Bank Branches and the Allocation of Capital across Cities*

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Abstract

We study how banking market structure and branch networks shape the spatial mobility of capital. Using administrative loan-level data from Chile, we show that bank-level deposit shocks lead receiving banks to increase lending and lower interest rates relative to other banks. Interest rate reductions are concentrated in cities where the bank has a small market share, consistent with local market power. We develop and estimate a quantitative spatial model with multi-city banks, oligopolistic local credit markets, and frictions in interbank lending. These channels lead to spatial dispersion in interest rates and the marginal productivity of physical capital, reducing GDP. Interbank frictions reduce steady-state GDP by 0.04%, while spatial variation in loan markups reduces GDP by 0.5%. 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 this 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 0.85% and a reduction in interest rates of 0.016% 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 interbank frictions equivalent to 0.6% of the pecuniary costs 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 1.6%. We estimate an elasticity of substitution of 16.8, 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 125 basis points, while the gap between the 25th and 75th percentiles is 231 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 0.04%. 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 2.9%, while equalizing markups in space would lead to an increase in productivity of 0.5%. In both cases, the increase in productivity reflects lower dispersion in the marginal productivity of capital across cities as well as more investment.

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 0% and -1.1%. 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; Manigi, 2025; 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; Manigi, 2025). A closely related paper is Manigi (2025), 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 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]

[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.

[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 3,000 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.

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

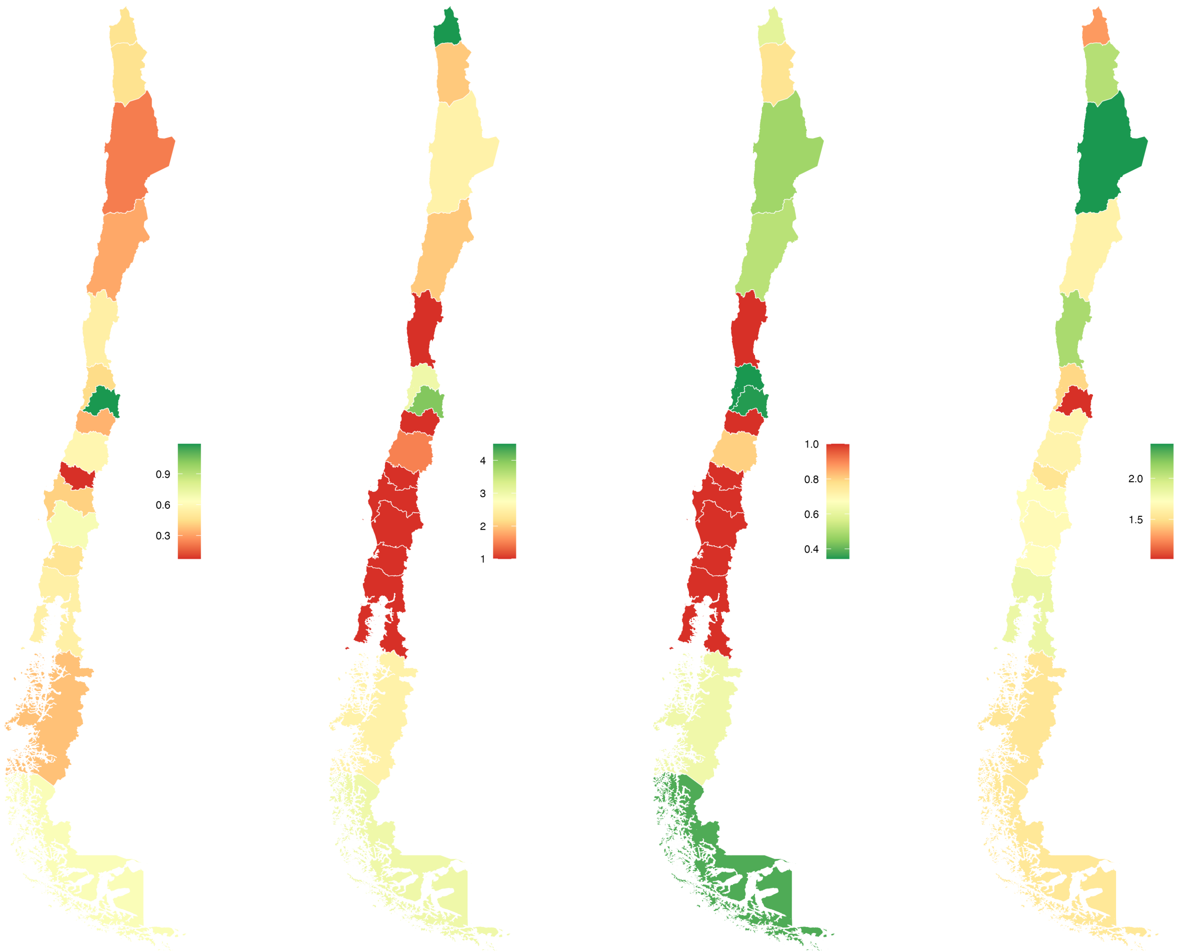
Notes: Authors' calculations using public data from the CMF. We use the stock of outstanding loans and deposits in December 2015 for the second and third columns of panel B.

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

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.

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 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 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 loan issuance and interest rates we complement this data with administrative loan-level data for the same period, also collected by the CMF. One advatange 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 — which are less directly related to investment in productive physical capital. 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. When we study the elasticity of loan issuance with respect to deposits in Section 3 we also rely on this data for consistency with the analysis of interest rates.

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 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.

[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; 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.

3 The spatial propagation of local deposit shocks

In this section we study how banks respond to exogenous deposit inflows. Following Gilje et al. (2016) and Bustos et al. (2020), who studied commodity shocks, we exploit variation in the world price of salmon, which disproportionately affects the growth of deposits in cities with a strong presence of the fishing industry. We construct bank-level deposit shocks by interacting movements in the price of salmon with banks' share of deposits coming from cities specialized in fishing (henceforth fishing cities).

3.1 The effects of deposit shocks on lending

We begin by estimating the effect of bank-level deposit inflows on loan growth across cities. We estimate

$$Loans_{nt}^{b} = \beta_0 + \beta_1 Deposits_t^b + \beta_2 MP_t + \gamma X_{nt}^b + \epsilon_t^b, \tag{1}$$

using the micro-data described in Section 2 aggregated at the level of the city-bank-month. $Loans_{nt}^b$ denotes the logarithm of new loans issued by bank b in city n during month t. Our independent variable of interest is the logarithm of deposits held by bank b at time t, aggregated at the national level. We include the monetary policy at t, MP_t, and the vector X_{nt}^b as controls; the latter includes city-bank, city-year, and bank-year fixed effects.

Our coefficient of interest, β_1, captures the elasticity of lending with respect to deposits. Given our controls, our results should be interpreted as a within-year, within-city comparison of loan issuance across banks with different deposit inflows.

The error term in equation (1) may be correlated with deposits if unobserved bank-level factors—such as improvements in branch quality or the reputation of a bank—jointly affect a bank's ability to attract deposits and extend credit. To address this possibility, we follow Gilje et al. (2016) and construct an instrument based on exogenous variation in commodity prices. We construct our instrument for deposits at bank b in month t, Z_{bt}, as

$$Z_{bt} = \frac{\sum_n \alpha_n^{\mathcal{F}} D_{bn2011}}{\sum_{n'} D_{bn'2011}} \times p_{t-3}^{salmon}, \;\; \alpha_n^{\mathcal{F}} = \frac{\ell_n^{\mathcal{F}}}{\ell_n}. \tag{2}$$

The first term in equation equation (2) captures bank b's deposits exposure to fishing cities, which we measure as the weighted sum of banks' 2011 deposits coming from each city n interacted with the local share of employment in fishing industries, $\alpha_n^{\mathcal{F}}$, divided by banks' total stock of deposits in 2011. The rest of our analysis uses data from 2012-2018, so measuring banks' exposure in 2011 alleviates concerns that banks enter particular markets driven by movements in the price of salmon. The second term, p_{t-3}^{salmon}, is the world price of salmon lagged one quarter.[8]

The salmon industry is well-suited for constructing localized deposit shocks in Chile. First, global salmon prices fluctuated substantially during 2012–2018.[9] Second, salmon is a major export industry, accounting for 9.5% of non-copper exports over the period (12.1% in 2018). Finally, most salmon firms are headquartered locally in the South of Chile, making it likely that firms' profits are deposited in local bank branches rather than redirected to corporate offices in Santiago, as might occur with the mining industry. Because the

[8]Results are qualitatively similar using shorter and slightly longer gaps.

[9]Figure 12 in Appendix A.5 plots the evolution of world salmon prices between 2005 and 2019.

fishing industry is geographically concentrated, we can treat the shock as spatially localized, which allows us to study how lending responses vary with distance.[10]

Our first-stage regression quantifies the effect of the instrument on bank-level deposit growth,

$$Deposits^b_t = \tilde{\beta}_0 + \tilde{\beta}_1 Deposits^b_{t-4} + \tilde{\beta}_2 Z_{bt} + \tilde{\gamma} X^b_t + \epsilon^b_t. \tag{3}$$

where $Deposits^b_t$ denotes the logarithm of total deposits held by bank b at time t, and Z_{bt} is the bank-specific instrument defined above. We control for the logarithm of deposits the month previous to the price shock, at $t-4$. The control vector X^b_t includes bank-year and month fixed effects. Subscripts follow the same definitions as in the previous equation.

The first column of Table 2 shows the results of estimating equation (3) by OLS. Banks that rely more on fishing cities for deposits experience significantly larger deposit inflows following an increase in the price of salmon. The first-stage coefficient is large and statistically significant. We keep the predicted values of deposits from the first stage and merge them with the sub-sample of the administrative data that we described in Section 2. In this merge we drop banks that received deposits but did not give loans to the firms we keep in our microdata.[11]. Moreover, we keep banks that issued loans every year during 2012-2018. After these two steps we are left with six banks, all of them among the largest in the country.

We estimate equation (1) excluding all firms in fishing cities and firms in the fishing industry from the sample, which makes the exclusion restriction for our instrument more plausible. We cluster standard errors at the bank-month level. The second column of Table 2 reports the 2SLS estimate. A 1% increase in deposits leads banks to increase lending by 0.85% relative to other banks. This result is in line with Gilje et al. (2016) and Bustos et al. (2020), who document that capital flows within countries are shaped by banks' geographic footprint.

Spatial spillovers through trade, migration, or commuting are mediated by geographic distance, while in a context where money is mostly digital, capital flows within banks need not follow this pattern. If financial linkages are stronger than indirect spatial spillovers stemming from exposed cities, the effect of a deposit shock on lending should not diminish with distance from its origin. To assess the role of geographic distance in our setting, we compute the average travel time between each city and all fishing cities and add the interaction between deposits and distance to equation (1). The third column of 2 shows the results. We find no statistically significant evidence that deposit shocks lead to stronger loan growth in cities that are closer to the shocked area.

Across a variety of models with oligopolistic competition, a firm's market share is closely linked with the demand elasticity faced by the firm. We calculate a banks' market share in city n and month t as

$$s^b_{nt} = \frac{\sum_\ell (1 + i^b_{\ell f t}) L^b_{\ell f t}}{\sum_{v=1}^{B} \sum_\ell (1 + i^v_{\ell f t}) L^v_{\ell f t}} \tag{4}$$

where in the numerator we sum across all loans issued by bank b in city n and, in the denominator, we sum across all banks.[12] We include the interaction between deposits and the lagged market share to equation (1). The fourth column of 2 shows the results. While the coefficient has the right sign, we don't

[10]See Figure 13 in the Appendix A.5 for the geographical presence of the fishing industry.

[11]One reason why this may happen is that certain banks specialize in consumer credit.

[12]Notice that by summing across loans we are also summing across firms, $f(\ell)$. We omit the sumation across firms to avoid cluttering.

Table 2: Deposit Shocks, Loan Growth and Interest Rates

	Deposits	**City-Bank Loans**				**Interest Rate**			
	OLS	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deposits_t		0.851^{*}	1.01	0.963^{**}	1.13^{**}	-0.016^{***}	-0.014^{***}	-0.021^{***}	-0.023^{***}
		(0.494)	(0.625)	(0.459)	(0.469)	(0.003)	(0.005)	(0.004)	(0.004)
$\text{Deposits}_t \times \text{Distance}$			-0.13				-0.00132		
			(0.16)				(0.00197)		
$\text{Deposits}_t \times s_n^b$				-0.621	-1.275			0.032^{***}	0.035^{***}
				(0.877)	(1.025)			(0.007)	(0.008)
$\text{Deposits}_t \times \frac{D}{L}$					0.0017^{**}				0.02^{**}
					(0.0007)				(0.01)
$\text{Deposits}_t \times s_n^b \times \frac{D}{L}$					-0.0079^{***}				-0.14^{**}
					(0.0030)				(0.07)
Deposits_{t-4}	1.21^{***}								
	(0.02)								
Z_{bt}	173.1^{***}								
	(56.0)								
Controls									
Month FE	Yes	–	–	–	–	–	–	–	–
Bank × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank × City FE	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City × Year FE	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Monetary Policy Rate	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Loan Characteristics	–	–	–	–	–	Yes	Yes	Yes	Yes
Observations	30,416	33,492	33,490	33,492	25,126	239,579	239,577	239,579	217,207
Number of Banks	13	6	6	6	6	6	6	6	6

Notes: Statistical significance denoted as $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Standard errors are clustered at the bank-month level.

find a statistically significant effect of market share.

The model of loan demand we write in Section 4 will help us rationalize the muted effect of market shares on loan growth responses. In the model, market shares are not a sufficient statistic for demand elasticity and we also need to consider the importance of deposits as a share of total lending. We come back to this point after laying out the model.

3.2 The effects of deposit shocks on interest rates

We complement our analysis with a study of how interest rates on firm loans respond to bank-level deposit shocks. We estimate

$$\log(1 + i^b_{\ell ft}) = \alpha_0 + \alpha_{n(f)\times b} + \alpha_{n(f)\times y(t)} + \alpha_1 Deposits^b_t + \alpha_2 MP_t + \alpha_3 X_{ft} + \alpha_5 X_{lt} + \epsilon^b_{\ell ft} \tag{5}$$

using the same subsample of firms and loans from the administrative data. For this part of the analysis we keep only single-city firms, for which the interest rate offered by banks is arguably shaped by local conditions.

The outcome variable, $\log(1 + i^b_{\ell ft})$, is the logarithm of the gross interest rate charged by bank b for loan ℓ extended to firm f, located in city $n(f)$, durnig month t. We include as controls the monetary policy rate, MP_t, city-bank fixed effects to capture local competition characteristics, and city-year fixed effects to capture changes in local economic conditions. We add firm-related controls, X_{ft}, including the firm's employment size and the risk measures described in Section 2.[13] We also include loan-level controls, $X_{\ell t}$, including the

[13] We include one fixed effect for each of the 16 for risk.

amount lent (in logs), the type of loan, maturity, expected loss (our second risk measure) and bank-year fixed effects. Observations are weighted by loan amount in all regressions. Our coefficient of interest is α_1.

The sixth column of Table 2 shows our results. Our estimates indicate that a 1% increase in deposits leads banks to reduce their interest rate on their loans by 0.016% on average. Following the same logic as above, we then include interactions between the deposit shocks and distance and market share. The seventh and eight columns of Table 2 shows the results. Our first result aligns with our finding for loan growth; we find no effect of distance from the shocked areas on interest rate reductions following the shock, which is what a gravity model would predict. Moreover, we do find strong and significant effects of market shares on interest rates responses. As expected, interest rates decline less in cities where banks have a large market share. The intuition for this result is that deposit shocks represent a reduction in marginal costs. In competitive cities the pass-through to lower rates is stronger than in cities where banks can adjust their markup upwards.

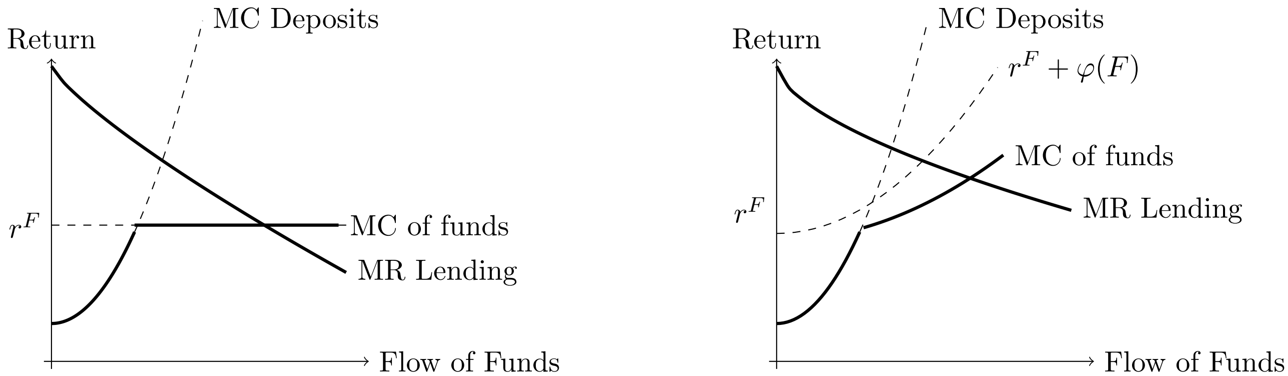
Our empirical results in this subsection align with Becker (2007), Gilje et al. (2016), and Bustos et al. (2020) who study localized deposit shocks in the US and Brazil and extend their findings in two directions. The detail of our data allows us to study the effect on interest rates while controlling 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 an interest rates in cities where banks hold different market share. Our results on heterogeneous responses across cities are consistent with market power highlighted by studies at the intersection of industrial organization literature and finance (Aguirregabiria et al., 2025), but at the same time suggest that market shares may not be sufficient to characterize demand elasticities.

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. 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).

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.

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 branches only for their saving and borrowing. 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 has access 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,

$$C_{nt}^{w} = \left(\sum_{i=1}^{N} (c_{it}^{w})^{\frac{\sigma_c - 1}{\sigma_c}}\right)^{\frac{\sigma_c}{\sigma_c - 1}}. \tag{6}$$

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

$$P_{nt} \equiv \left(\sum_{i} (\tau_{ni} p_{iit})^{1-\sigma_c}\right)^{\frac{1}{1-\sigma_c}} \quad \text{and} \quad \pi_{nit} = \left(\frac{\tau_{ni} p_{iit}}{P_{nt}}\right)^{1-\sigma_c}. \tag{7}$$

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

$$v_{nt}^{w} = \log(b_n C_{nt}^{w}) + \max_{d}\{\beta \mathbb{E}_t[v_{dt+1}^{w}] + \rho \epsilon_{dt}\}. \tag{8}$$

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,

$$i_{nt} = \left[\sum_{b \in \mathcal{B}^n} (\gamma_n^b \frac{L_{nt+1}^b}{P_{nt}})^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \tag{9}$$

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 (7).

Equation (9) 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

$$\mathcal{L}_{nt}(i_{nt}) = \min_{\{L_{nt+1}^b\}_b} \sum_{b \in \mathcal{B}^n} L_{nt+1}^b (1 + r_{nt+1}^b) \text{ s.t. equation (9).}$$

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

$$\frac{L^b_{nt+1}}{P_{nt}} = (\gamma^b)^{\sigma-1} \left(\frac{R_{nt+1}}{1 + r^b_{nt+1}} \right)^{\sigma} i_{nt} \tag{10}$$

$$\text{where } R_{nt+1} \equiv \left[\sum_{b\in\mathcal{B}} \left(\frac{1+r^b_{nt+1}}{\gamma^b_n} \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}. \tag{11}$$

From equation (9) and equation (10) it follows that

$$\mathcal{L}_{nt}(i_{nt}) = i_{nt} R_{nt+1} P_{nt}. \tag{12}$$

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 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[14]

$$\begin{aligned} \max_{\{C^c_{nt}, D^b_{nt+1}, k_{nt+1}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \left[\log C^c_{nt} + \log D_{nt+1}\right] \text{ with } D_{nt+1} = \left[\sum_b (\kappa^b_n D^b_{nt+1})^{1-\frac{1}{\eta}} \right]^{\frac{\eta}{\eta-1}}, \\ \underline{\text{s.t}}\ P_{nt} C^c_{nt} + \sum_b D^b_{nt+1} + i_{nt-1} R_{nt} P_{nt-1} = \hat{r}_{nt} k_{nt} + \sum_b D^b_{nt}(1 + \tilde{r}^b_{nt}) + T^c_{nt} \\ k_{nt+1} = k_{nt}(1-\delta) + i_{tn} \text{ and } k_{n0}, \{D^b_{n0}, L^b_{n0}\}_b. \end{aligned} \tag{13}$$

The budget constraint, equation (13), 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

$$D^b_{nt+1} = (\kappa^b_n)^{\eta-1} \left(\frac{Q_{nt+1}}{q^b_{nt+1}} \right)^{\eta} D_{nt+1}, \tag{14}$$

where

$$q^b_{nt+1} \equiv 1 - \underbrace{\left(1 + \tilde{r}^b_{nt+1}\right)}_{\text{Return on deposits}} / \underbrace{\left(\frac{(1-\delta) R_{nt+1} P_{nt}}{R_{nt} P_{nt-1} - \hat{r}_{nt}} \right)}_{\text{Return on investment}} \text{ and } Q_{nt+1} \equiv \left(\sum_b \left(\frac{q^b_{nt+1}}{\kappa^b_n}\right)^{1-\eta} \right)^{\frac{1}{1-\eta}}. \tag{15}$$

From the capitalist's perspective, the total price of a deposit with bank b is q^b_{nt+1}. This cost captures the dollar that she gives up when making a deposit, net of the interest income accruing tomorrow. The pecuniary

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

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^b_{nt+1}.

Deposits demand and consumption are given by

$$D_{nt+1} = \frac{M_{nt}}{Q_{nt+1} + Q^{\eta}_{nt+1}\tilde{Q}_{nt+1}}, \tag{16}$$

$$\text{and } P_{nt}C^c_{nt} = \frac{Q_{nt+1}M_{nt}}{Q_{nt+1} + Q^{\eta}_{nt+1}\tilde{Q}_{nt+1}}, \tag{17}$$

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

From equation (10), equation (14) and equation (16) the demand for deposits and loans from each bank b are

$$D^b_{nt+1} = (\kappa^b_n)^{\eta-1}\left(\frac{Q_{nt+1}}{q^b_{nt+1}}\right)^{\eta}\frac{M_{nt}}{Q_{nt+1} + Q^{\eta}_{nt+1}\tilde{Q}_{nt+1}} \tag{18}$$

$$\text{and } L^b_{nt+1} = (\gamma^b_n)^{\sigma-1}\left(\frac{R_{nt+1}}{1+r^b_{nt+1}}\right)^{\sigma} i_{nt}P_{nt}. \tag{19}$$

By increasing the interest rate on deposits $\tilde{r}^b_{t+1}$ (which translates into a decrease in q^b_{t+1}), the demand for deposits from bank b increases. By increasing the interest rate on loans r^b_{t+1}, 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

$$\Pi^b_t \equiv \left\{\sum_{n\in\mathcal{C}^b} \overbrace{L^b_{nt}(1+r^b_{nt})(1-\tau^b_n) + D^b_{nt+1}}^{\text{Retail inflow}} - \overbrace{L^b_{nt+1} - D^b_{nt}(1+\tilde{r}^b_{nt})}^{\text{Retail outflow}}\right\} + F^b_{t+1} - (1+r^F_t)F^b_t - T^b_t.$$

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^b_n represents city–bank–specific taxes on loans ($\tau^b_n < 0$ 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^b_{t+1}. All banks have access to the same interbank interest rate r^F_t, and a positive value of F^b_{t+1} indicates that the bank borrows from other banks. The term T^b_t is a bank-specific lump-sum tax, defined below.

The bank owner chooses city-specific nominal interest rates on loans r^b_{nt+1} and the cost of deposits q^b_{nt+1} to maximize the discounted sum of cash flows net of a nonpecuniary cost of tapping into the interbank market.[15] Banks must satisfy the balance sheet constraint equation (21). 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

$$\max_{\{\{r^b_{nt}, q^b_{nt}\}, F^b_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \left\{ \Pi^b_t - \big(\exp(\phi\omega^b) - 1\big)(1 + r^F_t) F^b_t \right\} \tag{20}$$

$$\underline{\text{s.t.}}\ [\mu^b_t] \sum_{n \in \mathcal{C}^b} L^b_{nt+1} = \sum_{n \in \mathcal{C}^b} D^b_{nt+1} + F^b_{t+1} \quad \forall t, \tag{21}$$

$$\text{equation (11), equation (18), equation (19)} \quad \forall t, \forall n \in \mathcal{C}^b.$$

where we define

$$\omega^b \equiv \frac{F^b_t}{\sum_{n \in \mathcal{C}^b} D^b_{nt}}.$$

We assume oligopolistic competition in the loan market and monopolistic competition in the market for deposits. That is, the bank owner takes the demand for deposits and loans given by equation (18) and equation (19) as given and internalizes its own effect on the interest rate index R_{nt}, but not on Q_{nt} or $\tilde{Q}_{nt}$.[16]

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

$$\mathcal{MC}^b_t \equiv \left(\tfrac{1}{\beta} + \mu^b_t \right) = \exp(\phi\omega^b)(1 + r^F_{t+1})\big(1 + \phi\omega^b\big). \tag{22}$$

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^b_t. The latter depends on who much the bank is currently tapping into the interbank market, as shown in the last expression in equation (22).

Optimal local interest rates satisfy

$$(1 + r^{b*}_{nt+1})(1 - \tau^b_n) = \frac{\varepsilon^{Lb}_{nt}}{\varepsilon^{Lb}_{nt} - 1} \mathcal{MC}^b_t, \tag{23}$$

$$q^b_{nt+1} = -\frac{\eta}{\eta - 1} \beta \left\{ \exp(\phi\omega^b)(1 + r^F_{t+1})\phi(\omega^b)^2 + \mathcal{MC}^b_t - \frac{1}{\beta} \right\}. \tag{24}$$

where $\varepsilon^{Lb}_{nt} \equiv -\frac{\partial L^b_{nt}}{\partial r^b_{nt}} \frac{(1 + r^b_{nt})}{L^b_{nt}}$ is the demand elasticity of loans. Equation (23) shows how loan markups vary across cities depending on the local sensitivity of loan demand to interest rates. The local elasticity for a

[15] 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 (15).

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

particular bank is is given by

$$\varepsilon_{nt}^{Lb} \equiv -\frac{\partial L_{nt}^b}{\partial r_{nt}^b}\frac{(1+r_{nt}^b)}{L_{nt}^b} = \sigma\big(1-s_{nt+1}^b\big) + s_{nt+1}^b \times \varepsilon_{nt+1}^i, \tag{25}$$

$$\text{where } \varepsilon_n^{i,R} \equiv -\frac{\partial i_{nt}}{\partial R_{nt+1}}\frac{R_{nt+1}}{i_{nt}} \overbrace{=}^{\text{at the steady state}} \frac{1}{\beta(1-\delta)}\left[1+\frac{D_n Q_n}{i_n R_n P_n}\right]. \tag{26}$$

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.

Equation (24) shows that markdowns on deposits are constant in the model, which follows from our assumption of monopolistic competition in the deposit market. The right-hand side of equation (24) includes an additional term capturing the fact that deposits lower nonpecuniary costs.[17]

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 (22), which translates into lower interest rates through equation (23) and leads to higher lending through the loan demand function equation (10).

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

$$T_t^b = \sum_{n\in\mathcal{C}^b} L_{nt}^b(r_{nt}^b(1-\tau_n^b)-\tau_n^b) - D_{nt}^b\tilde{r}_{nt}^b - r_t^F F_t. \tag{27}$$

The taxes defined in equation (27) 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,

$$T_{nt}^c = \sum_{b\in\mathcal{B}^n} L_{nt}^b r_{nt}^b - D_{nt}^b\tilde{r}_{nt}^b. \tag{28}$$

With the transfers defined in equation (28), 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 endoge-

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

nously to satisfy the government's budget balance condition

$$\tau \sum_{n} w_n \ell_n = -\sum_{b=1}^{B} \sum_{n \in \mathcal{C}^b} L_n^b (1 + r_n^b) \tau_n^b. \tag{29}$$

As we show below, proportional taxes on labor income do not distort workers' moving decisions, and 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 (7); (ii) the labor market clearing condition:[18]

$$\ell_n = \frac{\left(\frac{b_n w_n (1-\tau)}{P_n}\right)^{\frac{\beta}{\rho}}}{\sum_{i=1}^N \left(\frac{b_i w_i (1-\tau)}{P_i}\right)^{\frac{\beta}{\rho}}} \quad \forall n, \tag{30}$$

where ℓ_n is labor demand from local firms; (iii) capitalist's consumption, saving and borrowing optimality condition, equation (17), equation (18) and equation (19); (iv) optimality conditions from the bank owner's problem, equation (22), equation (23) and equation (24); (v) market clearing for final goods

$$w_n \ell_n + \hat{r}_n k_n = \sum_{i=1}^{N} \pi_{ni} \left(P_i C_i^w + P_i C_i^c + \sum_{b \in \mathcal{B}^i} L_i^b \right) \quad \forall n, \tag{31}$$

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

$$\sum_{b} F^b = 0; \tag{32}$$

(vii) the definition of bank taxes and capitalist's transfers, equation (27) and equation (28); 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

[18] 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 (27),

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

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

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

which follows from market clearing in the interbank market equation (32).

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 (23), 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,[19]

$$1 + r_n^b = \frac{\sigma - s_n^b \Delta_n}{\sigma - s_n^b \Delta_n - 1} \mu^b, \quad \text{where} \quad \Delta_n \equiv \sigma - \frac{1 + \frac{D_n Q_n}{i_n R_n P_n}}{\beta(1 - \delta)}. \tag{33}$$

The effective elasticity faced by a bank in a city is a weighted average of the elasticity of substitution across banks, σ, and the local elasticity of investment with respect to interest rates. The latter is an endogenous object in the model and is proportional to $1 + \frac{D_n Q_n}{i_n R_n P_n}$ (see Appendix Section B.2), reflecting that investment demand is more elastic in cities where capitalists rely more on deposits, their alternative means to transfer

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

resources inter-temporally other than investing in physical capital. This result highlights an important difference between our framework and Atkeson and Burstein (2008), where the relevant elasticities arise from the inner and outer nests in consumers' preferences.

Equation (33) highlights that, in our model, the link between markups and market shares need not be the same across cities. In cities with relatively inelastic investment demand ($\Delta_n > 0$), banks with higher market shares charge higher markups, as they face more inelastic demand at the margin than smaller banks, which mostly capture loans from bigger banks when their interest rates go down. The opposite is true if investment demand is relatively elastic ($\Delta_n < 0$). The latter case would charaterize an economy in which banks' specialize strongly in banks of particular types, and it is very costly for firms in a particular sector to borrow from a bank that is not their closes match. In such a world, σ would be small pushing towards $\Delta_n < 0$.

From equation (33), the loan-demand elasticity is higher in cities with a high value of deposits relative to loans. Moreover, an increase in a bank's local market share is associated with a lower 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 deposits shocks and the lagged deposit-loan ratio in our baseline analysis of the spatial propagation of deposit shocks. 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.

To gain further intuition on the mechanisms in the model, assume that there are no city–bank–specific matches, $\gamma_n^b = 1$ for all n, b, and that interbank frictions are zero ($\phi = 0$). Absent bank frictions, all banks have the same marginal cost equal to the interbank rate, $1 + r^F$, and charge the same markup, leading to equal market shares in the city. The loan-weighted interest rate any city n can therefore be written as

$$\overline{1 + r_n} = \sum_b \frac{1 + r_n^b}{B_n} = \frac{\sigma B_n - \Delta_n}{B_n(\sigma - 1) - \Delta_n}(1 + r^F), \tag{34}$$

where B_n denotes the number of banks in city n. From this expression,

$$\frac{\partial \overline{1 + r_n}}{\partial B_n} < 0 \iff \Delta_n > 0.$$

Intuitively, an increase in the number of banks reduces the share of each individual bank and leads them to choose markups based on the interbank elasticity of substitution, σ. Whenever $\Delta_n > 0$, this leads to a reduction in the chosen markup. Equation (34) 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 market rate and crowding out lending from city n.

As discussed extensively in Section 3.3, our empirical findings indicate that frictions in the interbank market play a role. To gain further intuition on how local interest rates depend on interbank frictions, we take a first-order approximation around $\phi = 0$ and calculate the loan-weighted average interest rate,

$$\overline{r}_n(\phi) \approx \overline{r}_n(0) + \frac{2\phi}{B_n} \sum_{b=1}^{B_n} \overbrace{\omega^b}^{\text{marginal cost}} + \overbrace{(1-\sigma)(\omega^b - \overline{\omega}_n)}^{\text{between-bank reallocation}} \overbrace{\left(1 + \frac{\Delta_n}{B_n(\sigma - \frac{\Delta_n}{B_n} - 1)(\sigma - \frac{\Delta_n}{B_n})}\right)}^{\text{direct impact + markup responses}} \tag{35}$$

where $\omega^n \equiv \frac{\sum_{b\in\mathcal{B}^n} F^b}{\sum_{b\in\mathcal{B}^n} D^b}$ is the aggregate reliance on the interbank market by the banks present in city n. Equation (35) decomposes the change in local interest rates relative to the frictionless benchmark (equation (34)) as a function of ϕ.[20]

The first channel is a change in marginal cost of funds for the local banks. Banks borrowing in the interbank market ($\omega^b > 0$) face an increase in their marginal cost, which directly raises their interest rates. By contrast, banks lending in the interbank market ($\omega^b < 0$) reduce their retail interest rates when interbank market frictions increase. The opportunity cost of retail lending deteriorates for these banks. This result highlights that the geographic segmentation of capital markets generates winners and losers: some cities are better off if they host branches of banks with such an abundance of deposits that they are lenders in the interbank market. The strength of this mechanism is governed by the size of ϕ.

The second group of effects is related to changes in market shares. Frictions induce differences in the cost of funds across banks and, therefore, reallocation of loans away from banks with relatively higher costs, i.e: banks that rely more on the interbank market than the average bank in the city. Finally, the last term in equation (35) captures markup responses when market shares change.

Our model introduces two key ingredients relative to benchmark models at the intersection of banking and spatial economics: frictions in an interbank market, which clears endogenously, and oligopolistic competition in local credit markets. Having illustrated the role of these channels theoretically in a general 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), 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 productivity by 1% in the cities with the highest level of employment in the fishing industry in the data. We solve the model under the new productivity values and treat this equilibrium as the equilibrium following the shock. We then replicate our IV strategy in the model-generated data under different values of ϕ and σ, and pick those that are able to much our estimates on quantities and prices reported in Table 2.

[20]The factor 2 comes from the functional-form assumption on nonpecuniary costs of tapping into the interbank market.

We estimate the vector of city-bank matches for loans and deposits, γ_n^b and κ_n^b, to match the observed value of loans and deposits at the city-bank level 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	0.17	Quantity IV results in Section 3
σ	Elasticity of substitution (loans)	16.8	Price IV results in Section 3
$\{z_n\}_{n=1}^N$	Productivity	[0.08,1.01]	Wages
$\{b_n\}_{n=1}^N$	Amenity	[0 ,69]	Employment
$\{\{\gamma_n^b\}_{b\in\mathcal{B}^n}\}_{n=1}^N$	Bank-city match	[6.3, 15.4]	Loans
$\{\{\kappa_n^b\}_{b\in\mathcal{B}^n}\}_{n=1}^N$	Bank-city match	[0, 5.9]	Deposits

5.1 Discussion

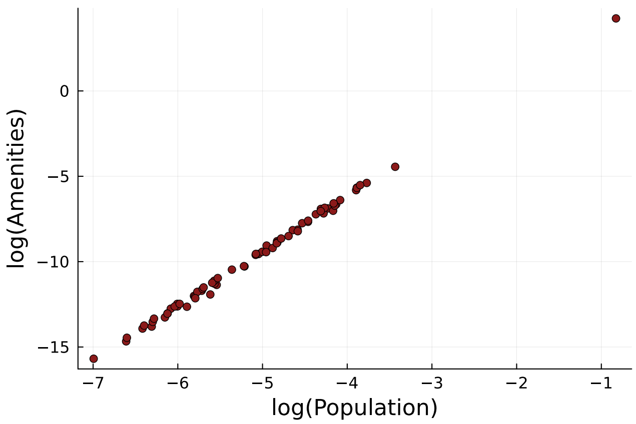
Interbank frictions. Our estimate implies that the average bank borrowing in the interbank market in the baseline scenario, for which interbank funding represents 3% of deposits, pays a non-pecuniary borrowing cost of 0.6%. That is, a bank borrowing in the interbank market for a market interest rate of 1% would act as if the interest rate was approximately 1.6%. In other words, borrowing banks face frictions approximately equal to 60 basis points on the margin.

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.

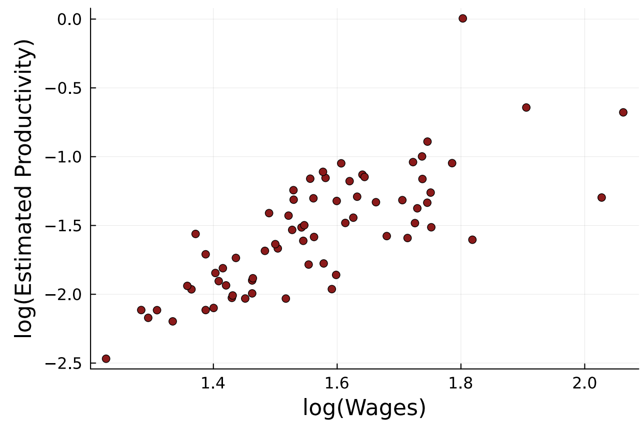
City-bank matches. The full estimates of $\{\gamma_n^b\}$ are shown in Section C.2 in the Appendix. While micro-founding the origins of city-bank matches is beyond the scope of this paper, we find a positive role for the number of local branches (which may reduce the distance between clients and the 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 7).



(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

As emphasized by Hsieh and Klenow (2009) and a vast literature on the effects of misallocation, dispersion in the marginal productivity of factors of production reduces the efficiency of the economy. Figure 4 shows the dispersion in the marginal productivity of capital (MPK) across cities in our baseline scenario.

In our model, the local MPK is closely related to local interest rates. Interest rates differ across cities mainly because of two channels. First, interbank frictions imply that the marginal cost of funds differs across banks: banks with better access to deposits face lower marginal costs of issuing loans. Second, market power implies that a bank charges higher interest rates in cities where its market shares are larger.

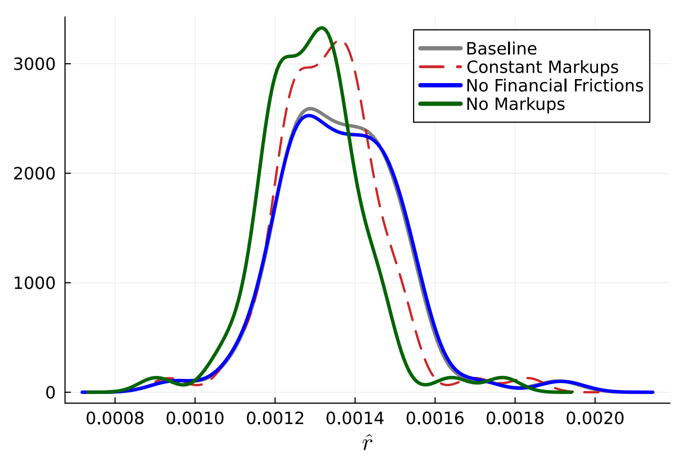


Figure 4: Spatial dispersion of the marginal productivity of capital

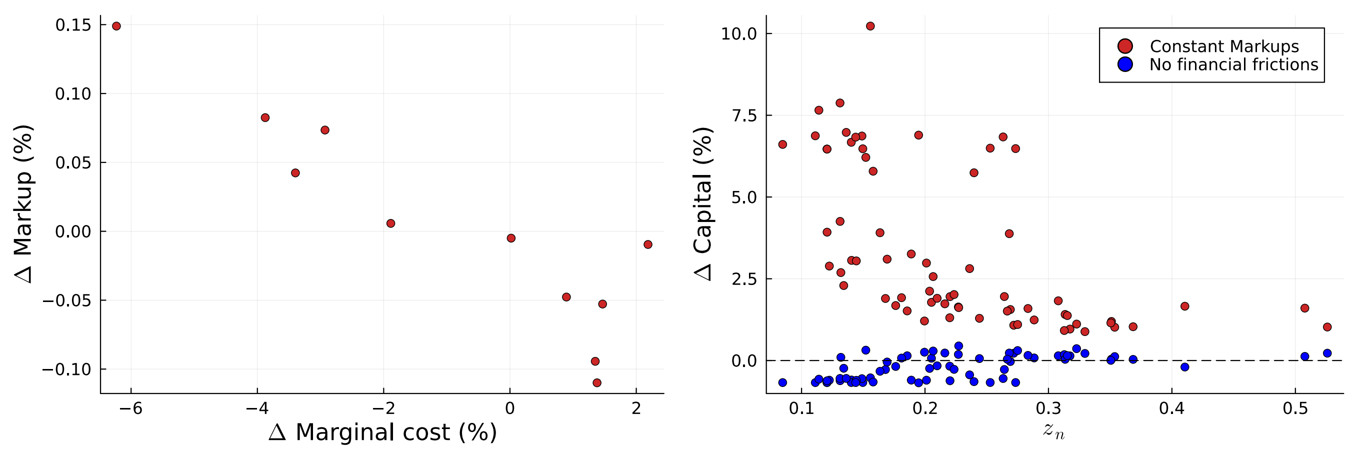
In the rest of this section we use the quantified version of our model to study whether interbank frictions or market power have stronger effects on MPK dispersion and, ultimately, productivity and welfare. Given our assumption of no migration costs, workers' expected welfare equalizes in space.[21] Expected worker welfare and the welfare of the capitalist in city n are, respectively,

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

No interbank frictions. We eliminate the non-pecuniary costs of accessing the interbank market by setting $\phi = 0$ and recompute the steady state. The marginal cost of funds equalizes across banks, which would—all else equal—compress spatial interest rate dispersion. However, the dispersion in marginal product of capital (MPK) actually increases by 3.0%, as endogenous markup adjustments more than offset the decline in cost dispersion. Figure 4 shows the distribution of MPK in this experiment and in Figure 5 we plot the average markup change for each bank against the change in each bank's marginal cost. Banks experiencing cost reductions respond by increasing markups, while those facing cost increases reduce them.

Despite higher MPK dispersion, aggregate GDP rises by 0.4%, driven by increased investment. Worker welfare increases by 0.03%, while the median increase in capitalists welfare across cities is 0.8%. The average capitalist welfare, however, declines by 0.4%, 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. Cities benefit from competition between banks and from hosting banks with ample access to deposits, which can lend at lower rates. Cities that previously benefited from geographic segmentation of capital markets lose when banks with local presence find it easier to lend to other banks. Inf Figure 5b we illustrate this heterogeneity by plotting investment responses against exogenous city productivity. Cities at the bottom of the productivity distribution are worse off when interbank lending becomes easier.



(a) No financial frictions: Effects across cities

(b) Heterogeneous Investment Responses

Figure 5: Counterfactual Analysis

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

No markups. We calculate the steady state of an economy in which city-bank specific subsidies correct markups,

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

$$\text{and, from equation (23)}, \; 1+r_n^b = \mathcal{MC}^b \; \forall n, b.$$

Eliminating markups leads to a reduction in MPK dispersion of 23%, shown in Figure 4. Jointly with an increase in investment, this leads to a 2.9% increase in productivity. The welfare of workers goes up barely by 0.05%, as they bear the full cost of the subsidies. Their pretax welfare increases by 2.9%. Compared to our previous counterfactual, this policy is more beneficial for capitalists, whose average welfare goes up by 4.1%.

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

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

$$\text{and, from equation (23)}, \; 1+r_n^b = \frac{\sigma}{\sigma-1}\mathcal{MC}^b \; \forall n, b.$$

Equalizing markups in space leads to a reduction in the spatial dispersion of MPK of 17%, which, jointly with an increase in investment, leads GDP to increase by 0.5%. Capitalist welfare increases by 1.5% on average, while worker welfare remains fairly constant. Their pre-tax welfare increases by 0.6%.

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	0.04%	2.9%	0.5%
MPK dispersion	3.0%	-23%	-17%
Workers			
Welfare	0.03%	0.05%	∼0%
Pre-tax welfare	0.03%	2.9%	0.6%
Capitalists			
Average welfare	-0.4%	4.1%	1.5%
Median welfare	0.8%	1.1%	-1.4%

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).

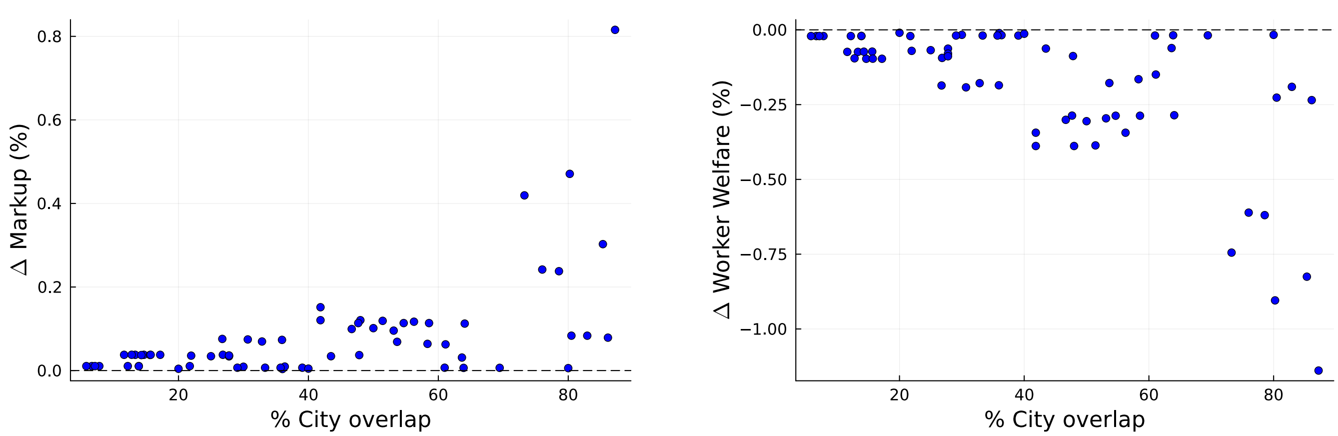
A natural concern with bank mergers is that lower competition will lead to higher interest rates. In Chile, where the median number of banks per city is three, bank mergers could lead to a substantial increase in markups in cities where both merging banks were present before the merger. Bank mergers, 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 -1.1% and $\approx 0\%$; the increase in markups varies between $\approx 0\%$ and 0.8%.

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 6 shows the effects of each merger as a function of city overlap. Figure 6a shows that the increase in markups is higher when banks' overlap in more cities. Figure 6b shows that the increase in markups is a key driver of welfare losses: higher markups lead to lower welfare.



(a) Δ Markup (b) Δ Welfare

Figure 6: Mergers' outcomes as a function of geographic overlap

We then sort mergers according to the financial integration dimension. If the two merging banks have

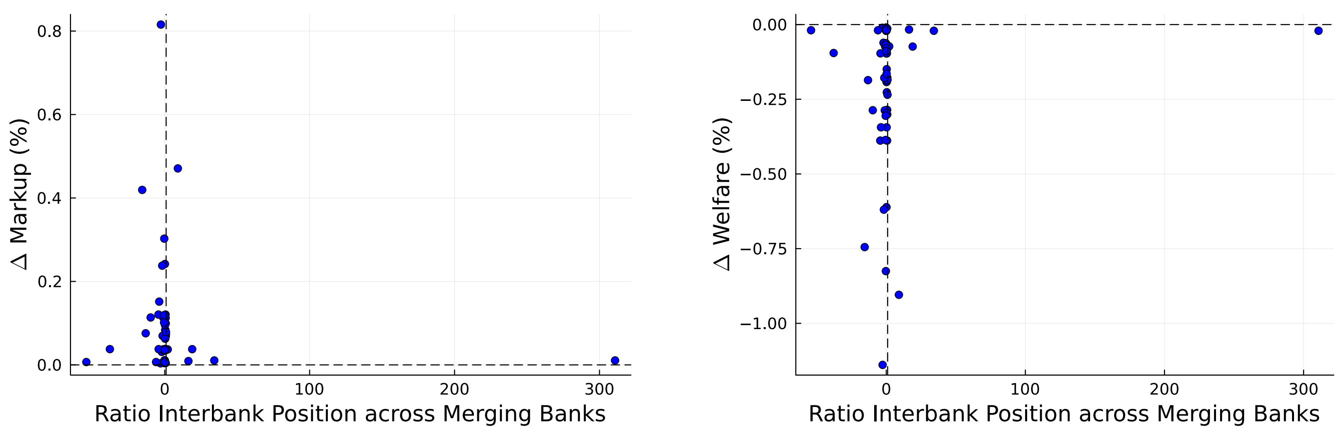
[22] That is, if Bank A, present in 10 cities, merges with Bank B, present in 8 cities, and the overlap in 5 cities, the city overlap would be 50%.

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 7 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 Welfare

Figure 7: 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 decline in aggregate productivity of around 0.4%. Local market power reduces productivity by 0.5% by distorting the allocation of capital across cities.

The policy implications of these results are not straightforward, as we keep the distribution of bank branches fixed throughout the analysis. A full-fledged analysis of policies addressing market power should incorporate bank's branching decisions, as in Oberfield et al. (2024). We view integrating banks' entry decisions with oligopolistic competition as a fruitful avenue for future research.

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.

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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 8 below shows the evolution of the two indicators of financial development mentioned in the main text.

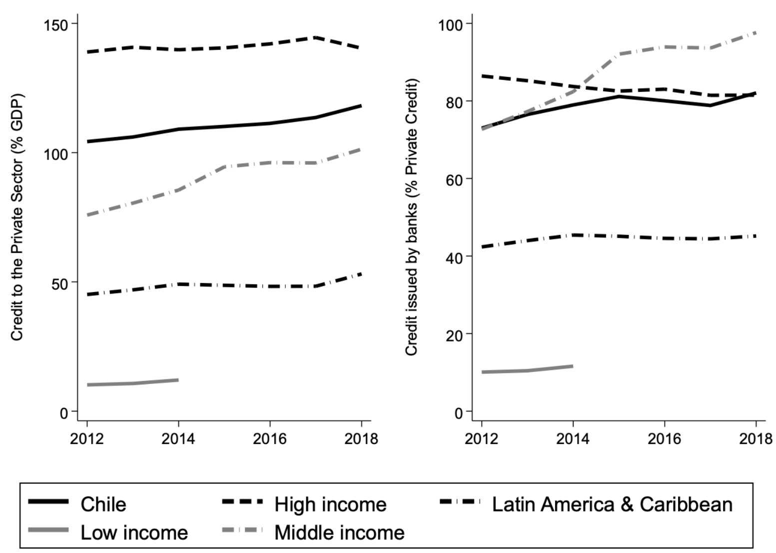

Figure 8: Financial development

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.

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 9.

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	

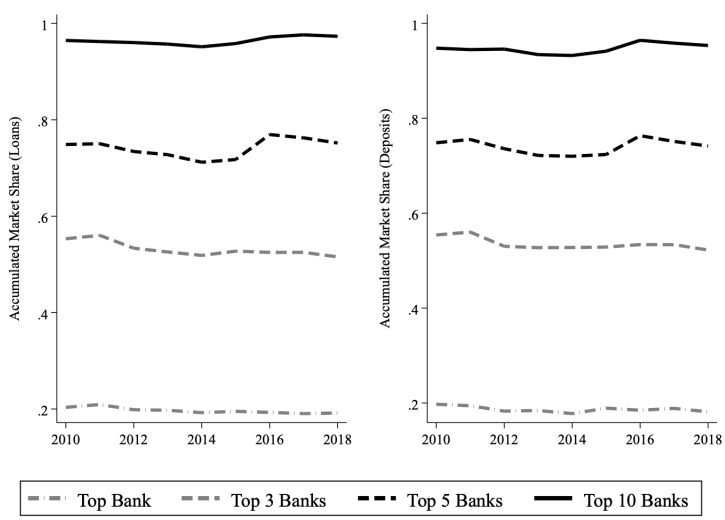

Figure 9: Concentration in the Banking Industry

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 10 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.

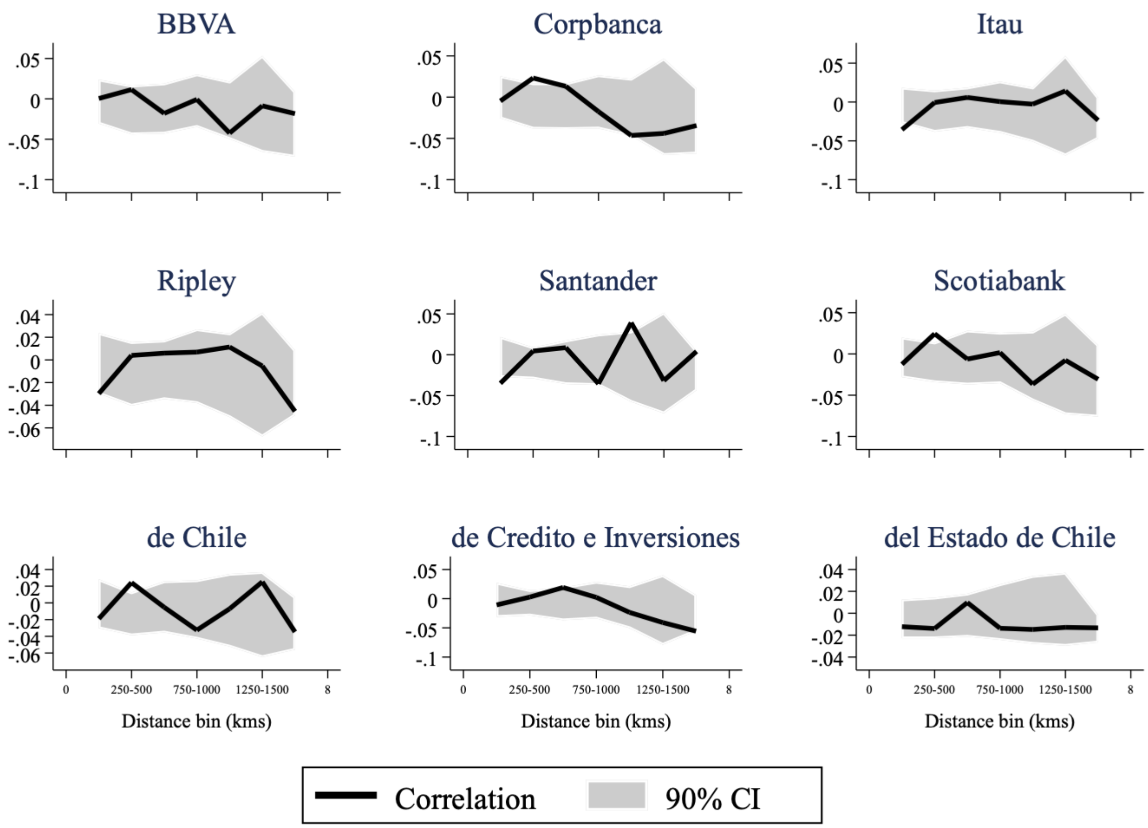

Figure 10: Spatial Correlation in Bank's Presence (Extensive Margin)

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 11 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.

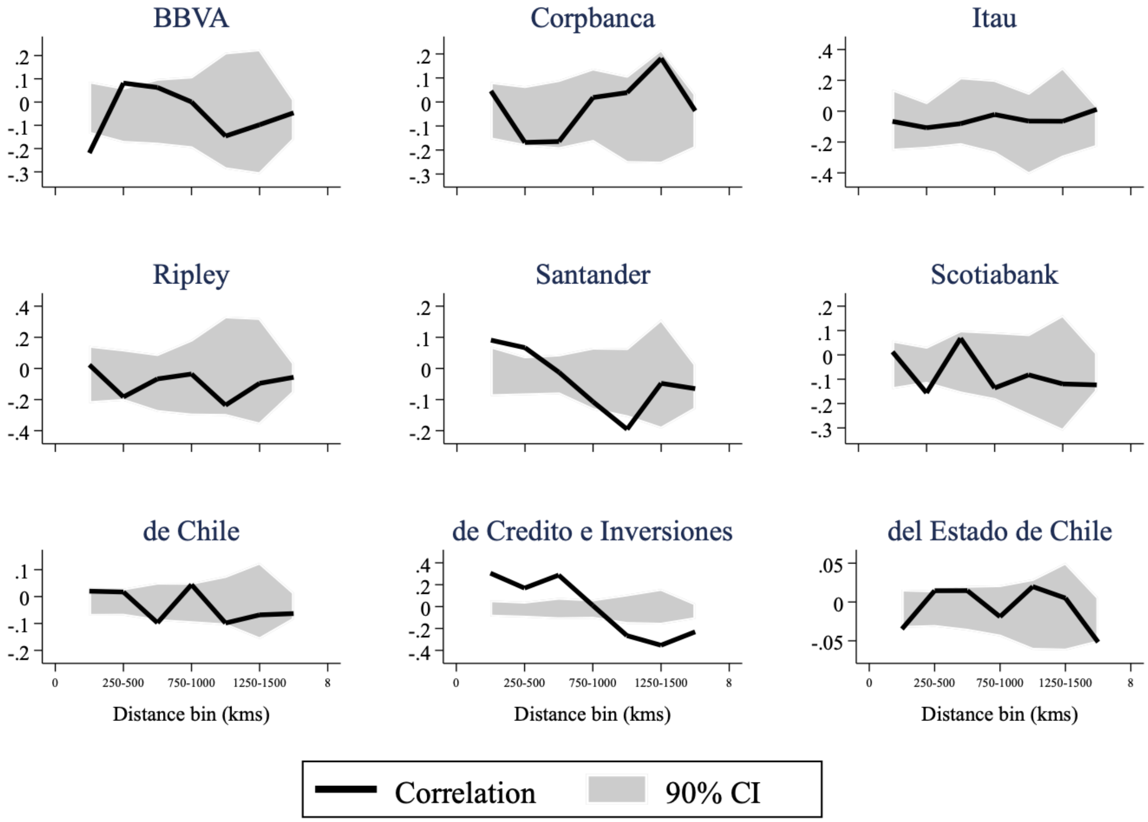

Figure 11: Spatial Correlation in Loan Market Shares (Intensive Margin)

A.5 Details on the Shift-Share IV

We use data from the IMF Commodity Price series. Figure 12 shows the evolution of the world price of salmon at a monthly frequency.

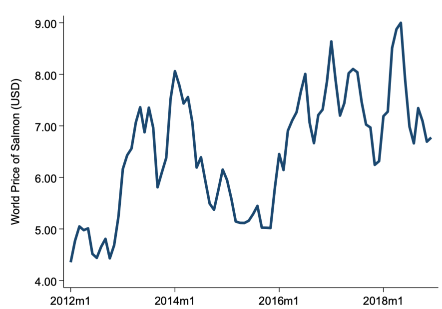

Figure 12: World Price of Salmon

Figure 13 shows the share of local employment in the Fishing industry. The industry is concentrated in the Southern region.

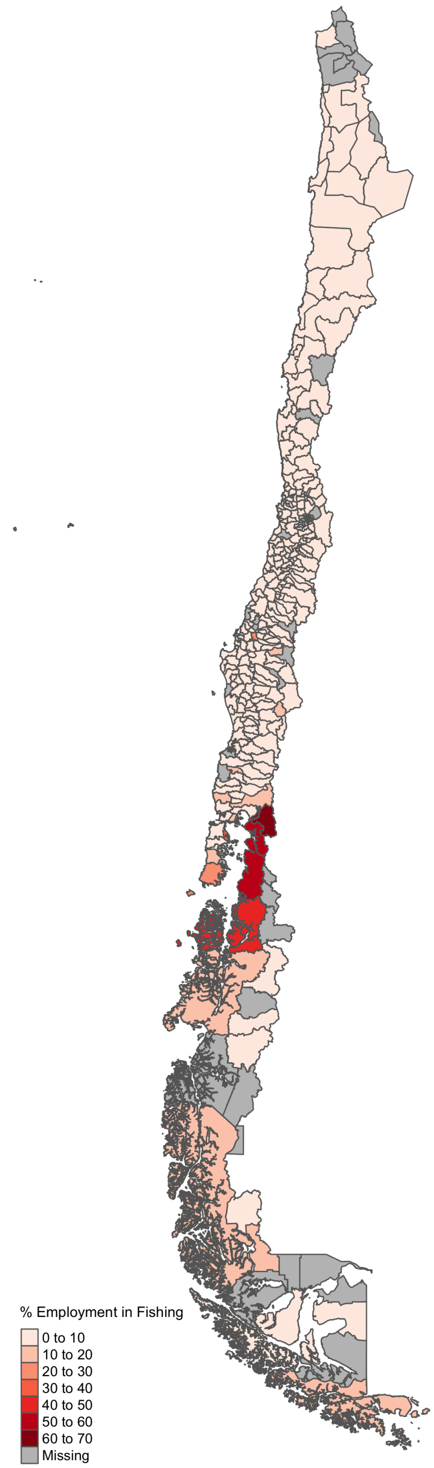

Figure 13: Share of local employment in the fishing industry

B Mathematical appendix

B.1 Workers

Starting from equation (8) 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

$$\phi \equiv \sum_{d=1}^{N} exp\Big(\tfrac{\beta}{\rho} v_d\Big). \tag{36}$$

The steady-state value of ϕ solves

$$\phi = \sum_{d=1}^{N} b_d^{\frac{\beta}{\rho}} \times [w_d(1-\tau^{ss})]^{\frac{\beta}{\rho}} \times P_d^{\frac{-\beta}{\rho}} \times \phi^{\beta} \tag{37}$$

$$= \Big(\sum_{d=1}^{N} b_d^{\frac{\beta}{\rho}} \times [w_d(1-\tau^{ss})]^{\frac{\beta}{\rho}} \times P_d^{\frac{-\beta}{\rho}} \Big)^{\frac{1}{1-\beta}} \tag{38}$$

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 (30), 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

$$\mathcal{L}_t(i_t) = \min_{\{L^b_{t+1}\}_b} \sum_{b\in\mathcal{B}} L^b_{t+1}(1+r^b_{t+1}) \tag{39}$$

$$s.t.\;\; i_t = \Big[\sum_{b\in\mathcal{B}} (\gamma^b \tfrac{L^b_{t+1}}{P_t})^{\frac{\sigma-1}{\sigma}}\Big]^{\frac{\sigma}{\sigma-1}}, \tag{40}$$

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

$$\mu(\tfrac{\gamma^b}{P_t})^{\frac{\sigma-1}{\sigma}}\Big(\frac{i_t}{L^b_{t+1}}\Big)^{\frac{1}{\sigma}} = (1+r^b_{t+1}), \tag{41}$$

where μ is the multiplier associated with the constraint in equation (40). Taking the ratio of equation (41) for two banks b and b',

$$\frac{L^{b'}_{t+1}}{L^b_{t+1}} = \Big(\frac{1+r^b_{t+1}}{1+r^{b'}_{t-1}}\Big)^{\sigma}\Big(\frac{\gamma^{b'}}{\gamma^b}\Big)^{\sigma-1}. \tag{42}$$

From here, picking an arbitrary b':

$$i_t = \Big(\sum_{b\in\mathcal{B}} (\gamma^b \tfrac{L^b_{t+1}}{P_t})^{\frac{\sigma-1}{\sigma}}\Big)^{\frac{\sigma}{\sigma-1}} = (1+r^{b'}_{t+1})^{\sigma}(\gamma^{b'})^{1-\sigma}\tfrac{L^{b'}_{t+1}}{P_t}\Big[\sum_{b\in\mathcal{B}} (\tfrac{1+r^b_{t+1}}{\gamma^b})^{1-\sigma}\Big]^{-\frac{\sigma}{1-\sigma}}. \tag{43}$$

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

$$i_t R^{\sigma}_{t+1} = (1+r^b_{t+1})^{\sigma}(\gamma^b)^{1-\sigma}\tfrac{L^b_{t+1}}{P_t} \tag{44}$$

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

$$\frac{L^b_{t+1}}{P_t} = \Big(\frac{R_{t+1}}{1+r^b_{t+1}}\Big)^{\sigma} i_t (\gamma^b)^{\sigma-1}, \tag{45}$$

which shows as equation (10) in the main text. From equation (45) and the definition of $\mathcal{L}_t(i_t)$,

$$\mathcal{L}_t(i_t) = \sum_{b\in\mathcal{B}} L^b_{t+1}(1+r^b_{t+1}) = i_t R_{t+1} P_t. \tag{46}$$

which shows as equation (12) in the main text.

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

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

$$\underline{s.t:}\; C^c_t + \sum_b \frac{D^b_{t+1}}{P_t} + \frac{(k_t - k_{t-1}(1-\delta))R_t P_{t-1}}{P_t} = \frac{\hat{r}_t k_t}{P_t} + \sum_b \frac{D^b_t}{P_t}(1+\tilde{r}^b_t) + \frac{T^c_t}{P_t} \tag{47}$$

$$D_{t+1} = \Big[\sum_b (\kappa^b D^b_{t+1})^{1-\frac{1}{\eta}}\Big]^{\frac{\eta}{\eta-1}} \tag{48}$$

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

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

$$\lambda_t \frac{\hat{r}_t}{P_t} + \lambda_{t+1} \frac{(1-\delta) R_{t+1} P_t}{P_{t+1}} = \lambda_t \frac{R_t P_{t-1}}{P_t}, \tag{49}$$

$$\frac{\beta^t}{C_t^c} = \lambda_t, \tag{50}$$

$$\text{and} \quad \beta^t D_{t+1}^{\frac{1-\eta}{\eta}} (D_{t+1}^b)^{-\frac{1}{\eta}} (\kappa^b)^{\frac{\eta-1}{\eta}} + \lambda_{t+1} \frac{1+\tilde{r}_{t+1}^b}{P_{t+1}} = \frac{\lambda_t}{P_t}. \tag{51}$$

Equation (49) 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 (50), is standard. The first order condition with respect to deposits in a specific bank, equation (51), 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 (49) and equation (50) we derive the following Euler equation,

$$\frac{P_{t+1} C_{t+1}}{P_t C_t} = \beta(1-\delta) \frac{R_{t+1} P_t}{R_t P_{t-1} - \hat{r}_t}. \tag{52}$$

Replacing equation (50) into equation (51), and then replacing $C_{t+1} P_{t+1}$ from equation (52),

$$\frac{1}{D_{t+1}} (\kappa^b)^{\frac{\eta-1}{\eta}} \left(\frac{D_{t+1}}{D_{t+1}^b} \right)^{\frac{1}{\eta}} = \frac{1}{P_t C_t} \left[1 - \frac{(1+\tilde{r}_{t+1}^b)(R_t P_{t-1} - \hat{r}_t)}{(1-\delta) R_{t+1} P_t} \right]. \tag{53}$$

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

$$\frac{D_{t+1}^b}{D_{t+1}^{b'}} = \left(\frac{\kappa^b}{\kappa^{b'}} \right)^{\eta-1} \left(\frac{q_{t+1}^b}{q_{t+1}^{b'}} \right)^{-\eta}, \tag{54}$$

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

$$q_{t+1}^b \equiv 1 - \left(1 + \tilde{r}_{t+1}^b\right) / \left(\frac{(1-\delta) R_{t+1} P_t}{R_t P_{t-1} - \hat{r}_t} \right). \tag{55}$$

We define the deposit price index as

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

It follows from equation (54) and the definition of D_{t+1} that the supply of deposits to bank b is given by

$$D_{t+1}^b = D_{t+1} (\kappa^b)^{\eta-1} \left(\frac{Q_{t+1}}{q_{t+1}^b} \right)^{\eta}. \tag{57}$$

Replacing this back into equation (53) we obtain that the capitalist equalizes of expenditure on the two 'goods' available to her, consumption and deposits,

$$D_{t+1} Q_{t+1} = P_t C_t. \tag{58}$$

The nominal value of total deposits at t is given by

$$\sum_b D_{t+1}^b = \sum_b D_{t+1}(\kappa^b)^{\eta-1}(\frac{Q_{t+1}}{q_{t+1}^b})^\eta = D_{t+1}Q_{t+1}^\eta \overbrace{\sum_b (\kappa^b)^{\eta-1}(q_{t+1}^b)^{-\eta}}^{\equiv \tilde{Q}_{t+1}}, \tag{59}$$

where $\tilde{Q}_{t+1} \equiv \sum_b \kappa^b)^{\eta-1}(q_{t+1}^b)^{-\eta}$. Plugging equation (59) into the budget constraint, equation (47), using equation (58) and defining M_t as

$$M_t \equiv \hat{r}_t k_t + \sum_b (1+\tilde{r}_t^b)D_t^b - (k_t - (1-\delta)k_{t-1})R_t P_{t-1} + T_t \tag{60}$$

we get

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

which are equations equation (16) and equation (17) 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 (52) becomes

$$1 = \frac{\beta(1-\delta)R_n P_n}{R_n P_n - \hat{r}_n}. \tag{61}$$

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

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

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

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

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

To calculate the elasticity of investment with respect to the interest rate R, start from the budget constraint equation (47) evaluated at $t+1$ and the Euler equation, equation (52),

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

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

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

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

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

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

which shows as equation (26) 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 (25) 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

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

$$\frac{1}{\beta} + \mu_t = \exp\left(\phi\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\left(1+\phi\frac{F_{t+1}}{\sum_n D_{nt+1}}\right) \tag{62}$$

Where $\mu_t = \frac{\lambda_t}{\beta^{t+1}}$. This expression for the marginal cost is equation (22) 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,

$$1 + r_{nt+1} = \frac{\epsilon_L}{\epsilon_L - 1}\left(\frac{1}{\beta} + \mu_t\right) \tag{63}$$

which is equation (23) 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

$$q_{nt+1} = -\frac{\epsilon_D}{\epsilon_D - 1}\beta\left\{\exp\left(\phi\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)(1+r_{t+1}^F)\phi\left(\frac{F_{t+1}}{\sum_n D_{nt+1}}\right)^2 + \mu_t\right\} \tag{64}$$

In equation (24) 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 (22), 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

$$s_n^b = \frac{1}{B_n} \tag{65}$$

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

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

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

$$\overline{1 + r_n} = \sum_b \frac{(1 + r_n^b)}{B_n} = \tfrac{B_n}{B_n} \frac{\sigma B_n - \Delta_n}{B_n(\sigma - 1) - \Delta_n}(1 + r^F) \tag{67}$$

which is equation (33) 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 (22),

$$\frac{\partial \mathcal{MC}^b}{\partial \phi} = exp(\tfrac{\phi F^b}{D^b})\tfrac{F^b}{D^b}(1 + r^F)(1 + \tfrac{\phi F^b}{D^b}) + exp(\tfrac{\phi F^b}{D^b})\tfrac{F^b}{D^b}(1 + r^F) \tag{68}$$

$$\frac{\partial \mathcal{MC}^b}{\partial \phi}|_{\phi=0} = 2(1 + r^F)\tfrac{F^b}{D^b}. \tag{69}$$

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

$$s_n^b = \frac{(1 + r_n^b)^{1-\sigma}}{\sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma}} \tag{70}$$

$$\to \frac{\partial s_n^b}{\partial \mathcal{MC}^b} = \frac{(1-\sigma)(1 + r_n^b)^{-\sigma}\mathcal{MK}^b \sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma} - (1 + r_n^b)^{1-\sigma}(1-\sigma)(1 + r_n^b)^{-\sigma}\mathcal{MK}^b}{(\sum_{v=1}^{B_n}(1 + r_n^v)^{1-\sigma})^2} \tag{71}$$

$$\frac{\partial s_n^b}{\partial \mathcal{MC}^b}|_{\phi=0} = \frac{(1-\sigma)(1 + r_n)^{1-2\sigma}\mathcal{MK}(B_n - 1)}{(B_n(1 + r_n)^{1-\sigma})^2} \tag{72}$$

$$= \frac{(1-\sigma)\mathcal{MK}(B_n - 1)}{B_n^2(1 + r_n)} \tag{73}$$

$$= \frac{1-\sigma}{(1 + r^F)} \frac{B_n - 1}{B_n^2}. \tag{74}$$

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

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

$$\frac{\partial s_n^b}{\partial \mathcal{MC}^v}|_{\phi=0} = \frac{-(1-\sigma)(1+r_n)^{1-2\sigma}\mathcal{MK}}{(B_n(1+r_n)^{1-\sigma})^2} \tag{76}$$

$$= \frac{-(1-\sigma)\mathcal{MK}}{B_n^2(1+r_n)} \tag{77}$$

$$= \frac{-(1-\sigma)}{(1+r^F)B_n^2}. \tag{78}$$

With these objects, we can calculate

$$\frac{\partial s_n^b}{\partial \phi}|_{\phi=0} = \sum_{v=1}^{B_n} \frac{\partial s_n^b}{\partial \mathcal{MC}^v} \frac{\partial \mathcal{MC}^v}{\partial \phi}|_{\phi=0} \tag{79}$$

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

$$= \frac{2(1-\sigma)}{B_n^2}\Big((B_n - 1)\frac{F^b}{D^b} - \sum_{v\neq b}\frac{F^v}{D^v}\Big) \tag{81}$$

$$= \frac{2(1-\sigma)(\omega^b - \overline{\omega}_n)}{B_n} \tag{82}$$

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,

$$\mathcal{MK}^b = \frac{\sigma - s_n^b \Delta_n}{\sigma - s_n^b\Delta_n - 1} \tag{83}$$

$$\frac{\partial \mathcal{MK}^b}{\partial s_n^b} = \frac{-\Delta_n(\sigma - s_n^b\Delta_n - 1) + (\sigma - s_n^b\Delta_n)\Delta_n}{(\sigma - s_n^b\Delta_n - 1)^2} \tag{84}$$

$$\frac{\partial \mathcal{MK}^b}{\partial s_n^b}|_{\phi=0} = \frac{\Delta_n}{(\sigma - s_n^b\Delta_n - 1)^2} = \frac{\Delta_n}{(\sigma - \frac{\Delta_n}{B_n} - 1)^2} \tag{85}$$

We take a first-order approximation around the frictionless benchmark

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

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

$$\approx \overline{1+r_n}|_{\phi=0} + \sum_{b=1}^{B_n}\Big(\frac{2(1-\sigma)(\omega^b-\overline{\omega}_n)}{B_n}(1+r_n^b) + s_n^b\big(\mathcal{MC}^b\frac{\partial\mathcal{MK}^b}{\partial\phi} + \frac{\partial\mathcal{MC}^b}{\partial\phi}\mathcal{MK}^b\big)\Big)|_{\phi=0}\times\phi \tag{88}$$

To proceed, note that

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

$$= 2s_n^b(1+r_n^b)\Big(\frac{\Delta_n(\sigma - s_n^b\Delta_n - 1)((1-\sigma)(\omega^b - \overline{\omega}_n))}{(\sigma - \frac{\Delta_n}{B_n} - 1)^2(\sigma - s_n^b\Delta_n)B_n} + (1+r^F)\frac{\omega^b}{\mathcal{MC}^b}\Big) \tag{90}$$

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

$$s_n^b\big(\mathcal{MC}^b\frac{\partial \mathcal{MK}^b}{\partial \phi} + \frac{\partial \mathcal{MC}^b}{\partial \phi}\mathcal{MK}^b\big)|_{\phi=0} = 2\frac{(1+r_n^b)}{B_n}\Big(\frac{\Delta_n(1-\sigma)(\omega^b - \overline{\omega}_n)}{(\sigma - \frac{\Delta_n}{B_n} - 1)(\sigma - \frac{\Delta_n}{B_n})B_n} + \omega^b\Big). \tag{91}$$

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

$$\overline{1+r_n}(\phi) \approx \overline{1+r_n}|_{\phi=0}\left(1 + \frac{2\phi}{B_n}\sum_{b=1}^{B_n}[(1-\sigma)(\omega^b - \overline{\omega}_n) + \omega^b + \frac{\Delta_n(1-\sigma)(\omega^b - \overline{\omega}_n)}{B_n(\sigma - \frac{\Delta_n}{B_n} - 1)(\sigma - \frac{\Delta_n}{B_n})}]\right) \tag{92}$$

Taking logs on both sides we get equation (35) 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 (10), 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 (54) implies that the ratio of deposits from two banks in the same city satisfies:

$$\frac{D_n^b}{D_n^{b'}} = \left(\frac{\kappa^b}{\kappa^{b'}}\right)^{\eta-1} \left(\frac{\beta - (1 + r_n^b)}{\beta - (1 + r_n^{b'})}\right)^{-\eta}. \tag{93}$$

For each city n, we normalize $\kappa_n^b = 1$ for one bank, then use equation equation (93) 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:

$$\hat{z}_n = \frac{w_n^{\mu} \hat{r}^{1-\mu}}{\hat{p}_n}, \tag{94}$$

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 (61) 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 (30), 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 (5) 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.

C.2 Estimated city-bank match γ_n^b

Figure 14 shows the estimated value of city-bank matches.

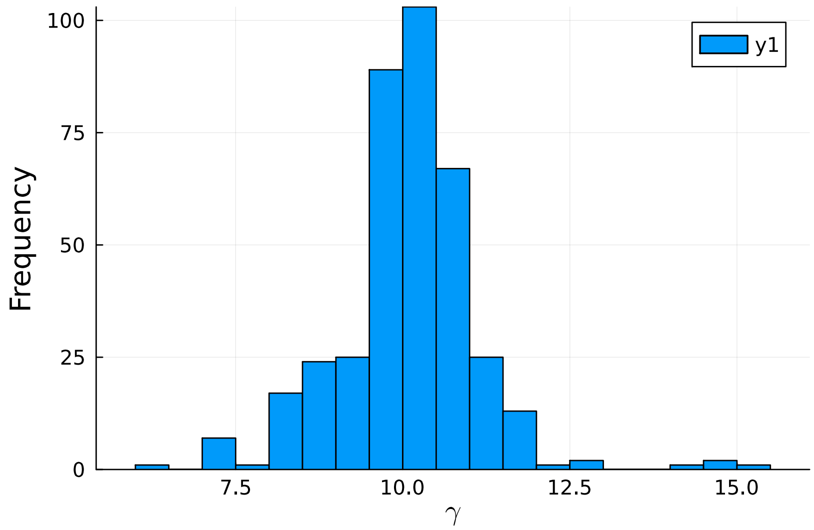

Figure 14: Estimated city-bank match γ

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 7 below shows the results of an OLS estimate of

$$Log(\gamma_n^b) = \beta_0 + \gamma_n + \gamma_b + \beta_1 Log(Branches_n^b) + \varepsilon_n^b. \tag{95}$$

Table 7: Branches

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