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THE DEPOSIT BUSINESS AT LARGE VS. SMALL BANKS

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ABSTRACT

The deposit business differs at large versus small banks. We provide a parsimonious model and extensive empirical evidence supporting the idea that much of the variation in deposit-pricing behavior between large and small banks reflects differences in "preferences and technologies." Large banks offer superior liquidity services but lower deposit rates, and locate where customers value their services. In addition to receiving a lower level of deposit rates on average, customers of large banks exhibit lower demand elasticities with respect to deposit rate spreads. As a result, despite the fact that the locations of large-bank branches have demographics typically associated with greater financial sophistication, large-bank customers earn lower average deposit rates. Our explanation for deposit pricing behavior challenges the idea that deposit pricing is mainly driven by pricing power derived from the large observed degree of concentration in the banking industry.

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1 Introduction

The business of creating and maintaining a deposit franchise is different for large vs. small banks. We show empirically that large banks experience significantly lower demand elasticities with respect to deposit rates, and they are more likely to be located in markets with less deposit-rate-elastic customers. Consistent with these findings, we provide an explanation for the different pricing behavior of large and small banks based on differences in preferences and technologies, as opposed to one that relies on market power derived from concentrated market shares. We show that large and small banks operate in markets with different characteristics and different customer bases. Large banks locate their branches in areas with high populations, high incomes, high house prices, and less-elderly populations. On the other hand, large-bank customers display *lower* deposit-price elasticities. That is, the urban, high-income, high-housing-wealth, younger customers of large banks make more suboptimal deposit withdrawal decisions from the view that deposit withdrawals are options on deposit spreads.

This result seems very surprising, particularly in light of the results in Campbell (2006) that younger, more educated, higher-income households with more-expensive houses exercise mortgage-prepayment options *more* optimally when considering the mortgage-prepayment option as a financial option on mortgage spreads. In mortgage markets, consumers with demographics correlated with higher financial sophistication earn higher financial returns by prepaying more optimally. By contrast, customers of large banks accept lower deposit rates and withdraw their deposits more slowly as deposit spreads widen. Thus, in deposit markets with demographics correlated with *greater* financial sophistication, customers earn *lower* deposit rates on average. Our result for deposit rates also stands in contrast to the findings in Smith, Zidar, and Zwick (2023) that wealthier households typically earn greater returns in fixed income and other asset classes.

We offer an explanation of the different businesses of deposits at large and small banks that is based on banks' market selection as a function of customer preferences and bank technologies. We argue that customers of large banks value superior liquidity services more highly and display lower deposit-rate elasticities as a result. Thus, deposit-withdrawal options are exercised as a function of both deposit spreads and the relative value customers place on liquidity services offered. Large banks charge higher spreads but offer liquidity services that reduce the relative value of withdrawing deposits as spreads widen.

To provide intuition for our empirical findings, we present a simple model of the deposit business at large and small banks.[1] We assume that large banks set uniform rates and

[1]For quantitative industry equilibrium models of banking, see the important contributions of Corbae and

offer lower deposit rates than small banks do. We provide robust empirical support of these assumptions in the data. We allow banks to pay a fixed cost to become large and provide liquidity services that are superior to those of small banks, perhaps by offering more convenient online banking, more ATMs, or other infrastructure that allows for faster or lower-cost access to deposits following the findings in Haendler (2022) regarding small banks' sluggish adoption of mobile-banking services. The tradeoff inherent in being a large bank, aside from the fixed cost, is the constraint of uniform rates.

From our simple model we generate two key predictions that we test in the data. The first prediction is for market selection by large and small banks. Large banks locate branches where customers value their superior liquidity services. Small banks choose to locate in places where customers put a lower value on better liquidity services relative to higher deposit rates.[2] The second prediction of our model compares the relative demand elasticities of large and small banks. In particular, we show that small banks face higher demand elasticities with respect to deposit rates than large banks do.

Understanding the business of deposits at large and small banks is crucial for understanding bank valuations. The franchise values of deposit businesses has been documented as a key driver of bank value in the cross section and time series. Minton, Stulz, and Taboada (2019) show that large banks do not appear to be valued more highly than small banks, and that the size of banks' deposit liability relative to total bank liabilities is positively correlated with bank values.[3] Egan, Lewellen, and Sunderam (2022) show that deposit productivity is more important than loan productivity for understanding the cross section of bank values. Atkeson, d'Avernas, Eisfeldt, and Weill (2018) develop a calibrated framework which quantifies the impact of time-series variation in the value of the deposit franchise on the financial soundness of the banking sector. Ma and Scheinkman (2020) shows that the leverage of banks is supported by their going-concern value, which includes the deposit-franchise value. It is important to note that despite the importance of deposit franchises for bank values, and despite the higher spreads that large banks have and the lower elasticities of their customers, large banks have *lower* valuation ratios (Minton et al. (2019), Atkeson et al. (2018)). This fact cuts against explanations of large banks' pricing behavior that rely on high profitability.

In sum, deposit franchises are a key driver of bank asset values, and the financial stability of the banking system rests on the value of bank assets relative to liabilities. Thus, a comprehensive understanding of the deposit business at large vs. small banks is an important input into measuring financial stability. Our deposit-rate-setting framework contributes to

D'Erasmo (2021, 2013); Wang, Whited, Wu, and Xiao (2022); Bianchi and Bigio (2022).

[2]For an equilibrium model of how banks become large and the role of deregulation, see Corbae and D'Erasmo (2022).

[3]See also Calomiris and Nissim (2014) for a related empirical study of bank valuation ratios.

our understanding of recent bank failures and to discussions regarding bank-interest-rate risks.[4] Small banks may be more vulnerable in a tightening environment because their customers are more sensitive to deposit-rate changes, and because they need to incur higher funding costs by offering higher rates to retain deposits.[5] This is despite the fact that, on average, small banks have a lower fraction of uninsured deposits. Consequently, small-bank deposit franchises may have weaker hedging benefits (Drechsler et al., 2021) and a shorter duration. We note that the greater potential fragility of small banks is despite the fact that small banks have a smaller fraction of uninsured deposits.

Recently, Begenau and Stafford (2022b) initiated a debate regarding one of the findings in a series of very important contributions to the study of deposit markets, monetary policy, and bank risk exposures (Drechsler, Savov, and Schnabl, 2017; Drechsler et al., 2021). We confirm the uniform pricing result in Begenau and Stafford (2022b),[6] but emphasize it does not rule out deposit market power or the main contribution in Drechsler et al. (2017) and Drechsler et al. (2021) on the transmission of monetary policy to bank lending and the exposure of banks to interest rate risk. The main findings in Drechsler et al. (2017) and Drechsler et al. (2021) are that deposit rates are low and insensitive to market rates. They show that the low sensitivity to market rates creates a deposit channel for the transmission of monetary policy to bank lending, and also reduces the exposure of banks to interest rate risk. A secondary finding concerns the mechanism for this behavior. Drechsler et al. (2017) argue that it is due to deposit market power. They use market concentration (HHI) as an instrument for deposit market power to test this mechanism. They also use a bank's "deposit beta" as a comprehensive measure of deposit market power. Begenau and Stafford (2022b) find that many banks set uniform deposit rates, which they argue goes against the deposit market power mechanism. Our contribution emphasizes that banks do not compete solely on rates and that large and small banks operate different deposit business models.

The literature on competition in deposit markets is extensive and diverse. In the early 1960s, retail banking markets were commonly seen as local. Studies revealed that deposit interest rates were correlated with local levels of bank competition,[7] leading antitrust regu-

[4]See Jiang, Matvos, Piskorski, and Seru (2023b); Haddad, Hartman-Glaser, and Muir (2023); Chang, Cheng, and Hong (2023) for studies of the 2023 bank failures. Drechsler, Savov, and Schnabl (2021) is the classic study of the effect of the deposit franchise on bank interest rate exposures. Begenau, Piazzesi, and Schneider (2015) study bank-interest-rate exposures, but focus on the asset side of banks' balance sheet.

[5]See Egan, Hortaçsu, and Matvos (2017) for a model of a related effect for banks with a greater share of uninsured deposits. Chang et al. (2023) shows that smaller banks with more uninsured deposits had greater profitability and market valuations prior to the bank failures in the spring of 2023.

[6]See also Granja and Paixão (2022), and the older literature including Calem and Nakamura (1998), Radecki (1998), Radecki (2000), Biehl (2002), Heitfield and Prager (2004), and Park (2009).

[7]See, for example, Berger and Hannan (1989); Hannan (1991, 1997); Hannan and Berger (1991); Neumark and Sharpe (1992); Rhoades (1992); Sharpe (1997).

lators to focus on local competition levels. However, research in the 1980s and 1990s began to question these conclusions, especially in light of banking deregulation, which permitted banks to have multiple branches,[8] leading to substantial growth in the average size of banks and an accompanying decrease in their number.[9]

As the size of banks changed, so did their behavior. Mester (1987) noted that allowing bank branching might increase competition because firms interact at multiple locations, and Calem and Nakamura (1998) showed theoretically that allowing bank branching may lead to banks setting constant rates across large regions. Using 1996–97 deposit and loan data from the Bank Rate Monitor, Inc., Radecki (1998) found that this was indeed the case, with many major banks setting constant rates across large regions, and the local-level correlations previously observed had vanished. Later studies confirmed these findings using more recent data, demonstrating that while large banks tend to set uniform rates across extensive regions, smaller banks base their rates on local competitive conditions (see, for example, Radecki, 2000; Biehl, 2002; Heitfield, 1999; Heitfield and Prager, 2004; Park and Pennacchi, 2009). Park and Pennacchi (2009) suggested that this uniformity in rates may also be encouraged by the growth of the Internet, with large banks unwilling to upset consumers who would be offered a relatively unattractive rate due to their location.

These older results on uniform pricing appear to have been largely overlooked in the more recent literature, which, like the early literature, has once again focused on the relationship between cross-sectional variation in local bank competition and monetary policy. Two exceptions are Begenau and Stafford (2022a) and Granja and Paixão (2022), which offer a new emphasis on uniform pricing. We confirm the main result in Begenau and Stafford (2022a) of uniform pricing by large banks and put this finding into the context of the extensive prior literature on this subject. Our contribution is to offer a framework that highlights the differences in the deposit business models of large vs small banks and to structurally link their pricing behaviors, location choices, and customer elasticities, to these different deposit business models.

Prior research documents a number of other differences between large and small banks. Bassett and Brady (2002) find that large and small banks have quite different liabilities, with small banks' liabilities comprised mainly by (FDIC-insured) retail deposits, while larger banks have larger quantities of uninsured deposits. We confirm their results and show that, consistent with Egan et al. (2017), banks with a higher fraction of uninsured deposits have a higher deposit-rate elasticity. Given that large banks have a higher fraction of uninsured

[8]See Berger, Kashyap, and Scalise (1995); Demyanyk, Ostergaard, and Sørensen (2007)

[9]Bassett and Brady (2002) document a reduction from more than 14,000 banks in 1985 to about 8,300 in 2000.

deposits, but a lower deposit-rate elasticity, these results demonstrate that it is unlikely that the share of uninsured deposits is driving our results documenting elasticity differences between large and small banks. Park and Pennacchi (2009), supported empirically by Berger, Miller, Petersen, Rajan, and Stein (2005); Cole, Goldberg, and White (2004); Haynes, Ou, and Berney (1999), note that larger banks face lower funding costs than smaller banks due to their access to wholesale financing, and that the greater organizational complexity of large banks may mean that they face higher costs of servicing small businesses and consumers, and may be more likely to rely on simple decision rules regarding lending and pricing that are based only on "hard" information. In a comparison of the capital structure of traditional banks and shadow banks, Jiang, Matvos, Piskorski, and Seru (2023a) show that bank leverage is insensitive to bank size and that uninsured leverage increases with bank size. Our complementary focus is on the different business models for deposits at large vs. small banks.

Confirming both older and more recent findings, our paper documents uniform rate policies, particularly among large banks. Our analysis uses weekly deposit rates at the branch level from RateWatch, revealing limited rate variation within banks. Bank size is the primary contributor to rate variation, emphasizing differences between large vs. small banks. Local market conditions, such as HHI and demographics, have little impact on deposit rate setting. While rates do vary with HHI for small banks (the majority of bank branches), HHI does not matter much for aggregate deposits, because large banks make up the majority of the deposit market.

An important empirical moment for comparing large and small banks is the higher average rate of small vs. large banks. Large banks set lower deposit rates for all deposit products. Additionally, rate disparities exist among small banks that do vs. do not co-locate with large banks. Small banks in areas with a higher market share of large banks set relatively lower rates than those in regions with a smaller share of large banks.

How do large banks retain deposits with low deposit rates and uniform-rate policies? We contend that differences in preferences and technologies is the answer. Rather than market power arising from concentration, we define the product market competition as occurring within counties but between differentiated products. Large banks typically operate in markets with similar characteristics, primarily in densely populated urban areas with higher household income, housing prices, and fewer elderly individuals. This supports the idea that large banks serve locations with customers who have a higher willingness to pay for superior liquidity technologies and are less concerned about low deposit rates, while small banks locate where customers are more sensitive to deposit rates.

The large vs. small differentiation among banks is also evident in their respective asset and liability structures. Large banks hold more complex financial assets, including real estate

loans, commercial loans, and mortgage-backed securities (MBS), while small banks possess more agriculture loans, catering to farmers and rural customers, as well as highly liquid assets, consistent with more rate-sensitive deposit withdrawals. Large banks also maintain a larger savings-deposit base, whereas small banks hold more transaction deposits.

To document that large-bank customers exhibit lower deposit-demand elasticities, we conduct a structural estimation of banks' demand elasticities by extending the methodology of Egan et al. (2017); Xiao (2020); Wang et al. (2022) to focus on bank size and location choice. Our premise is that size proxies for the technologies of banks' deposit businesses and that location proxies for the preferences of customers. Banks are differentiated by offered deposit rates and the quality of liquidity services. Large banks are characterized by superior liquidity services, consistent with Haendler (2022), while small banks provide higher deposit rates. Assuming households choose from available local-market banks, we conduct our analysis at the bank-county level, clustering very small neighboring counties. We estimate the deposit-demand system on a cluster-by-cluster basis. After estimating the model's demand parameters, we calculate each bank's demand elasticity in each local market, finding that large banks experience significantly lower demand elasticities and are more likely to be located in markets with less-elastic customers.[10]

The remainder of this paper is organized as follows: We start by presenting and analyzing our model in Section 2 to gain intuition. Section 3 details the data. Section 4 provides comprehensive evidence describing banks' deposit-rate-setting behavior and investigates the different rate-setting behavior of large vs. small banks. Section 5 discusses the different market selection of large and small banks, Section 6 presents estimates of deposit-demand elasticities, and Section 7 concludes.

2 Model

In this section, we present a simple model of banking for large vs. small banks in a partial-equilibrium setting. The purpose of our model is to illustrate the structural relationships between the technologies of banks' deposit businesses, the preferences of customers, and variation in deposit-rate elasticities. We take as given uniform rate setting and the equilibrium rate differences between large and small banks observed in the data. We confirm support for the assumptions in our model using the empirical findings in Section 4. The model then describes the structural relationships between these rate differences, bank location choices,

[10] A connection can be drawn to the sorting emphasized in Chang et al. (2023), who show that uninsured depositors at smaller banks have small-business loan demands, and the value of their banking relationship is a joint consideration.

and predictions regarding deposit elasticities.

We assume that large banks set uniform rates, and that large banks offer lower deposit rates than small banks do.[11] We also allow large banks to offer superior liquidity services than small banks, perhaps by offering more convenient online banking, more ATMs, or other infrastructure that allows for faster or lower-cost access to deposits. In addition to the fact that large banks offer widespread brick-and-mortar branch and ATM networks, Haendler (2022) offers substantial evidence that smaller banks are slower to adopt and offer liquidity-enhancing and time-savings technologies for depositors.[12]

From our simple model we generate two key predictions that we test in Sections 5 and 6. The first prediction describes the location choices made by large vs. small banks. We show that small banks choose to locate in places where consumers put a lower value on better liquidity services relative to higher deposit rates. The second prediction describes the demand elasticities of large and small banks. In our model, small banks face higher demand elasticities with respect to deposit rates than large banks do.

The prediction that small banks face higher demand elasticities with respect to deposit rates than large banks do is in line with recent events in which small banks saw greater deposit outflows than large banks, despite small banks paying higher rates. Unlike existing explanations for these outflows, our simple explanation based on differences in demand elasticities does not depend on differences between large and small banks in terms of insured vs. uninsured deposits. Thus, we argue that different sensitivities of deposit flows to interest rate spreads for large and small banks can arise even without deposit-insurance considerations. At the same time, we do not argue that differences in demand elasticities and effects from deposit insurance are mutually exclusive. Indeed, in line with the findings in Egan et al. (2017), we document variation in deposit-rate elasticities across banks with different shares of insured vs. uninsured deposits in our data.

We formulate a parsimonious, static model in which bank owners make the following decisions. Bankers choose to open banks and whether to invest in a bank-specific technology that provides liquidity services to its customers. This technology encompasses services such as mobile apps, large number of branches and ATMs, or credit card services, and requires the investment of a large fixed cost $\phi > 0$. For each bank, bankers then decide whether to open a branch in each available county. Finally, the bank sets its interest rate, with the constraint that it is the same across all of its branches.[13]

Counties vary in terms of customers' preferences over higher deposit rates vs. liquidity

[11] Section 4 documents this rate difference.

[12] See Choi and Rocheteau (2023) for a model in which banks can increase market power by learning about consumers' liquidity needs, for example using "big data".

[13] The evidence in Section 4 is consistent with uniform rate setting.

services. If a bank operates in multiple counties, it must set a uniform deposit rate across those counties. Thus, banks face a tradeoff between paying the cost for liquidity-services technologies, and thereby being a large bank and able to operate across multiple counties, vs. setting rates specific to a single county.

Counties are indexed by i from 1 to N. A bank opening a branch in county i faces a demand for deposits given by $d_i(r, \ell)$, a function of its deposit interest rate r and whether or not it provides liquidity services, $\ell \in \{0, 1\}$. Thus, the profit maximization problem of the bank is given by

$$\max_{b_i, r, \ell} \sum_i \left((r^f - r) d_i(r, \ell) - \kappa \right) \mathbb{1}\{b_i = 1\} - \phi \mathbb{1}\{\ell = 1\}, \tag{1}$$

where $b_i = 1$ if the bank decides to pay the fixed cost κ to open a branch in county i and r^f is the interest rate the bank earns by investing its deposits. We make the following assumption regarding the demand functions $d_i(r, \ell)$.

Assumption 1 *The demand function is weakly increasing in both arguments:*

$$\frac{\partial d_i(r, \ell)}{\partial r} \geq 0 \quad \textit{and} \quad d_i(r, 1) \geq d_i(r, 0) \tag{2}$$

for all $i \in \{1, \ldots, N\}$, $\ell \in \{0, 1\}$, *and* $r \in \mathbb{R}^+$.

We define a large bank as a bank that invests in liquidity services technologies ℓ. Small banks are banks that do not invest in liquidity services technologies. Because in our model the only benefit to having several branches under one bank is to benefit from consumers' preferences for the liquidity service technology at the cost of setting the same interest rate for all counties, it is always weakly preferable for small banks to open branches in only one county. Thus, the optimal interest rate r_i^S of a small bank investing only in county i is characterized by

$$(r^f - r_i^S) \frac{\partial d_i(r_i^S, 0)}{\partial r} - d_i(r_i^S, 0) = 0. \tag{3}$$

We formalize this prediction in Lemma 1.

Lemma 1 (Small Banks Operate in One County) *If the optimal interest rate of a small bank in county i and county j are different—that is, $r_i^S \neq r_j^S$—then a small bank does not open branches in both county i and county j.*

We can then define the set of counties $\mathcal{L}$ ($\mathcal{S}$) as the counties where it is optimal for large (small) banks to open a branch,

$i \in \mathcal{L}$ if and only if

$$(r^f - r^L)d_i(r^L, 1) - \kappa \geq 0 \tag{4}$$

and $i \in \mathcal{S}$ if and only if

$$(r^f - r_i^S)d_i(r_i^S, 0) - \kappa \geq 0. \tag{5}$$

From these optimality conditions, we get Lemma 2, which states that if we observe a county with only small banks setting a deposit interest rate higher than large banks, then it means that the deposit demand of that county is such that increasing the deposit interest rate accrues more deposits than providing liquidity services. We provide empirical support for the idea that large and small banks operate in counties with different characteristics, consistent with different consumer preferences in Section 5.

Lemma 2 (Counties with Small Banks) *If $i \in \mathcal{S}$ while $i \notin \mathcal{L}$ and $r_i^S \geq r^L$, then $d_i(r_i^S, 0) - d_i(r^L, 0) \geq d_i(r^L, 1) - d_i(r^L, 0)$.*

Finally, Lemma 3 states that if we observe that small banks set a deposit interest rate higher than large banks, then the demand elasticity faced by small banks is higher than the average demand elasticity faced by large banks. We test this key prediction specifically in Section 6 by showing that small banks face higher demand elasticities with respect to deposit rates.

Lemma 3 (Demand Elasticities of Small and Large Banks) *If $k \in \mathcal{S}$ and $r_k^S \geq r^L$, then*

$$\frac{\partial d_k(r_k^S, 0)}{\partial r} \Big/ d_k(r_k^S, 0) > \sum_{i \in \mathcal{L}} \frac{\partial d_i(r^L, 1)}{\partial r} \Big/ \sum_{i \in \mathcal{L}} d_i(r^L, 1). \tag{6}$$

In the next sections we first verify the assumptions of our model, namely that banks tend to set uniform rates and that large banks tend to offer lower deposit rates. Then, we test the predictions of our model conditional on these assumptions holding in the data. We show that large banks tend to locate in areas in which demand for superior liquidity services is likely to be stronger. Finally, we show that large banks face lower demand elasticities than small banks do.

3 Data

Our analysis relies on two major datasets for deposit rates. First, we investigate branch-level deposit rates using RateWatch Data. Owned by S&P Global, RateWatch offers a comprehensive deposit- and loan-rate database covering nearly 100,000 institutions from 2001 to 2019. The deposit-rate dataset collects weekly branch-level advertised deposit rates for various products such as CDs, savings accounts, and money market accounts, updated weekly. Following Drechsler et al. (2017) and many others, we focus on the three products with the greatest coverage in RateWatch, namely $10,000 12-month CD rates, $25,000 money-market account rates, and savings accounts with balances below $2,500.

We start with rates for all branches covered by RateWatch. RateWatch manages their database storage structure by creating rate-setting networks, designating "rate setters" as parent branches and "followers" as child branches with identical deposit rates. However, "rate setters" do not necessarily have local officers setting rates in these branches and passing them on to follower branches. Instead, rate setters are selected by RateWatch from the pool of branches sharing the same rates, with head offices and large branches in major cities being more likely to be chosen. RateWatch creates rate-setter flags primarily for data-storage purposes and thus we do not limit our study to these branches.

We also utilize bank-level deposit rates derived from the Consolidated Report of Condition and Income, known as the Bank Call Reports. We calculate deposit rates by dividing deposit interest expenses by deposit balance. We also use Call Reports to obtain other bank-level characteristics. The Call Reports contain data on broad categories of deposits, namely, time deposits, savings and money market deposit accounts, and demand deposits. We supplement Call Report data with the FDIC's Summary of Deposits, which reports branch-level total deposit balances and branch location. This additional data source allows us to explore banks' branch-site choices and to obtain local market shares for demand-elasticity analysis.

To explore the demographics of customers and their potential impact on deposit rates, we rely on Data Axle's U.S. Consumer Database, formerly known as Infogroup. This dataset provides comprehensive residential information on demographics, household wealth, and income for about 67 million U.S. households from 2006 to 2019 and is available at the household level using latitudinal and longitudinal geo-identifiers.

We define large banks as the fourteen depositories that were identified as large complex bank-holding companies subject to the Supervisory Capital Assessment Program (SCAP) of 2009 with year-end 2008 assets exceeding $100 Billion.[14] These fourteen banks also participated in the 2011 Comprehensive Capital Analysis and Review (CCAR) for complex

[14]See `https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20090424a1.pdf`.

bank-holding companies, and accounted for 29% of all U.S. deposits in 2000 and 54.7% in 2019.[15] The fourteen banks are all designated as either Systemically Important Financial Institutions (SIFIs) or U.S.-domiciled Global Systemically Important Financial Institutions (G-SIBs).[16]. We designate all branches that are acquired by these institutions over our analysis period of 2000 to 2019 as 'large-bank branches' post-acquisition.[17]

4 Rate-setting behavior of large and small banks

In this section, we document that rate setting is uniform across branches within banks, and that large banks have lower deposit rates than small banks, confirming the two assumptions we use when analyzing our model.

Table 1 looks at weekly deposit rates at the branch level from RateWatch between 2001 and 2019, examining how various fixed effects contribute to deposit-rate variation. Columns 1 and 2 concentrate on $10,000 12-month CD rates. The R^2 indicates that 87.8% of rate variation can be explained by time fixed effects, suggesting that rate setting is similar across both branches and banks at any given point in time. Meanwhile, 98.8% of variance can be accounted for by bank-time fixed effects, confirming quite minimal rate variation within banks. The remaining columns examine $25,000 money market deposit rates and rates for savings accounts with balances below $2,500. These two deposit products exhibit more rate variation across branches and banks, with only around 60% of variation explained by time fixed effects. However, bank-time fixed effects still account for almost all of the rate variation, at 95%. Overall, Table 1 shows that banks tend to set uniform rates across branches, with the majority of deposit-rate variation arising across rather than within banks.

There are various potential reasons why large banks might implement uniform rates. First, a lack of local experts and high costs make it difficult for banks to analyze local markets

[15]The fourteen banks include Bank Of America Corporation, BB&T Corporation, Capital One Financial Corporation, Citigroup Inc., Fifth Third Bancorp, Goldman Sachs Group, Inc., The JP Morgan Chase & Co., Keycorp, Morgan Stanley, PNC Financial Services Group, Inc., The Regions Financial Corporation, Suntrust Banks, Inc., U.S. Bancorp, and Wells Fargo & Company. The SCAP and CCAR reviews also included three other non-depositories, Ally Financial, American Express Company, Metlife Inc., and two processing banks, State Street Corporation and Bank of New York Mellon Corporation. (See `https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20110318a1.pdf`).

[16]Under Section 117 of the Dodd-Frank Act, the SIFI designation applies to any bank holding company with total consolidated assets of at least $50 Billion (`https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/designations`). The G-SIB designation is determined by the Financial Stability Board (FSB) in consultation with the Basel Committee on Banking Supervision (BCBS) and national authorities of the Group of Twenty (see `https://www.bis.org/bcbs/publ/d445.pdf`).

[17]In the appendix to the paper, we replicate our structural analysis with the top 1% of large bank holding companies by deposits. In 2000, the top 1% of banks consisted of 89 banks which accounted for 57% of total U.S. deposits. In 2019 the top 1% of banks consisted of 53 banks accounting for 72% of deposits.

	12M CD 10K		MM 25K		Saving 2.5K	
	(1)	(2)	(3)	(4)	(5)	(6)
FE	Time	Bank×Time	Time	Bank×Time	Time	Bank×Time
Observations	46,443,692	44,766,046	43,920,768	42,343,777	45,846,684	44,174,299
R-squared	0.878	0.988	0.610	0.950	0.557	0.949

Table 1: **Rate variation within banks.** This table investigates the sources of deposit rate variation by conducting regression analysis using the equation:

$$Rate_{branch,t} = FE + \epsilon_{branch,t}.$$

The data consist of weekly deposit rates from RateWatch, covering the period from 2001 to 2019 at the branch level. The selected deposit products include 12-month CDs with a balance of $10,000 (columns 1 and 2), money market accounts with a balance of $25,000 (columns 3 and 4), and savings accounts with balances below $2,500 (columns 5 and 6). Odd-numbered columns incorporate time fixed effects, while even-numbered columns include time-bank fixed effects.

and set deposit rates at the branch level.[18] Second, setting different rates exposes banks to potential complaints about regional price dispersion.[19] Uniform rate setting has crucial implications for how banks compete for deposits. Large banks operating in multiple regions and setting uniform rates face limitations when responding to changes and competition in local markets, instead determining rates based on national market conditions. Conversely, small and local banks can set rates locally, offering greater flexibility. Our empirical findings are consistent with the prior empirical literature that argues that large banks leverage their extensive ATM networks and superior liquidity technologies to operate nationally, while small banks rely on local knowledge, personalized services, and community ties to compete within their specific regions. This results in a disparity in rate-setting behavior and in the business of deposits at large vs. small banks.

Table 2 tests the contribution of local-market characteristics to rate variation after removing time variation, implementing a two-step analysis. We first regress branch-level deposit rates on time fixed effects to extract the time effects, and then regress the residuals on the fixed effects of interest in the second step to evaluate their explanatory power for the remaining variation. As a baseline, we test bank-time fixed effects in the second step, finding that 90% of the remaining rate variation can be accounted for by bank-time in all three products.

[18]See the earlier literature on uniform deposit rates (for example, Radecki, 2000; Biehl, 2002; Heitfield, 1999; Heitfield and Prager, 2004; Park and Pennacchi, 2009).

[19]See the large literature on uniform pricing by chain stores (see, for example, DellaVigna and Gentzkow, 2019) and online retailers (`https://thebillionpricesproject.com/datasets/` and Cavallo, 2018).

By contrast, time-varying local HHI and local population have little explanatory power for rate variance, with only 2% for CD and savings rates, and less than 1% for money market account rates. Instead, bank size has more explanatory power for rate variation. Using the SCAP/CCAR set of 14 large banks, we find that large × time fixed effects explain 21.5% of the remaining variance of CD rates, 10.7% of money market rates, and 15.4% of savings rates, which is over 10 times the impact from local characteristics. These results support the argument that variation in local market conditions doesn't explain much of the variation in deposit-rate setting behavior, particularly for large banks, while differences in bank size explain substantially more of the variation in rates.

$$Rate_{branch,t} = \alpha_t + \epsilon_{branch,t}$$
$$\hat{\epsilon}_{branch,t} = FE + \varepsilon_{branch,t}$$

	12M CD 10K			
	(1)	(2)	(3)	(4)
FE	Bank×Time	Large×Time	HHI×Time	Population×Time
Observations	44,766,046	44,766,046	44,749,523	44,266,697
R-squared	0.909	0.215	0.018	0.026
	MM 25K			
	(5)	(6)	(7)	(8)
FE	Bank×Time	Large×Time	HHI×Time	Population×Time
Observations	42,343,777	42,343,777	42,328,766	41,862,179
R-squared	0.879	0.107	0.005	0.007
	Saving 2.5K			
	(9)	(10)	(11)	(12)
FE	Bank×Time	Large×Time	HHI×Time	Population×Time
Observations	44,174,299	44,174,299	44,158,357	43,680,242
R-squared	0.896	0.154	0.024	0.027

Table 2: **Residual analysis.** This table tests the contribution of local market characteristics to rate variations after removing time variation, implementing a two-step analysis and reporting the results of the second stage. The data consist of weekly deposit rates from RateWatch, covering the period from 2001 to 2019 at the branch level. The selected deposit products include 12-month CDs with a balance of $10,000 (columns 1–4), money market accounts with a balance of $25,000 (columns 5–8), and savings accounts with balances below $2,500 (columns 9–12). Fixed effects incorporated are bank-time, large-time (with "Large" as a dummy for the 14 large banks defined above), HHI-time (calculated at zip-code level), and population-time fixed effects.

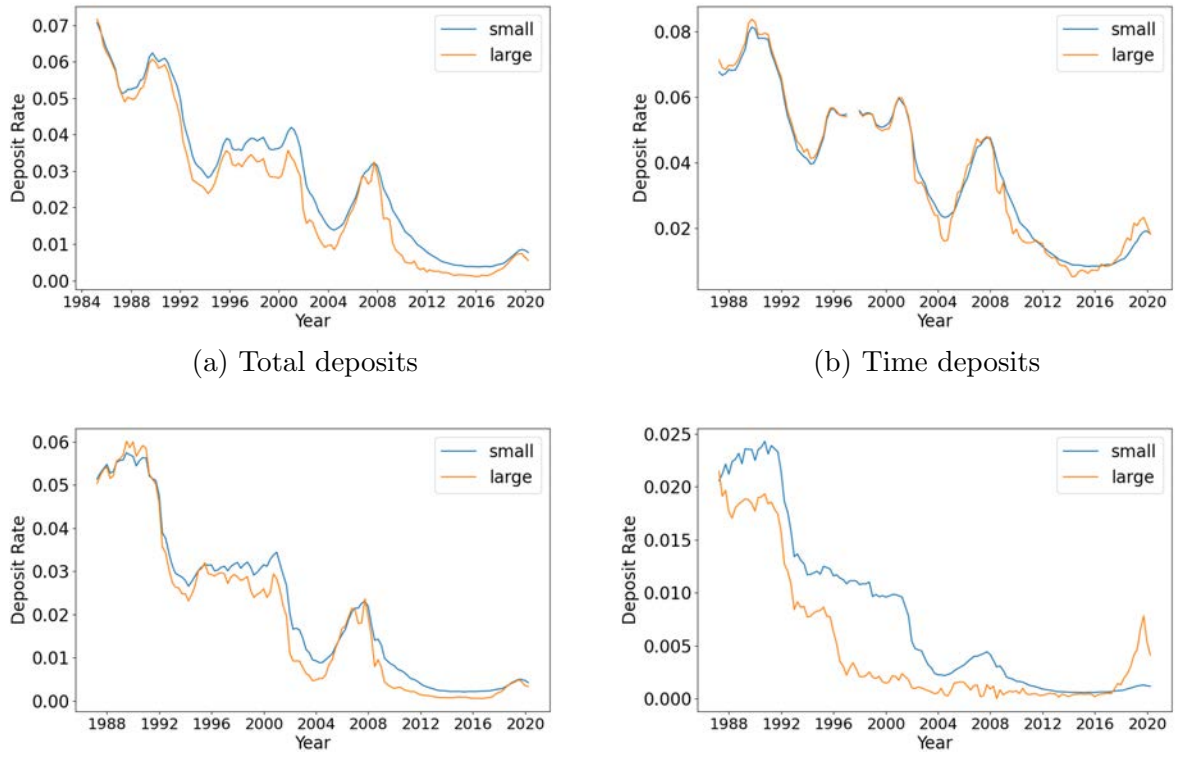
One salient difference between large and small banks is the difference in the levels of their deposit rates. Since banks largely set uniform rates, we focus on the bank-level deposit rates from Bank Call Reports, calculated by dividing interest expense on deposit products by their deposit balance. Figure 1 plots the median deposit rates of the large banks vs. other banks. Both small and large banks' deposit rates vary with the Federal funds rates, though all banks' deposit rates tend to be well below the Federal funds rate. This is consistent with depositors valuing the liquidity services of deposits generally.

Figure 1a displays the deposit rates on total deposits, revealing that small banks tend to set higher deposit rates than large banks. The gap between small and large-bank deposit rates appears to widen when the Federal funds rate drops, and narrows during the zero-rate period after 2009. Since banks set different rates on various deposit products, the differences in small vs. large deposit rates on average could be the result of differences in deposit-product composition between large and small banks. To show that large vs. small rate differences also characterize product-level deposit rates, the other subfigures plot the deposit rates on time deposits, savings deposits, and transaction deposits, respectively, demonstrating that small banks also set higher rates by product types. While time deposit rates are more similar between large and small banks, and align more closely with Federal funds rates, small banks still set relatively lower rates on CDs. Savings-deposit rates exhibit similar patterns in large vs. small rate differences as total deposits, and transaction deposits feature the most pronounced rate differences between large and small banks.

Figure 2 presents deposit rates from RateWatch. The RateWatch data show patterns similar to those from the Call Reports rate data. Small banks persistently set higher rates in money market accounts over \$25k, 12-month CDs of \$10k, and saving transactions accounts of \$2.5k.

To quantify the rate difference, we evaluate the difference between small and large-bank deposit rates using the RateWatch data to perform a regression analysis in Table 3. Branch-level deposit rates are collapsed into bank-level rates by taking the average rates weighted by branch deposit balances. We use either LIBOR or time fixed effects to control for the general level of interest rates, and study the coefficients on a dummy variable indicating if the bank is among the 14 large depository banks. Odd-numbered columns use 3-month LIBOR rates and even-numbered columns display results using time fixed effects. We study the three products with the most coverage in the RateWatch data.

Columns 1 and 2 show that large banks set 12-month CD rates 0.54% lower than small banks (0.49% lower after controlling for fixed effects). The remaining columns implement the same tests, revealing that large banks set rates 0.24% lower for Money Market accounts of \$25,000 and 0.31% lower for saving accounts below \$2,500. Saving accounts below \$2,500



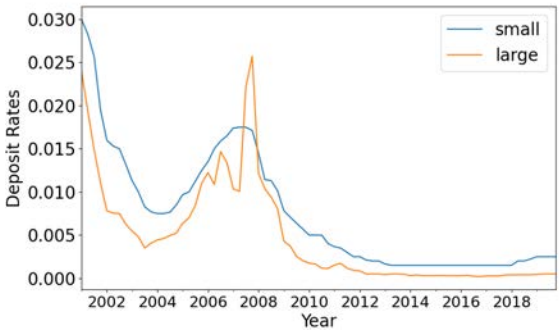
(a) Total deposits

(b) Time deposits

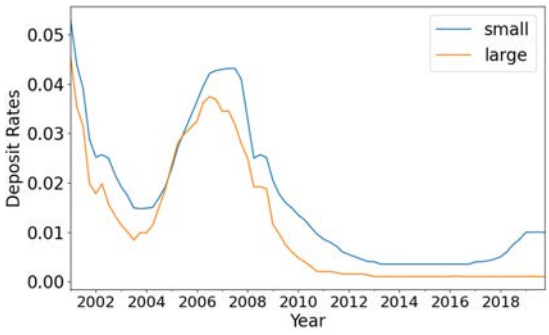
(c) Saving deposits

(d) Transaction deposits

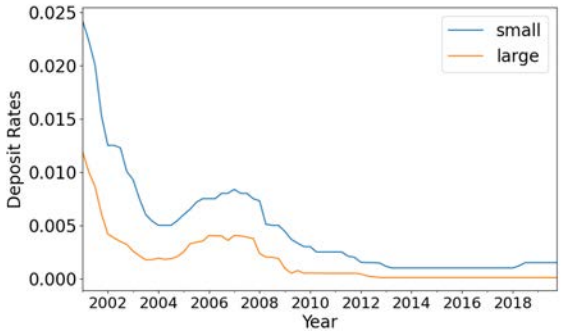
Figure 1: **Median deposit rates (Call Report data).** The figures present the time series of median deposit rates for the 14 large banks compared to other banks, using bank-level deposit rates calculated from Call Reports covering the period from 1985 to 2020. The charts display the implied deposit rates for total deposits, time deposits, saving deposits, and transaction deposits. The blue lines denote small banks, and the orange lines denote large banks



(a) MM 25K



(b) 12M CD 10K



(c) Savings 2.5K

Figure 2: **Median deposit rates (RateWatch data).** The figures present the time series of median deposit rates for 19 large banks compared to other banks using RateWatch data from 2001 to 2019. The branch-level deposit rates are collapsed at the bank level, weighted by branch deposit balance. The charts display deposit rates for $25,000 money market accounts, $10,000 12-month CDs, and savings accounts below $2,500. The blue lines denote small banks and the orange lines denote large banks.

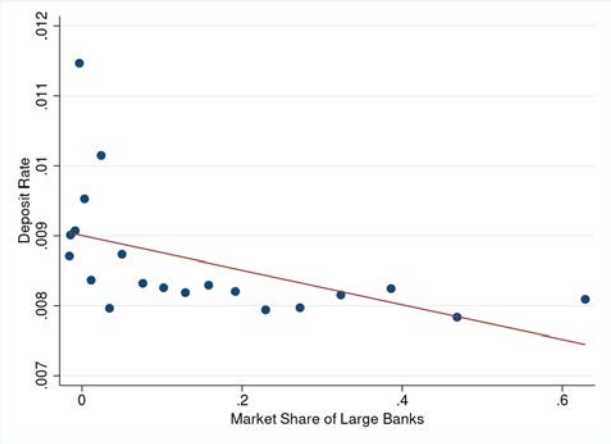
are very similar to checking accounts, except for limitations on the number of withdrawals. Consistent with this, the average rates are lower than those for MM25K accounts. However, the difference between large and small-bank deposit rates is even more substantial for Saving2.5K accounts, suggesting that large banks have particularly inferior rates in the Saving2.5K product, which is more likely to be held by low-income groups. Overall, large banks offer lower rates across all three products.

	12M CD 10K		MM 25K		Saving 2.5K	
	(1)	(2)	(3)	(4)	(5)	(6)
Libor	0.719***		0.345***		0.189***	
	(0.000201)		(0.000189)		(0.000149)	
Large	-0.00537***	-0.00485***	-0.00260***	-0.00244***	-0.00329***	-0.00310***
	(6.55e-05)	(3.65e-05)	(6.24e-05)	(4.60e-05)	(4.87e-05)	(3.27e-05)
T-FE		Yes		Yes		Yes
Observations	4,354,051	4,354,051	4,170,821	4,170,821	4,334,833	4,334,833
R-squared	0.746	0.921	0.443	0.698	0.270	0.672

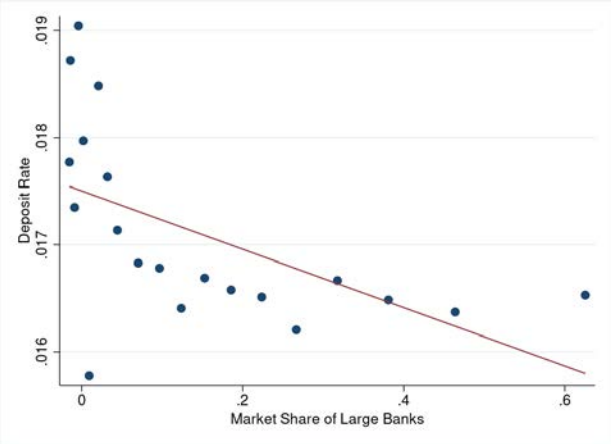
Table 3: **Deposit rate differences between large and small banks.** This table estimates the average deposit rate difference between large and small banks using RateWatch data. Branch-level deposit rates are collapsed into bank-level rates by taking the average rates weighted by branch deposit balance. The 14 large depository institutions are defined above and the dependent variables are deposit rates of 12 month CD of $10,000, money market accounts of $25,000, and saving account below $2,500. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Interestingly, rate disparities also exist between small banks. We document differences in the deposit rates of small banks that either do or do not co-locate with large banks. Small banks located in areas where large banks have a higher market share set relatively lower rates than small banks in areas with a smaller share of large banks. Figure 3 illustrates this fact using deposit rates of small banks from RateWatch, indicating that the deposit rates of all products have a negative relationship with the deposit share of large banks in the areas where the small banks operate. This pattern seems inconsistent with small banks needing to set higher rates to compete effectively against large banks when small banks co-locate with large banks. Instead, small banks co-located with larger banks charge lower rates on average relative to other small banks.

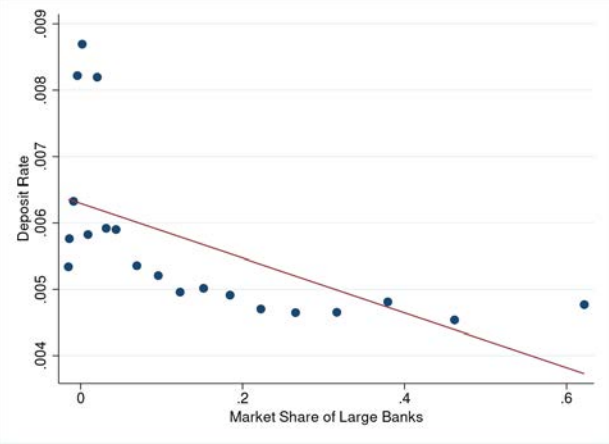
Although large banks set lower deposit rates, they account for the majority of deposits in the US. Figure 4 shows that the total deposit share of the 14 large banks grew steadily, exceeding 50% of total deposits in the US, with growth slowing down after 2009. Large banks hold relatively larger shares in savings deposits and transaction deposits compared to



(a) MM 25K



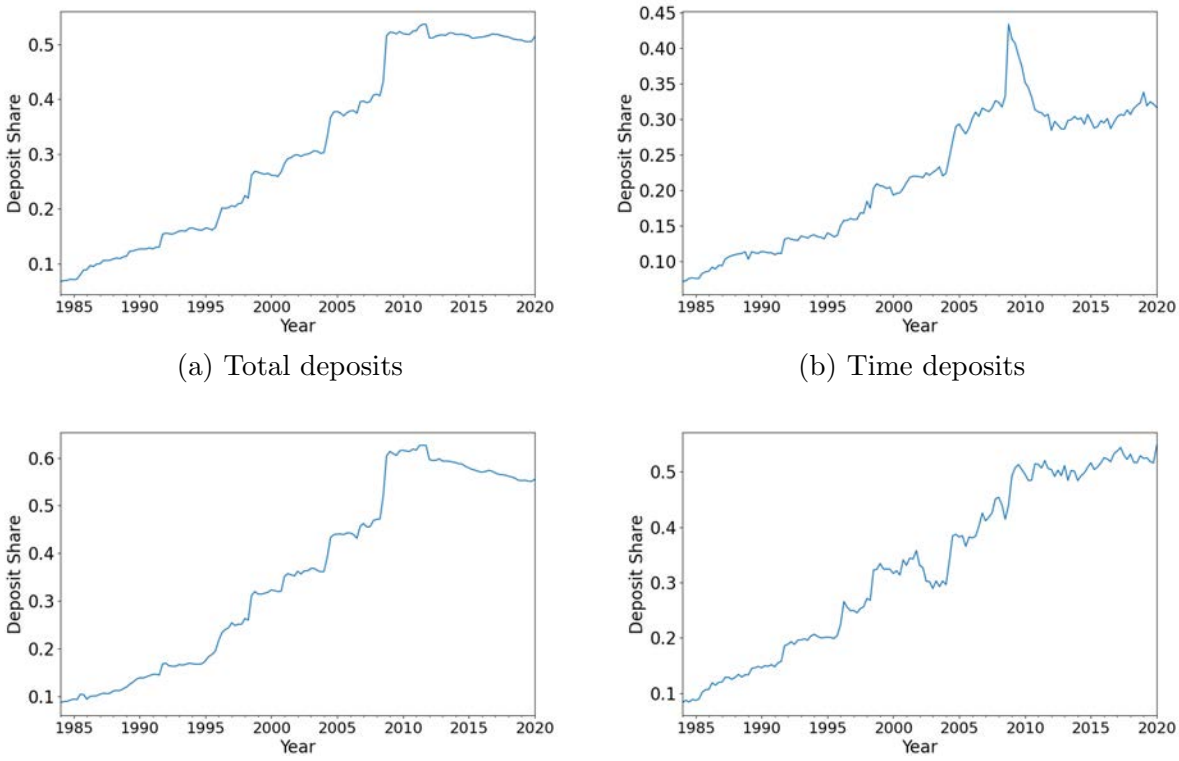
(b) 12M CD 10K



(c) Savings 2.5K

Figure 3: **Deposit rates and market share of large banks.** These figures illustrate the relationship between deposit rates of small banks and the market share of large banks in the local market where small banks operate, using RateWatch data from 2001 to 2019. Branch-level deposit rates are collapsed at the bank level, weighted by branch deposit balance. The charts display deposit rates of money market accounts of $25,000, 12 month CD of $10,000, and saving account below $2,500. The market share of large banks is calculated at the zip-code level by dividing the total deposits held by large banks by the total deposits within the zip-code.

time deposits.



(a) Total deposits

(b) Time deposits

(c) Savings deposits

(d) Transaction deposits

Figure 4: **Deposit share of the 14 large banks.** These figures plot the deposit share of the 14 large banks using Call Report data from 1984 to 2020. The deposit share is calculated by dividing the total deposit held by the 19 large banks by the total national deposit. The figures also display the large bank deposit share for time deposits, saving deposits, and transaction deposits.

5 Market selection by large vs. small banks

In this section, we provide evidence that large and small banks tend to operate in markets with different characteristics, and have different balance-sheet compositions. These differences are consistent with large and small banks having different liquidity-services technologies, and serving customers with different preferences over the tradeoff between higher deposit rates and such services. Lemma 2 showed which counties small and large banks locate in that large and small banks operate in counties with different consumer preferences. Lemma 2 also showed that the location and rate-setting behavior of small vs. large banks is informative about how sensitive deposits are to rates and superior liquidity services in counties served by small banks vs. large banks.

First we show that large banks typically operate in markets with similar characteristics, primarily in densely populated urban areas with higher household income, housing prices, and fewer elderly individuals.[20] This is interesting, because large banks also offer lower deposit rates. Why would *more* financially sophisticated consumers receive *lower* deposit rates on average? Campbell (2006) and Smith et al. (2023) document the many environments in which *less* financially sophisticated consumers earn higher financial returns. We argue that the reason more financially sophisticated consumers receive lower deposit rates, and are less likely to withdraw deposits as deposit spreads widen, is because they are willing to accept lower "financial returns" (including only the deposit rate earned) in exchange for superior liquidity services.

Next, we document the differences between large and small banks' balance sheets. Large banks hold more complex financial assets, including real estate loans, commercial loans, and mortgage-backed securities (MBS), while small banks possess more agriculture loans, catering to farmers and rural customers. Small banks also hold larger balances of liquid assets, consistent with higher potential for deposit withdrawals. Large banks maintain a larger savings deposit base, whereas small banks hold more transaction deposits.

These balance-sheet differences between large and small banks are consistent with a technological difference between large and small banks, and with large and small banks serving customers with different preferences. We provide demographic evidence that, indeed, large and small banks serve different types of customers. We argue that large banks therefore operate different business models for their deposit franchises. Our empirical findings suggest that differences in preferences and technologies are the main driver of differences between the deposit franchises of large vs. small banks. Our model and empirical findings stand in contrast to the prior literature, which has emphasized market power from market-share concentration as the key force behind bank rate-setting behavior.

5.1 Customer demographics

We document that large banks are located in areas with high populations, high incomes, high housing prices, and less elderly populations.

Consistent with large banks finding it costly to offer county-specific deposit rates, large banks generally operate in markets with shared characteristics. In particular, large banks are primarily found in more densely populated and more urban areas. Such urban areas may be populated with consumers with strong preferences for low-cost deposit access due

[20] See Sakong and Zentefis (2023) for a study of customer activity at bank branches. Consistent with our model and empirical findings, they show that branch activity is correlated with demographics. Importantly, they also provide evidence that customers use banks with local branches.

to commuting and other opportunity costs. In contrast, rural areas are more likely to be served by small banks, consistent with small banks utilizing local knowledge and community connections to address county-specific needs.

Figure 5 displays the branch locations of large banks in 2019 in red, and population in shades of green, with darker green indicating a higher population. The figure clearly illustrates the concentration of large banks in more densely populated areas on the coasts and in large cities. We categorize banks into large and small based on whether the bank is one of the 14 large, complex financial institutions that are depositories.

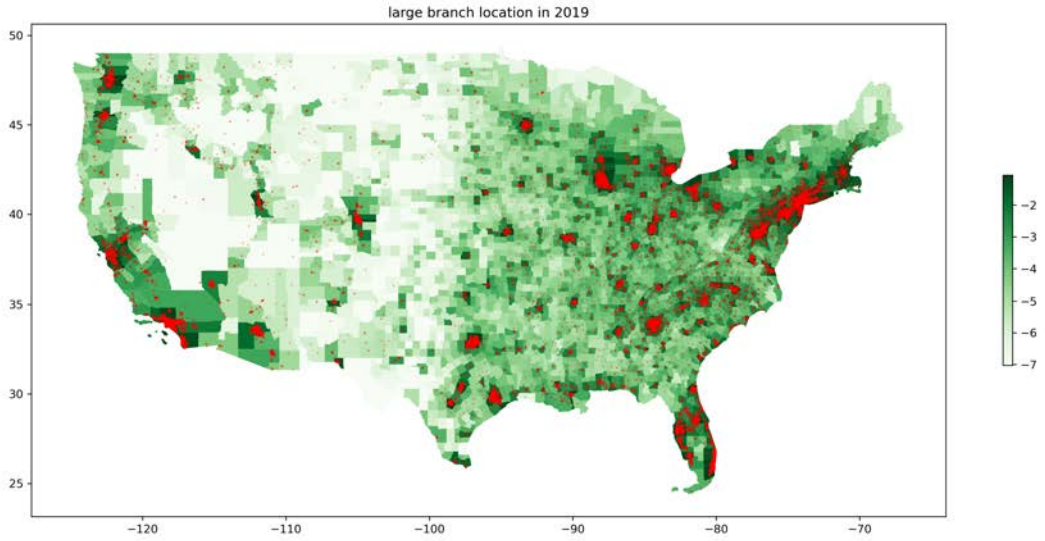


Figure 5: **Branch location of large banks and county population.** This map displays the branch locations of large banks in 2019 in red, and population in shades of green with dark green indicating a higher population

Figure 6 provides further detail on the distribution of large and small bank branches across the US by mapping the share of branches belonging to large and small banks. Counties are colored according to the proportion of branches held by smaller banks in 2019, with darker shades of green indicating a larger share of branches being owned by small banks. Large banks hold more shares in coastal and major cities, whereas more rural and less populated areas, such as the Midwest and Central South regions, have a higher share of branches owned by small banks.

Figure 7 provides a heat map of counties showing the fraction of uninsured vs. insured deposits, with darker green representing a higher fraction of uninsured deposits. It appears that, overall, the same geographic regions that have a larger proportion of large banks also have a higher fraction of uninsured deposits. This pattern shows that the proportion of

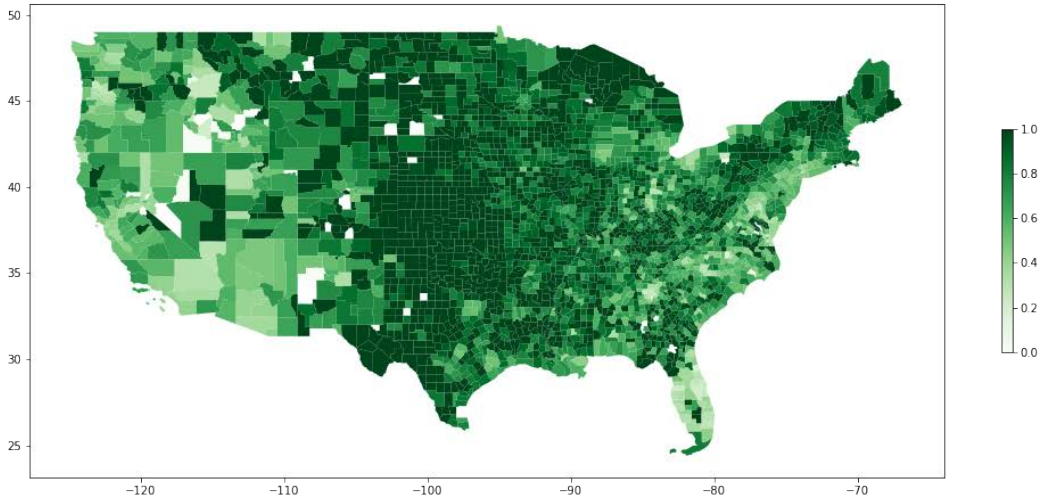


Figure 6: **Share of branches held by small banks.** This map displays the share of branches held by small banks at the county level in 2019. The share of small banks' branches is calculated by dividing the number of branches held by small banks by the total number of branches in the county. The intensity of the color represents the level of branch shares, with deeper shades indicating a higher share of small bank branches.

uninsured vs. insured deposits not likely to be driving our result that large banks have lower deposit elasticities. Note that our study is not focused on banking crises or runs, but on bank and depositor behavior on average over our sample. We argue that differences in preferences and technologies drive such differences on average.

Figure 8 presents bin-scatter plots illustrating the correlations between large and small banks' location choices and geographical demographics. Each panel displays the share of branches at the zip-code level on the y-axis and the average of demographic characteristics at the zip-code level, controlling for year fixed effects, on the x-axis. Bands of one standard deviation above and below the mean are shaded in light gray. These figures show that small banks hold a higher market share in areas characterized by lower population density, lower household income, lower housing prices, and a higher proportion of individuals over 65 years of age.

These graphs suggest differences in the customer bases of large and small banks. Large banks target more highly populated areas with higher average incomes, higher house prices, and lower average ages. We argue that customers with these demographics, who were shown by Campbell (2006) to have higher financial sophistication, place a higher value on the greater liquidity services (as well as complex financial services beyond deposits) of large banks. Small banks operate in less populated areas with lower average incomes, lower house

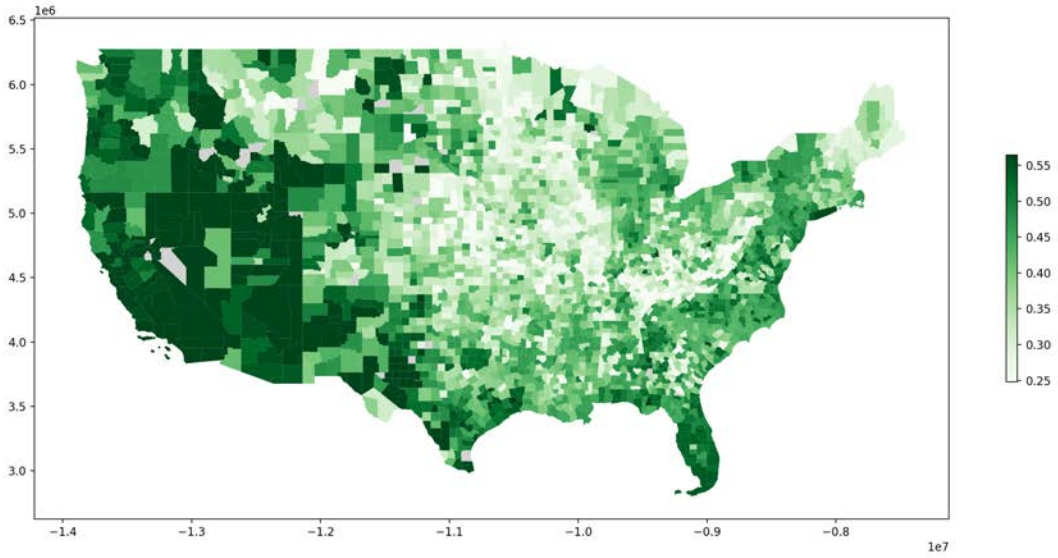


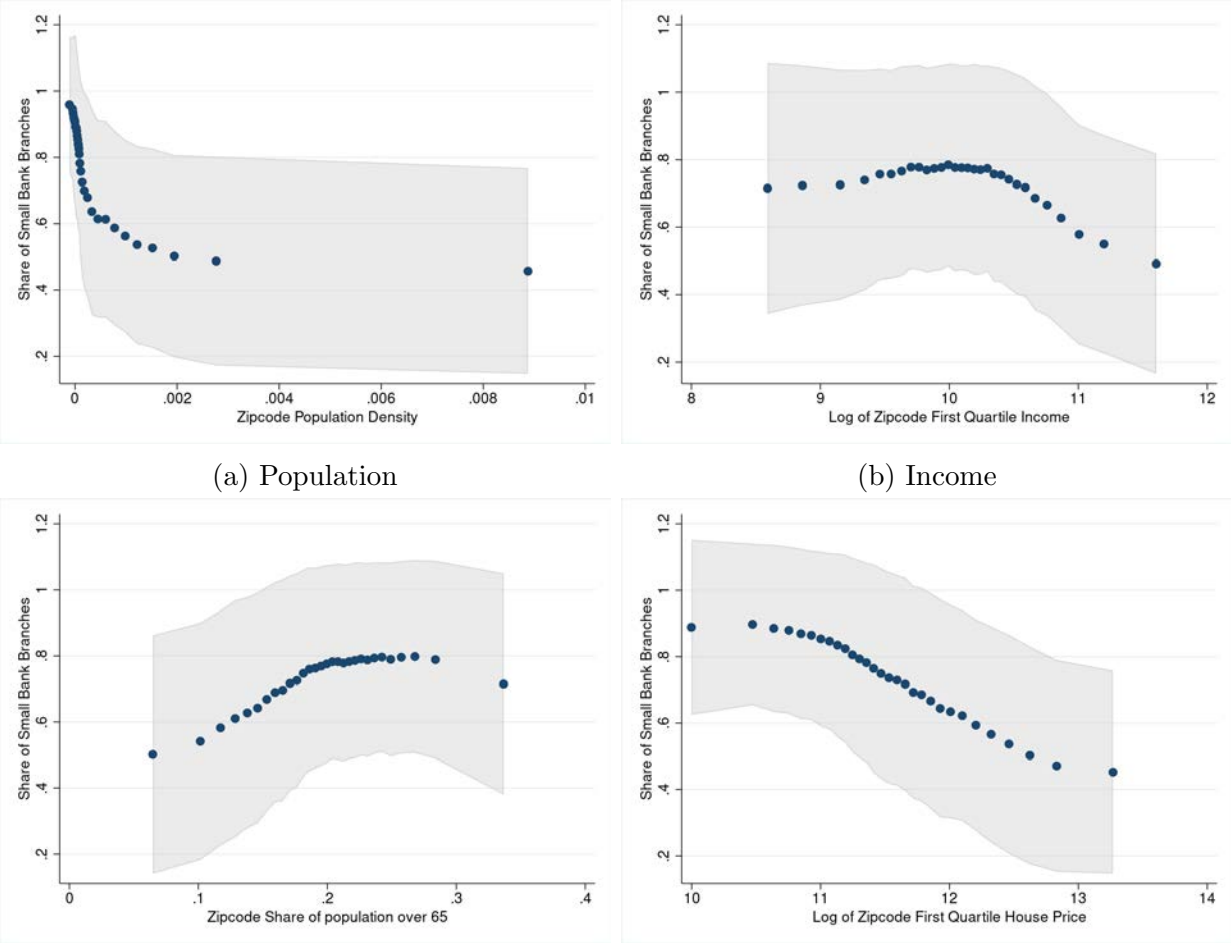
Figure 7: **Median proportion of uninsured deposits per county.** This map displays the median proportion of uninsured to total deposits of banks within a given county in 2019.

prices, and an older demographic.[21] Although these characteristics have been shown to be associated with a lower degree of financial sophistication, and lower financial returns on average (Smith et al., 2023), it appears that within the deposit asset class these consumers actually earn higher deposit rates on average. This may be because deposits represent a larger fraction of their overall wealth, and thus more attention is directed at deposit rates than for wealthier consumers for whom deposits offer liquidity services but are a smaller fraction of overall wealth.[22] That is, deposits may serve different purposes for customers with different demographics.

We note the connection between the different customer bases of large vs. small banks, and banks' uniform rate-setting policies. If large banks were to expand into rural areas dominated by small banks, they would find it costly to offer county-specific rates. Since customers in small-bank markets are sensitive to deposit rates, large banks may struggle to compete effectively with small banks offering better rates. Alternatively, large banks could raise rates to compete, but they would lose profits in urban areas since customers there are inelastic to

[21] Jiang, Yu, and Zhang (2022) show that older individuals tend to exhibit lower elasticity in their demand than younger individuals, so the presence of old customers is unlikely to be driving the higher elasticities at small banks.

[22] See, for example, `https://www.federalreserve.gov/econres/scfindex.htm`.



(a) Population (b) Income

(c) Old population (d) Housing price

Figure 8: **Small bank share and demographics.** These figures examine the relationship between the share of small bank branches and local population, income, elderly population, and housing prices from 2006 to 2019. Demographic data are sourced from Data Axle at the zip-code level. Income and housing prices represent the 25% quantile of the respective measures. The grey area in the figures illustrates one standard deviation below and above the average.

deposit rates. Consequently, neither approach to expanding into rural areas may be profitable for large banks. Similarly, in urban areas, superior liquidity-services technologies appear to be valued more highly than superior rate offerings, making it challenging for small banks to compete in urban areas served by large banks with superior liquidity-services technologies.

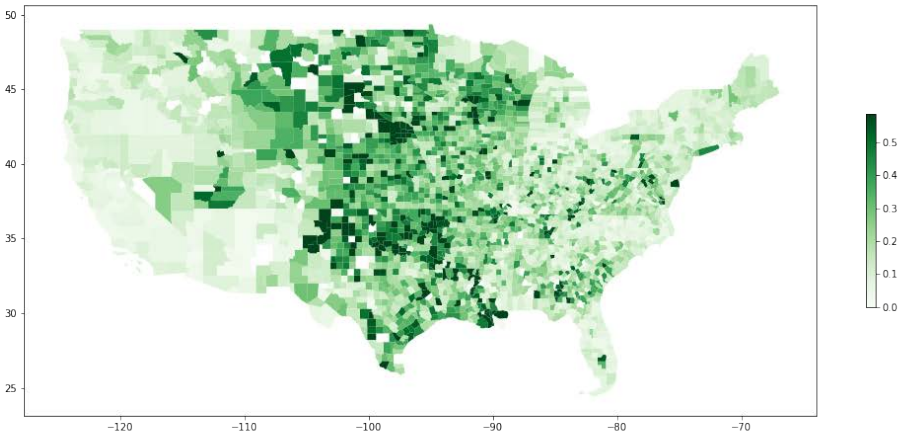
The geographic distribution of large vs. small banks, along with the rate differences between them, results in observable deposit rate differences across distinct geographic areas. Figure 9 displays the average deposit rates weighted by branches' deposit shares by county using RateWatch data from 2019. This figure can be compared with Figure 6, depicting the geographic distribution of small banks, indicating that areas with a higher share of small banks exhibit higher average deposit rates for CDs, Savings, and Money Market Accounts. Rural and less-populated area populations benefit from higher deposit rates, while urban populations appear to value the compensating differential of the superior liquidity services of large banks. We note that low-income populations in urban areas may be worse off due to market segmentation, as they may prefer higher deposit rates over liquidity services but are served by large banks that cater to other urban consumers.

5.2 Balance sheet composition

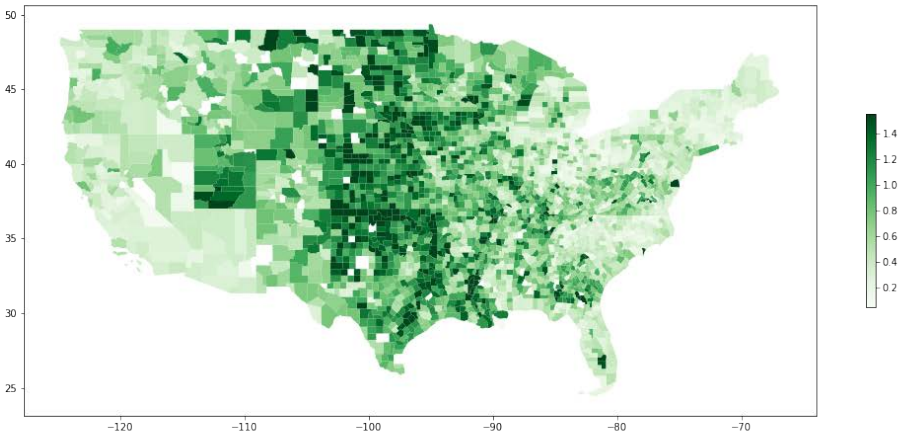
In addition to serving distinct geographic areas and demographic populations, large and small banks vary in the composition of their balance sheets. This variation is indicative of the different business models of large and small banks, and the different financial products and services they offer to cater to the specific needs and preferences of their respective clients.

Figures 10a and 10b display the asset and liability structures of banks with asset sizes in the lowest decile and the 14 large banks, highlighting significant differences in their compositions. Large banks tend to hold more real estate loans, accounting for about 50% of their total assets in recent years. In contrast, small banks allocate 20% more of their assets to liquid assets, such as cash, treasuries, government bonds, and Federal funds repurchase agreements. This is consistent with small banks facing more volatile deposit balances, and maintaining higher levels of liquidity to accommodate potential withdrawals. Small banks also allocate 10% more of their assets to agricultural loans, consistent with the idea that small banks support more farmers and rural populations.

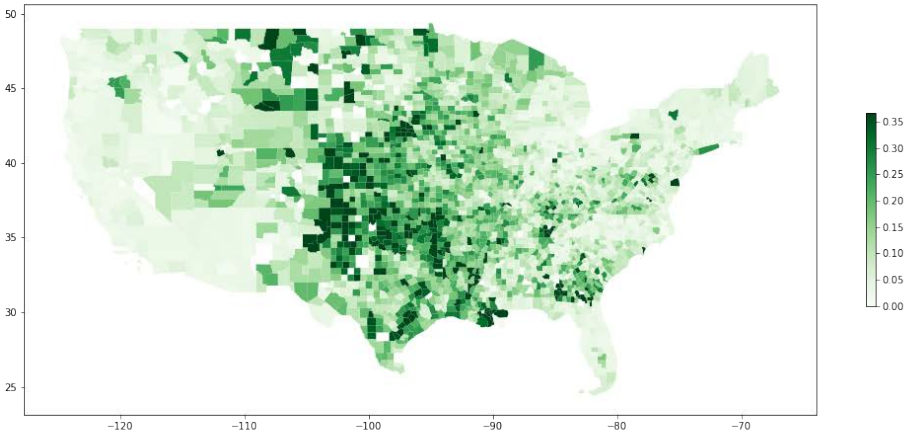
Figure 10b illustrates the differences in liability structures between large and small banks. While deposits constitute the majority of liabilities for both types of banks, their deposit product compositions vary significantly. Large banks display a growing share of savings deposits, which include money market accounts, reaching around 50% in recent years, compared to just 21% in small banks. Small banks, on the other hand, hold relatively more time



(a) MM 25K

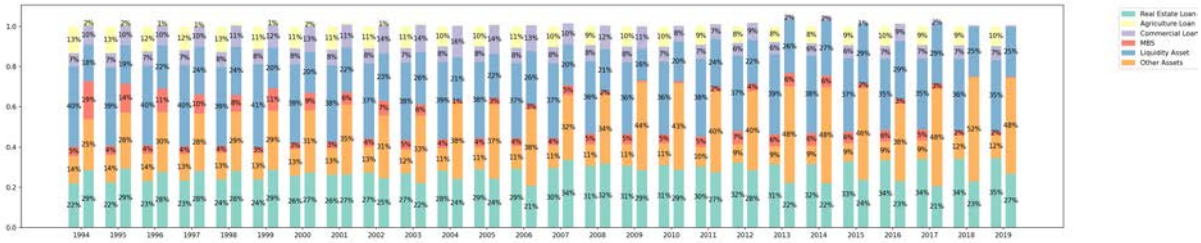


(b) 12M CD 10K

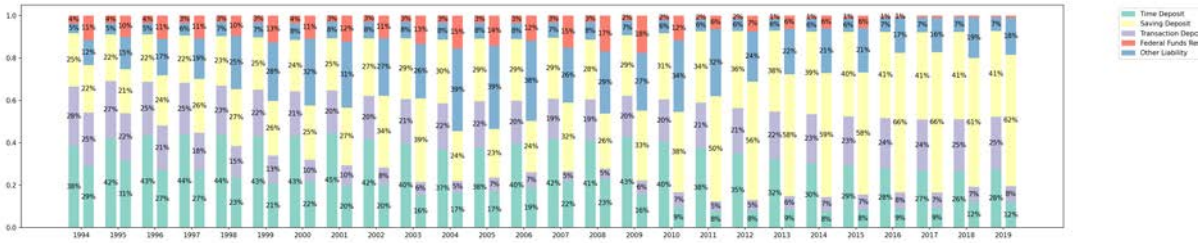


(c) Savings 2.5K

Figure 9: **Geographic distribution of deposit rates.** These maps display the deposit rates of Money Market account of $25,000, 12 Month CD of $10,000, and Saving account below $2,500 in 2019 using RateWatch data. The deposit rates are collapsed at county level weighted by branch deposit balance. The intensity of the color represents the level of deposit rates, with deeper shades indicating a higher county-level rate.



(a) Asset structure: lowest asset decile (left) vs 14 large banks (right)



(b) Liability structure: lowest asset decile (left) vs 14 large banks (right)

Figure 10: **Asset and liability structure.** These figures display the asset and liability structures of banks based on Call Report data from 1994 to 2019. The asset (liability) share is calculated by dividing the specific asset (liability) of interest by the total assets (liabilities) at the bank level, and then plotting the average for each bank group. The left bar in each group represents data for banks with total assets below the lowest decile, while the right bar corresponds to the 14 large banks.

deposits, which offer the highest deposit rates, and substantially more transaction deposits, such as checking accounts. These differences suggest that small banks serve a customer base with smaller deposit balances who choose a different mix of deposit products than the customers of large banks. Another notable difference is that large banks have more diverse funding sources beyond deposits. In most years, large banks borrow more from Federal funds repos than small banks, making them less dependent on deposit funding. Recall that Figure 7 documents a larger share of uninsured vs. insured deposits in counties that tend to have more large banks.

In summary, the asset and liability structures of small and large banks are consistent with segmentation between their customer bases and with differences in rate-setting behavior arising from variation in the production functions of large and small banks.

6 Large vs. small banks: deposit demand elasticities

In this section we provide evidence that deposit demand elasticities vary systematically across large vs. small banks. Our findings support the predictions of our model in which customers of large banks place a higher value on liquidity services, while customers of smaller banks are more rate-sensitive. Empirically, deposit demand elasticities are substantially more negative at small bank branches, meaning that depositors of small banks withdraw deposits at a higher rate as deposit rates decline and the spread of deposit rates below the Federal funds rate increases. Thus, our empirical findings support the key result of our model that customers of large banks exhibit lower deposit demand elasticities with respect to deposit rates.

To estimate bank-county-year elasticities, we employ methods from the industrial organization literature following Egan et al. (2017), Xiao (2020), and Wang et al. (2022). Egan et al. (2017) find higher insured and uninsured deposit rates lead to higher market share, and that the elasticities of both deposit rates are fairly small. Their sample consists of the 16 largest banks, and thus their finding that the depositors are relatively inelastic aligns with our finding that large banks have low deposit elasticities. Xiao (2020) finds that higher deposit rates lead to a higher market share, and the deposit-rate elasticity for banks is a lot lower than that of non-banks. Wang et al. (2022) develops a large-scale DSGE model in order to study both supply of and demand for deposits. While they also estimate a deposit-demand elasticity, they do not distinguish between elasticities at small and large banks, which is the main focus of our study.

6.1 Estimating demand elasticities

Defining markets. We define markets based on counties to capture local-branch customer preferences. The idea is that customers choose banks based on their local availability and accessibility, with households in San Francisco being more likely to opt for banks with branches in San Francisco relative to banks operating exclusively in New York. The distribution of the US population across counties is highly skewed, with some very large counties and a long tail of very small counties. Given our interest in the differences across banks of different sizes and technologies, and counties with different demographics and preferences, we cluster the smallest counties together based on distance rather than dropping them from the sample or grouping them in another way.[23]

We employ the breadth-first search algorithm (see Even and Even, 2011; Zhou and Hansen, 2006) to construct county clusters for low-population counties. This algorithm systematically searches through the county network to identify suitable groupings. We specify counties with populations below the 80^{th} percentile and land area below the 99^{th} percentile[24] as candidates to be grouped with neighboring counties. Starting with the smallest county as the "target" county, we identify neighboring counties and prioritize merging the small county with neighboring counties with shorter distances between county centers with the target county and counties with lower population. The process is iterative, and continues merging counties until the total population of the cluster surpasses the 80^{th} percentile threshold or the total land area of the cluster reaches the cutoff of the 99^{th} percentile. Our procedure results in 3,075 counties being organized into 1,330 clusters. We separately estimate the demand system for each county cluster. We exclude clusters with less than 10 years of data to maintain a sufficient sample size, resulting in a final selection of 1,326 clusters for estimation. We aggregate branches to the bank level using RSSD identifiers from the Federal Reserve.

Estimation Model Setup. There is measure one of customers in each county-cluster year. In each cluster-year market (denoted by c, t), each customer i is endowed with one dollar, and can make a discrete choice to allocate this dollar to bonds (denoted by $j = 0$ and used as the outside good or numeraire), deposits in one of the banks (denoted by $j = 1, ..., J$) that are available in their (cluster-year) market, or cash (denoted by $j = J + 1$). We set bonds as the numeraire and study deposit pricing relative to bonds that we assume return the Federal funds rate. The normalized deposit rate at bank j in county c in year t is the

[23] Wang et al. (2022) combine all banks with market shares less than 0.001% or less than 10 branches into one bank.

[24] These population and land-area cutoffs ensure that the clusters will not become too large or contain too large a population.

	Mean	Std	Min	25%	Median	75%	Max
Land Area (km^2)	5704.21	6708.83	38.68	1468.77	2827.06	7085.06	51975.91
Population (thousand)	229.47	451.51	2.39	92.68	123.60	186.30	9818.61
Total Personal Income ($billion)	15.76	36.26	0.12	4.37	6.53	11.51	728.77
Deposit HHI	0.17	0.11	0.04	0.11	0.14	0.20	1
Observation	1326						

Table 4: **County Cluster Summary Statistics.** This table reports the summary statistics of characteristics of county clusters.

deposit spread $\tilde{r}_{j,c,t} \equiv r_t^{\text{ff}} - r_{j,c,t}$, i.e. the spread of deposit rates below the Federal Funds rate. Customers allocate funds to deposits based on bank-cluster-year characteristics $X_{j,c,t}$ and the (normalized) deposit rate $\tilde{r}_{j,c,t}$. We normalize the rate earned by holding cash to zero, so the normalized rate is the full opportunity cost relative to bonds that earn the Federal funds rate. The customer chooses their allocation to cash, bonds and deposits to maximize their indirect utility,

$$U_{i,j,c,t} = \alpha_c \tilde{r}_{j,c,t} + \beta_c X_{j,c,t} + \xi_{j,c,t} + \epsilon_{i,j,c,t}, \tag{7}$$

where $\xi_{j,c,t} = \xi_{c,j} + \xi_{c,t} + \Delta\xi_{j,c,t}$ consists of bank fixed effects in each cluster $\xi_{c,j}$, market fixed effects $\xi_{c,t}$, and unobserved product characteristics $\Delta\xi_{j,c,t}$, where $\Delta\xi_{j,c,t} = \xi_{j,c,t} - \xi_{c,j} - \xi_{c,t}$. The error term $\epsilon_{i,j,c,t}$ is a stochastic term capturing customer-product specific shocks, which we assume follow a Type I extreme-value distribution with $F(x) = e^{-e^{-x}}$.

The market share of product j in a county cluster c at time t can be represented as

$$\begin{aligned} s_{j,c,t}(X_{j,c,t}, \tilde{r}_{j,c,t}; \alpha_c, \beta_c) &= \int_i \mathbb{1}_{i,j,t}\, dF(\epsilon_{i,j,c,t}) \\ &= \frac{\exp(\alpha_c \tilde{r}_{j,c,t} + \beta_c X_{j,c,t} + \xi_{j,c,t})}{1 + \sum_{k=1}^{J+1} \exp(\alpha_c \tilde{r}_{k,c,t} + \beta_c X_{k,c,t} + \xi_{k,c,t})}, \end{aligned} \tag{8}$$

where the indicator variable takes a value of one if household i invests in deposits of product j in county c in year t, so that integrating over all households yields the share of deposit product j on the left-hand side of Equation (8). The second line of Equation (8) utilizes the indirect utility specified in Equation (7), which states the maximal utility the consumer can achieve given the commodity space, prices, and their wealth. Taking logs on both sides, we

obtain the log market share for product j in county-cluster c in year t,

$$\log s_{j,c,t}(X_{j,c,t}, \tilde{r}_{j,c,t}; \alpha_c, \beta_c) = \alpha_c \tilde{r}_{j,c,t} + \beta_c X_{j,c,t} + \xi_{j,c,t} - \log\left(1 + \sum_{k=1}^{J+1} \exp(\alpha_c \tilde{r}_{k,c,t} + \beta_c X_{k,c,t} + \xi_{k,c,t})\right). \quad (9)$$

The log market share of bonds (the numeraire) is

$$\log s_{0,c,t} = -\log\left(1 + \sum_{k=1}^{J+1} \exp(\alpha_c \tilde{r}_{k,c,t} + \beta_c X_{k,c,t} + \xi_{k,c,t})\right). \quad (10)$$

Combining Equations (9) and (10), we get the expression for the share of product j in county-cluster c in year t relative to the share of bonds.

$$\log s_{j,c,t}(X_{j,c,t}, \tilde{r}_{j,c,t}; \alpha_c, \beta_c) - \log s_{0,c,t} = \alpha_c \tilde{r}_{j,c,t} + \beta_c X_{j,c,t} + \xi_{j,c,t}. \quad (11)$$

We use this equation to estimate $\theta_c \equiv (\alpha_c, \beta_c)$, where α_c is the sensitivity of indirect utility to deposit spreads, and the sensitivity of relative log market shares to spreads. β_c is the vector of coefficients on X. After estimating θ_c, we generate estimates of the demand elasticity for each bank in each cluster using the following equation:

$$\hat{\eta}_{j,c,t} \equiv \frac{\%\Delta \hat{s}_{j,c,t}}{\%\Delta \tilde{r}_{j,c,t}} = \frac{\partial \hat{s}_{j,c,t}}{\partial \tilde{r}_{j,c,t}} \cdot \frac{\tilde{r}_{j,c,t}}{\hat{s}_{j,c,t}} = -\hat{\alpha}_c \tilde{r}_{j,c,t} (1 - \hat{s}_{j,c,t}) \quad (12)$$

where $\hat{s}_{j,c,t}$ is the fitted market share of bank j in cluster c and market t.

Identification. A standard identification challenge in demand estimation is the endogenous determination of the price, in this case, the deposit rate. This endogeneity implies that $\Delta\xi_{j,c,t}$ is not independent from $\tilde{r}_{j,c,t}$, leading to biased estimates if market shares are directly regressed on prices or rates. To address the endogeneity problem, we follow Wang et al. (2022) and employ supply shocks $Z_{j,c,t}$ as instrumental variables. Following that study, we use the ratio of staff salaries to total assets in the prior year, and the ratio of non-interest expenses on fixed assets to total assets in the previous year, as supply-shock instruments. The fundamental assumption supporting this IV strategy is that customers are unlikely to be aware of these changes in costs, and thus unlikely to modify their demand in response to them, while banks should adjust prices in response to changes in their marginal costs. The moment condition for the exclusion restriction states that the supply shocks are expected to

be orthogonal to the unobserved product characteristics in Equation (11):

$$E[Z_{j,c,t}\,\Delta\xi_{j,c,t}(\theta_c)] = 0 \tag{13}$$

We then estimate the parameters of Equation (11), θ_c, using linear IV GMM cluster by cluster and yearly panel data on deposit spreads. The bank characteristics $X_{j,c,t}$ include the logarithm of the number of branches the bank owns, the logarithm of the number of employees per branch, a dummy variable specifying if the bank is large, and the share of agricultural loans in total assets, which helps to proxy for more rural areas.

Estimation data. We estimate deposit spread elasticities using deposit rates data from the Call Reports spanning 2001 to 2019. We assume that total household wealth is composed of cash, investments in treasury securities, money market funds, and deposits. Following prior the prior literature, we utilize macro aggregates from FRED (Federal Reserve Economic Data) to proxy for the share of cash, bonds, and overall deposits in households' portfolios over time. To allocate aggregate holdings across counties, we assume that non-deposit wealth at the county level is proportional to county income obtained from the Bureau of Economic Analysis.

Estimation results. Table 5 displays our estimation results for Equation (11). It presents the mean and quartile cutoffs for our bank/cluster estimates of the sensitivity of relative market shares to deposit spreads at the cluster level, as well as the sensitivity of relative market shares to other bank characteristics. Additionally, the table reports standard errors for each estimate. The average estimate of the coefficient on deposit rates in Equation (11) is -0.44. This estimate implies that when the deposit spread increases by 1%, product j's county-cluster market share declines by 0.44% on average when the other variables are held constant. Using the other terms in Equation (11), Table 5 shows that market shares are also increasing in bank size, number of branches, employees per branch, and share of loans that are agricultural.

6.2 Deposit demand elasticities: Large vs. Small banks

With our parameter estimates in hand, we generate bank-county cluster-year elasticity estimates using Equation (12). Table 6 displays the summary of demand elasticities generated by our IV estimation and Equation (12). The average elasticity is -0.372, indicating that when the deposit spread decreases relatively by 1%, the deposit quantity on average rises by 0.372%.

(a) Coefficients

	Mean	Median	25%	75%
α_c	-0.446	-0.300	-1.051	0.173
Log(Branch Number)	0.418	0.416	0.122	0.715
Log(Employee per Branch)	0.265	0.289	-0.032	0.588
Large	0.325	0.000	-0.031	0.683
Share of Agriculture Loans	0.612	-0.377	-7.893	7.368
Observation	1326			

(b) Standard Errors

	Mean	Median	25%	75%
Standard Error for α_c	1.222	0.442	0.255	0.812
Standard Error for Log(Branch Number)	0.403	0.188	0.125	0.297
Standard Error for Log(Employee per Branch)	0.453	0.241	0.156	0.379
Standard Error for Large	1.129	0.388	0.151	0.859
Standard Error for Share of Agriculture Loans	25.776	7.191	2.478	19.079
Observation	1326			

Table 5: **Demand estimation.** This table reports the summary statistics of estimated deposit demand parameters using county cluster-level market shares. The sample includes all U.S. commercial banks from 2001 to 2019. The data is from the Call Reports and the Summary of Deposits. Price is the difference between federal funds rate and deposit rates, Log(Branch Number) is the logarithm of total number of branches held by the bank, Log(Employee per Branch) is the logarithm of average number of employees per branch, Large indicates if the bank are held by the 14 large bank holding companies, and the share of agriculture loans represents the proportion of agriculture loans in total bank assets.

This average masks substantial differences across large vs. small banks. Small banks have higher average demand elasticities, with deposit decreases of 0.644% corresponding to a 1% relative increase in deposit spreads, while at large banks the deposit increase associated with a 1% increase in spreads is only 0.445%. The median elasticity for small banks is approximately four times that of large banks, suggesting that small bank customers are much more sensitive to deposit rate changes. The empirical difference between the elasticity estimates for large and small banks match the prediction in Lemma 3 in our model that states that large banks face lower deposit rate demand elasticities because their customers also value the superior liquidity-services technologies of large banks.

The data presented for the 75$^{\text{th}}$ percentile in Table 6 shows that a considerable share of the elasticity estimates are positive, which is counterintuitive. These positive estimates are primarily driven by insignificant estimations of α, meaning that the elasticity is not significantly different from zero in these bank county-clusters. Regardless of these insignificant estimates, however, the differences between large vs. small banks are apparent.

	N	Mean	Std	1%	10%	25%	Median	75%	90%	99%
Small	338431	-0.644	2.357	-7.507	-2.515	-1.100	-0.258	0.037	0.629	4.332
Large	63405	-0.445	2.438	-7.302	-1.918	-0.618	-0.065	0.037	0.534	4.234
All	401836	-0.612	2.371	-7.482	-2.434	-1.029	-0.216	0.037	0.614	4.314

Table 6: **Demand elasticity.** This table presents summary statistics for calculated demand elasticity.

Figure 11 plots the full distributions of deposit elasticities for large and small banks. For the majority of large banks, the elasticity estimates are centered around zero. Zero estimates imply that customers' demand is inelastic, or completely insensitive to changes in deposit rates. In contrast, the distribution of small banks' demand elasticity estimates has considerably more mass in the left tail. Small banks' customers clearly exhibit higher absolute values of deposit elasticities. In other words, the deposit balances at small banks are more sensitive to deposit rate changes. This is consistent with small banks relying on offering attractive deposit rates to maintain and expand their customer base.

Figure 12 plots the relationship between county-cluster average elasticities and the market share of large banks within each county cluster. A clear correlation emerges, showing that in areas with a higher concentration of large banks, demand tends to be more inelastic. These results confirm the prediction of our model in Lemma 2. That lemma states that, in our model, in counties populated small banks that offer higher rates, deposit balances depend more on rates than on liquidity services.

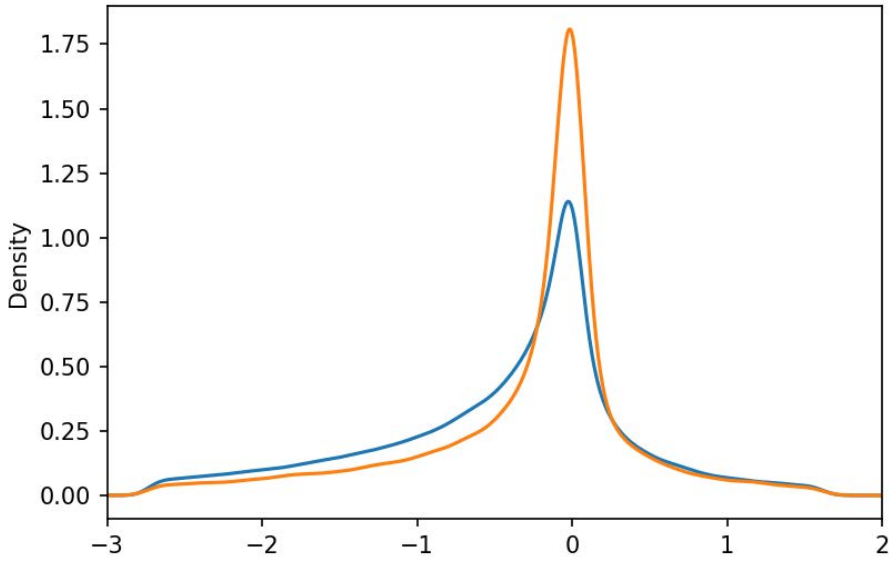


Figure 11: **Density of deposit elasticities.** This figure plots the density graph of estimated deposit demand elasticities of large and small banks. Orange denotes large banks, and blue denotes small banks.

Next, we provide a more granular analysis of the relationship between bank size and deposit demand elasticities. Figure 13 is a bivariate density heatmap over the demand elasticities from Figure 11 and log total assets at the bank level.[25] The heatmap shows that for larger banks, elasticities are generally near zero, consistent with Figure 11. For smaller banks, the elasticities vary more, and have a fatter left tail, meaning that a larger share of small banks face highly elastic deposit demand. To understand the size distribution of banks, and the distribution of our elasticity estimates underlying this heat map, we plot the univariate kernel density plots of log assets on the right and elasticities on the top of Figure 13.

Our evidence documenting differences in demand elasticities between large and small banks provides support for the key results from our model. The higher price elasticities at small banks is consistent with these banks serving a different customer base than that of large banks, and operating a different deposit business model as a result.

[25]We use the RSSD ID to identify banks for Figure 13. RSSD ID is a unique identifier assigned to institutions by the Federal Reserve (FRB).

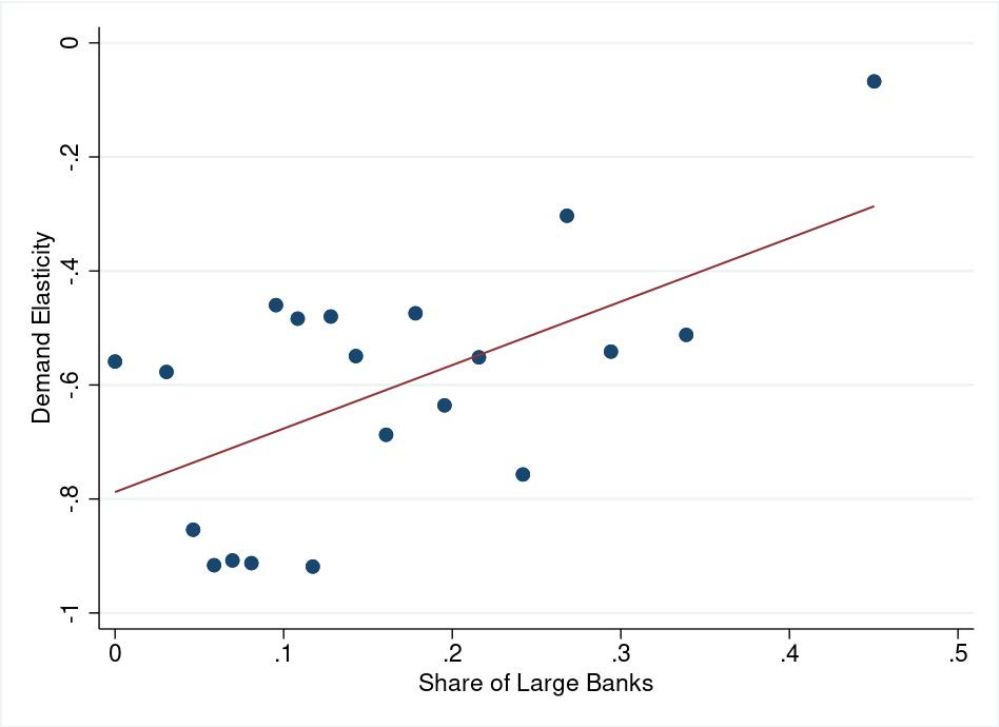


Figure 12: **Deposit elasticity and large bank local share.** This figure presents the relationship between bank demand elasticity and share of large banks. Share of large banks is calculated by dividing the number of large banks by the total number of banks in the county cluster.

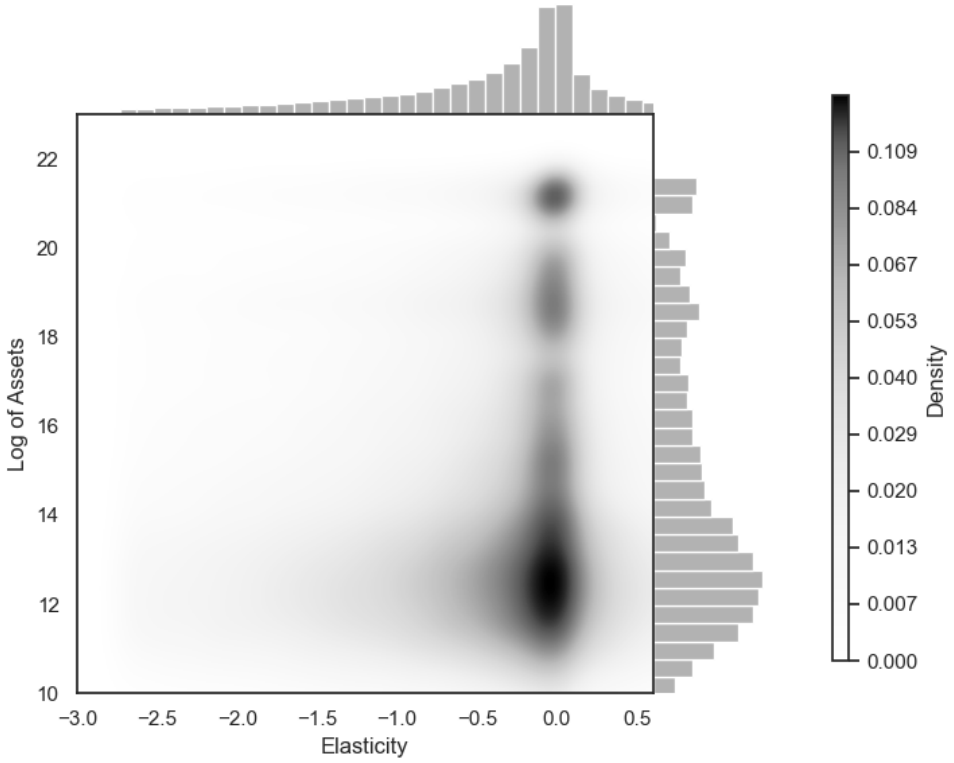


Figure 13: Elasticity and log asset density

6.3 Deposit demand elasticities: Further Analysis

In this subsection, we present further analysis on the cross section and time series of deposit demand elasticities. In particular, we show that banks with more uninsured deposits face higher demand elasticities, and that large banks have a higher fraction of uninsured deposits. Thus, it is unlikely that variation in the fraction of uninsured deposits is driving our results for the lower elasticities at large vs. small banks. Finally, we document the behavior of the elasticity estimates over time.

Elasticities and share of uninsured deposits. We document that, as is intuitive, deposit demand elasticities tend to be higher in absolute value at banks with a higher fraction of uninsured deposits.

Uninsured deposits are defined as deposits greater than $100k until Dec. 31, 2009, and greater than $250k after that. The data are obtained from the Call Reports. The unit of analysis is the RSSD level and large banks consist of the banks owned by the 14 large bank holding companies. Elasticity estimates are computed for each bank-county-year combination. As such, for each bank-year combination, we compute a measure of average elasticity weighted by branch deposits. That is, for a bank with N branches in a given year t we

compute: $\sum_{i=1}^{N} \frac{d_{i,t}}{D_t} \cdot \epsilon_{i,t}$ where $\epsilon_{i,t}$ denotes the demand elasticity of branch i at time t. This is then plotted against bank uninsured deposits as a share of total bank deposits as follows: We sort bank-year observations by the share of uninsured deposits into 20 bins and compute the mean elasticity by bin, this is overlaid with a line of best fit between the average bank elasticity and the share of uninsured deposits. Figure 14 presents the results.

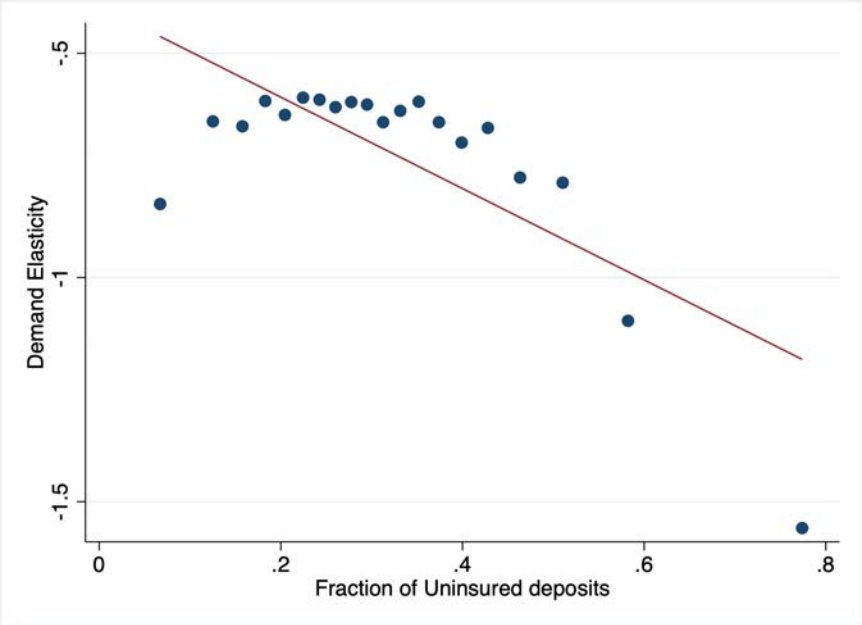
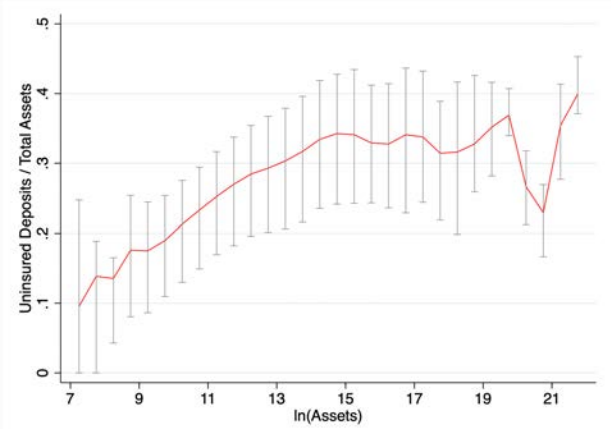
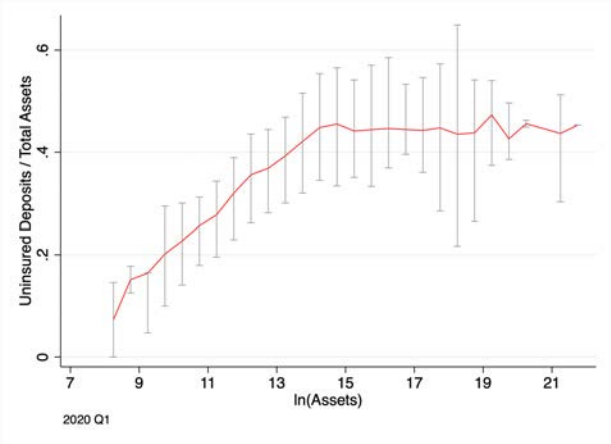


Figure 14: **Average elasticity and log uninsured timed deposits.** This figure presents the relationship between Average bank demand elasticity and log uninsured deposits at the RSSD level. Average Bank demand elasticities are computed as the deposit weighted average elasticity within a given bank for a given year. Uninsured deposits are defined as deposits greater than \$100k until 2009-12-31 and greater than \$250k after that.

This result is intuitive, but how does it interact with our results on the elasticities of small vs. large banks? Is our result for the lower elasticity at large banks due to large banks having fewer uninsured deposits? We show that this is not the case. Large banks actually have a higher fraction of uninsured deposits.[26] Thus, the lower elasticities at large banks do not appear to be driven by large banks having more insured deposits.



(a) 2001-2020



(b) 2020 Q1

Figure 15: **Ratio of uninsured deposits to total assets.** This figure presents the relationship between log total assets and the ratio of uninsured deposits to total assets at the RSSD level. Over the interval [7,22] for log assets we compute bins of size 0.5, i.e., the bins are the intervals [4,4.5), [4.5,5), [5.5,6), and so on, and compute the mean, Q1, Q3 of uninsured deposits to total assets ratio within each bin. In grey we plot the Q1-Q3 bands. Panel (a) computes this over the full call data sample between 2001 and 2020, panel (b) repeats the same exercise for a sample limited to Q1 of 2020. Uninsured deposits are defined as deposits greater than \$100k until 2009-12-31 and greater than \$250k after that.

Figure 15 shows the relationship between size on the x-axis, and uninsured deposits to

[26] Jiang et al. (2023b) also document the larger share of uninsured deposits at *large* banks.

total assets on the y-axis, following Jiang et al. (2023b). The pattern of uninsured deposits increasing with size is very similar to the analogous one in that paper, confirming their result. We also present tabular evidence in Table 7. Panel A reports the proportion of uninsured deposits. Panel B reports the proportion of uninsured deposits not including time deposits, which may generally have lower elasticities due to the penalties associated with early liquidation.

	Panel A			Panel B		
	Small	Large	Total	Small	Large	Total
Mean	33.72	48.86	33.81	36.35	43.34	36.39
Std. Dev.	16.36	25.17	16.46	18.22	25.43	18.27
25%	22.44	34.74	22.47	23.89	25.27	23.89
50%	31.26	46.81	31.32	34.23	47.21	34.27
75%	42.22	63.15	42.33	46.47	59.27	46.57
Observations	135,340	778	136,118	135,340	778	136,118

Table 7: **Proportion of uninsured deposits and uninsured deposits (less time deposits).** Panel A presents summary statistics of the ratio of uninsured deposits to total deposits. Panel B presents summary statistics for the ratio of uninsured deposits (less uninsured time deposits) to total deposits (less time deposits) between 2001 and 2019. All figures are in percent. Data is sourced from the Call Reports.

Elasticities over time. In Figure 16 we show the large amount of time variation in the county-cluster-bank elasticity estimates. We plot year-wise kernel distributions of the elasticities estimated in Table 6 at three-year intervals. The sample is trimmed at the 5% level. Our previous figures and tables used time series averages of these estimates. The Figure shows that the left tail of elasticities was fatter prior to and subsequent to the zero lower bound environment.

7 Conclusion

A comprehensive understanding of how banks set deposit rates is essential for researchers and policymakers. Prior work has emphasized market power and de-emphasized differences in customer preferences and the deposit-business technologies of banks. We argue that large and small banks operate different production functions for their deposit franchises, and serve customers with different preferences over deposit rates vs. liquidity services. We provide a parsimonious model illustrating these ideas and extensive empirical evidence supporting

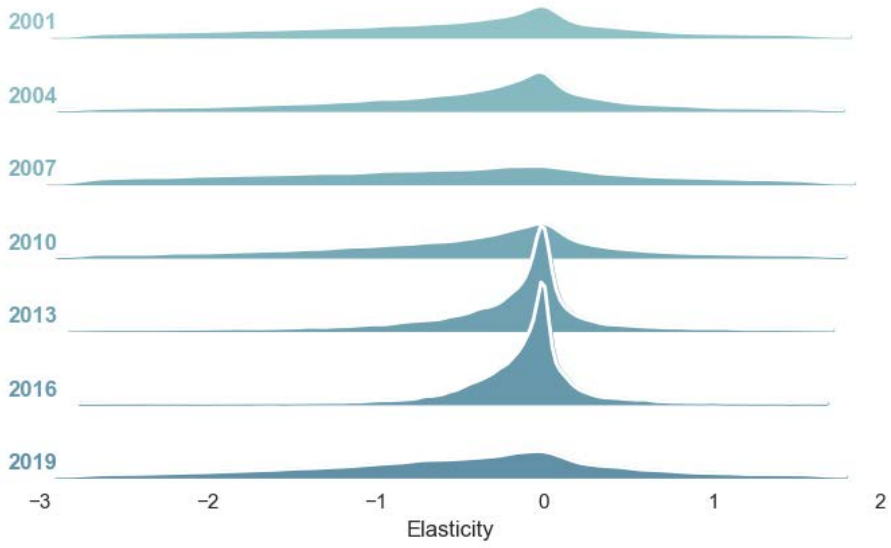


Figure 16: Elasticity year-wise ridge plot

the idea that much of the variation in deposit pricing behavior across banks may be due to variation in preferences and technologies, as opposed to being driven purely by pricing power derived from the large observed degree of concentration in the banking industry. Indeed, such concentration may be the result of large fixed costs that are required in order for large banks to offer superior liquidity-services technologies, such as ATM networks and consumer-facing software solutions to customers who value such services highly.

Internet Appendix

A Confirming and Refining the Results in Table 2 in Drechsler et al. (2017)

Table A.1 replicates the results in Table 2 of Drechsler et al. (2017), utilizing RateWatch data from 2001 to 2013 to examine the relationship between the Herfindahl-Hirschman Index (HHI) and bank rate-setting behavior. The main regression is

$$\Delta y_{it} = \alpha_i + \eta_{c(i)} + \lambda_{s(i)t} + \delta_{j(i)t} + \gamma\, \Delta FF_t \times \text{HHI}_i + \epsilon_{it},$$

where Δy_{it} represents the changes in deposit spreads of money market accounts of \$25,000, ΔFF_t denotes the changes in Federal Funds rate, and HHI is the rate-family-level HHI. Following the methodology laid out in Drechsler et al. (2017), we calculate HHI by aggregating the square of deposit-market shares of all banks within a specific county for each year, followed by averaging the results over the entirety of the years.

Column 1 replicates and confirms the main result of Table 2 of Drechsler et al. (2017). Columns 2 through 5 explore potential factors contributing to rate variation, serving as supplementary analyses to Table 1 in the main text. Column 2 reveals that variation in the Federal Funds Rates can account for over half of the variation of observed rate changes. Incorporating the HHI into the third column leads to little improvement to the R-squared value, suggesting that HHI plays a relatively minor role in explaining the variation in deposit rate changes. Analyses presented in Columns 4 and 5, which respectively include all fixed effects and only bank-time fixed effects, reveal that bank-time fixed effects predominantly account for the variation in rate settings, indicating minimal rate variation within banks as shown in the main text.

Lastly, Column 6 examines the rate-setting by large vs. small banks in the context of variation in HHI. The sensitivity of large bank deposit rates does not seem to vary significantly with HHI, which is important because large banks own the majority of deposits. The sensitivity of rates to HHI appears to be driven by small banks, which are much greater in number, but jointly own a minority of deposits.

The original studies in Drechsler et al. (2017) and others incorporate only rate-setting branches from RateWatch. Recognizing that banks may take into account the HHI at all of their branches when setting rates, and the fact that branches flagged as rate-setting by RateWatch may not necessarily be the actual rate setters, we also present results using HHI at the "rate family" level. We classify all branches of a bank operating under the same

	(1) Replication	(2) No FE	(3) No FE	(4) All FE	(5) Bank*T	(6) Add size
$\Delta FF\times$ HHI	0.0820***		0.0603**			
	(0.0227)		(0.0288)			
ΔFF		0.728***	0.714***			
		(0.00378)	(0.00780)			
Small$\times\Delta FF\times$HHI						0.0869***
						(0.0239)
Large$\times\Delta FF\times$HHI						0.0536
						(0.0553)
Bank$\times$T FE	Y	N	N	Y	Y	Y
State$\times$T FE	Y	N	N	Y	N	Y
Branch FE	Y	N	N	Y	N	Y
County FE	Y	N	N	Y	N	Y
T FE	Y	N	N	Y	N	Y
Observations	107,306	107,306	107,306	107,306	107,306	107,306
R-squared	0.898	0.675	0.675	0.898	0.887	0.898

Table A.1: **Replication of Drechsler et al. (2017) Table 2.** This table replicates Table 2 in Drechsler et al. (2017) using RateWatch data from 2001 to 2013. The main regression is

$$\Delta y_{it} = \alpha_i + \eta_{c(i)} + \lambda_{s(i)t} + \delta_{j(i)t} + \gamma\, \Delta FF_t \times \text{HHI}_i + \epsilon_{it},$$

where Δy_{it} is changes in deposit spreads of money market accounts of \$25,000, ΔFF_t is changes in Federal Funds rate. HHI measures market concentration at branch family level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

"rate-setter" as a rate family. We calculate the rate-family-level HHI, using each branch's deposit balance as weights to determine the weighted-average HHI of the family.

Table A.2 replicates Table 2 of Drechsler et al. (2017) using rate-family-level HHI. Column 1 presents the main regression with various fixed effects including bank-time, state-time, branch, county, and time. The result in Column 1 is similar to Drechsler et al. (2017), indicating that banks tend to offer rates that are more sensitive to changes in the Federal funds rate in regions characterized by higher concentration. That is, even using "rate family" data vs. the rate-setters used in the RateWatch data structure, the result of Drechsler et al. (2017) remains. Similarly, the result that small banks appear to drive the finding of a significant interaction between deposit rate sensitivities to the Federal Funds rate and HHI.

	(1) Replication	(2) No FE	(3) No FE	(4) All FE	(5) Bank*T	(6) Add size
$\Delta FF\times$ HHI	0.0789***		0.0361*			
	(0.0191)		(0.0216)			
ΔFF		0.734***	0.726***			
		(0.00285)	(0.00600)			
Small$\times\Delta FF\times$HHI						0.0881***
						(0.0208)
Large$\times\Delta FF\times$HHI						0.0145
						(0.0440)
HHI			0.0108***			
			(0.00322)			
Bank$\times$T FE	Y	N	N	Y	Y	Y
State$\times$T FE	Y	N	N	Y	N	Y
Branch FE	Y	N	N	Y	N	Y
County FE	Y	N	N	Y	N	Y
T FE	Y	N	N	Y	N	Y
Observations	184,775	184,775	184,775	184,775	184,775	184,775
R-squared	0.897	0.713	0.713	0.897	0.892	0.897

Table A.2: **Replication of Drechsler et al. (2017) Table 2.** This table replicates Table 2 in Drechsler et al. (2017) using RateWatch data from 2001 to 2019. The main regression is

$$\Delta y_{it} = \alpha_i + \eta_{c(i)} + \lambda_{s(i)t} + \delta_{j(i)t} + \gamma\, \Delta FF_t \times \text{HHI}_i + \epsilon_{it},$$

where Δy_{it} is changes in deposit spreads of money market accounts of \$25,000, ΔFF_t is changes in Federal Funds rate. HHI measures market concentration at the *rate-family* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B Large banks as top 1% of assets

For robustness, we present results using an alternative definition of large banks using banks in the top 1% of assets. We replicate our demand estimation using this alternate definition for large banks.

Table B.1 replicates the findings of Table 5 using the top 1% asset size to define large banks. The average point estimate of price sensitivity closely mirrors that in Table 5. Table B.2 replicates Table 6 with the alternative large definition. The distribution of elasticities for both large and small banks closely aligns with the results in Table 6. On average, the large banks exhibit lower elasticities. Figure B.1 depicts the elasticity distribution, illustrating that, as expected, small bank elasticities under the alternative size definition also have a fatter left tail. The shape of the distribution for large banks is also relatively unaffected by the alternative definition of a large bank.

(a) Coefficients

	Mean	Median	25%	75%
α_c	-0.441	-0.205	-0.906	0.245
Log(Branch Number)	0.474	0.404	0.115	0.696
Log(Employee per Branch)	0.322	0.281	-0.033	0.577
Large	0.005	0.000	-0.029	0.036
Share of Agriculture Loans	1.775	-0.418	-7.929	7.313
Observation	1326			

(b) Standard Errors

	Mean	Median	25%	75%
Standard Error for α_c	2.128	0.424	0.236	0.745
Standard Error for Log(Branch Number)	1.245	0.181	0.123	0.282
Standard Error for Log(Employee per Branch)	1.129	0.234	0.157	0.364
Standard Error for Large	0.251	0.130	0.000	0.252
Standard Error for Share of Agriculture Loans	46.579	6.902	2.433	18.296
Observation	1326			

Table B.1: **Demand estimation.** This table reports the summary statistics of estimated deposit demand parameters using county cluster-level market shares. The sample includes all U.S. commercial banks from 2001 to 2019. The data is from the Call Reports and the Summary of Deposits. Price is the difference between federal funds rate and deposit rates, Log(Branch Number) is the logarithm of total number of branches held by the bank, Log(Employee per Branch) is the logarithm of average number of employees per branch, Large indicates if the bank has assets above the 99% percentile, and the share of agriculture loans represents the proportion of agriculture loans in total bank assets.

	N	Mean	Std	1%	10%	25%	Median	75%	90%	99%
Small	303653	-0.640	2.636	-8.102	-2.496	-1.044	-0.212	0.075	0.723	4.287
Large	98468	-0.425	2.678	-7.413	-1.815	-0.532	-0.047	0.071	0.597	3.966
All	402121	-0.587	2.648	-7.970	-2.350	-0.926	-0.156	0.074	0.692	4.227

Table B.2: **Demand elasticity.** This table presents summary statistics for calculated demand elasticity.

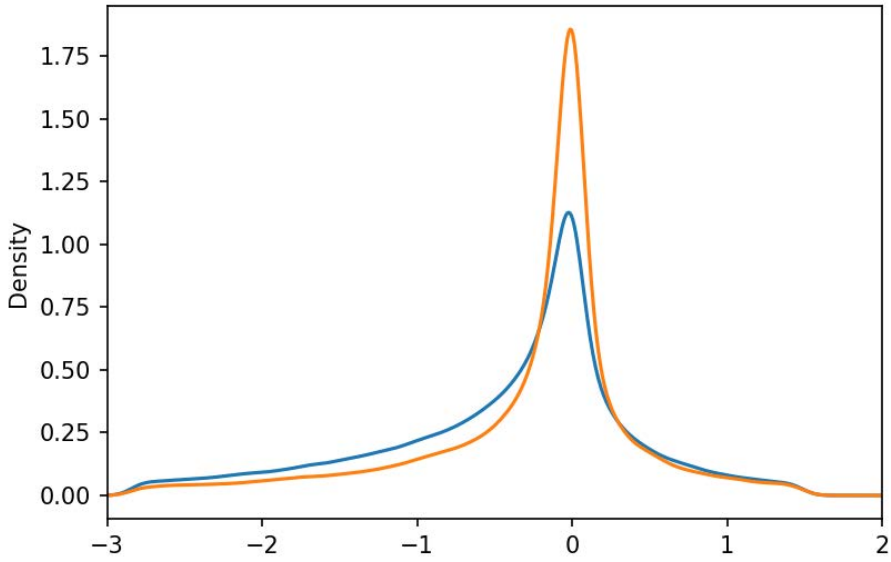


Figure B.1: **Density of deposit elasticity.** This figure plots the density graph of estimated deposit demand elasticity of large and small banks. Large banks are banks with assets above the 99% percentile.

Figure B.2 illustrates the correlation between the average elasticity within a cluster and the market share of large banks for each cluster, echoing the findings presented in figure 12. Regions dominated by a higher proportion of large banks typically exhibit less elastic deposit demand elasticities.

Together, these results indicate that altering the definition of large banks does not significantly affect the overall analysis.

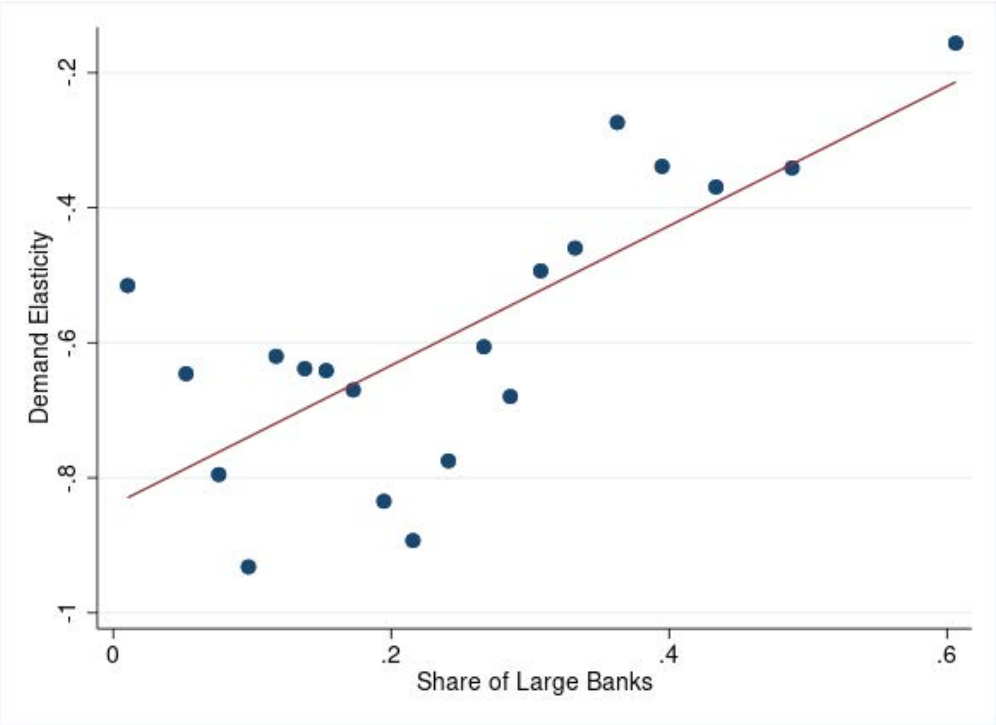


Figure B.2: **Deposit elasticity and large bank local share.** This figure presents the relationship between bank demand elasticity and share of large banks. Share of large banks is calculated by dividing the number of large banks by the total number of banks in the county cluster. Large banks are banks with assets above the 99% percentile.

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