elasticity of substitution between banks, σ, and the city-level aggregate elasticity of investment with respect to the price index, ε_n^i. We discuss the relationship between these two objects in Section 4.3 below. Similar expressions feature in the models of loan demand in Herreno (2023) and Altavilla et al. (2022). The main difference in our setting is that we link the aggregate elasticity of investment $\epsilon_n^{i,R}$ to the local availability of deposits.

Equation (22) shows that markdowns on deposits are constant in the model, which follows from our

[13]We exclude oligopolistic competition in deposits to keep the analysis focused on loan rates, but it can be tractably incorporated into our framework.

assumption of monopolistic competition in the deposit market. The right-hand side of equation (22) includes an additional term capturing the fact that deposits lower nonpecuniary costs.[14]

In Section 3 we documented that, following a shock to its deposit base, a bank issues more loans and lowers its interest rates, and we used a simple partial equilibrium model to explain these results in subsection 3.3. The quantitative model captures the same intuition: an increase in deposits lowers marginal costs in the right-hand side of equation (20), which translates into lower interest rates through equation (21) and leads to higher lending through the loan demand function equation (8).

4.1.5 Fiscal policy

The government collects taxes and transfers the revenue back into the economy. In the baseline scenario, the government levies taxes on banks and rebates the revenue to capitalists, both lump-sum from the perspective of banks and capitalists. Taxes on bank b are

$$T_t^b = \sum_{n \in \mathcal{C}^b} L_{nt}^b (r_{nt}^b (1 - \tau_n^b) - \tau_n^b) - D_{nt}^b \tilde{r}_{nt}^b - r_t^F F_t. \tag{25}$$

The taxes defined in equation (25) are such that after-tax bank cash flows are zero at the steady state, which makes the geographic location of bank owners irrelevant. The government uses these funds to finance lump-sum transfers to capitalists,

$$T_{nt}^c = \sum_{b \in \mathcal{B}^n} L_{nt}^b r_{nt}^b - D_{nt}^b \tilde{r}_{nt}^b. \tag{26}$$

With the transfers defined in equation (26), capitalist's net interest losses (or gains) from interacting with their local branches are undone by the government transfers. After defining the steady state, we show that government finances are balanced.

Counterfactual analysis . To study the role of market power, we will analyze policies that undo markups. These city-bank specific subsidies τ_n^b will be fully financed by a labor-income tax τ, which adjusts endogenously to satisfy the government's budget balance condition

$$\tau \sum_n w_n \ell_n = -\sum_{b=1}^{B} \sum_{n \in \mathcal{C}^b} L_n^b (1 + r_n^b) \tau_n^b. \tag{27}$$

As we show below, proportional taxes on labor income do not distort workers' moving decisions, and

[14] For analyses of market power on the deposit side, see Drechsler et al. (2017) and Albertazzi et al. (2024).

therefore provide a useful tool to undo the distortions coming from market power without incorporating other distortions. Assuming that these policies are fully financed by taxing workers, naturally, is highly demanding on the effect they can have on workers' welfare, as we discuss in the quantitative analysis.

4.2 Steady state

Given a vector of productivity and amenity values, $\{z_n, b_n\}_{n\in N}$, the set of cities in which each bank is present, $\{\mathcal{C}^b\}_{b\in B}$ and fiscal policy $\tau, \{T^b\}_{b\in B}, \{T_n, \{\tau_n^b\}_{b\in\mathcal{B}^n}\}_{n=1}^N$, a steady state consists of a vector of prices $r^F, \{w_n, p_n, \{r_n^b, \tilde{r}_n^b\}_{b\in B}\}_{n\in N}$, and quantities $\{F^b\}_{b\in B}, \{\ell_n, k_n, i_n, y_n, C_n^w, C_n^c, k_n, \{L_n^b, D_n^b\}_{b\in B}\}_{n\in N}$, that satisfy: (i) optimality for consumption shares, equation (5); (ii) the labor market clearing condition:[15]

$$\ell_n = \frac{\left(\frac{b_n w_n(1-\tau)}{P_n}\right)^{\frac{\beta}{\rho}}}{\sum_{i=1}^N \left(\frac{b_i w_i(1-\tau)}{P_i}\right)^{\frac{\beta}{\rho}}} \ \ \forall n, \tag{28}$$

where ℓ_n is labor demand from local firms; (iii) capitalist's consumption, saving and borrowing optimality condition, equation (15), equation (16) and equation (17); (iv) optimality conditions from the bank owner's problem, equation (20), equation (21) and equation (22); (v) market clearing for final goods

$$w_n\ell_n + \hat{r}_n k_n = \sum_{i=1}^N \pi_{ni}\left(P_i C_i^w + P_i C_i^c + \sum_{b\in\mathcal{B}^i} L_i^b\right) \ \ \forall n, \tag{29}$$

where consumption of city n goods comes from workers and capitalists nationally; (vi) market clearing in the interbank market,

$$\sum_b F^b = 0; \tag{30}$$

(vii) the definition of bank taxes and capitalist's transfers, equation (25) and equation (26); and $(viii)$ all variables are time invariant.

4.2.1 Fiscal policy at the steady state

Bank profits are fully taxed at the steady state: Bank b's cash flows are

[15] See Section B.1 for a derivation.

$$\Pi_t^b = \Big\{ \sum_n L_{nt}^b(1+r_{nt}^b)(1-\tau_n^b) + D_{nt+1}^b - L_{nt+1}^b - D_{nt}^b(1+\tilde{r}_{nt}^b) \Big\} + F_{t+1}^b - (1+r_t^F)F_t^b - T_t^b.$$

At a steady state in which $L_n^b = L_{nt}^b, D_n^b = D_{nt}^b$, and $F^b = F_t^b$ for all t, and using equation (25),

$$\Pi^b = \Big\{ \sum_n L_n^b(r_n^b(1-\tau_n^b) - \tau_n^b) - D_n^b \tilde{r}_n^b \Big\} - r^F F^b - T^b = 0.$$

Budget balance: The budget constraint of the government in the baseline case, $\tau_n^b = 0 \; \forall n, b$ is satisfied if

$$\begin{aligned} \sum_{n=1}^N T^c &= \sum_{b=1}^B T^b \\ \sum_{n=1}^N \sum_{b\in\mathcal{B}^n} L_n^b r_n^b - D_n^b \tilde{r}_n^b &= \sum_{b=1}^B \sum_{n\in\mathcal{C}^b} L_n^b r_n^b - D_n^b \tilde{r}_n^b - r^F F^b \\ r^F \sum_{b=1}^B F^b &= 0 \end{aligned}$$

which follows from market clearing in the interbank market equation (30).

4.3 The determinants of local interest rates

Bordeu et al. (2025) show that there is substantial dispersion in interest rates across Chilean cities, even after controlling for borrowing-firm characteristics and the identity of the lending bank. Moreover, interest rate dispersion underlies our empirical results in Section 3, where we showed that, following a shock to deposits, interest rates respond differently across cities. In the next section we show the ability of our model to match both moments quantitatively; in the remainder of this section we discuss more generally the mechanisms at play.

The model developed in this section rationalizes city-specific interest rates as an equilibrium outcome driven by the extent of competition between local branches and banks' marginal cost of funds, namely, their ability to raise deposits. From equation (21), the optimal interest rate charged by bank b in city n in steady state consists of a markup over the bank-specific marginal cost μ^b,[16]

$$1 + r_n^b = \underbrace{\frac{\sigma - s_n^b \Delta_n}{\sigma - s_n^b \Delta_n - 1}}_{\text{markup}} \mu^b, \quad \text{where} \quad \Delta_n \equiv \sigma - \varepsilon_n^{i,R} = \sigma - \frac{1 + \frac{D_n Q_n}{\alpha i_n R_n P_n}}{\beta(1-\delta)}. \tag{31}$$

As in Atkeson and Burstein (2008), the effective elasticity of demand faced by a bank in a city is a weighted average of two elasticities: the elasticity of substitution across banks, σ, and the aggregate elasticity of investment with respect to the loan price index, $\varepsilon_n^{i,R}$ (see equation (24) and Appendix Section B.2). The parameter Δ_n captures the wedge between these two elasticities.

The outer elasticity $\varepsilon_n^{i,R}$ is an endogenous object in the model. It is proportional to $1+\frac{D_n Q_n}{\alpha i_n R_n P_n}$, reflecting that investment demand is more elastic in cities where capitalists rely more on deposits, their alternative means to transfer resources inter-temporally other than investing in physical capital. This endogeneity is an important difference between our framework and Atkeson and Burstein (2008), where both the inner and outer elasticities are structural parameters of consumers' preferences.

In the next section we estimate $\sigma = 14.11$, which is substantially larger than $\varepsilon_n^{i,R}$ in all cities, leading to $\Delta_n > 0$ throughout.[17] In this case, equation (31) delivers the standard prediction that banks with higher local market shares charge higher markups: at the margin, a large bank faces more inelastic demand because borrowers have fewer alternative banks to switch to, pushing the effective elasticity toward the lower outer elasticity $\varepsilon_n^{i,R}$.

Moreover, the loan-demand elasticity is higher in cities with a high value of deposits relative to loans, because the outer elasticity rises with the deposit-loan ratio. An increase in a bank's local market share is therefore associated with a smaller increase in market power in these cities. We can test for these predictions of the model in our data. The fifth and ninth columns of Table 2 show the results of including the lagged deposit-loan ratio and an interaction between deposit shocks and the lagged deposit-loan ratio in our baseline analysis. We indeed find that loan growth is higher in cities where the deposit-loan ratio is higher, while the effect of the interaction on interest rates is close to zero.

The role of competition. To build intuition on how competition shapes local interest rates, we consider a simplified version of the model. Assume that there are no city–bank–specific matches, $\gamma_n^b = 1$ for all n, b,

[16] All derivations in this subsection are relegated to Appendix Section B.4.

[17] Intuitively, $\Delta_n > 0$ whenever the elasticity of substitution across banks exceeds the elasticity of investment with respect to the overall cost of borrowing. This is the empirically relevant case whenever banks are reasonably substitutable, so that the main margin of adjustment when a bank raises its interest rate is reallocation of loans toward other banks rather than a reduction in total investment.

and that interbank frictions are zero ($\phi = 0$). In this case, all banks have the same marginal cost equal to the interbank rate, $\mu^b = 1 + r^F$, and charge identical markups, leading to equal market shares $s_n^b = 1/B_n$ in every city. The loan-weighted interest rate in city n can therefore be written as

$$\overline{1 + r_n} = \frac{\sigma B_n - \Delta_n}{B_n(\sigma - 1) - \Delta_n} (1 + r^F), \tag{32}$$

where B_n denotes the number of banks in city n. This expression reveals two determinants of local interest rates: the number of competing banks and the sensitivity of local investment to borrowing costs, captured by Δ_n. A useful way to see the role of competition is to note that the markup in equation (32) can be written as $(\sigma - \Delta_n/B_n)/(\sigma - \Delta_n/B_n - 1)$. As B_n increases, $\Delta_n/B_n \to 0$, and the markup converges to the standard monopolistic competition markup that obtains when each bank's market share is negligible, $\sigma/(\sigma - 1)$.

Since $\Delta_n > 0$, it also follows that

$$\frac{\partial \overline{1 + r_n}}{\partial B_n} = \frac{-\Delta_n}{[B_n(\sigma - 1) - \Delta_n]^2} (1 + r^F) < 0$$

and markups converge to the monopolistic benchmark from above, and more banks unambiguously lower local interest rates. The magnitude of the reduction depends on Δ_n. It is larger in cities where the wedge between the inner and outer elasticities is large, because in such cities the transition from oligopolistic to monopolistic competition markups is more pronounced.

Equation (32) also highlights how, in our framework, local lending rates depend on shocks in other cities through the interbank market. An increase in lending opportunities in other cities, for example, increases the demand for funds by banks present in the shocked city, raising the interbank rate r^F and crowding out lending from city n.

The role of interbank frictions. As discussed in Section 3.3, our empirical findings indicate that frictions in the interbank market play a role. To understand how local interest rates depend on these frictions, we take a first-order approximation around $\phi = 0$ and decompose the change in the loan-weighted average interest rate relative to the frictionless benchmark equation (32),[18]

$$\overline{r}_n(\phi) \approx \overline{r}_n(0) + \frac{2\phi}{B_n} \sum_{b=1}^{B_n} \Bigg[\overbrace{\omega^b}^{\substack{\text{marginal} \\ \text{cost}}} + \overbrace{(1-\sigma)(\omega^b - \overline{\omega}_n)}^{\text{reallocation across banks}} \overbrace{\left(1 + \frac{\Delta_n}{B_n\left(\sigma - \frac{\Delta_n}{B_n} - 1\right)\left(\sigma - \frac{\Delta_n}{B_n}\right)}\right)}^{\text{direct effect + markup responses}} \Bigg], \tag{33}$$

[18]The factor 2 in equation (33) comes from the functional-form assumption on nonpecuniary costs of tapping into the interbank market.

where $\omega^b \equiv F^b/D^b$ is bank b's reliance on the interbank market (positive for net borrowers, negative for net lenders) and $\overline{\omega}_n \equiv \frac{1}{B_n}\sum_{b\in\mathcal{B}^n}\omega^b$ is the simple average across banks present in city n.[19]

Equation (33) decomposes the effect of interbank frictions on local interest rates into three channels.

The first channel is a direct increase in the marginal cost of funds. Banks that are net borrowers in the interbank market ($\omega^b > 0$) face higher costs when frictions increase, which raises their interest rates. By contrast, banks that are net lenders ($\omega^b < 0$) see their opportunity cost of retail lending decline, leading them to lower interest rates. This channel highlights that the geographic segmentation of capital markets generates winners and losers: cities that host branches of deposit-rich banks benefit from lower lending rates.

The second and third channels operates through the reallocation of market shares. When frictions create differences in costs across banks, loans shift away from banks that rely more on the interbank market than the local average ($\omega^b > \overline{\omega}_n$) toward banks that rely less on it. Since $\sigma > 1$, the term $(1-\sigma)(\omega^b - \overline{\omega}_n)$ captures how the market share of a high-cost bank declines. This reallocation has an ambiguous effect on the average interest rate. On the one hand, it shifts lending toward cheaper banks, lowering the average. On the other hand, changes in market shares lead to changes in markups. These changes are captured by the terms involving Δ_n. As a bank's market share shrinks, it faces more elastic demand and reduces its markup. The size of this markup adjustment is larger in cities where the gap between the inner and outer elasticities is wide, so that shifts in market shares have a bigger effect on the effective elasticity of demand.

Our model introduces two key ingredients relative to benchmark models at the intersection of banking and spatial economics: frictions in an interbank market and oligopolistic competition in local credit markets. Having illustrated the role of these channels theoretically in a simplified environment, we now turn to estimating the model to assess the quantitative importance of each channel.

5 Estimation

We estimate the model by matching our empirical results in Section 3 and the spatial distribution of employment, wages, and lending in 2015. Table 3 lists the parameters we borrow from the literature as well as internally estimated parameters with their empirical counterparts.

We borrow μ, δ, β and ρ from Kleinman et al. (2023), who parameterize their model to the U.S. economy. We set the value of the elasticity of substitution across final goods to 4, which is standard in the literature, and assume that transport costs are a function of travel times, namely $\tau_{ij} = t_{ij}^{0.375}$ (Redding and Rossi-Hansberg, 2017). We borrow the deposit-elasticity of substitution across banks from Albertazzi et al. (2024),

[19] Throughout this section, F^b and D^b denote bank b's total (across all cities) interbank position and deposits, respectively.

who study deposit markdowns in Europe.

We estimate the loan-elasticity of substitution across banks, interbank frictions, and the vector of productivities, amenities and city-bank matches jointly. The loan-elasticity of substitution and the parameter for interbank frictions are tightly connected to the effect of deposit shocks on lending and interest rates from Section 3. For higher values of σ, the increase in lending at the bank-level is associated with smaller reductions in interest rates. For higher values of ϕ, deposit inflows have a stronger effect on lending, as deposits constitute the main source of funds.

To replicate our empirical exercise in the model, we increase the city-bank deposit shifter κ_n^b proportionally to bank b's exposure to the fishing industry, measured as the deposit-weighted average of fishing employment shares across the cities where the bank collects deposits. This generates a bank-level deposit inflow analogous to the one induced by salmon price movements in the data: banks with a larger share of deposits originating in fishing cities experience a larger increase in their deposit base driven by a higher κ_n^b.

We solve the model under the new values of κ_n^b and compare the resulting equilibrium to the baseline. Using the model-generated data, we then replicate our empirical strategy by instrumenting for bank-level deposit growth with exposure to the shock and estimating the effects on city-bank loan volumes and interest rates. We search over values of ϕ and σ and select the pair that matches the estimated effects of deposit shocks on quantities and prices reported in columns (1) and (5) of Table 2. As discussed in Appendix C.1, we are able to exactly match these empirical elasticities.

We estimate the vector of city-bank matches for loans and deposits, γ_n^b and κ_n^b, to match the observed values of loans and deposits in each city-bank in 2015. Using the wages observed in the data, we estimate the value of productivity $\{z_n\}$ and amenities $\{b_n\}$ in each city as those that rationalize observed labor shares and such that model-implied market clearing conditions hold. For a full description of the estimation algorithm, see Section C.1 and Section C.2.

Table 3: Estimated Parameters

	Description	Value/Range	Source or Objective
A. External sources			
μ	Capital share	0.65	Kleinman et al. (2023)
δ	Rate of depreciation	0.05	Kleinman et al. (2023)
β	Discount factor	0.95	Kleinman et al. (2023)
ρ	Such that the elasticity of migration to ϵ_d is $\frac{1}{3}$	3β	Kleinman et al. (2023)
σ_c	Elasticity of substitution (consumption)	4	Redding and Rossi-Hansberg (2017)
$\{\tau_{nj}\}_{n,j=1,..,N}$	Elasticity of trade costs to travel times t_{ij}	$t_{ij}^{0.375}$	Redding and Rossi-Hansberg (2017)
η	Elasticity of substitution (deposits)	1.6	Albertazzi et al. (2024)
B. Internally estimated			
ϕ	Cost of wholesale funding	0.004	Quantity IV results in Section 3
σ	Elasticity of substitution (loans)	14.11	Price IV results in Section 3
$\{z_n\}_{n=1}^N$	Productivity	[0.26, 0.48]	Wages
$\{b_n\}_{n=1}^N$	Amenity	[0.79, 1.16]	Employment
$\{\{\gamma_n^b\}_{b\in\mathcal{B}^n}\}_{n=1}^N$	Bank-city match	[9.19, 10.93]	Loans
$\{\{\kappa_n^b\}_{b\in\mathcal{B}^n}\}_{n=1}^N$	Bank-city match	[0.10, 1.51]	Deposits

Notes: For productivity, amenity and the bank-city matches, the range shows the 25th-75th percentile ranges.

5.1 Discussion

Elasticity of loan demand across banks. Our estimate for the elasticity of loan demand across banks is 14.11, which lies within the wide range of estimates available in the literature. Maingi (2026) estimates a range of 1.14 to 2.06 using U.S. data, while Altavilla et al. (2022) estimate values between 7 and 22 using European data. Several factors could explain this difference: borrowers in Chile may face lower switching costs, relationship lending may be less prevalent, or the composition of firms in our sample may differ. Given the importance of this elasticity in shaping local market power, understanding its determinants across contexts is an important avenue for future research.

Interbank frictions. In our baseline calibration, the median borrowing bank finances 30 percent of its total funding through the interbank market. Our estimate of $\phi = 0.004$ implies that such a bank behaves as if the interbank rate were 13 basis points higher than the market rate.

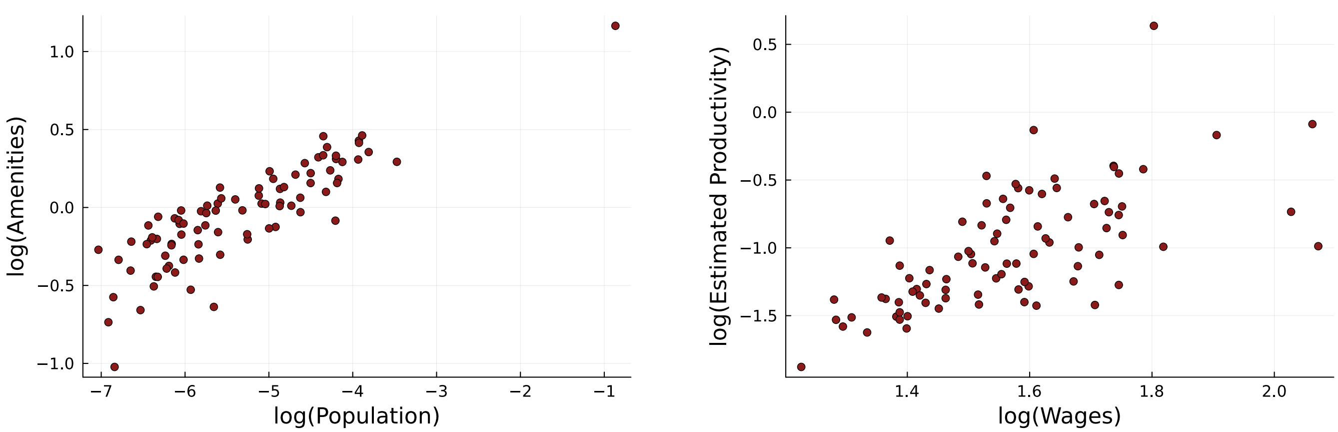
Our estimate of the frictions is not independent from our estimate of the elasticity of substitution between banks. To see this, consider a bank that receives an exogenous inflow of deposits. If demand for loans was very inelastic, the bank would prefer to lend in the interbank market rather than to retail lending, to avoid decreasing prices. To match our quantity responses in Table 2, therefore, interbank frictions would need to be substantially higher. In particular, if we had assumed a value of $\sigma = 4$ instead of $\sigma = 14.11$, our estimate of ϕ would have been 3.8 times larger.

Productivity and amenities. Figure 3a shows the estimated local amenities against employment shares. The two are tightly connected through the lens of the model. Figure 3b shows the estimated productivity values against average local wages from the data. Wages and productivity are positively related, but the relationship is not as tight because the model imposes market clearing, which introduces additional constraints on wages besides the direct effect of productivity.

City-bank matches. The full estimates of $\{\gamma_n^b\}$ are shown in Section C.2 in the Appendix. While microfounding the origins of city-bank matches is beyond the scope of this paper, we find a positive role for the number of local branches (which may reduce the distance between clients and the bank). We estimate

$$\hat{\gamma}_n^b = \beta_0 + \beta \times \text{LogBranches}_n^b + \gamma_n + \gamma_b + \epsilon_n^b$$

using data on the number of branches in each city-bank pair in December 2015. The left-hand side includes our estimates of city-bank matches. By including city fixed effects, our results capture the effect of having a higher share of the local branches. By including bank fixed effects, our results are not mechanically capturing other qualities that differentiate banks. We estimate a positive and statistically significant coefficient on log-branches, indicating that the number of branches within cities plays a role (Appendix Table 10).



(a) Employment Data and Estimated Amenities

(b) Wage Data and Estimated Productivities

Figure 3: Estimated Residential Amenities and Productivity Parameters

6 Interbank frictions, market power, and the spatial allocation of capital

Since Hsieh and Klenow (2009), a large literature has studied how dispersion in the marginal productivity of factors of production reduces aggregate efficiency.[20] Figure 4 shows the dispersion in the marginal productivity of capital (MPK) across cities in our baseline calibration.

In our model, local MPK is closely linked to local interest rates, which differ across cities through two channels. First, interbank frictions cause the marginal cost of funds to vary across banks: banks with better access to deposits face lower costs of issuing loans. Second, market power allows banks to charge higher interest rates in cities where they hold larger market shares.

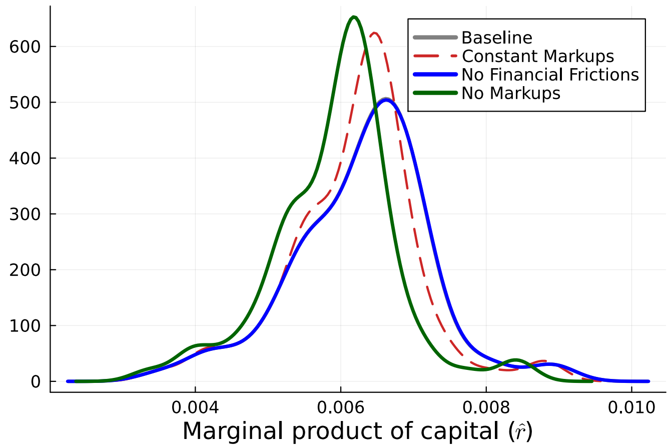


Figure 4: Spatial dispersion of the marginal productivity of capital

In the rest of this section, we use the quantified model to decompose the relative contributions of interbank frictions and market power to MPK dispersion and, ultimately, to productivity and welfare losses.

Given our assumption of no migration costs, expected worker welfare equalizes across cities.[21] Expected worker welfare and the welfare of the capitalist in city n are, respectively,

$$\overline{V}^w = \left(\sum_{n=1}^{N} \left(\frac{b_n w_n}{P_n} \right)^{\theta} \right)^{\frac{1}{\theta}} \quad \text{and} \quad V_n^c = C_n^c D_n^{\alpha}.$$

No interbank frictions. We eliminate the non-pecuniary costs of accessing the interbank market by setting $\phi = 0$ and recomputing the steady state. The marginal cost of funds equalizes across banks, which would, all else equal, compress spatial interest rate dispersion. However, through the lens of the model, dispersion in the marginal product of capital (MPK) relative to its mean rises by 0.02%. In the model,

[20] See Bergquist et al. (2026) for a recent survey.

[21] Realized welfare does not, as it includes idiosyncratic shocks.

endogenous markup adjustments more than offset the decline in cost dispersion. To illustrate this idea, in Figure 5 we compare changes in marginal costs to changes in markups at the bank level. Banks experiencing a reduction in marginal costs after the removal of interbank frictions respond by increasing their markups. Conversely, banks that face higher costs, previously benefiting from preferential access to deposits but now exposed to greater competition for these funds, reduce their markups.

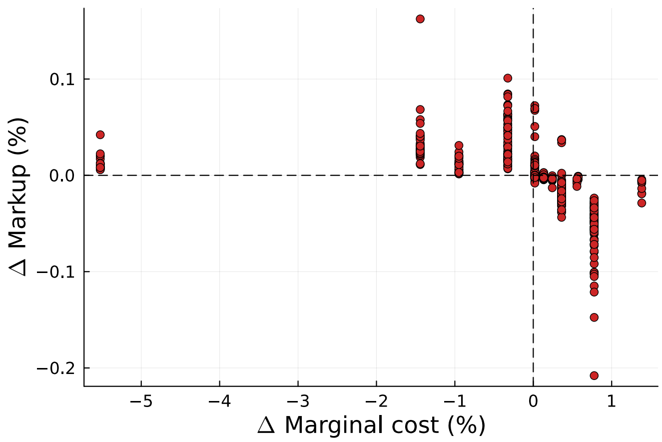
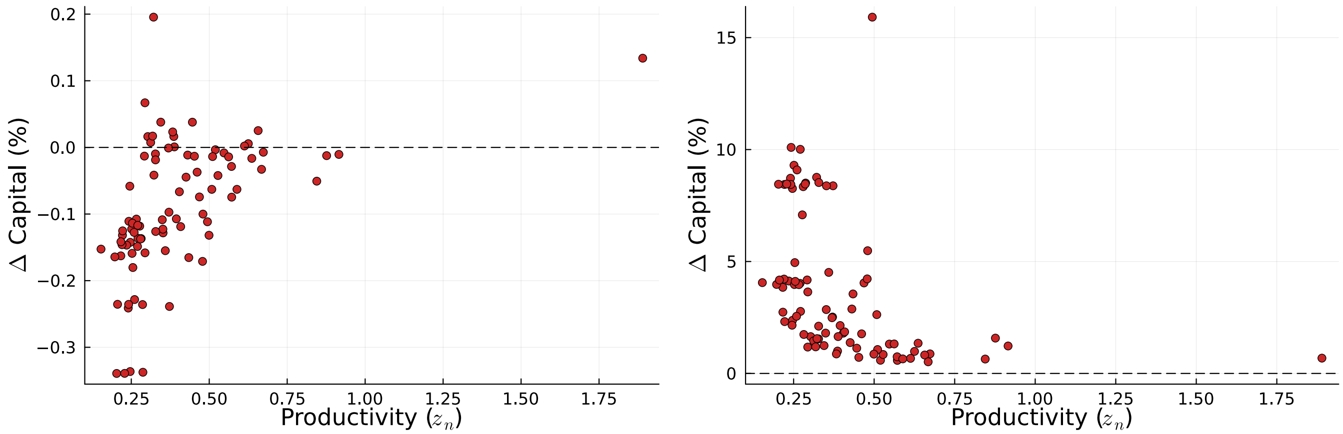


Figure 5: Markup responses to changes in marginal cost

Despite higher MPK dispersion, aggregate GDP rises modestly by 0.02% in this scenario, driven by better allocation of capital across cities: capital reallocates towards more productive cities (Figure 6a). Worker welfare increases by 0.01%, while the median increase in capitalists welfare across cities is 0.26%. The average capitalist welfare, however, declines by 0.07%, which highlights the heterogeneous effect of this policy across cities.

The bank network has heterogeneous effects in space, as we discussed analytically in Section 4.3. Some cities benefit from the geographic segmentation of capital markets, where local deposits were effectively captive and had to be lent locally. When interbank lending becomes frictionless, banks with a local presence in these cities find it easier to channel funds elsewhere. In Figure 6a we illustrate this heterogeneity by plotting investment responses against exogenous city productivity z_n. Cities at the bottom of the productivity distribution lose capital when interbank frictions are removed, while capital flows toward cities with higher productivity. In the case of Chile, the captive deposits mechanism tends to benefit least productive cities.



(a) No financial frictions

(b) Constant markups

Figure 6: Heterogeneous Investment Responses

No markups. To gauge the effect of market power, we calculate the steady state of an economy in which city-bank specific subsidies correct markups,

$$1 - \tau_n^b = \frac{\epsilon_n^{L,b} - 1}{\epsilon_n^{L,b}} \ \forall n, b$$

$$\text{and, from equation (21)}, \ 1 + r_n^b = \mathcal{MC}^b \ \forall n, b.$$

Eliminating markups reduces MPK dispersion by 1.5% and the average MPK by 6%, as shown in Figure 4. The resulting increase in investment raises aggregate productivity by 3.6%. Workers bear the full cost of the subsidies required to eliminate markups, so their after-tax welfare falls by 0.02%, even though their pre-tax welfare increases by 3.6%. Capitalists benefit more than under the removal of interbank frictions: their average welfare rises by 4.1%.

Constant markups. To gauge the effect of oligopolistic competition, we solve for the steady state of an economy in which city-bank specific subsidies are such that markups replicate monopolistic competition markups,

$$1 - \tau_n^b = \frac{\epsilon_n^{L,b} - 1}{\epsilon_n^{L,b}} \frac{\sigma - 1}{\sigma} \ \forall n, b$$

$$\text{and, from equation (21)}, \ 1 + r_n^b = \frac{\sigma}{\sigma - 1} \mathcal{MC}^b \ \forall n, b.$$

Equalizing markups across cities reduces the spatial dispersion of MPK by 1.5% and the average MPK by 1.7%. The resulting increase in investment raises GDP by 0.5%. Capitalist welfare increases by 1% on average, while workers see a small after-tax welfare decline of 0.02% despite a pre-tax welfare gain of 0.6%. Compared to the full elimination of markups, equalizing them across space captures all of the reduction in MPK dispersion but a smaller share of the reduction in average MPK, resulting in more muted aggregate GDP gains.

Similarly as for interbank frictions, the effects of oligopolistic competition are heterogeneous across cities. Figure 6b shows the investment response in each city. Market power hinders investment the most in the least productive cities.

It is clear from Figure 4 that even in all cases there is some residual dispersion in MPK. This persistence stems from the underlying structure of the banking network itself, as cities vary in their number of operating banks, and the city-bank shifter γ_n^b creates heterogeneity in each bank's comparative advantage for lending across different cities.

Table 4 summarizes our quantitative results on the role of the observed bank network. Our main quantitative conclusion is that local market power has the strongest effect on productivity and welfare. In each experiment, the increase in productivity results from both an increase in overall investment and better allocation of capital across cities.

Table 4: The role of interbank frictions and market power

	No interbank frictions	No markups	Constant markups
Steady state outcomes			
Aggregate productivity	0.02%	3.55%	0.52%
Average MPK ($\mathrm{E}[\hat{r}_n]$)	0.03%	-6.02%	-1.73%
MPK dispersion ($\mathrm{std}(\hat{r}_n)/\mathrm{E}[\hat{r}_n]$)	0.02%	-1.52%	-1.52%
Workers			
Welfare	0.01%	-0.02%	-0.02%
Pre-tax welfare	0.01%	3.60%	0.57%
Capitalists			
Average welfare	-0.07%	4.14%	1.01%
Median welfare	0.26%	3.86%	0.79%

7 Bank mergers

While our results in Section 6 suggest an important role for banks' market power, city-bank specific subsidies are rarely used in practice. On the other hand, evaluating and regulating bank mergers are recurrent questions facing policymakers. In Chile alone, four large bank mergers occurred during 2000-2020 (Marivil et al., 2021).

A natural concern with bank mergers is that lower competition will lead to higher interest rates. In Chile, where the median number of banks per city is three, bank mergers could lead to a substantial increase in markups in cities where both merging banks were present before the merger. Bank mergers, on the other hand, can enhance the efficiency of the banking sector if they allow the merging banks to circumvent the interbank market. Our framework with oligopolistic competition allows us to capture both sides of the trade-off.

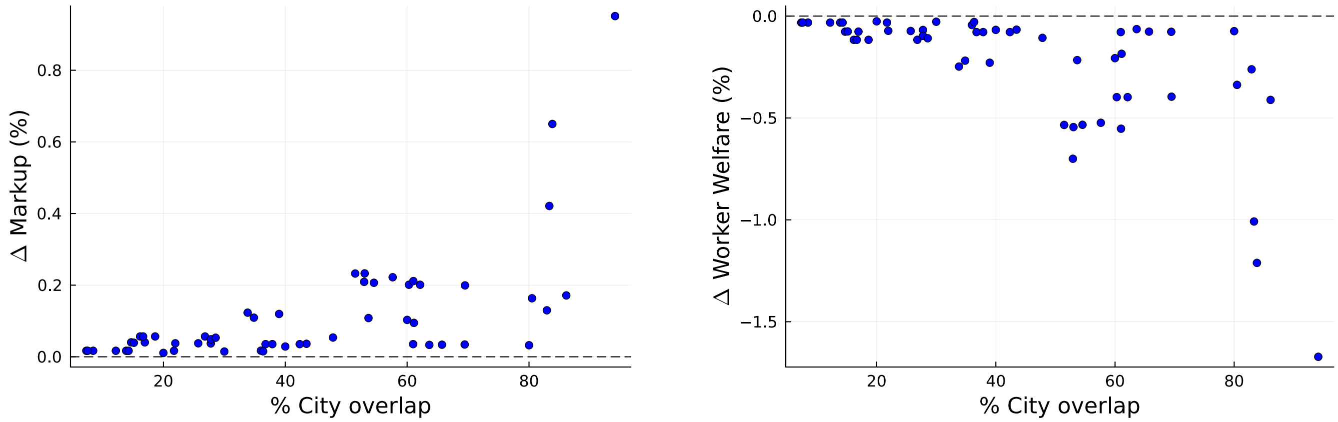
Using the quantified version of our model, we evaluate every possible two-bank merger between the twelve largest banks in our data, leading to sixty-six mergers. For each merger, we compute the steady state of the economy where the two banks merge. We assume that the city-bank match, γ_n^b and κ_n^b of the merged bank equals the maximum among the two merging banks in city n whenever both banks are present in the city. We focus on worker welfare, productivity, and the average markup for each merger.

The economic effects of mergers are heterogeneous. The change in welfare ranges between -1.7% and $\approx 0\%$; the increase in markups varies between $\approx 0\%$ and 0.95%.

A first determinant of the welfare effect of a merger is the overlap in space of the two merging banks. We calculate geographic overlap as the percentage of cities where banks overlap relative to the largest number of cities in which each of the merging banks has branches.[22] If both banks have branches in the same cities, the merger will lead to a strong increase in markups without improving financial integration.

Figure 7 shows the effects of each merger as a function of city overlap. Figure 7a shows that the increase in markups is higher when banks' overlap in more cities. Figure 7b shows that the increase in markups is a key driver of welfare losses: higher markups lead to lower welfare.

[22] That is, if Bank A, present in 10 cities, merges with Bank B, present in 8 cities, and the overlap in 5 cities, the city overlap would be 50%.



(a) Δ Markup

(b) Δ Worker Welfare

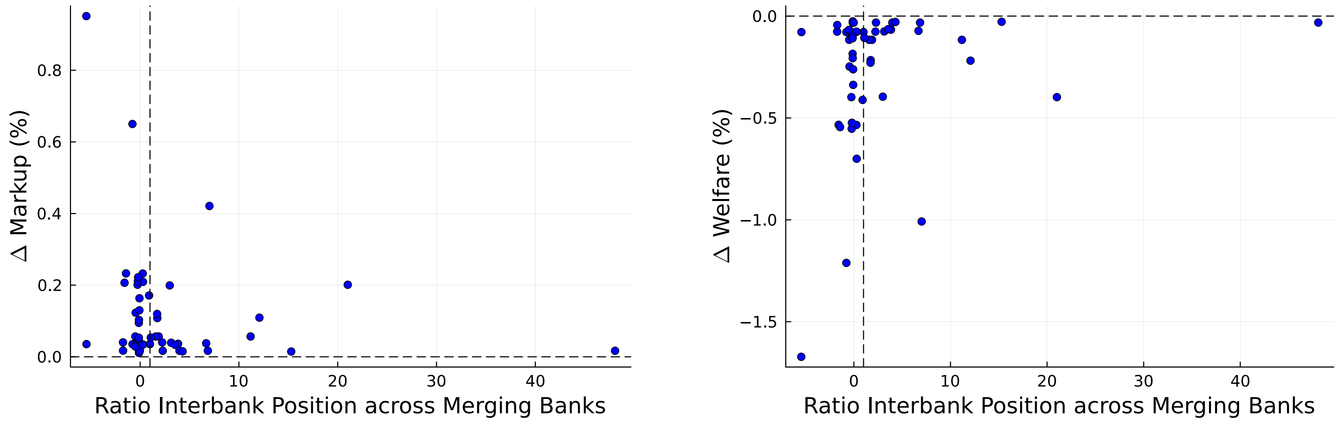
Figure 7: Mergers' outcomes as a function of geographic overlap

We then sort mergers according to the financial integration dimension. If the two merging banks have opposite positions with the interbank market, merging allows them to transfer funds internally, bypassing the frictions associated with the interbank market. We define a measure of differences in merging banks' position in the interbank market as

$$\text{Ratio of interbank market positions between A and B} = \frac{\min\left(F^A, F^B\right)}{\max\left(F^A, F^B\right)}.$$

The ratio takes the value of one if both banks have the same position in the interbank market; it is positive if both banks are borrowing or lending, and negative if they take opposite positions in the interbank market. The ratio is large in absolute value if the gap between banks' positions is large.

Whenever both banks' reliance on the interbank market is similar, merging will not change their reliance on it. Indeed, Figure 8 shows that markup reductions and welfare effects are larger when merging banks have opposite positions in the interbank market. Merging allows these banks to circumvent the interbank market.



(a) Δ Markup (b) Δ Worker Welfare

Figure 8: Mergers' outcomes as a function of banks' position in the interbank market

8 Conclusion

In this paper we make two main contributions. Empirically, we show that localized deposit shocks lead to more lending and reductions in interest rates by exposed banks. Moreover, we show that loan growth is concentrated in cities where banks hold a low share of the loan market. Our results complement and extend findings on banks' lending responses to deposit inflows. Previous studies did not study the interest rate response nor include banks' local market power into the analysis (Becker, 2007; Gilje et al., 2016; Bustos et al., 2020). Our results align with studies in industrial organization and finance which incorporate banks' local market power (Wang et al., 2020; Aguirregabiria et al., 2025).

We develop a novel theory with oligopolistic competition and interbank frictions which rationalizes our empirical results and allows us to study their general equilibrium implications. We use the quantified version of our model to isolate two features of the observed branch network and their effect on economic outcomes in Chile. First, we study a counterfactual economy without interbank frictions and find that these frictions affect the allocation of capital across banks, which results in a negligible decline in aggregate productivity. Local market power reduces productivity by 0.5% by distorting the allocation of capital across cities. Finally, we use the model to assess all possible two-bank mergers in Chile. Bank mergers are a common challenge for policy makers: in Chile alone, four large banks merged between 2000 and 2020 (Marivil et al., 2021). A spatial perspective sheds light on the trade-offs associated with bank mergers. Our main results are that the welfare effects of bank mergers are higher when the merging banks have little geographic overlap, which limits the increase in markups, and when one of them borrows and the other lends in the interbank market. In such cases, merging allows them to channel funds internally and bypass the frictions associated with the interbank market.

An important limitation of our analysis is that we take the bank branch network as given throughout. This means that our counterfactual exercises capture the effects of interbank frictions and market power conditional on the observed geographic distribution of branches, but cannot account for how banks would adjust their entry and exit decisions in response to changes in the competitive environment. This limitation is particularly relevant for the policy implications of our market power counterfactuals. For example, under constant markups (Figure 6b), most of the increase in capital is directed toward lower-productivity cities. In practice, however, policies that curtail oligopolistic rents may also reduce banks' incentives to maintain branches in these cities, potentially undoing some of the gains from lower markups. A full analysis of competition policy in banking should therefore incorporate banks' endogenous branching decisions, as in Oberfield et al. (2024). Integrating entry and exit with oligopolistic pricing in a spatial framework is a challenging but important direction for future research.

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9 Appendix

A Empirical appendix

A.1 Chile's financial development

We use public data from the World Bank, accessed online on June 2024. Figure 9 below shows the evolution of the two indicators of financial development mentioned in the main text.

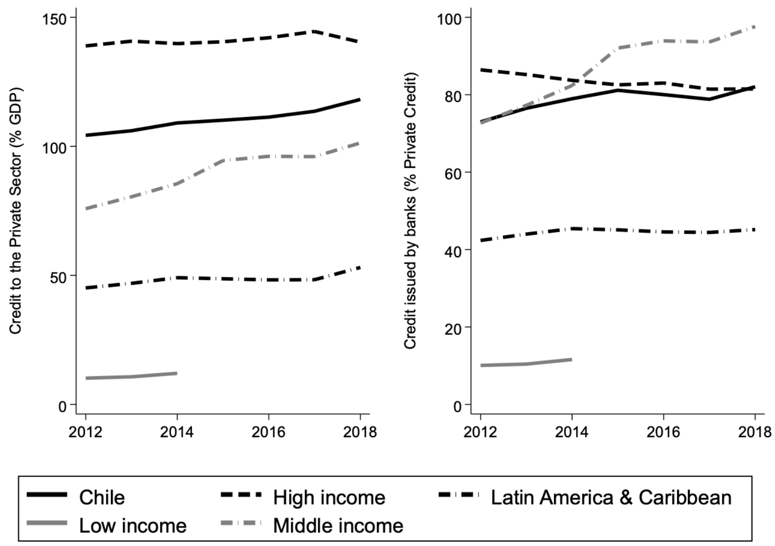


Figure 9: Financial development

A.2 The importance of banks for domestic credit in Chile: Survey evidence

Firms and households rely mostly on banks for financial services and local branches play a significant role.

Firms. To delve deeper into the importance of banks for private firms in Chile, we rely on firm-level data from the 2015 *Encuesta Longitudinal de Empresas* (ELE), a nationally representative survey that includes a module on firms' sources of credit. We calculate the percentage of private firms that borrow from banks and the percentage of firms for which banks constitute the main source of credit. We exclude Santiago, the capital city and home to approximately 29% of the population and bigger firms, to show that Santiago does not drive the results. The first two columns of Table 5 show that banks stand out as the main source of credit for large private firms outside the capital area.

Table 5: Credit sources for firms (excluding Santiago)

Firm size	2015 ELE		
	% borrows from banks	% biggest loan comes from banks	% private employment
Micro	57.1	16.7	7.7
Small	66.4	29.6	39.3
Medium	77.7	42.1	21.9
Large	80.5	50.4	30.1

Households. In 2007 and 2017, the *Encuesta Financiera de Hogares* (EFH), a nationally representative survey of households' financial behavior, included modules on the financial assets held by households; using these modules, we first document that households rely significantly on banks to purchase financial assets (compared to other institutions) and, secondly, that Internet banking remains limited.

In the EFH we separately observe the total amount invested by an individual household in stocks, mutual funds, fixed income, saving accounts, and other instruments. The survey contains information on the financial institution through which these assets were purchased. Panel A in Table 6 shows — for the sub-sample of respondents with positive financial assets — what percentage of savings were allocated to each asset and the percentage of respondents who used banks to purchase that asset. Banks are the primary institutions used by households to invest in mutual funds and fixed-income assets and to open savings accounts. These represent around half the total investment in financial assets in 2007 and 2017.

The main concern regarding reliance on local branches is the expansion of Internet banking, which makes it easier to save and borrow from geographically distant banks. The EFH includes a question on the use of Internet banking, where people are asked whether they used the Internet to carry out a variety of financial transactions. Panel B in Table 6 shows the share of respondents who used the Internet to purchase financial assets or get new loans. In both cases, we calculate the percentage over the total number of respondents who either purchase assets or get new loans. Internet was used more intensively to purchase new financial assets than to get loans. Although there was an increase in both uses between 2007 and 2017, a majority of the transactions still happen in physical branches. Moreover, the survey does not distinguish between new transactions and the first transaction with a bank, therefore representing an upper bound on the reliance on the Internet to start new financial relationships with an institution.

Table 6: Households' savings behavior

A. Asset types	2007 EFH		2017 EFH	
	% of assets	% purchased through banks	% of assets	% purchased through banks
Stock	19.1	36.1	15.1	44.2
Mutual Fund	30.8	80.4	24.3	83.7
Fixed-income	9.4	82.9	21.3	90.0
Saving Account	7.0	91.6	7.3	72.3
Other	33.6	-	31.7	-
B. Used the internet to...	% respondents in 2007		% respondents in 2017	
purchase financial assets	6.5		21.0	
get a loan	0.3		2.1	

A.3 Concentration in banking industry

We calculate the market share for top banks using aggregate data from the CMF. Results are shown in Figure 10.

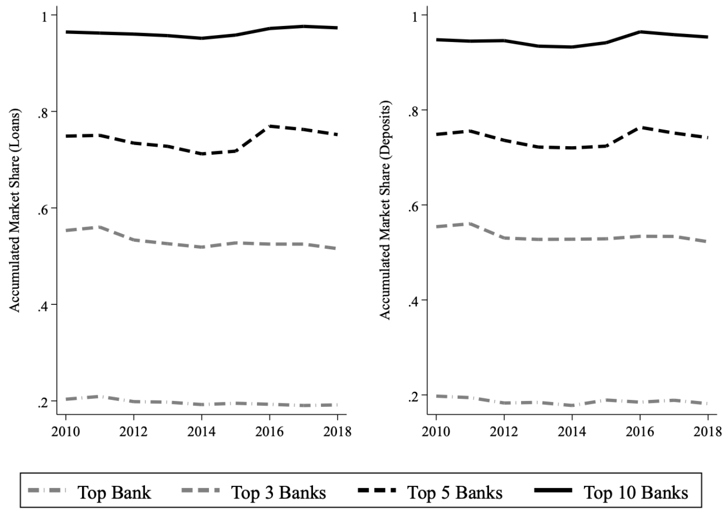


Figure 10: Concentration in the Banking Industry

A.4 Spatial Clustering of Banks

To determine whether banks' economic activity is geographically clustered we follow the approach in Conley and Topa (2002), who study the degree of spatial correlation in unemployment between neighborhoods. More closely related to our setting, the approach has been used to study the degree of geographical concentration in market shares for a variety of consumer goods in Bronnenberg et al. (2007). For this exercise, we use aggregate data from the year 2015 (publicly available through the CMF) and focus exclusively on banks present in at least ten cities in 2015. These banks explained 96.8% of all the outstanding loans in that year. We exclude the metropolitan area around Santiago.

Extensive margin. First, we define the dummy variable X_{ib}, which takes the value 1 if bank b gave any loans in city i. We are interested in the correlation of X_{ib} between pairs of cities i, j as the distance between i and j changes. Figure 11 shows these correlations for each individual bank, where we have defined bins of 250 kilometers in size.

A correlation close to zero suggests that banks' presence is independent across cities. To determine how close to zero the observed measures of correlation would be if the X_{ib} were independent we follow the bootstrap approach in Conley and Topa (2002). We create 100 samples in which we randomize the identity of the cities in which each bank is present by drawing (with replacement) from the observed distribution of that particular bank. The two dashed lines in each figure show the 90% confidence interval across bootstrapped samples. For almost all banks and all distance bins we cannot reject that the observed correlations are different than what we would observe if banks' presence was independent across cities.

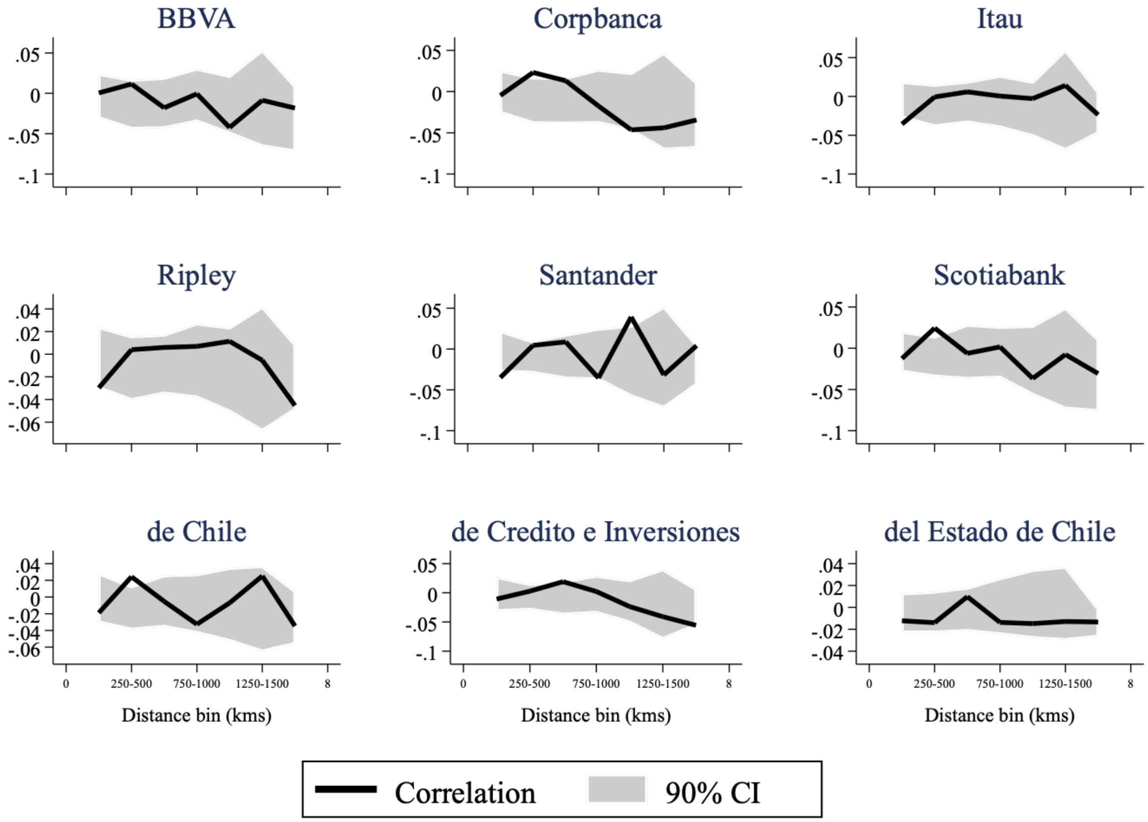


Figure 11: Spatial Correlation in Bank's Presence (Extensive Margin)

Intensive margin. To complement the previous analysis, we study whether there is spatial correlation in market shares (conditional on banks' presence). The approach is analogous to the one described above except that, in this case, the outcome variable is defined as the share of outstanding loans in city i issued by bank b in 2015. When we construct the confidence intervals, we randomize the particular market share of a bank in a city without changing the cities in which a bank is present, therefore focusing exclusively on the intensive margin.

Figure 12 shows the results. The conclusion is similar to the one before, albeit less clear-cut. *Banco de Crédito e Inversiones* and *Banco Santander* exhibit patterns of geographical clustering in market shares.

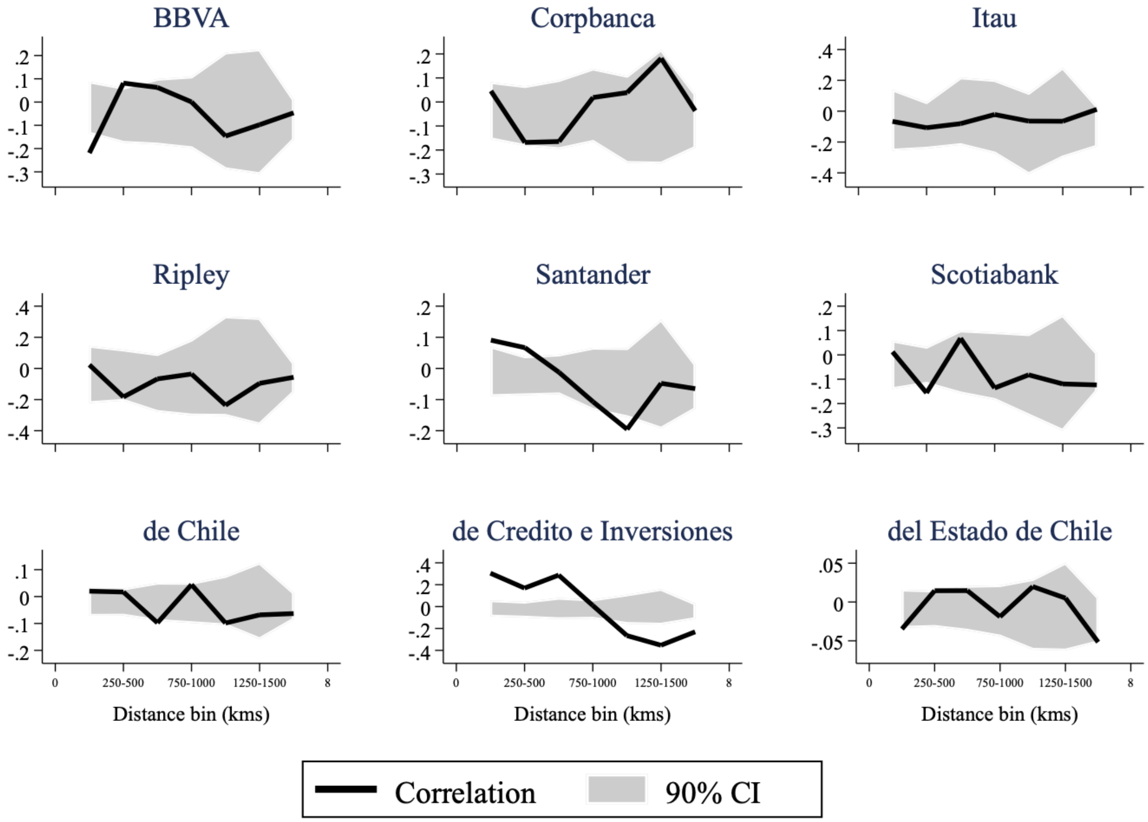


Figure 12: Spatial Correlation in Loan Market Shares (Intensive Margin)

A.5 Details on the Shift-Share IV

We use data from the IMF Commodity Price series. Figure 13 shows the evolution of the world price of salmon at a monthly frequency.

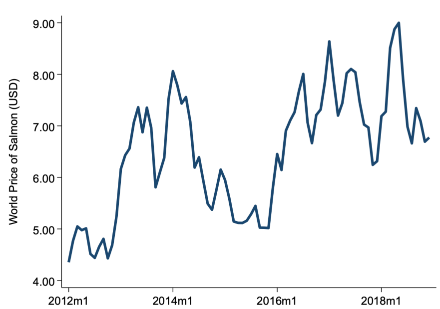


Figure 13: World Price of Salmon

Figure 14 shows the share of local employment in the Fishing industry. The industry is concentrated in the Southern region.

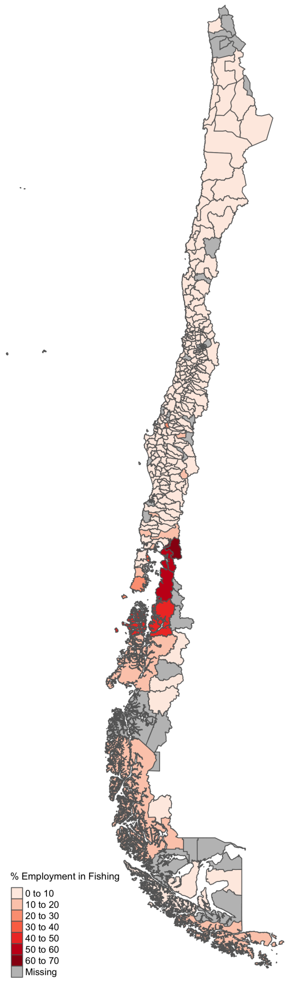


Figure 14: Share of local employment in the fishing industry

A.6 Robustness and extensions of the empirical analysis in Section 3

Robustness 1: Controlling for city-time unobservable shocks. We first modify our main estimating equation, equation (1), by dropping city-month fixed effects but including city fixed effects which absorb time-invariant differences between cities. Table 7 below shows that our estimate of the elasticity increases from 0.11 to 0.13. This difference suggest when exposed banks increase lending in destination cities, all banks present in that city respond by lending more. In our main specification, city-month fixed effects partly absorb those aggregate effects.

Robustness 2: Two-way clustering at the bank-month and city-bank level. In our baseline specification we cluster at the bank-month level, which is the level at which the deposit shocks occur. To account for correlation in shocks within city-bank pair across time, we cluster standard error at both levels. Table 8 shows the results. The main difference is that the interaction between deposit shocks and market share is no longer statistically significant.

Robustness 3: Loan flows as an outcome. The public data from the CMF reports the stock of outstanding loans and the value of loans maturing every month. In principle, therefore, we could calculate the flow of new loans by differencing the stock and adding the value of maturing loans. However, mainly due to noise in the data, this measure leads to many negative values. To address this issue, we add over a longer horizon.

For every t, we calculate an estimate of the number of new loans over the last three months as

Table 7: The Effect of Deposit Shocks on Lending

	Loans (log)			
	(1)	(2)	(3)	(4)
Deposits (log)	0.133***	0.147***	0.123***	0.122***
	(0.048)	(0.048)	(0.040)	(0.040)
× Distance		−0.010		
		(0.011)		
× Mkt Share			−0.439***	−0.427***
			(0.122)	(0.124)
× D-L Ratio				−0.000
				(0.000)
× Mkt Share × D-L Ratio				−0.000
				(0.000)
Loans_{t-4} (log)	0.672***	0.671***	0.586***	0.586***
	(0.032)	(0.032)	(0.037)	(0.037)
City × Bank FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Observations	30,353	30,353	30,021	30,021
R-squared	0.994	0.994	0.995	0.995

Notes: This table reports 2SLS estimates of the effect of deposit shocks on bank lending. The sample excludes cities with any employment in fishing industries. Distance is average travel time to fishing cities. Market share is bank b's share of local lending in city n. D-L Ratio is the local deposit-to-loan ratio. Observations weighted by total bank-level loan volume. Standard errors clustered at the bank-month level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 8: Robustness: Two-Way Clustering

	Loans (log)			
	(1)	(2)	(3)	(4)
Deposits (log)	0.111*	0.092	0.172***	0.162***
	(0.062)	(0.076)	(0.059)	(0.059)
× Distance		0.014		
		(0.030)		
× Mkt Share			−1.518***	−1.457***
			(0.328)	(0.316)
× D-L Ratio				0.004*
				(0.002)
× Mkt Share × D-L Ratio				−0.001*
				(0.001)
Loans_{t-4} (log)	0.684***	0.684***	0.517***	0.517***
	(0.049)	(0.049)	(0.050)	(0.050)
City × Bank FE	Yes	Yes	Yes	Yes
City × Month FE	Yes	Yes	Yes	Yes
Observations	28,439	28,439	28,127	28,127
R-squared	0.994	0.994	0.996	0.996

Notes: This table replicates Table 2 with two-way clustering at the bank-month and city-bank levels. Observations weighted by total bank-level loan volume. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

$$\text{Loan Flow}_{ntb} = \text{Loan Stock}_{ntb} - \text{Loan Stock}_{nt-4b} + \sum_{j=1}^{3} \text{Maturing Loans}_{nt-sb}. \tag{34}$$

Even after averaging over 3 months, around 5% of the observations are negative. Table 9 shows the results of estimating equation (1) with flows as an outcome variable. The results are qualitatively similar to those in the baseline analysis but larger quantitatively.

Table 9: Robustness: Loan Flows as Outcome

	Loan Flows (log)			
	(1)	(2)	(3)	(4)
Deposits (log)	0.788***	0.480***	0.996***	0.922***
	(0.133)	(0.167)	(0.117)	(0.117)
× Distance		0.231***		
		(0.050)		
× Mkt Share			−3.635***	−3.468***
			(0.546)	(0.550)
× D-L Ratio				0.046***
				(0.009)
× Mkt Share × D-L Ratio				−0.007***
				(0.001)
Loans_{t-4} (log)	0.363***	0.364***	−0.007	0.001
	(0.042)	(0.043)	(0.053)	(0.052)
City × Bank FE	Yes	Yes	Yes	Yes
City × Month FE	Yes	Yes	Yes	Yes
Observations	26,556	26,556	26,253	26,253
R-squared	0.909	0.909	0.914	0.915

Notes: This table replicates Table 2 using log loan flows rather than log loan stocks as the outcome variable. Observations weighted by total bank-level loan volume. Standard errors clustered at the bank-month level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

B Mathematical appendix

B.1 Workers

Starting from equation (6) in the main text we derive steady-state employment shares. Using properties of the T1EV distribution of idiosyncratic shocks and dropping time-subindices (as we focus on a steady state), the value function of a worker who has moved to n is

$$v_n = \ln b_{nt} + \ln \frac{w_n(1-\tau^{ss})}{P_{nt}} + \rho \ln \Big(\sum_{d=1}^{N} exp\Big(\tfrac{\beta}{\rho} v_d\Big)\Big).$$

Then,

$$exp\Big(\frac{\beta}{\rho} v_n\Big) = b_n^{\frac{\beta}{\rho}} \times [w_n(1-\tau^{ss})]^{\frac{\beta}{\rho}} \times P_n^{\frac{-\beta}{\rho}} \times \Big(\sum_{d=1}^{N} exp\Big(\tfrac{\beta}{\rho} v_d\Big)\Big)^{\beta}.$$

We define

$$\phi \equiv \sum_{d=1}^{N} exp\Big(\tfrac{\beta}{\rho} v_d\Big). \tag{35}$$

The steady-state value of ϕ solves

$$\begin{aligned} \phi &= \sum_{d=1}^{N} b_d^{\frac{\beta}{\rho}} \times [w_d(1-\tau^{ss})]^{\frac{\beta}{\rho}} \times P_d^{\frac{-\beta}{\rho}} \times \phi^{\beta} & (36)\\ &= \Big(\sum_{d=1}^{N} b_d^{\frac{\beta}{\rho}} \times [w_d(1-\tau^{ss})]^{\frac{\beta}{\rho}} \times P_d^{\frac{-\beta}{\rho}} \Big)^{\frac{1}{1-\beta}} & (37) \end{aligned}$$

From the T1EV assumption for idiosyncratic shocks, migration shares between any cities n and d are

$$M_{nd} = \ell_d = \frac{exp\Big(\frac{\beta}{\rho} v_d\Big)}{\sum_{m=1}^{N} exp\Big(\frac{\beta}{\rho} v_m\Big)} = exp\Big(\frac{\beta}{\rho} v_d\Big)\phi^{-1} = b_d^{\frac{\beta}{\rho}}\, [w_d(1-\tau^{ss})]^{\frac{\beta}{\rho}}\, P_d^{\frac{-\beta}{\rho}}\, \phi^{\beta-1}.$$

Given that we have normalized the population to 1, migration shares and population equalize in the steady state. The expression for population in the main text, equation (28), follows.

B.2 Capitalists

For this subsection we drop n from the sub-indices for clarity, as the problem is isomorphic for all capitalists. The problem of the capitalist can be divided in two stages. In a first stage, the capitalist decides from which banks to borrow in order to finance a level of investment i_t at the lowest cost. In a second stage she maximizes her welfare by deciding how much investment to make taking the cost of investment, $\mathcal{L}_t(i_t)$, as given. We begin by solving the latter.

Solving for $\mathcal{L}_t(i_t)$ The problem of minimizing the cost of investment is

$$\mathcal{L}_t(i_t) = \min_{\{L^b_{t+1}\}_b} \sum_{b\in\mathcal{B}} L^b_{t+1}(1+r^b_{t+1}) \tag{38}$$

$$s.t.\ \ i_t = \Big[\sum_{b\in\mathcal{B}} (\gamma^b \tfrac{L^b_{t+1}}{P_t})^{\frac{\sigma-1}{\sigma}}\Big]^{\frac{\sigma}{\sigma-1}}, \tag{39}$$

From the first order condition with respect to an arbitrary L^b_{t+1},

$$\mu(\tfrac{\gamma^b}{P_t})^{\frac{\sigma-1}{\sigma}}\Big(\frac{i_t}{L^b_{t+1}}\Big)^{\frac{1}{\sigma}} = (1+r^b_{t+1}), \tag{40}$$

where μ is the multiplier associated with the constraint in equation (39). Taking the ratio of equation (40) for two banks b and b',

$$\frac{L^{b'}_{t+1}}{L^b_{t+1}} = \Big(\frac{1+r^b_{t+1}}{1+r^{b'}_{t-1}}\Big)^{\sigma}\Big(\frac{\gamma^{b'}}{\gamma^b}\Big)^{\sigma-1}. \tag{41}$$

From here, picking an arbitrary b':

$$i_t = \Big(\sum_{b\in\mathcal{B}} (\gamma^b \tfrac{L^b_{t+1}}{P_t})^{\frac{\sigma-1}{\sigma}}\Big)^{\frac{\sigma}{\sigma-1}} = (1+r^{b'}_{t+1})^{\sigma}(\gamma^{b'})^{1-\sigma}\tfrac{L^{b'}_{t+1}}{P_t}\Big[\sum_{b\in\mathcal{B}}(\tfrac{1+r^b_{t+1}}{\gamma^b})^{1-\sigma}\Big]^{-\frac{\sigma}{1-\sigma}}. \tag{42}$$

Defining $R_{t+1} \equiv \Big[\sum_{b\in\mathcal{B}}(\frac{1+r^b_{t+1}}{\gamma^b})^{1-\sigma}\Big]^{\frac{1}{1-\sigma}}$,

$$i_t R^{\sigma}_{t+1} = (1+r^b_{t+1})^{\sigma}(\gamma^b)^{1-\sigma}\tfrac{L^b_{t+1}}{P_t} \tag{43}$$

and, therefore, we can express the equilibrium loans from bank b as

$$\frac{L^b_{t+1}}{P_t} = \Big(\frac{R_{t+1}}{1+r^b_{t+1}}\Big)^{\sigma} i_t(\gamma^b)^{\sigma-1}, \tag{44}$$

which shows as equation (8) in the main text. From equation (44) and the definition of $\mathcal{L}_t(i_t)$,

$$\mathcal{L}_t(i_t) = \sum_{b\in\mathcal{B}} L^b_{t+1}(1+r^b_{t+1}) = i_t R_{t+1} P_t. \tag{45}$$

which shows as equation (10) in the main text.

Capitalist's full problem The full problem of the capitalist is

$$\max_{\{C^c_t, D^b_{t+1}, k_{t+1}\}^{\infty}_{t=0}} \sum_{t=0}^{\infty} \beta^t \Big[\log C^c_t + \alpha \log D_{nt+1}\Big]$$

$$\underline{s.t:}\ C^c_t + \sum_b \frac{D^b_{t+1}}{P_t} + \frac{(k_t - k_{t-1}(1-\delta))R_t P_{t-1}}{P_t} = \frac{\hat{r}_t k_t}{P_t} + \sum_b \frac{D^b_t}{P_t}(1+\tilde{r}^b_t) + \frac{T^c_t}{P_t} \tag{46}$$

$$D_{t+1} = \Big[\sum_b (\kappa^b D^b_{t+1})^{1-\frac{1}{\eta}}\Big]^{\frac{\eta}{\eta-1}} \tag{47}$$

$$k_0, \{D^b_0, L^b_0\}_b$$

where we have replaced $i_{t-1} = k_t - k_{t-1}(1-\delta)$ and expressed the budget constraint in real terms. The first-order conditions with respect to k_t, C^c_t and D^b_{t+1} are

$$\lambda_t \frac{\hat{r}_t}{P_t} + \lambda_{t+1} \frac{(1-\delta) R_{t+1} P_t}{P_{t+1}} = \lambda_t \frac{R_t P_{t-1}}{P_t}, \tag{48}$$

$$\frac{\beta^t}{C_t^c} = \lambda_t, \tag{49}$$

$$\text{and } \beta^t \alpha D_{t+1}^{\frac{1-\eta}{\eta}} (D_{t+1}^b)^{-\frac{1}{\eta}} (\kappa^b)^{\frac{\eta-1}{\eta}} + \lambda_{t+1} \frac{1+\tilde{r}_{t+1}^b}{P_{t+1}} = \frac{\lambda_t}{P_t}. \tag{50}$$

Equation (48) equates the marginal benefit of an extra unit of capital in period t, which consists of the per-period rental rate and the extra capital she would carry to period $t+1$, to its cost, loan repayment in period t. The first order condition with respect to consumption, equation (49), is standard. The first order condition with respect to deposits in a specific bank, equation (50), reflects the dual role of deposits in the model: they enter directly into the utility function and are means for transferring resources between periods.

By combining equation (48) and equation (49) we derive the following Euler equation,

$$\frac{P_{t+1} C_{t+1}}{P_t C_t} = \beta (1-\delta) \frac{R_{t+1} P_t}{R_t P_{t-1} - \hat{r}_t}. \tag{51}$$

Replacing equation (49) into equation (50), and then replacing $C_{t+1} P_{t+1}$ from equation (51),

$$\frac{\alpha}{D_{t+1}} (\kappa^b)^{\frac{\eta-1}{\eta}} \left(\frac{D_{t+1}}{D_{t+1}^b} \right)^{\frac{1}{\eta}} = \frac{1}{P_t C_t} \left[1 - \frac{(1+\tilde{r}_{t+1}^b)(R_t P_{t-1} - \hat{r}_t)}{(1-\delta) R_{t+1} P_t} \right]. \tag{52}$$

Dividing this equation for two banks, b and b',

$$\frac{D_{t+1}^b}{D_{t+1}^{b'}} = \left(\frac{\kappa^b}{\kappa^{b'}} \right)^{\eta-1} \left(\frac{q_{t+1}^b}{q_{t+1}^{b'}} \right)^{-\eta}, \tag{53}$$

where we defined q_{t+1}^b as

$$q_{t+1}^b \equiv 1 - \left(1 + \tilde{r}_{t+1}^b \right) / \left(\frac{(1-\delta) R_{t+1} P_t}{R_t P_{t-1} - \hat{r}_t} \right). \tag{54}$$

We define the deposit price index as

$$Q_{t+1} \equiv \left(\sum_b (\tfrac{q_{t+1}^b}{\kappa^b})^{1-\eta} \right)^{\frac{1}{1-\eta}}. \tag{55}$$

It follows from equation (53) and the definition of D_{t+1} that the supply of deposits to bank b is given by

$$D_{t+1}^b = D_{t+1} (\kappa^b)^{\eta-1} \left(\frac{Q_{t+1}}{q_{t+1}^b} \right)^{\eta}. \tag{56}$$

Replacing this back into equation (52) we obtain that the capitalist equalizes of expenditure on the two 'goods' available to her, consumption and deposits,

$$D_{t+1} Q_{t+1} = \alpha P_t C_t. \tag{57}$$

The nominal value of total deposits at t is given by

$$\sum_b D^b_{t+1} = \sum_b D_{t+1}(\kappa^b)^{\eta-1}(\tfrac{Q_{t+1}}{q^b_{t+1}})^{\eta} = D_{t+1}Q^{\eta}_{t+1}\overbrace{\sum_b(\kappa^b)^{\eta-1}(q^b_{t+1})^{-\eta}}^{\equiv\tilde{Q}_{t+1}}, \tag{58}$$

where $\tilde{Q}_{t+1} \equiv \sum_b \kappa^b)^{\eta-1}(q^b_{t+1})^{-\eta}$. Plugging equation (58) into the budget constraint, equation (46), using equation (57) and defining M_t as

$$M_t \equiv \hat{r}_t k_t + \sum_b (1+\tilde{r}^b_t)D^b_t - (k_t - (1-\delta)k_{t-1})R_t P_{t-1} + T_t \tag{59}$$

we get

$$Q_{t+1}D_{t+1} + D_{t+1}Q^{\eta}_{t+1}\tilde{Q}_{t+1} = M_t \to D_{t+1} = \frac{\alpha M_t}{Q_{t+1} + \alpha Q^{\eta}_{t+1}\tilde{Q}_{t+1}}$$
$$\text{and } P_t C^c_t = \frac{Q_{t+1}M_t}{Q_{t+1} + Q^{\eta}_{t+1}\tilde{Q}_{t+1}}.$$

which are equations equation (14) and equation (15) in the main text.

B.2.1 Derivatives at the steady state

Having calculated capitalists' demand for loans and deposits, we calculate the derivatives of these functions with respect to the cost of loans and deposits (r and q respectively). Throughout, we will use the fact that in a steady state, the Euler equation equation (51) becomes

$$1 = \frac{\beta(1-\delta)R_n P_n}{R_n P_n - \hat{r}_n}. \tag{60}$$

Derivative of L with respect to r. The demand function for loans is

$$L^b_{t+1} = P_t i_t(R_{t+1})(\gamma^b)^{\sigma-1}\left(\frac{R_{t+1}}{1+r^b_{t+1}}\right)^{\sigma}.$$

The derivative and elasticity of loans with respect to r are, respectively,

$$\frac{\partial L^b_{t+1}}{\partial r^b_{t+1}} = \underbrace{\left\{\sigma \frac{L^b_{t+1}}{R_{t+1}} + \frac{L^b_{t+1}}{i_t}\frac{\partial i_t}{\partial R_{t+1}}\right\}\left(\frac{R_{t+1}}{1+r^b_{t+1}}\right)^{\sigma}(\gamma^b)^{\sigma-1}}_{\frac{\partial L^b_n}{\partial R_n}\frac{\partial R_n}{\partial r_n}} \underbrace{-\sigma\frac{L^b_n}{1+r^b_n}}_{\frac{\partial L^b_n}{\partial r^b_n}}$$

$$\begin{aligned}
\text{and } \epsilon_L &\equiv -\frac{\partial L^b_{t+1}}{\partial r^b_{t+1}}\frac{1+r^b_{t+1}}{L^b_{t+1}} \\
&= \sigma\left(1-s^b_{t+1}\right) - s^b_{t+1} \times \underbrace{\frac{\partial i_t}{\partial R_{t+1}}\frac{R_{t+1}}{i_t}}_{\equiv -\varepsilon^{i,R}_n} \\
&= \sigma\left(1-s^b_{t+1}\right) + s^b_{t+1}\varepsilon^{i,R}_n,
\end{aligned}$$

$$\text{where } s^b_{t+1} \equiv \left(\frac{R_{t+1}}{1+r^b_{t+1}}\gamma^b\right)^{\sigma-1} = \underbrace{\frac{(1+r^b_{r+1})L^b_{t+1}}{i_t R_{t+1} P_t}}_{\text{Revenue Share}}.$$

To calculate the elasticity of investment with respect to the interest rate R, start from the budget constraint equation (46) evaluated at $t+1$ and the Euler equation, equation (51),

$$\frac{P_{t+1}C_{t+1}}{P_t C_t} = \frac{\hat{r}_{t+1}k_{t+1} + \sum_b D^b_{t+1}(1+r^b_{t+1}) + T^c_{t+1} - \sum_b D^b_{t+2} - i_t R_{t+1}P_t}{P_t C_t} = \frac{\beta(1-\delta)R_{t+1}P_t}{R_t P_{t-1} - \hat{r}_t}$$

$$i_t\left(\hat{r}_{t+1} - R_{t+1}P_t\right) + \hat{r}_{t+1}(1-\delta)k_t + \sum_b D^b_{t+1}(1+r^b_{t+1}) + T^c_{t+1} - \sum_b D^b_{t+2} = \frac{\beta(1-\delta)R_{t+1}P_t}{R_t P_{t-1} - \hat{r}_t}P_t C_t$$

$$i_t = \frac{1}{\hat{r}_{t+1} - R_{t+1}P_t}\left(\frac{\beta(1-\delta)R_{t+1}P_t}{R_t P_{t-1} - \hat{r}_t}P_t C_t - \hat{r}_{t+1}(1-\delta)k_t - \sum_b D^b_{t+1}(1+r^b_{t+1}) - T^c_{t+1} + \sum_b D^b_{t+2}\right)$$

$$\frac{\partial i_t}{\partial R_{t+1}} = -\frac{i_t P_t}{R_{t+1}P_t - \hat{r}_{t+1}} - \frac{\beta(1-\delta)P_t}{R_t P_{t-1} - \hat{r}_t} \times \frac{P_t C_t}{R_{t+1}P_t - \hat{r}_{t+1}}$$

Evaluated at the steady state, this expression can be simplified to

$$\begin{aligned}
\frac{\partial i_n}{\partial R_n} &= -\frac{1}{R_n} \times \frac{i_n R_n P_n + P_n C_n}{\beta(1-\delta)R_n P_n}, \\
\rightarrow \epsilon^{i,R}_n &= -\frac{1}{i_n} \times \frac{i_n R_n P_n + P_n C_n}{\beta(1-\delta)R_n P_n} = \frac{1}{\beta(1-\delta)}\left(1 + \frac{D_n Q_n}{\alpha i_n R_n P_n}\right)
\end{aligned}$$

which shows as equation (24) in the main text. Plugging this back into the loan-elasticity,

$$\epsilon^{L,r}_n = \sigma(1-s^b_n) + s^b_n \epsilon^{i,R}_n.$$

which shows as equation (23) in the main text.

B.3 Banks

We assume oligopolistic competition at the local level in loans, and monopolistic competition on the deposit side. While our framework is amenable to incorporating oilgopolistic competition on deposits, we prefer to assume monopolistic competition given that it is arguably easier for depositors to move their money between banks.

Omitting super-script b to keep notation clean, the problem of a bank is described as

$$\max_{\{\{r_{nt},\tilde{r}_{nt}\},F_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \Big\{ \sum_n L_{nt}(1+r_{nt}) + D_{nt+1} - L_{nt+1} - D_{nt}(1+\tilde{r}_{nt}) + F_{t+1} - \exp\left(\phi \frac{F_t}{\sum_n D_{nt}}\right)(1+r_t^F)F_t \Big\}$$
$$\underline{s.t:}\ [\lambda_t]\ \sum_n L_{nt+1} = \sum_n D_{nt+1} + F_{t+1} \quad \forall t.$$

The first order condition with respect to F_{t+1} reads

$$\beta^t - \beta^{t+1}\left\{ \exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F) + \exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\phi \frac{F_{t+1}}{\sum_n D_{nt+1}} \right\} + \lambda_t = 0$$

$$\frac{1}{\beta} + \mu_t = \exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\left(1+\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right) \tag{61}$$

Where $\mu_t = \frac{\lambda_t}{\beta^{t+1}}$. This expression for the marginal cost is equation (20) in the main text.
The first order condition with respect to L_{nt} reads

$$\frac{\partial L_{nt+1}}{\partial r_{nt+1}}\left[\frac{1}{\beta} - (1+r_{nt+1}) + \mu_t\right] = L_{nt+1}$$
$$\epsilon_L\left[-\frac{1}{\beta} + (1+r_{nt+1}) - \mu_t\right] = (1+r_{nt+1})$$

Solving for the interest rate,

$$1 + r_{nt+1} = \frac{\epsilon_L}{\epsilon_L - 1}\left(\frac{1}{\beta} + \mu_t\right) \tag{62}$$

which is equation (21) in the main text. The first order condition with respect to deposits reads

$$\frac{\partial D_{nt+1}}{\partial q_{nt+1}} \underbrace{\frac{\partial q_{nt+1}}{\partial \tilde{r}_{nt+1}}}_{\text{in SS: } -\beta} \left[\frac{1}{\beta} - (1+\tilde{r}_{nt+1}) + \exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\phi\left(\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)^2 + \mu_t\right] = D_{nt+1}$$

$$\epsilon_D\left[\underbrace{1-\beta(1+\tilde{r}_{nt+1})}_{q_{nt+1}} + \beta\exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\phi\left(\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)^2 + \beta\mu_t\right] = q_{nt+1}$$

Solving for q

$$q_{nt+1} = -\frac{\epsilon_D}{\epsilon_D - 1}\beta\left\{\exp\left(\phi \frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\phi\left(\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)^2 + \mu_t\right\} \tag{63}$$

In equation (22) we have substituted $\epsilon_D = \eta$ given our monopolistic competition assumption.

B.4 Special case in Section 4.3

We consider the special case in which $\gamma_n^b = 1\,\forall n, b$. We first solve for the average interest rate in city n in the case with $\phi = 0$, and then we consider a first-order deviation around it.

If $\phi = 0$, it is clear from the expression of the marginal cost in the main text, equation (20), that $\mathcal{MC}^b = (1 + r^F)$ for all banks. Access to deposits does not play a role in an economy in which banks can borrow from each other costlessly. It follows that all banks in a city will charge the same interest rate and market shares will be

$$s_n^b = \frac{1}{B_n} \tag{64}$$

where B_n denotes the number of banks with branches in city n. From here, it follows that the optimal interest rate charged by any bank b in city $n$will be

$$1 + r_n^b = \frac{\sigma B_n - \Delta_n}{B_n(\sigma - 1) - \Delta_n}(1 + r^F) \tag{65}$$

where the markup is the same across banks, as market shares are equal. The loan-weighted average interest rate in city n is

$$\overline{1 + r_n} = \sum_b \frac{(1 + r_n^b)}{B_n} = \tfrac{B_n}{B_n}\frac{\sigma B_n - \Delta_n}{B_n(\sigma - 1) - \Delta_n}(1 + r^F) \tag{66}$$

which is equation (31) in the main text.

Derivatives with respect to ϕ. We now turn to calculating derivatives with respect to interbank frictions ϕ evaluated at the benchmark with $\phi = 0$. Start from equation (20),

$$\frac{\partial \mathcal{MC}^b}{\partial \phi} = exp(\tfrac{\phi F^b}{D^b})\tfrac{F^b}{D^b}(1 + r^F)(1 + \tfrac{\phi F^b}{D^b}) + exp(\tfrac{\phi F^b}{D^b})\tfrac{F^b}{D^b}(1 + r^F) \tag{67}$$

$$\frac{\partial \mathcal{MC}^b}{\partial \phi}|_{\phi=0} = 2(1 + r^F)\tfrac{F^b}{D^b}. \tag{68}$$

Using $\mathcal{MK}^b$ to denote the markup charged by bank b in city n, we can write the share of bank b in city n and the derivative of this share with respect to an increase in banks b's marginal cost as

$$s_n^b = \frac{(1 + r_n^b)^{1-\sigma}}{\sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma}} \tag{69}$$

$$\to \frac{\partial s_n^b}{\partial \mathcal{MC}^b} = \frac{(1-\sigma)(1 + r_n^b)^{-\sigma}\mathcal{MK}^b \sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma} - (1 + r_n^b)^{1-\sigma}(1-\sigma)(1 + r_n^b)^{-\sigma}\mathcal{MK}^b}{(\sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma})^2} \tag{70}$$

$$\frac{\partial s_n^b}{\partial \mathcal{MC}^b}|_{\phi=0} = \frac{(1-\sigma)(1 + r_n)^{1-2\sigma}\mathcal{MK}(B_n - 1)}{(B_n(1 + r_n)^{1-\sigma})^2} \tag{71}$$

$$= \frac{(1-\sigma)\mathcal{MK}(B_n - 1)}{B_n^2(1 + r_n)} \tag{72}$$

$$= \frac{1-\sigma}{(1 + r^F)}\frac{B_n - 1}{B_n^2}. \tag{73}$$

The derivative of bank b's market share with respect to the marginal cost of a different bank v is

$$\frac{\partial s_n^b}{\partial \mathcal{MC}^v} = \frac{-(1+r_n^b)^{1-\sigma}(1-\sigma)(1+r_n^v)^{-\sigma}\mathcal{MK}^v}{(\sum_{v=1}^{B_n}(1+r_n^v)^{1-\sigma})^2} \tag{74}$$

$$\frac{\partial s_n^b}{\partial \mathcal{MC}^v}|_{\phi=0} = \frac{-(1-\sigma)(1+r_n)^{1-2\sigma}\mathcal{MK}}{(B_n(1+r_n)^{1-\sigma})^2} \tag{75}$$

$$= \frac{-(1-\sigma)\mathcal{MK}}{B_n^2(1+r_n)} \tag{76}$$

$$= \frac{-(1-\sigma)}{(1+r^F)B_n^2}. \tag{77}$$

With these objects, we can calculate

$$\frac{\partial s_n^b}{\partial \phi}|_{\phi=0} = \sum_{v=1}^{B_n} \frac{\partial s_n^b}{\partial \mathcal{MC}^v}\frac{\partial \mathcal{MC}^v}{\partial \phi}|_{\phi=0} \tag{78}$$

$$= \frac{1-\sigma}{(1+r^F)}\frac{B_n-1}{B_n^2}2(1+r^F)\tfrac{F^b}{D^b} + \sum_{v\neq b}\frac{-(1-\sigma)}{(1+r^F)B_n^2}2(1+r^F)\frac{F^v}{D^v} \tag{79}$$

$$= \frac{2(1-\sigma)}{B_n^2}\Big((B_n-1)\frac{F^b}{D^b} - \sum_{v\neq b}\frac{F^v}{D^v}\Big) \tag{80}$$

$$= \frac{2(1-\sigma)(\omega^b-\overline{\omega}_n)}{B_n} \tag{81}$$

which states that a banks' market share will increase if the bank relies less on the interbank market than the average bank in the city. In the last step, we used the definition from the main text, $\omega^b = \frac{F^b}{D^b}$ and defined $\overline{\omega}_n \equiv \frac{1}{B_n}\sum_{v=1}^{B_n}\frac{F^v}{D^v}$.

Finally, we calculate the response of the markup charged by bank b if its market share goes up,

$$\mathcal{MK}^b = \frac{\sigma - s_n^b\Delta_n}{\sigma - s_n^b\Delta_n - 1} \tag{82}$$

$$\frac{\partial \mathcal{MK}^b}{\partial s_n^b} = \frac{-\Delta_n(\sigma - s_n^b\Delta_n - 1) + (\sigma - s_n^b\Delta_n)\Delta_n}{(\sigma - s_n^b\Delta_n - 1)^2} \tag{83}$$

$$\frac{\partial \mathcal{MK}^b}{\partial s_n^b}|_{\phi=0} = \frac{\Delta_n}{(\sigma - s_n^b\Delta_n - 1)^2} = \frac{\Delta_n}{(\sigma - \frac{\Delta_n}{B_n} - 1)^2} \tag{84}$$

We take a first-order approximation around the frictionless benchmark

$$\overline{1+r_n}(\phi) \approx \overline{1+r_n}|_{\phi=0} + \sum_{b=1}^{B_n}\Big(\frac{\partial s_n^b}{\partial \phi}(1+r_n^b) + s_n^b\frac{\partial(1+r_n^b)}{\partial \phi}\Big)|_{\phi=0}\times\phi \tag{85}$$

$$\approx \overline{1+r_n}|_{\phi=0} + \sum_{b=1}^{B_n}\Big(\frac{\partial s_n^b}{\partial \phi}(1+r_n^b) + s_n^b\big(\mathcal{MC}^b\frac{\partial \mathcal{MK}^b}{\partial \phi} + \frac{\partial \mathcal{MC}^b}{\partial \phi}\mathcal{MK}^b\big)\Big)|_{\phi=0}\times\phi \tag{86}$$

$$\approx \overline{1+r_n}|_{\phi=0} + \sum_{b=1}^{B_n}\Big(\frac{2(1-\sigma)(\omega^b-\overline{\omega}_n)}{B_n}(1+r_n^b) + s_n^b\big(\mathcal{MC}^b\frac{\partial \mathcal{MK}^b}{\partial \phi} + \frac{\partial \mathcal{MC}^b}{\partial \phi}\mathcal{MK}^b\big)\Big)|_{\phi=0}\times\phi \tag{87}$$

To proceed, note that

$$s_n^b\big(\mathcal{MC}^b \overbrace{\frac{\partial \mathcal{MK}^b}{\partial s_n^b}\frac{\partial s_n^b}{\partial \phi}}^{\frac{\partial \mathcal{MK}^b}{\partial \phi}} + \frac{\partial \mathcal{MC}^b}{\partial \phi}\mathcal{MK}^b\big) = s_n^b\Big(\frac{\mathcal{MC}^b\Delta_n}{(\sigma - \frac{\Delta_n}{B_n} - 1)^2}\frac{2(1-\sigma)(\omega^b - \overline{\omega}_n)}{B_n} + 2(1+r^F)\frac{\mathcal{MK}^b F^b}{D^b}\Big) \tag{88}$$

$$= 2s_n^b(1+r_n^b)\Big(\frac{\Delta_n(\sigma - s_n^b\Delta_n - 1)((1-\sigma)(\omega^b - \overline{\omega}_n))}{(\sigma - \frac{\Delta_n}{B_n} - 1)^2(\sigma - s_n^b\Delta_n)B_n} + (1+r^F)\frac{\omega^b}{\mathcal{MC}^b}\Big) \tag{89}$$

where in the last line we multiplied and divided the relevant terms to obtain $(1 + r_n^b)$. From here,

$$s_n^b\big(\mathcal{MC}^b\frac{\partial \mathcal{MK}^b}{\partial \phi} + \frac{\partial \mathcal{MC}^b}{\partial \phi}\mathcal{MK}^b\big)|_{\phi=0} = 2\frac{(1+r_n^b)}{B_n}\Big(\frac{\Delta_n(1-\sigma)(\omega^b - \overline{\omega}_n)}{(\sigma - \frac{\Delta_n}{B_n} - 1)(\sigma - \frac{\Delta_n}{B_n})B_n} + \omega^b\Big). \tag{90}$$

Putting it all together, and using that $\overline{1 + r_n} = 1 + r_n^b$ when $\phi = 0$,

$$\overline{1+r_n}(\phi) \approx \overline{1+r_n}|_{\phi=0}\left(1 + \frac{2\phi}{B_n}\sum_{b=1}^{B_n}[(1-\sigma)(\omega^b - \overline{\omega}_n) + \omega^b + \frac{\Delta_n(1-\sigma)(\omega^b-\overline{\omega}_n)}{B_n(\sigma - \frac{\Delta_n}{B_n} - 1)(\sigma - \frac{\Delta_n}{B_n})}]\right) \tag{91}$$

Taking logs on both sides we get equation (33) in the main text.

C Estimation Appendix

C.1 Estimation algorithm

Our estimation strategy proceeds in two stages. In the outer loop, we search over structural parameters $\Gamma^o \equiv \{\sigma, \phi\}$. For each candidate value of $\{\sigma, \phi\}$, the inner loop inverts the model to recover $\Gamma^I \equiv \{z_n, b_n, \{\gamma_n^b, \kappa_n^b\}_{b\in\mathcal{C}^b}\}_{n=1}^N$. Our estimated Γ^o is chosen to match the estimated effects of deposit shocks on loan quantities and interest rates from Section 3.

Inner loop For a given pair $\{\sigma, \phi\}$, we recover the model's implied fundamentals Γ^I in four steps.

Step 1: City-bank match parameters. We estimate the city-bank match parameters $\{\gamma_n^b\}$ and $\{\kappa_n^b\}$ to exactly replicate observed loan and deposit volumes at the city-bank level in 2015.[23]

In the data we observe total loan repayment in each city,

$$\mathcal{L}(i_n) = \sum_{b\in\mathcal{B}^n}(1+r^b)L_n^b.$$

In the model, loan repayment equals investment expenditure: $\mathcal{L}(i_n) = i_n R_n P_n$. Using the loan demand function, equation (8), we can write loan volumes as a function of the match parameters

$$L_n^b = \mathcal{L}(i_n)\frac{R_n^{\sigma_0 - 1}}{(1+r_n^b)^{\sigma_0}}(\gamma_n^b)^{\sigma_0 - 1}.$$

This yields a system of $\tilde{N}$ equations in $\tilde{N}$ unknowns (where $\tilde{N}$ is the number of city-bank pairs operating in Chile in 2015). Solving this system delivers estimates $\{\hat{\gamma}_n^b\}$ that perfectly rationalize observed city-bank

[23]We cannot extract information specific to a bank from the micro-data, so in this section we use publicly available data on new loans by city-bank, the average interest rate by bank, and the average interest rate by city from the CMF.

loan volumes.

To estimate κ_n^b, we use data on average deposit rates by bank in 2015. Under our assumption of monopolistic competition in the deposit market, banks offer uniform deposit rates across all cities they serve. In steady state, equation equation (53) implies that the ratio of deposits from two banks in the same city satisfies:

$$\frac{D_n^b}{D_n^{b'}} = \left(\frac{\kappa^b}{\kappa^{b'}}\right)^{\eta-1} \left(\frac{\beta - (1+r_n^b)}{\beta - (1+r_n^{b'})}\right)^{-\eta}. \tag{92}$$

For each city n, we normalize $\kappa_n^b = 1$ for one bank, then use equation equation (92) to solve for κ_n^b for all other banks operating in that city. Finally, we normalize the city-level average of κ_n^b to equal one.

Step 2: Free-on-board prices. Given the estimated match parameters, we solve for the vector of (unobserved) free-on-board prices $\{p_n\}$ that rationalizes the observed spatial distribution of wages and employment as an equilibrium. This requires imposing goods market clearing in all N cities. We normalize the average price of local goods to one, yielding N independent equations in N unknowns.

Step 3: Local productivities. With prices $\{\hat{p}_n\}$ in hand, we back out city-specific productivities from the zero-profit condition:

$$\hat{z}_n = \frac{w_n^{\mu}\hat{r}^{1-\mu}}{\hat{p}_n}, \tag{93}$$

where w_n is observed in the data and $\hat{r}_n$ is the estimated marginal product of capital in city n. We recover $\hat{r}_n$ from equation (60) using our estimates of γ_n^b from Step 1, which allow us to compute the loan price indices R_n and P_n.

Step 4: Local amenities. Finally, we recover amenities $\{\hat{b}_n\}$ as the values that rationalize the observed distribution of workers across cities as a migration equilibrium. These are pinned down by the labor market clearing condition, equation (28), where all other terms are now known. We normalize the average amenity to equal one.

Outer loop We search over the structural parameters $\Gamma^o = \{\sigma, \phi\}$ to match our reduced-form empirical estimates from Section 3.

To construct model-based analogs of our empirical moments, we proceed as follows. We increase productivity by 1% in the fishing cities (those with high employment shares in fishing). For each candidate $\{\sigma, \phi\}$, we solve for the new equilibrium and implement the empirical strategy used in Section 3.

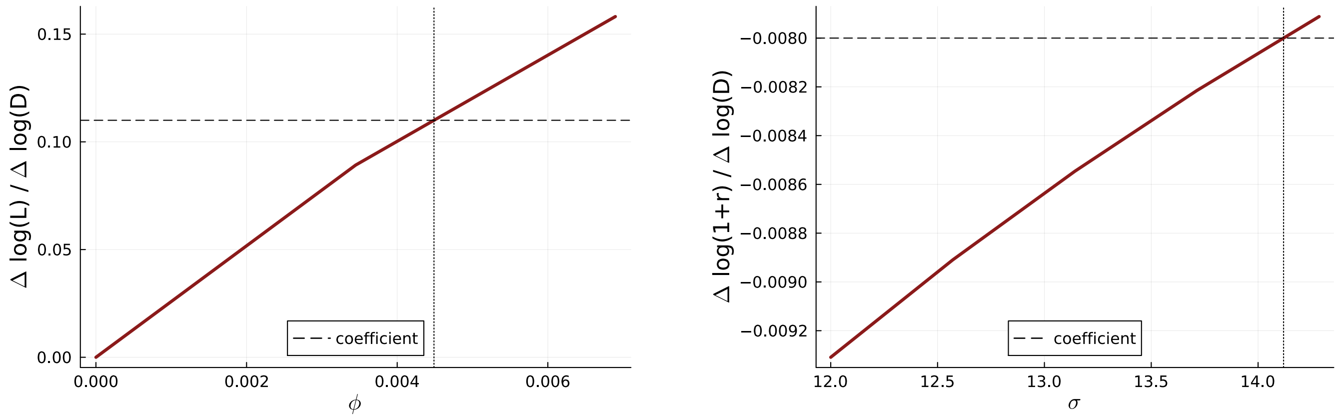
Specifically, we construct bank-level exposure to the shock as in equation (2) as the share of each bank's baseline deposits originating in fishing cities. We then run a first-stage regression at the bank level of the change in log total deposits on this exposure measure. Using predicted deposit growth from this first stage, we estimate second-stage regressions at the city-bank level:

- *Quantity response:* Change in log loans at the city-bank level.
- *Price response:* Change in $\log(1 + r_n^b)$ at the city-bank level.

These second-stage specifications correspond to equation (1) and equation (3) in the main text. By taking differences at the city-bank level before and after the shock, we effectively control for the analog of city fixed effects.

Identification of the structural parameters in Γ^o can be interpreted as follows. The interbank friction parameter, ϕ, primarily governs the magnitude of the quantity response: larger frictions force banks to rely more heavily on retail deposits, amplifying the effect of deposit shocks on lending. The elasticity of substitution, σ, primarily determines the price response: higher elasticity means banks can expand lending with smaller interest rate reductions.

We are able to match the two empirical moments exactly. Figure 15 shows the relationship between each parameter and the targeted empirical elasticities, with dashed lines indicating our preferred estimates. As discussed in the paper, the left panel illustrates that the elasticity of loans with respect to deposits is zero when there are no interbank frictions ($\phi = 0$): in that case, deposits flow freely through the interbank market to the best lending opportunities, so the identity of the shocked bank is irrelevant.



(a) Estimating ϕ

(b) Estimating σ

Figure 15: Estimation strategy, inner and outer loop

C.2 Estimated city-bank match γ_n^b

Figure 16 shows the estimated value of city-bank matches.

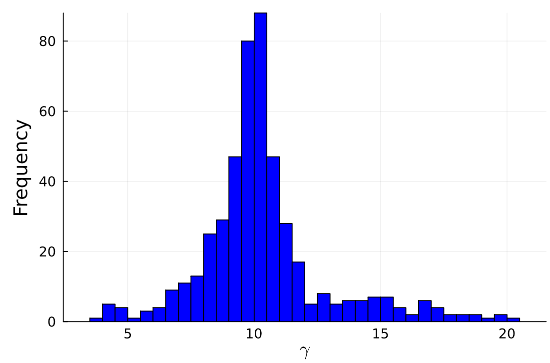


Figure 16: Estimated city-bank match γ

These estimates are closely related to the number of branches that bank b has in city n, after controlling for city and bank fixed effects. Table 10 below shows the results of an OLS estimate of

$$Log(\gamma_n^b) = \beta_0 + \gamma_n + \gamma_b + \beta_1 Log(Branches_n^b) + \varepsilon_n^b. \tag{94}$$

Table 10: Branches

	Estimated city-bank match (Log)
Branches	0.03***
	(0.006)
Bank FE	Yes
City FE	Yes
Observations	344