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Hidden Cost of Better Bank Services: Carefree Depositors in Riskier Banks?

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Abstract

Better customer service helps banks attract core deposits and increase funding stickiness by raising depositors' switching costs and enhancing their loyalty. This funding stickiness, however, could impair market discipline and lead to excessive risk-taking. We find that banks providing better services attract more core deposits, pay less for their funding, and are exposed to lower funding outflow risks. At the same time, these banks carry lower quality loans. We argue that this contradictory finding of cheaper funding cost with lower asset quality stems from the lack of risk monitoring by loyal, sticky depositors, which exacerbates agency problems.

Key words: bank liability, funding cost, deposit, risk taking, market discipline

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I. Introduction

Certain banks are better than others at providing customer services to depositors; for instance, they may have longer business hours, hire more employees for personalized services, or have a more expansive branch network with a higher density of ATMs. Like those in other industries, these services help attract new customers and retain current ones by bolstering customer loyalty. However, unlike customers in other industries, bank depositors are not just buyers of services or products; they are also lenders to banks. Customers may very well choose their bank based on the quality of services that it provides, but in doing so, they could overlook the importance of the bank's financial soundness. This kind of oversight might lead to lax market discipline, thus inducing banks to take excessive risk. In this paper, we study the bright and dark sides of bank services, analyzing whether a bank's service quality is associated with its (i) funding structure, (ii) funding cost and liquidity risk, and (iii) asset quality and soundness, in a novel contribution to the banking literature.

[Figure 1 here]

Core deposits, sourced from customers in the bank's local market, are the primary funding source for banks. Core deposits represent 70% of total liabilities for small "community" banks (below $1 billion in assets), though they represent a relatively smaller share for larger banks with easier access to wholesale market funding (see Figure 1). Raised from a bank's traditional and regular customer base, core deposits are considered cheaper in terms of funding costs (Berlin and Mester 1999, DeYoung and Rice 2004), and are more stable ("sticky") in terms of funding outflow risks (Flannery and James 1984, Black, Hancok, and Passmore 2007, Cornett,

McNutt, Strahan, and Tehranian 2011). Banks could thus lower their funding cost and liquidity risk by acquiring more core deposits, which would allow them to direct more funds to lending and promote profits.

Since core deposits mainly reflect transactional or storage purposes of depositors, they have lower interest rate-elasticity than other funding sources such as large time deposits or short-term wholesale funding (Amel and Hannan 1999). Moreover, core depositors also value various non-pecuniary "quality" benefits (Flannery 1982, Kiser 2002a, Berger and Dick 2007, Dick 2007, 2008). As such, it is very costly for banks to raise the interest rates offered on the margin to attract more core deposits from their local markets, so instead, a bank often opts to provide better "services" (Harvey and Spong 2001). These services may include conveniently located branches, a large ATM network, and any other services or added convenience that would allow the bank to better appeal to its customer base,[1] which would also make the switching costs of depositors higher (Kiser 2002b, DeYoung and Hunter 2003).[2] These non-pecuniary benefits are implemented by incurring higher operating costs, and as a result, a bank might need to substitute lower interest expenses with higher non-interest expenses in the pursuit of more core deposits.

[Figure 2 here]

This "bright" side of better bank services clearly shows up in the data. We measure the "quality" of bank services from regulatory Call Report forms, using a set of service-related non-

[1] For instance, a bilingual employee could help broaden the customer base in certain areas.

[2] FDIC Risk Management Manual (FDIC 2015) suggests that "Convenient branch locations, superior customer service, extensive ATM networks, and low or no fee accounts are factors that contribute to the stability of the deposits."

interest expenses normalized by total assets.[3] The idea is to capture the "intensity" of services per dollar of assets, assuming that more service-related expenditures would imply better service provision. As a preliminary inspection, we examine visually how this variable associates with other bank characteristics cross-sectionally. Figure 2 indicates that a bank with better service quality attracts more core deposits, pays less for its funding, and holds fewer liquid assets. Surprisingly, however, its asset quality (measured by non-performing loans or net charge offs) is lower while its asset yield is higher, indicating increased asset risk-taking or lax lending standards. It also tends to hold less capital.

At first glance, this relationship is puzzling since funding costs should be higher for riskier banks with fewer liquid assets, lower quality loans, or higher leverage—there is thus something missing with the risk evaluation of these banks. One clue from the banking theory literature is that there are fair reasons, namely market discipline, for banks to be exposed to funding outflow risks.[4] Consistent with this theoretical understanding, our hypothesis is that there is lax market discipline (risk monitoring) imposed on these high service-quality banks. This reduced market discipline could arise through two channels. First, as a bank acquires more core deposits, a larger fraction of its borrowed funds are protected by deposit insurance, which impairs overall creditor surveillance imposed on the bank[5] (change in funding composition); and second, even within core depositors, there could be less surveillance due to customer satisfaction arising from the non-pecuniary benefits of better bank services, which could make depositors

[3] Main components of our non-interest expense measure are salaries, expenses of premises and fixed assets, along with other operating expenses, which include, among others, corporate overhead, information technology and data processing fees, and advertising/marketing expenses. See Section III.

[4] See Calomiris and Kahn (1991), and Diamond and Rajan (2001) for the theoretical discussion on the relationship between funding liquidity risk and the discipline effect.

[5] See Billett, Garfinkel, and O'Neal (1998), and Ioannidou and Penas (2010) for the empirical evidence.

less likely to switch banks (increase in funding stickiness).[6] In sum, our conjecture is that banks with better services benefit from more access to core deposits (extensive margin), as well as from enhanced loyalty from existing core depositors (intensive margin), which would lower their funding costs and liquidity risks. However, this effect could also lead to less creditor surveillance (e.g., through less sensitive risk pricing) and thus less market discipline, which would exacerbate the moral hazard problem and impair financial soundness.

We conduct our empirical analysis using quarterly panel data from Call Reports between 1995 and 2014. Ideally, we would need to compare a bank to a *similar* bank within the *local market*, with the only difference being the degree of service provision. Within-market comparison is necessary since difference in loan demand or market structure (Hutchison and Pennacchi 1996, Park and Pennacchi 2009) could affect our empirical results. We hence limit our sample to similarly sized "community" banks that are likely to operate in a single market.[7] We then include time and market (state or MSA) fixed effects, or market-time fixed effects, where the former is used to control time-invariant local market characteristics and macroeconomic factors, and the latter is used to control any local characteristics that could vary over time such as local competition and demand sensitivity. Thus, in the latter case, we compare local banks within the same banking market at a given point in time. We find that banks providing better services do have higher core deposit ratios (to total assets) and lower funding costs. Interestingly, they also pay lower interest rates for their core deposits as well, even though they attract more of them.

[6] Martinez Peria and Schmukler (2001) find that deposit insurance does not necessarily decrease market discipline. Iyer and Puri (2012) and Iyer, Puri, and Ryan (2016) find that insured depositors also withdraw during bank runs despite of deposit protection.

[7] We found similar empirical results when including larger banks and using FR Y-9C holding company data.

This finding is clear evidence of non-pecuniary benefits being appreciated by core depositors if the supply of core deposits is upward sloping.

We then test whether banks that provide better services are exposed to lower funding liquidity risks. Our analysis suggests that they hold fewer liquid assets and allocate more funds to lending, suggesting lower *ex ante* perceived funding outflow risk. This is also the case when we control for core deposit ratios, which we interpret as evidence of incremental core deposit "stickiness" when providing better services. We also examine whether core deposits of better-service-banks fluctuate less *ex post* in response to a shock. In order to verify this, we test how service quality affects the bank lending channel of monetary policy. Kashyap and Stein (2000) argue that monetary tightening drains bank deposits, and thus bank lending decreases if a bank is unable to compensate for the deposit loss. Augmenting their argument, our conjecture is that lending of better-service-banks is less sensitive to monetary tightening, since their funding is stickier and less sensitive to interest rate changes. We document that better-service banks could mitigate the bank lending channel of monetary policy, and their core-deposit growth is less affected by the changes in the monetary policy stance.

Examining the relationship between service quality and asset quality (or the financial soundness of a bank), we find that better-service banks have lower quality loans and higher loan yields. Namely, these banks have more non-performing loans, higher net-charge offs, larger loan loss provisions, and lower Z-score and ROA. The higher loan yield, coupled with these poor performance metrics, indicate that high service-quality banks take more risks ex ante relative to their low service-quality counterparts. We find that this loan-quality deterioration effect, a response to higher service quality, is mitigated when a bank holds more capital, indicating the possibility of an agency problem (Park and Peristiani 2007). We finally examine the risk pricing

of bank liabilities and how its sensitivity to bank risk characteristics varies when a bank provides better services. Although it is difficult, due to data limitations, to find direct evidence of the exacerbated agency problem with better service provision, this risk pricing sensitivity analysis serves as indirect evidence. We document that, with better service provision, funding costs become less sensitive to underlying risks (i.e., less risk surveillance) for not only the total liability funding cost, but also the core deposit interest rate. Since core deposits are mostly insured, our result on the core deposit interest rate sensitivity already accounts for the deposit insurance effect and suggests that (core) depositors could become less attentive to bank risk-taking purely through the non-pecuniary benefits of service provision. We thus interpret the results as "loyal" creditors not accurately pricing risks, resulting in less monitoring being imposed to prevent bankers' moral hazard, which could lead to more risk-taking and impair financial health.

Note that our analysis considers neither the optimal level of service provision for a bank nor the direct causal effect of service quality, although our economic argument does not preclude the existence of a causal relationship; rather, our modest goal is to assess the cross-sectional associations of certain asset and liability characteristics within a local banking market, which we should observe in equilibrium when taking the service quality of the banks as exogenous parameters, so as to examine novel theoretical predictions unstudied previously. That said, our empirical analyses face two major challenges besides the imperfect measurement of service quality. First, our cross-sectional comparison should capture the effect of service expenditures among all-else-being-equal banks, but the regression results might simply reflect the differing business models of banks. For instance, banks focusing on small business lending might have more branches and employees compared to mortgage banks since soft information and

relationships are more critical for them (Berger and Udell 1995, Petersen and Rajan 2002). In addition, it is known that economies of scale exist in operating expenses (Kovner et al. 2014). We thus include various balance sheet variables to control for different asset-side business models, such as the composition of real estate loans, C&I loans, small business, commercial real estate, and farm loans, as well as credit line provision. We further limit our sample of banks so that their asset sizes are similar ($250 million to $1 billion), and that they are likely to operate in a single market. Second, a reverse causality could be driving the negative association between service expenditures and loan quality. Rather than missing market discipline–owing to better service provision–inducing risky lending, it could be that less-sound banks provide better services to attract more core deposits since their funding costs in the wholesale market are very high or hire more employees simply to monitor the non-performing loans. We try to mitigate this endogeneity problem with IV analysis, by using alternative measures, and by comparing banks operating in markets with different (age-)demographic characteristics. Concretely, in our IV estimation, we use the service expenditure *prior to* our sample period (5 years before the sample starts) as an instrument for actual service quality measure. Our identification assumption is that this old expenditure and any innovation to bank performance during the sample period (e.g., shocks to the bank's loan quality unexplained by fixed effects and controls) should be independent. Our empirical results under these alternative specifications are mostly robust.

The importance of stable funding has been widely emphasized after the financial crisis (e.g., Net Stable Funding Ratio of Basel III). One of the policy implications of our result is that there might be an undesirable side effect of "excessive" stable funding. Calomiris and Kahn (1991) and Diamond and Rajan (2001) argue that funding liquidity risk is a necessary device for disciplining bank managers. Our analysis suggests that better service provision could lower

funding liquidity risk, which could lower asset quality via lax discipline. Our results also suggest that this is less of a problem for better capitalized banks, thus suggesting that liquidity regulation is less distortive when supplemented with capital regulation to mitigate the agency problem.

This paper is related to several strands of literature. Our paper focuses on the role of core deposits; what factors affect their supply; and how they affect bank performance through various channels. Flannery (1982), Dick (2007, 2008), and Kiser (2002a, b) study the effect of location and service quality on the customers' choice of banks. Kiser (2002b) and Kim, Kliger, and Vale (2003) document the effect of service provision on customers' switching cost. Hutchison and Pennacchi (1996) analyze rents in deposit markets. Acharya and Mora (2015) and Egan, Hortascu, and Matvos (2015) study substitution between core and non-core funding during times of bank stress. Focusing on lending, Berlin and Mester (1999) document that banks provide more rate smoothing for their loans when using more core deposits, and Black, Hancock, and Passmore (2007) study how reliance on core deposits affects the bank lending channel of monetary policy. We also study bank liquidity risk management, particularly relating to funding structure. Cornett, McNutt, Strahan, and Tehranian (2011) show that banks that relied more on core deposits were less affected by the financial crisis in 2007-09. Strahan and Loutskina (2009) and Loutskina (2011) study how changes in asset liquidity affect bank behavior.

Our paper is also related to the literature on market discipline and its relation to bank funding structure. Calomiris and Kahn (1991) and Diamond and Rajan (2001) discuss the importance of funding liquidity risks for disciplining bank managers, and Iyer, Puri, and Ryan (2016) study how deposit base composition affects funding liquidity risks. Billett, Garfinkel, and O'Neal (1998), Demirgüç-Kunt and Huizinga (2004), Ioannidou and Penas (2010), and Karas, Pyle and Schoors (2013) find that deposit insurance lowers market discipline, while Martinez

Peria and Schmukler (2001) find that this is not necessarily the case. Other papers on depositor discipline include Park and Peristiani (1998) and Goldberg and Hudgins (2002).

II. Economic argument and hypotheses

A. The Bright side: service quality, funding cost, and liquidity risks

Bank funding can typically be divided into two sources, core deposits and non-core funding. Core deposits, collected from the local geographic market, reflect transactional or storage purposes of depositors. Non-core funding includes large time deposits, as well as other wholesale funding. Core deposits are the primary source of funding for banks, especially for small banks that have limited access to wholesale funding markets. Figure 1 describes the liability structure of large (over $50 billion), medium (between $1 billion and $50 billion), and small banks (less than $1 billion); the average ratio of core deposits to total liabilities is 59.2% for large banks, 62.2% for medium banks, and 69.9% for small banks.

Core deposits have several advantages compared to non-core funding. They represent funding from a bank's traditional and regular customer base and, as such, are considered more stable (i.e., lower funding liquidity risks) funding sources. Acquiring more core deposits implies more loyalty from customers, and a higher share of core deposits makes a bank's funding less sensitive to interest rate changes. Its funding cost is also lower than other funding sources, as the primary purpose of the core depositor is to have access to financial services rather than to seek for yield; the supply of core deposits is therefore less elastic to price changes. Thus, banks with more core deposit access can lower their overall funding cost as well as outflow risks, which enables them to allocate more funds to profitable lending opportunities.

As the interest rate elasticity of the core deposit supply is low, and liquidity and payment "services" are one of the primary factors in a depositor's choice of bank, a bank can more efficiently attract core deposits on the margin by providing better services than by offering higher interest rates relative to local market competitors.[8] Services may include, for instance, expansive branch networks, more ATMs, longer business hours, more employees, or even free food, all of which provide non-pecuniary benefits that core depositors appreciate (Harvey and Spong 2001, Dick 2007, 2008, Kiser 2002a). These non-pecuniary benefits are implemented by incurring higher operating costs, potentially making banks trade lower interest expenses for higher non-interest expenses.

Prediction 1. A better-service bank acquires more core deposits compared to its counterparts in the local market.

Prediction 2. A better-service bank (a) faces lower funding cost and (b) pays lower interest rates to its (core) depositors compared to its counterparts in the local market, and it also (c) pays less to its (core) depositors than its wholesale creditors.

Note that funding costs could decrease through two channels when offering services: (i) by acquiring more (cheaper) core deposits replacing non-core funding (extensive margin); (ii) by offering non-pecuniary benefits to existing (core) depositors and lowering interest payments (intensive margin). Unlike Prediction 2 (a), which does not separate the two, Prediction 2 (b)

[8] This is particularly the case since price discrimination among depositors is limited because of the very short maturity; to acquire new deposits, a bank might need to offer higher rates to its incumbent depositors instead of paying more only to the marginal depositor.

tries to isolate the second channel by explicitly focusing on the funding costs of core deposits, which is independent of compositional effects. Prediction 2 (c) directly examines the cost savings driven by additional service provision. Here, the underlying assumption is that wholesale funding costs accurately reflect the underlying risks of a bank. Thus, we expect that the spread between wholesale funding costs and (core) deposit funding costs for a bank, which should reflect non-pecuniary benefits to the depositors, would be greater if the bank provides better services.

Better-quality services could also affect funding liquidity (outflow) risks if they increase depositors' switching costs and make them less willing to withdraw their funding. Again, overall bank funding could become "stickier" through two channels on extensive margin and intensive margin: (i) by acquiring more core deposits, which are considered to be stickier than non-core funding (Flannery and James 1984), and (ii) core deposits themselves becoming stickier due to better services. This lower funding liquidity risk would result in less fluctuation in core deposits and would allow banks to hold fewer liquid assets and allocate more funds to lending.

Prediction 3. A better-service bank is exposed to lower funding liquidity risk compared to its counterparts in the local market.

If better services make bank funding stickier, this effect could also mitigate the impact of monetary policy on bank lending. Monetary tightening decreases the amount of (core) deposits in the banking sector, and banks would need to reduce their lending unless they attract alternative funding sources or consume liquid assets (Kashyap and Stein 2000, Choi and Choi 2016). A

bank providing better services could increase its deposit stickiness and retain more funding during monetary tightening. Thus, its lending would be less affected.

Prediction 4. A better-service bank could better mitigate the monetary policy impact on its lending than its counterparts in the local market, and its core deposits fluctuate less in response to changes in the monetary policy stance.

B. The dark side: service quality, bank risks, and missing market discipline

We now discuss the dark side of better bank services, focusing on how service quality might relate to lending quality and bank soundness. A preliminary inspection in Figure 2 indicates a positive cross-sectional relationship between our proxy of service quality and the asset interest rate (interest income divided by interest-earning assets). Higher asset yields could imply better asset performance, but it could simply come from more risk-taking ex ante. Economically, both explanations are plausible; there could be a synergy between asset-side management and liability-side services (more employees help screen and monitor loans, and more branches with geographic proximity provide better information about the borrowers), so a positive association between loan quality and service quality could arise, reflecting better asset management.[9] However, better services could also lead to lax market discipline and more risk-taking if the agency problem prevails. Again, there are two possible channels contributing to attenuated creditor surveillance and a pronounced agency problem: (i) more core deposit

[9] Alternatively, better service provision lowers funding costs, which could help in alleviating the risk-shifting or debt overhang problem and improve lending quality. This would be the case if the efficiency (intensity) of overall (average) creditor surveillance on a bank is fixed with the only change being funding costs. We instead argue that this overall surveillance is decreased in response to better service provision.

acquisition replacing non-core funding implies more deposit insurance protection, impairing overall surveillance (Billett, Garfinkel, and O'Neal 1998, Ioannidou and Penas 2010, Karas, Pyle, and Schoors 2013); and (ii) more stable bank funding and lower outflow risks resulting in less market discipline (Calomiris and Kahn 1991, Diamond and Rajan 2001). The first channel comes from the changes in liability composition (extensive margin), while the second comes from the enhanced funding stickiness within the core deposit funding class (intensive margin).[10]

In this paper, we focus on the market discipline aspect and claim that better service quality is associated with more risk-taking, owing to loyal depositors with higher switching costs becoming less attentive to their borrower's soundness. We empirically test if this is the case. If banks with better service quality carry lower quality loans, that would be the evidence against the better-asset-management argument and in favor of the risk-taking argument. Therefore, our hypothesis is as follows:

Prediction 5. A better-service-bank takes more asset risks or adopts laxer lending standards, i.e., it has higher asset yields, but also has lower quality loans and lower Z-scores. This relationship is weaker for banks that are better capitalized, as the additional capital helps mitigate the agency problem.

We then analyze the potential channel driving these relationships. In particular, we look for evidence of decreased overall surveillance by creditors, which could contribute to the

[10] Iyer and Puri (2012) and Iyer, Puri, and Ryan (2016) study the effect of depositor characteristics on withdrawal behavior during bank runs. They find that depositors with old accounts are less likely to withdraw, and insured depositors also withdraw despite of the protection.

excessive risk-taking in the context of lax market discipline.[11] If the creditors provided proper monitoring, underlying risks would be correctly incorporated into the funding costs and we would expect to observe fewer agency problems due to market discipline. We examine if risk pricing becomes less sensitive to changes in bank risk characteristics when banks provide better quality services. Note that Prediction 2 focuses on whether service provision changes the *level* of funding costs across the banks, while we now ask whether it affects the within-bank *sensitivity* of funding costs in response to changes in bank risk characteristics (soundness).

Prediction 6. The funding costs of a better-service-bank are less sensitive to its risk characteristics compared to its counterparts.

As previously discussed, examining aggregate funding costs does not allow us to differentiate the effect of enhanced funding stickiness (i.e., depositor loyalty) from that of more deposit insurance protection; risk pricing sensitivity could change simply by the changes in funding composition (extensive margin). For instance, the sensitivity could become lower because a bank switches from uninsured deposits to insured deposits, irrespective of whether there is a change in surveillance intensity within the core deposit funding class. We overcome this challenge by analyzing the risk pricing for (insured) core deposits, which is mostly driven by the heterogeneity in depositor loyalties among banks with different service levels (i.e., whether core depositors become less sensitive to bank risk-taking when provided with better services).[12]

[11] Here, we only examine the surveillance aspect using risk pricing. See Bliss and Flannery (2002), and Kishan and Opiela (2012) for a discussion on the distinction between risk pricing (surveillance) and influencing (disciplining).

[12] There could also be an effect from a compositional change within the core depositors. Suppose that there are two types of core depositors, A and B. Type A depositors care relatively more about services than bank soundness

III. Data

We retrieve quarterly bank-level characteristics from the Federal Reserve's Consolidated Reports of Condition and Income (henceforth, Call reports) from 1995 Q1 to 2014 Q4. Call reports include balance sheet and income statement data on a quarterly basis for all U.S. commercial banks, which allow us to form a bank-quarter panel dataset. We also retrieve demographic variables from the Census annual population estimate. We cut our panel pre-1995 to mitigate effects stemming from regulatory changes regarding interstate banking. Moreover, to ensure robustness to outliers, we eliminate all entities that are non-banks, defined as entities whose mean share of deposits or loans, as a percentage of total assets, is less than fifty percent over the time series. Along these same lines, non-interest expense ratio observations are trimmed each quarter at the 0.5% level. Sample is further trimmed by removing extreme outliers (0.5% level of entire time series) of several bank characteristics in Table 1: NPL ratio, net charge-off ratio, Z-score, tier 1 capital ratio, core deposit ratio, liquid asset ratio, ROA, deposit rate, liabilities rate, core deposit rate, asset interest rate, net interest margin, deposit growth rate, share of real estate loans, and loan loss provision ratio.

Since our focus is on service quality and its effect on traditional banking activity, and since we attempt to compare otherwise similar banks within a local market, we keep only community banks (below 1 billion) whose main source of funding is local core deposits and who are likely to operate within a single market (state, or MSA). We exclude all bank-quarter observations in which assets fall below 250 million, thus keeping only banks with asset size from 250 million to 1 billion, to mitigate issues caused by a scale economy in operating expenses

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compared to Type B. When offering more services, a bank could tilt its core deposit acquisition to Type A from Type B, which would lower the overall surveillance from its core depositors.

(Kovner et al. 2014).[13] We also drop all bank-quarter observations that have a quarterly asset growth rate of greater than 10% (M&A effect), and the final bank-quarter observation for banks that do not survive for the entirety of the time series (bank failure). After applying these filters, the entire sample consists of 69,890 bank-quarters.

We measure the bank-level service quality ("*ServiceQuality*") from Call Reports using the amount of service-related non-interest expenses divided by total assets. Our choice of non-interest expenses includes expenses due to salaries (e.g. reflecting the number and quality of employees, RIAD4135), premises and fixed asset expenses (e.g. reflecting branch network, etc. RIAD4217), and "other" noninterest expenses (RIAD 4092).[14] We capture the service "intensity" by normalizing by total assets, which is our preferred measure of the service quality of a bank. Figure 3 presents the decomposition of noninterest expenses based on the aggregate amount across our sample banks; salaries account for 53.6%; premises and fixed assets expenses for 13.8%, and "other" expenses for 32.6% of total non-interest expenses. We define core deposits as total deposits net of large time deposits (>100K) as in Berlin and Mester (1999), and include the following six "business model" controls whenever necessary: ratios of (1) real estate loans, (2) commercial and industrial loans, (3) small business, (4) small commercial real estate, (5) small farm loans, to total loans, as well as (6) unused commitments to total assets. Thorough descriptions of variable constructions can be found in the Data Appendix. Table 1 presents summary statistics for the bank-specific variables used in our empirical analysis.

[Table 1 here]

[13] Our empirical results still hold when including larger banks and using holding company data from FR Y-9C.

[14] This category includes, for instance, data processing expenses, advertising expenses, postage, and ATM expenses. See Section V for more discussion and alternative measures of service quality.

IV. Empirical results

A. Service quality and bank funding

We first examine the relationship between service quality and (i) core deposit ratio which is defined as core deposits divided by total assets, as well as (ii) funding cost. Our hypotheses are that banks with better service quality raise more core deposits compared to their counterparts in the local market, and have a lower cost of funding (Prediction 1 and 2). To be concrete, we run the following panel regressions for bank *i* head-quartered in state *s* at time *t*:

$$CoreDepositRatio_{ist} = \alpha_s + \delta_t + \beta\, ServiceQuality_{ist-1} + \Upsilon X_{ist-1} + \varepsilon_{ist} \qquad (1)$$

$$FundingCost_{ist} = \alpha_s + \delta_t + \beta\, ServiceQuality_{ist-1} + \Upsilon X_{ist-1} + \varepsilon_{ist} \qquad (2)$$

where X_{ist-1} is relevant bank controls, and α_s and δ_t are state and time fixed effects, respectively. We lagged control variables to mitigate the simultaneity problem, and standard errors are clustered on entity.

Throughout the analyses in Section IV, our regression result would be biased if there are omitted confounding variables. For instance, heterogeneity among the banking markets could induce a statistically significant relationship between the service-related expenses and the funding composition or costs. For instance, banks in "deposit-rich" regions (Becker 2007, Han, Park, and Pennachi 2015) should rely more on core deposits while paying less; and banks in more competitive markets might need to provide better services while their funding costs are higher compared to those in less competitive markets. Heterogeneity in borrowing demand between different local markets could also make these variables correlated. In order to mitigate

these problems, we thus include state or state-time fixed effects.[15] Since we restrict our samples to small "community" banks that are likely to operate in a single market, our analysis in this case thus compares similarly sized banks within a local market (same state, or MSA in the robustness check) at a certain point in time. We also add relevant bank balance sheet controls for each specification as well as business model controls. This comparison of relatively homogeneous local banks within a local market would help us mitigate any effects from heterogeneous and time-varying local market characteristics or demand.

We analyze three different funding costs: (i) total liability interest rate focusing on the funding cost of a bank as a whole (using total interest expenses divided by total liabilities), (ii) deposit interest rate specifically focusing on the deposit funding cost (using total interest expenses on deposits divided by total deposits), and (iii) core deposit interest rate (excluding large time deposits from total deposits), to exclusively focus on the price paid to the core depositors (presumably protected by the FDIC). We expect $\beta > 0$ in regression (1), and $\beta < 0$ in regression (2). Recall that there could be two channels driving the lower cost: (i) acquisition of more (cheap) core deposits (extensive margin, substitution between core deposits and non-core funding); (ii) provision of additional non-pecuniary benefits are appreciated by core depositors, making them willing to accept a lower interest rate (intensive margin). As discussed in Section III, a negative β for the core deposit rate implies the second channel is operative, independent of the first channel.

Table 2 reports the estimation results of Regression (1). Service quality is positively associated with the core deposit ratio with a 1% significance level in all specifications, which corresponds to our hypothesis that a bank providing better services acquires more core deposits.

[15] We do not include bank fixed effects since our focus is on the cross-bank comparison within a market.

This is still the case even after controlling for banks' business models, interest rates offered to depositors to control banks' demand for deposits, and time-varying local factors using state-time fixed effects.

[Table 2 here]

We then examine the relationship between service quality and funding costs. Table 3 presents our estimation results for three different funding costs: total liability interest rate (Panel A), deposit interest rate (Panel B), and core deposit interest rate (Panel C). All three funding costs are negatively correlated with service quality with a 1% significance level, even after controlling for bank characteristics that affect the borrowing cost, such as size, capital, liquidity, profitability, and loan performance variables. Surprisingly, even the core deposit interest rate is negatively correlated with service quality; better-service banks pay less to their (core) depositors while attracting more of them as previously shown in Table 2. Evaluating economic significance, the coefficient in column (9) Panel C implies that a one standard deviation increase in service quality within a market at a given time (equal to 0.76) is associated with a drop of 15 basis points in the core deposit interest rate, which is equivalent to 35% of the within-a-market standard deviation of core deposit rates at a given time.[16] This supports our hypothesis that the (core) depositors appreciate non-pecuniary benefits and become willing to accept a lower interest payment. In Panel D, we further examine the cost differential between market funding (large CDs in this case) and (core) deposit funding that a bank faces (Prediction 2 (c)). Our prediction is

[16] Defined by the standard deviation of residuals from regressing core deposit rates on state-time fixed effects, which is equal to 0.43.

that this spread would be positively associated with service quality—if the cost of market funding correctly captures the underlying risks of a bank and is independent of the service quality, a larger spread between the two costs would imply additional cost savings for a bank when borrowing from its core depositors. We can observe a significant discount at the 1% level in all specifications of Panel D for better-service-quality banks, with a one standard deviation increase in service quality being associated with approximately more than 9 basis points of cost saving.

[Table 3 here]

B. Service quality and liquidity risk

We next analyze how service quality affects liquidity risk (Prediction 3). We first examine its effect on funding liquidity risks in banks by looking at the liquid asset holdings, which focuses on the *ex ante* perception of a bank's funding liquidity outflow risks. We thus test the following regression specification:

$$LiquidAssetRatio_{ist} = \alpha_s + \delta_t + \beta\, ServiceQuality_{ist-1} + \Upsilon X_{ist-1} + \varepsilon_{ist} \qquad (3)$$

where *LiquidAssetRatio* is the ratio of liquid assets (cash, reverse repo and fed funds lending, and securities) to total assets. We expect β to be negative, implying banks decide to hold fewer liquid assets due to the anticipation of more sticky funding stemming from the provision of better services. We also test a specification controlling for the core deposit ratio, to test whether the second channel (intensive margin) discussed in Section III.A is operative, as well as the business

model, where we also include the unused commitment ratio. We therefore examine whether banks with better service quality hold fewer liquid assets in their book even when they have the same core deposit ratios, to exclusively analyze *perceived* stickiness *within* the core deposit category. The panel regression results are reported in Table 4. As anticipated, banks with better service quality hold significantly fewer liquid assets in all specifications (with 1% significance level), even when controlling for the core deposit ratio, though estimates become less negative. This suggests the existence of both extensive margin and intensive margin channels for enhanced funding stickiness: (i) more reliance on core deposits, which are a relatively stickier funding source, and (ii) core deposits themselves become stickier as depositors are less willing to switch banks due to the better service quality.

[Table 4 here]

Note that our Regression (3) tests how banks *perceive* a potential liquidity shock (*ex ante* perspective) by looking at their choices of liquidity cushion held on the asset side. We now test how service quality affects the *ex post* responses of banks to the outside shocks. We specifically analyze how service quality affects the bank lending channel of monetary policy. The bank lending channel is operative if a bank experiences deposit outflow in response to a monetary tightening and cannot replace the lost funding, forcing it to reduce lending. As in Prediction 4, a bank with better service quality could mitigate the impact of monetary policy on its lending if its deposits are stickier.

We implement the following two-step regression based on Kashyap and Stein (2000). In the first step, we estimate β_t for each period from the following regression:

$$\Delta \log(L_{ist}) = \sum_{j=1}^{4} \gamma_j \Delta \log(L_{ist-j}) + \alpha_s + \beta_t \, ServiceQuality_{ist-1} + \varepsilon_{ist} \qquad (4)$$

where α_s is the state fixed effect. This gives us a time series of $\{\beta_t\}$. We then estimate the following:

$$\beta_t = \alpha + \sum_{j=1}^{4} \mu_j \Delta FF_{t-j} + \delta Time_t + u_t \qquad (5)$$

where FF_t is the federal funds rate, and $Time_t$ is the linear time trend. In an alternative specification, we also include 4 lags of changes in real GDP as a macroeconomic control. We expect $\sum_{j=1}^{4} \mu_j > 0$, which indicates a bank providing better services could lend more compared to its counterparts in the same state during monetary tightening.

In addition to the continuous measure of service quality based on the non-interest expense to asset ratio, we also estimate the same specification using the discrete measure. In each quarter, we divide banks into two subgroups; $ServiceQuality_{ist} = 1$ if bank *i*'s non-interest expense to asset ratio is above the median among all the sample banks, and 0 otherwise.

Table 5 reports the regression analysis of the lending channel. We limit our sample to before the Great Recession (< 2007:Q3) to exclude any crisis related factors and periods with no target rate variation. Signs for the sum of μ_j are positive and significant for the total loan growth (Panel A) and real estate loan growth (Panel B, except when including the macro controls and using the continuous service quality measure), as anticipated. However, we don't find significant results for C&I loan growth (Panel C). This could be due to the fact that we only analyze small community banks whose main focus is on real estate lending, so C&I lending accounts for only a small fraction of their total lending. Table 1 indicates that for our sample, the median of real

estate loan to total loan ratio is 74.9% while that of C&I loan to total loan ratio is only 11.3%, 25th percentile being only 4.3%.

[Table 5 here]

We next test whether core deposits of better-service banks fluctuate less compared to their counterparts. In our first test, we examine the fluctuations of core deposits in response to monetary policy stances by estimating the following:

$$\Delta \log(CoreDeposit_{ist}) = \alpha_s + \sum_{j=0}^{4} \mu_j \Delta FF_{t-j} + \beta\ ServiceQuality_{ist-1} + \sum_{j=0}^{4} \lambda_j (ServiceQuality_{ist-1} * \Delta FF_{t-j}) + \varepsilon_{ist} \quad (6)$$

where α_s is a state or bank fixed effect. We would expect negative $\sum_{j=0}^{4} \mu_j$ and positive $\sum_{j=0}^{4} \lambda_j$, which implies that better-service-quality banks could mitigate the (core) deposit outflows during monetary tightening. In our second test, we compare the core deposit volatilities across banks following the method of Morgan, Rime, and Strahan (2004). Specifically, we estimate

$$Fluctuation_{ist} = \alpha_s + \delta_t + \beta\ ServiceQuality_{ist-1} + \varepsilon_{ist} \quad (7)$$

where $Fluctuation_{ist}$ is from the residual of the first stage estimation:

$$\Delta \log(CoreDeposit_{ist}) = \alpha'_s + \delta'_t + v_{ist}$$

which gives

$$Fluctuation_{ist} = |v_{ist}|.$$

Here α_s, α'_s are state (or bank) fixed effects and δ_t, δ'_t are time fixed effects. We expect β<0 in (7), that is, core deposits fluctuate less for banks with better service quality.

Table 6 presents the estimation results using the continuous and discrete measures of service quality as in Table 5. Panel A presents the results for (6); the sum of interaction terms $\sum_{j=0}^{4} \lambda_j$ is positive and significant in all the specifications as predicted. Panel B presents the results for (7); signs are as anticipated in all specifications such that core deposits fluctuate less for banks with higher $ServiceQuality$, although the coefficient is not significant when using the continuous $ServiceQuality$ measure along with state fixed effects instead of bank fixed effects (specification (1)).

C. Service quality and loan quality

We next examine Prediction 5, the relationship between service quality and asset-side risk-taking (loan quality). Specifically, we test whether β_1 in the following specifications are positive:

$$AssetInterestRate_{ist} = \alpha_s + \delta_t + \beta_1 ServiceQuality_{ist-1} + \Upsilon X_{ist-1} + \varepsilon_{ist}$$

$$LoanQuality_{ist} = \alpha_s + \delta_t + \beta_1 ServiceQuality_{ist-1} + \Upsilon X_{ist-1} + \varepsilon_{ist}$$

where asset interest rate is defined by interest income divided by interest-earning assets, and loan quality variables include non-performing loan ratio, net charge-off ratio, and loan loss provision ratio, all normalized by total loans.

As our loan quality measures are greater for banks with worse quality loans, the positive β_1 for the loan quality regressions implies worse quality lending and more risk-taking when combined with the positive β_1 for the asset interest rate regression. We also examine whether this could be related to the agency problem. If the greater risk-taking is owing to missing market discipline, this agency problem should be less severe if the bank is well capitalized. We try to capture this effect by adding the interaction term of service quality and capital ratio, $\beta_2 ServiceQuality_{ist-1} * CapitalRatio_{ist-1}$, where we expect β_2 to be negative.

Table 7 presents the estimation results. As can be seen in Panel A, service quality is positively correlated with the asset interest rate, which, when combined with the lower funding cost, indeed improves the net interest margin (not reported in the paper). Our results in Panel B, C, and D of Table 7 suggest that this higher yield might be a product of more risk-taking rather than better asset management; service quality is also positively correlated with (negative) measures of lending quality: non-performing loan ratio (Panel B), net charge-off rates (Panel C), and loan loss provision ratio (Panel D), and this relationship is stronger when we control for different bank business models. We also find similar deterioration effects on Z-score (Panel E) and ROA (not reported), indicating a negative correlation between the service quality and overall bank soundness. Evaluating economic significance, a one standard deviation increase in service quality is associated with an increase in the non-performing loan ratio by 0.17~0.24, depending on the specification, which is 21%~30% of the median non-performing loan ratio, 0.8.

[Table 7 here]

Note that this relationship weakens for a more capitalized bank, evidenced by the negative coefficients of the interaction term between service quality and capital ratio, which are significant for all specifications (column 3, 6, and 9 with different sets of fixed effects) in Panel A, C, and D, while the results are less clear in Panel B and E. Thus, we interpret this result as an indication of low quality lending due to the agency problem. Depositors appreciate extra services and as a result, become less willing to switch banks. This decreased surveillance could lead to excessive risk-taking, but a higher capital ratio could mitigate this problem. Further examining if the creditors of the better-service-quality banks are less attentive to the bank soundness, we now look at the risk pricing of bank funding and its relationship to service quality.

D. Service quality and risk pricing

In examining Prediction 6, we estimate the following:

$$FundingCost_{ist} - Tbill\ rate_t = \alpha_i + \beta_1\ ServiceQuality_{ist-1} + \beta_2 Soundness_{ist-1} + \beta_3\ ServiceQuality_{ist-1} * Soundness_{ist-1} + \gamma X_{ist-1} + \varepsilon_{ist}$$

where $Tbill\ rate_t$ is a 6-month T-bill rate at time *t* to control for time-varying risk free rates, and *Soundness* includes bank-level soundness characteristics (Tier 1 capital ratio, NPL ratio, standard deviation of ROA based on previous 8 quarters, and ROA). We focus on the signs of β_2 and β_3, examining whether high service quality alleviates sensitivity of risk pricing (and thus risk monitoring). Again, we examine three different funding costs: (i) total liability interest rate, (ii)

deposit interest rate, and (iii) core deposit interest rate. The first case examines how the funding cost of the bank as a whole varies in order to capture the monitoring intensity at the entity level.[17] The last case, as discussed previously, looks at the more homogeneous funding class exclusively, aside from the extensive margin funding composition effect, which is a more direct test on whether core depositors become less concerned with bank soundness when provided better quality services. We include bank fixed effects as we now focus on within-a-bank variation of its funding cost in response to its riskiness, rather than comparison to local counterparts.

[Table 8 here]

Table 8 presents our estimation results of risk pricing sensitivity. Funding cost – measured as a risk premium over the 6-month T-bill rate – increases if a bank holds more non-performing loans, has lower ROA, or has a higher volatility in ROA; but the signs of the interaction terms are opposite at the 1% significance level, that is, price sensitivity of risk becomes attenuated for banks providing better services. This is true even for the core deposit interest rate, controlling for the funding composition or deposit insurance protection effect, implying that core depositors impose less surveillance when better services are provided. The estimated coefficients of the interaction term between the service quality and the capital ratio, however, are not statistically significant.

[17] In this case, we don't consider any differences in monitoring intensity at the creditor level. All we try to capture is whether risk pricing becomes less sensitive when spending more on service provisions, regardless of the underlying mechanism (e.g. substitution of uninsured deposits with insured deposits, less reliance on wholesale funding).

V. Robustness

A. Instrumental variable estimation

In this subsection, we present an IV estimation result to mitigate concerns on reverse causality. Our main argument is that service provision impairs market discipline by increasing switching cost and loyalty of depositors, which leads to risky lending. However, it could be possible that banks that are suffering from their worse performing loans choose to invest more in service provision in order to attract retail funding as it becomes more costly for them to access market funding. Alternatively, they might simply need to hire more employees to monitor these non-performing loans. Both of these would lead to a positive association between our measure of service quality and asset quality.

In order to mitigate this reverse causality problem, we estimate the following 2SLS. In our first stage, we use the ratio of service expenditure to total assets 5 years *prior to* our sample period ($\overline{ServiceQuality}_{1990}$, averaging over 1990Q1 to 1990Q4) as an instrument for the actual service quality measures between 1995 and 2014. Our identification assumption is that this stale expenditure, which is chosen long before our sample period starts, should be independent from the innovations to bank performance in the future (e.g., shocks to the bank's loan quality unexplained by the fixed effects and included controls).

Table 9 presents the IV estimation results. The instrument is powerful, as evidenced by the first-stage results, and the empirical results are similar. Coefficients for the non-performing loan ratio on the service quality are actually greater under the IV estimation (0.418 and 0.307, column (7) and (8)) than simple OLS (0.274 and 0.269, column (5) and (8) of Table 7, Panel B). There is an obvious limitation with this IV approach; the exclusion restriction would be violated if both bank asset quality and service expenditures are very persistent. However, the bank-level

ServiceQuality measure in our sample is not too persistent and the degree of persistency varies across the banks.[18] Nonetheless, this IV regression result should be interpreted with caution and we don't attempt to claim that this is a critical evidence of a causal relationship. Again, our more modest goal of the paper is to provide a snapshot of a local banking market, observed in equilibrium when taking the service quality across the banks as given, and present the paradoxical relationship between the service quality, asset quality, and funding cost.

[Table 9 here]

B. Alternative measures of bank service quality

In this subsection, we adopt alternative measures of service quality. Recall that our preferred choice of service-related expense includes salaries, premises and fixed asset expenses, and "other" non-interest expenses. Although we don't have more granular information on "other" expenses for all banks, memoranda of Schedule RI-E in Call Reports provides some information of its decomposition.[19] Among those, we only pick up entries directly related to services, i.e., advertising (RIAD0497), ATM (RIADF558), and postage expenses (RIAD8403),

[18] We first estimate $ServiceQuality_{it} = \alpha_i + \beta_i ServiceQuality_{it-1} + \varepsilon_{it}$ for each bank indexed by i, and the 25, 50, and 75 percentile of the estimates for β_i are 0.15, 0.50, and 0.77. We also estimate $ServiceQuality_{it} = \alpha_i + \alpha_t + \beta \ ServiceQuality_{it-1} + \varepsilon_{it}$, and the estimate for $\beta = 0.64$.

[19] The limitation is that banks are required to report these granular expenses only if the amount of that subcategory is greater than $25,000 and exceeds 3 percent of total "other" non-interest expenses. Kovner, Vickery, and Zhou (2014) analyze the FR-Y9C data from 2008 to 2012 and report the decomposition of "other noninterest expenses" by manually classifying them into subcategories. According to their calculations, corporate overhead (18.63%), information technology and data processing (12.63%), consulting and advisory (11.07%) are the top 3 classified components of "other noninterest expense" for the industry aggregate, while 33.80% were "Unclassified". Note that they don't limit their samples to small community banks like our analysis.

instead of using total "other" non-interest expenses. The downside is that for each of these subcategories, approximately 70% of our sample lists it as 0. For those bank-quarter samples that have non-zero values for the aforementioned entries, the correlation between our preferred measure of service quality and this alternative measure of service quality is 0.95, which implies that we don't lose much generality by assuming that "other" expenses reflect service-related expenses. Our empirical results are similar when we use this more narrowly-defined measure of service quality (See Panel A of Table 10, Column 1,4,7,10 for the subset of the results).

[Table 10 here]

Salaries might not be a good measure if this reflects the different loan quality or different business models (e.g., a bank might need to hire more employees simply to monitor its non-performing loans, rather than providing better services) although we tried to solve this issue with the IV in our previous subsection. In order to mitigate this concern, we further exclude salary expenses from the above measure; thus service quality is now defined by the ratio of even narrower service-related expenses (i.e., premises and fixed assets, advertising, ATM, and postage expenses) to total assets. Our empirical results are still similar when we instead adopt this new measure of service quality (See Panel A of Table 10, Column 2,5,8,11 for the subset of the results; however, the coefficient on the liquid asset ratio is not significant).

C. MSA fixed effects

Our empirical analysis has been based on the cross-sectional comparison of small banks within a state. In order to capture the local market characteristics more tightly, we include MSA

or MSA-time fixed effects instead. The downside is that we lose close to 20% of our sample as these banks are not headquartered in MSA areas. Our results are similar (See Panel A of Table 10, Column 3,6,9,12 for the subset of the results; however, the coefficient on the liquid asset ratio is not significant).

D. Differential effects with demographic variation

In this subsection, we exploit the regional demographic variation to better identify the existence of our mechanism, focusing on the difference in the fraction of seniors (older than 65) across MSAs. Our argument is as follows. Seniors, who mostly consume their accumulated savings as retirees, use bank deposit accounts primarily for the purpose of "storage" compared to non-seniors, who would be more sensitive to "investment" incentives and thus more yield-seeking. This implies that in MSAs with more seniors, service quality (e.g. proximity to a branch or ATM) would matter more to potential customers and thus our predicted effects would be more evident. Again, our underlying assumption is that a bank in our sample operates in a single MSA in which its headquarters is located.

Panel B of Table 10 reports our estimation results. Our main term of interest is the interaction of the fraction of seniors and the service quality ("*Senior Share*Service Quality*"). As anticipated, better-quality-service is associated with larger core deposit ratios, lower funding cost (core deposit interest rates), and fewer liquid assets, and this is more pronounced in MSAs with more seniors. However, we don't find a significant difference in the case of loan quality, which could reflect that there is less demand for loans in a region with more seniors (Han, Park, and Pennacchi 2015), and thus loans ex ante tend to be more homogeneous. This ex ante loan quality

homogeneity would make it harder for us to detect the effect of service quality on loan quality in those regions using our regression specification.

VI. Conclusion

Our paper provides a novel economic argument on how the service quality of a bank could affect its funding structure, funding cost, funding liquidity risks, and financial stability. Using the panel data of community banks, we document the cross-sectional relationship that our hypotheses predict in a local banking market: banks spending more on services acquire more sticky core deposits, pay less for their funding (both for total liabilities and for core deposits, exclusively), but hold lower-quality loans. This combination of cheaper funding cost with worse soundness suggests that underlying risk might not be correctly priced for banks with better service provision. We argue that the last result might be due to the agency problem being exacerbated by the decreased surveillance by "loyal" creditors. Overall, this result suggests that "too stable" funding could impair the market discipline imposed on bank managers.

One obvious limitation of our analysis is the measurement of service quality. We assume that higher service-related expenditures reflect better service quality, but those additional costs could be simply reflecting operational inefficiencies.[20] However, the inefficiency argument alone does not explain how inefficient banks could attract more core deposits with lower funding costs, nor does it provide implications on funding stickiness and agency problems; on the other hand, this paper focuses on the tradeoff between these expenses and corresponding benefits, as well as the implications on financial stability, which are not explored in the banking literature.

[20] See the literature on bank cost efficiency (e.g., Berger and Humphrey 1991, Berger, Hunter, and Timme 1993, Berger and Mester 1997, Berger and DeYoung 1997) in which operating expenses including our service expenditures are considered as an "input" in the input/output analysis.

Improving the service quality measurement for a clearer identification would be the goal for future research.

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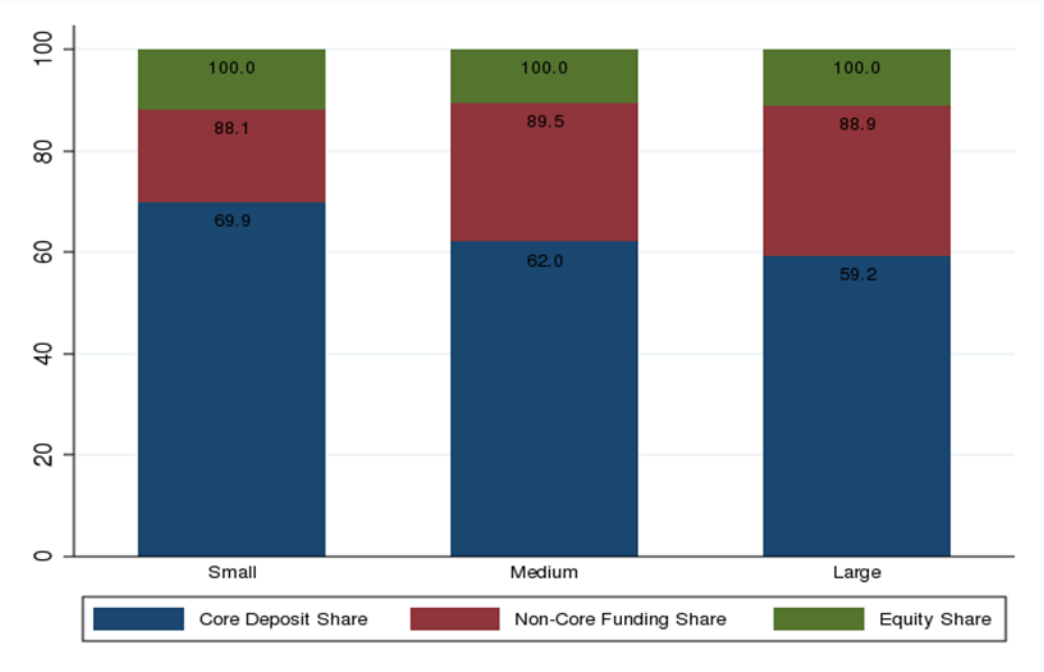
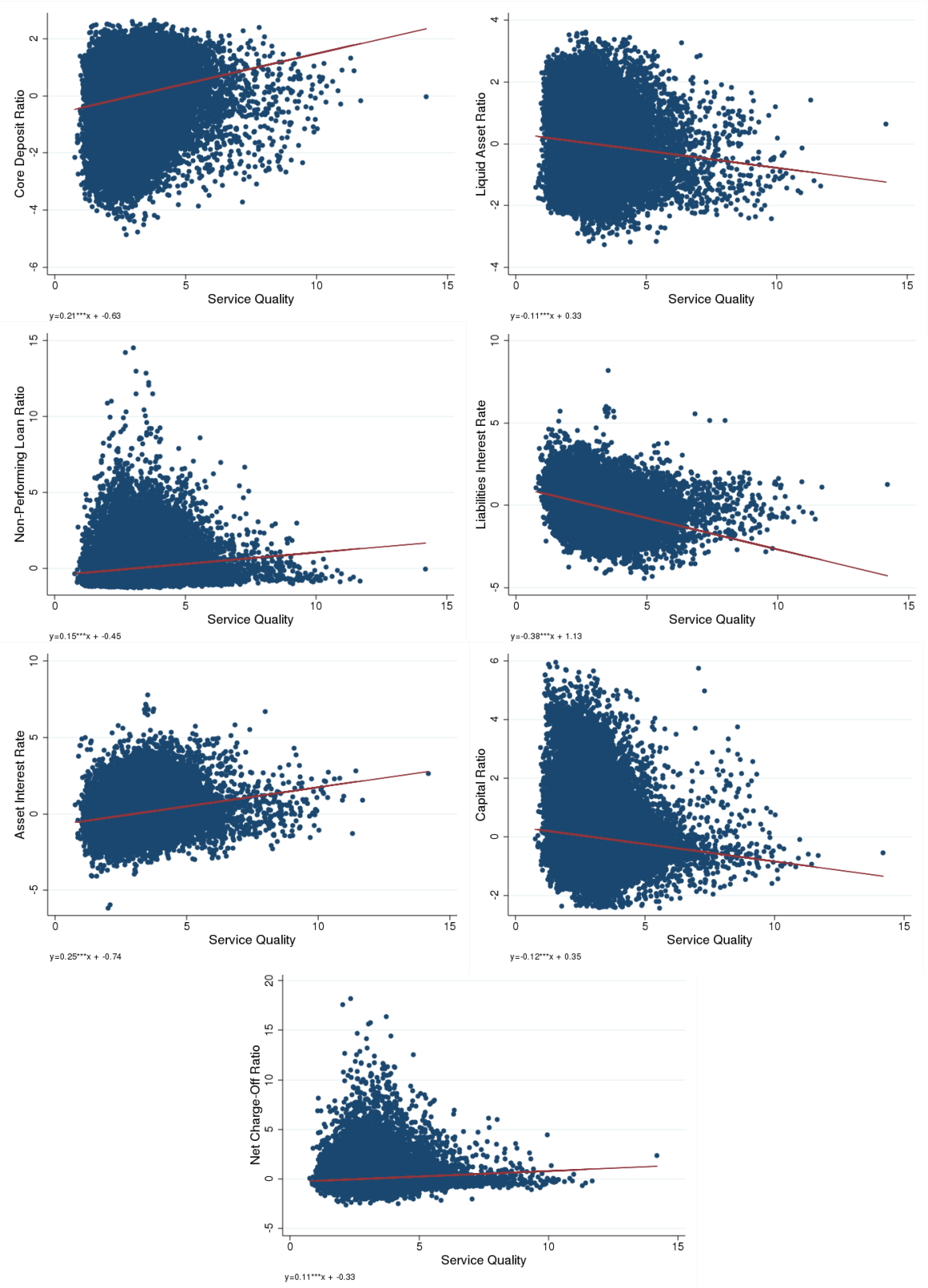
Figure 1: Bank liability decomposition (aggregated)



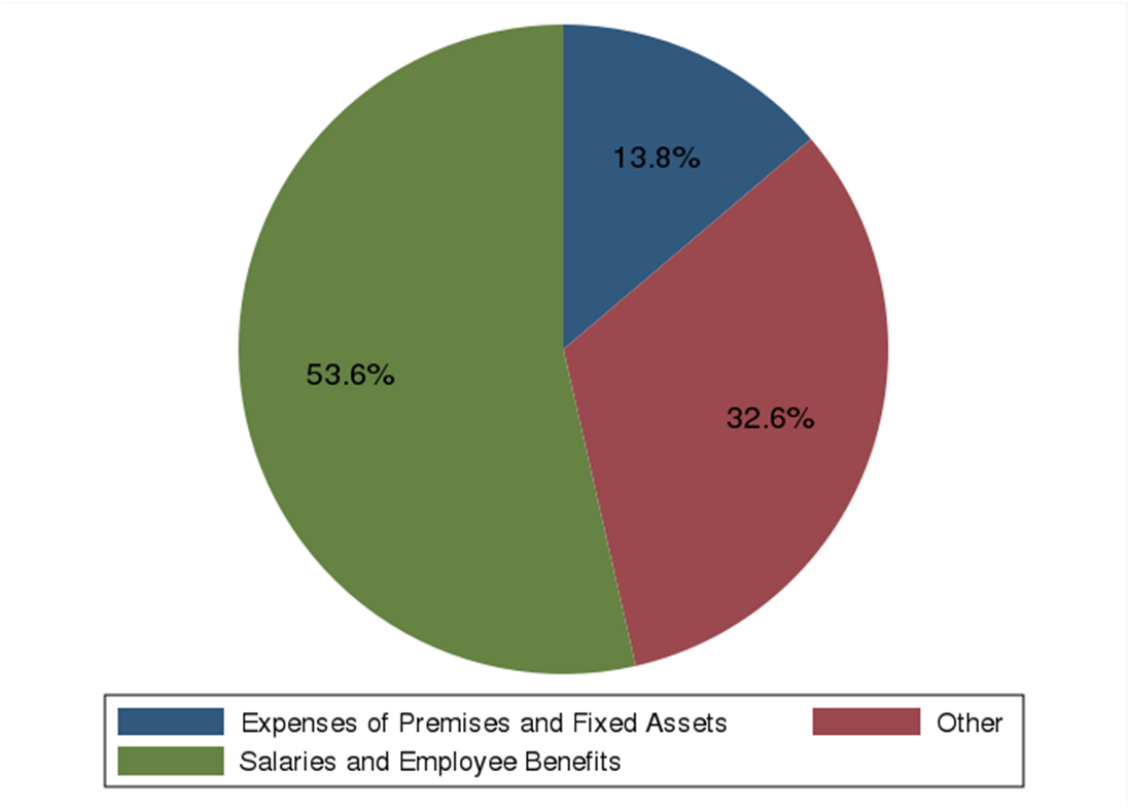
Note: This figure presents bank funding decomposition by size category. All shares are calculated by taking the average shares of all entities from 1995 to 2014, by size category. Shares are based on a percentage of total liabilities, which includes equity and noncontrolling interest. Core Deposits are measured as total deposits net of large time deposits (>$100k). Equity is measured as book equity and noncontrolling interest. Non-Core Funding is measured as total liabilities net of core deposits and equity. Small Banks are considered to be those that are under 1 billion of assets; Medium Banks are those that are between 1 billion and 50 billion in assets; and Large Banks are those that are in excess of 50 billion in assets. Data is based on Call Reports from 1995 to 2014.

Figure 2: Cross-sectional relationship between Service Quality and Selected Bank Characteristics



Note: This figure presents univariate analysis of the relationship between bank service quality (measured by relevant non-interest expenses divided by total assets) and the following bank characteristics: (1) core deposit ratio (Top left); (2) liquid asset ratio (Top right); (3) non-performing loan ratio (2nd row left); (4) liabilities interest rate (2nd row right); (5) asset interest rate (3rd row left); (6) capital ratio (3rd row right); and (7) net charge-off ratio (bottom row). Core deposit ratio is core deposits divided by total assets. Liquid asset ratio is liquid asset holdings (cash, securities, fed funds lending and reverse-repo) divided by total assets. NPL ratio and NCO ratio are normalized by total loans. Liabilities interest rate is total interest expenses divided by average total liabilities. Asset interest rate is interest income divided by total interest-earning assets. *X*-axis variable is bank-level service quality. Based on Call Reports of community banks with total assets between $250 million and $1 billion, from 1995Q1 to 2014Q4. All y variables are demeaned and standardized using the quarterly cross-sectional means and standard deviations. OLS regression results are reported and ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Figure 3: Decomposition of Non-Interest Expenses for Service Expenditures (aggregated)



Note: This figure presents decomposition of the service-related "non-interest expenses". Component shares are the average shares of all entities from 1995Q1 to 2014Q4. Based on Call reports from 1995Q1 to 2014Q4, focusing on community banks with total assets between $250 million and $1 billion. "Other" includes Data processing expenses; Advertising and marketing expenses; Directors' fees; Printing, stationery, and supplies; Postage; Legal fees and expenses; FDIC deposit insurance assessments; Accounting and auditing expenses; Consulting and advisory expenses; ATM and interchange expenses; and Telecommunications expenses.

Table 1: Summary Statistics

The statistics below describe the bank-quarter dataset from the Call reports, which encompasses all quarters between 1995 and 2014 (69,848 observations). Bank-quarter variables include: *NPL Ratio* is the ratio of non-performing loans to total loans; *Loan Loss Provision Ratio* is the ratio of quarterly loan loss provisions to total loans; *Z-score* is measured as the sum of the annualized return on assets (ROA) and the capital ratio, normalized by a rolling 8-quarter standard deviation of ROA; *NCO Rate* is the annualized quarterly net-charge offs normalized by total loans; *ROA* is the bank's return on assets, measured as annualized net income normalized by total assets; *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets; *Log(Assets)* is the natural logarithm of total assets; *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets; *Core Deposit Ratio* is the ratio of core deposits to total assets; *Liquid Assets Ratio* is the ratio of liquid assets to total assets, where liquid assets include cash, securities, reverse repo and fed funds lending; *Deposit Rate* is the annualized quarterly interest expense on deposits normalized by average total deposits; *Liabilities Rate* is the annualized quarterly interest expense on liabilities normalized by average total liabilities; *Core Deposit Rate* is the annualized quarterly interest expense on core deposits normalized by average total core deposits; *Assets Interest Rate* is the annualized quarterly interest income normalized by interest-earning assets; *Net Interest Margin* is measured as the annualized net interest income normalized by interest-earning assets; *% Growth in Deposits* is the quarterly growth rate in total deposits; *Real Estate Loans (%)* is the share of real estate loans in the bank's loan portfolio; *C&I Loans(%)* is the share of commercial and industrial loans in the bank's loan portfolio; *Small Business C&I Loans (%)* is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)* is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)* is the share of small agricultural/farm loans in the bank's portfolio.

Descriptive Statistics						
	Mean	SD	p25	p50	p75	N
NPL Ratio	1.4	1.8	0.4	0.8	1.7	69890
Loan Loss Provision Ratio	0.1	0.2	0.0	0.1	0.1	69890
Z-score	54.8	39.9	25.3	46.4	74.8	69440
NCO Rate	0.4	0.7	0.0	0.1	0.4	69890
ROA	1.0	0.7	0.7	1.1	1.4	69890
Service Quality	3.0	0.8	2.4	2.9	3.4	69890
Log(Assets)	13.0	0.4	12.6	12.9	13.2	69890
Tier 1 Capital Ratio	12.5	3.1	10.2	11.8	14.0	67859
Core Deposit Ratio	68.5	9.1	62.9	69.5	75.3	69890
Liquid Assets Ratio	26.4	10.2	18.7	25.9	33.6	69890
Deposit Rate	2.1	1.2	1.0	2.0	3.2	69890
Liabilities Rate	2.2	1.2	1.1	2.1	3.3	69890
Core Deposit Rate	1.9	1.2	0.9	1.7	2.8	69890
Assets Interest Rate	6.2	1.4	5.1	6.1	7.4	69890
Net Interest Margin	4.1	0.7	3.6	4.0	4.5	69890
% Growth in Deposits	1.5	3.6	-0.9	1.3	3.6	69889
Real Estate Loans (%)	72.7	14.0	64.1	74.9	83.3	69890
C&I Loans (%)	12.3	10.2	4.3	11.3	18.2	69890
Small Business C&I Loans (%)	4.4	6.0	0.0	0.0	8.0	69890
Small Business CRE Loans (%)	7.1	8.9	0.0	0.0	13.8	69890
Small Farm Loans (%)	2.1	5.8	0.0	0.0	0.5	69890

Table 2: Funding Composition

This table presents our estimation results of Regression (1). The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variable is *Core Deposit Ratio*, the ratio of core deposits to total assets. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. *Log(Assets)* is the natural logarithm of total assets. *Core Deposit Interest Rate* is the annualized quarterly interest expense on core deposits normalized by average core deposits. Business Model Controls include the following: *C&I Loans (%)*, which is the share of commercial and industrial loans in the bank's loan portfolio; *Real Estate Loans (%)*, which is the share of real estate loans in the bank's loan portfolio; *Small Business C&I Loans (%)*, which is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)*, which is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)*, which is the share of small agricultural/farm loans in the bank's portfolio; and *Unused Commitment Ratio*, which is the ratio of unused commitments to total assets. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Column (1) to (4) include time fixed effects, (5) to (8) include state and time fixed effects, (9) to (12) include state*time fixed effects. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Core Deposit Ratio											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Service Quality	1.972***	1.566***	1.945***	1.559***	2.101***	1.769***	2.096***	1.773***	2.112***	1.805***	2.097***	1.800***
	(0.194)	(0.199)	(0.192)	(0.196)	(0.197)	(0.197)	(0.195)	(0.195)	(0.205)	(0.205)	(0.203)	(0.203)
Log(Assets)	-1.670***	-1.840***	-0.928**	-1.011***	-1.778***	-1.929***	-1.008***	-1.098***	-1.665***	-1.814***	-0.878**	-0.969***
	(0.329)	(0.325)	(0.363)	(0.358)	(0.318)	(0.312)	(0.349)	(0.343)	(0.323)	(0.319)	(0.359)	(0.354)
Core Deposit Interest Rate		-2.051***		-2.025***		-2.119***		-2.104***		-2.046***		-2.055***
		(0.298)		(0.295)		(0.302)		(0.297)		(0.326)		(0.320)
Observations	60373	60373	60373	60373	60373	60373	60373	60373	60373	60373	60373	60373
R^2	0.157	0.168	0.166	0.177	0.229	0.239	0.235	0.245	0.288	0.296	0.293	0.301
Adj R^2	0.156	0.167	0.165	0.176	0.227	0.237	0.233	0.243	0.239	0.248	0.245	0.254
Business Model Controls			Y	Y			Y	Y			Y	Y
State FE					Y	Y	Y	Y				
State * Quarter FE									Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y				

Table 3: Funding Costs

This table presents our estimation results of Regression (2). The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variable in Panel A is *Liabilities Rate*, the annualized quarterly interest expense on liabilities normalized by average total liabilities; the dependent variable in Panel B is *Deposit Rate*, the annualized quarterly interest expense on deposits normalized by average total deposits; the dependent variable in Panel C is *Core Deposit Rate*, the annualized quarterly interest expense on core deposits normalized by average total core deposits; and the dependent variable in Panel D is *Non-Core Deposit Rate – Core Deposit Rate*, the difference between the Non-Core Deposit Rate and the Core Deposit Rate, where the Non-Core Deposit Rate is defined as the annualized quarterly interest expense on large time deposits normalized by average total large time deposits. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. *Log(Assets)* is the natural logarithm of total assets. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *NPL Ratio* is the ratio of non-performing loans to total loans. *NCO Rate* is the annualized quarterly net-charge offs normalized by total loans. *Liquid Assets Ratio* is the ratio of liquid assets to total assets, where liquid assets include cash, securities, reverse repo and fed funds lending. *ROA* is the bank's return on assets, measured as annualized net income normalized by total assets. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Column (1) to (3) include time fixed effects, (4) to (6) include state and time fixed effect, (7) to (9) include state*time fixed effects. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Liabilities Rate								
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	-0.201***	-0.223***	-0.248***	-0.164***	-0.188***	-0.217***	-0.159***	-0.183***	-0.212***
	(0.012)	(0.012)	(0.013)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)
Log(Assets)	-0.047***	-0.087***	-0.069***	-0.032*	-0.075***	-0.057***	-0.034**	-0.077***	-0.060***
	(0.018)	(0.017)	(0.016)	(0.017)	(0.016)	(0.015)	(0.017)	(0.017)	(0.016)
Tier 1 Capital Ratio		-0.036***	-0.012***		-0.034***	-0.012***		-0.034***	-0.013***
		(0.003)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)
NPL Ratio		0.030***	0.014***		0.030***	0.015***		0.030***	0.017***
		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)
NCO Rate		0.029***	-0.015**		0.017***	-0.025***		0.020***	-0.019***
		(0.005)	(0.006)		(0.005)	(0.005)		(0.004)	(0.005)
Liquid Assets Ratio			-0.011***			-0.011***			-0.010***
			(0.001)			(0.001)			(0.001)
ROA			-0.175***			-0.177***			-0.170***
			(0.011)			(0.010)			(0.011)
Observations	60373	58657	58657	60373	58657	58657	60373	58657	58657
R^2	0.865	0.872	0.883	0.885	0.890	0.900	0.898	0.903	0.911
Adj R^2	0.865	0.871	0.883	0.885	0.890	0.900	0.891	0.896	0.905
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

	Deposit Rate								
Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	-0.197***	-0.217***	-0.241***	-0.165***	-0.186***	-0.215***	-0.160***	-0.182***	-0.210***
	(0.012)	(0.012)	(0.012)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
Log(Assets)	-0.089***	-0.125***	-0.107***	-0.077***	-0.115***	-0.097***	-0.079***	-0.117***	-0.100***
	(0.017)	(0.016)	(0.015)	(0.016)	(0.016)	(0.015)	(0.017)	(0.016)	(0.015)
Tier 1 Capital Ratio		-0.032***	-0.008***		-0.031***	-0.008***		-0.031***	-0.009***
		(0.003)	(0.003)		(0.002)	(0.003)		(0.003)	(0.003)
NPL Ratio		0.027***	0.012***		0.026***	0.013***		0.026***	0.014***
		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)
NCO Rate		0.031***	-0.010*		0.017***	-0.024***		0.019***	-0.018***
		(0.005)	(0.006)		(0.005)	(0.005)		(0.004)	(0.005)
Liquid Assets Ratio			-0.012***			-0.011***			-0.011***
			(0.001)			(0.001)			(0.001)
ROA			-0.164***			-0.170***			-0.163***
			(0.011)			(0.010)			(0.010)
Observations	60373	58657	58657	60373	58657	58657	60373	58657	58657
R^2	0.866	0.870	0.882	0.884	0.888	0.898	0.898	0.901	0.910
Adj R^2	0.865	0.870	0.882	0.884	0.888	0.898	0.891	0.895	0.904
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

	Core Deposit Rate								
Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	-0.197***	-0.214***	-0.237***	-0.156***	-0.176***	-0.203***	-0.149***	-0.169***	-0.194***
	(0.012)	(0.012)	(0.012)	(0.010)	(0.011)	(0.011)	(0.010)	(0.011)	(0.011)
Log(Assets)	-0.082***	-0.115***	-0.098***	-0.070***	-0.105***	-0.089***	-0.071***	-0.107***	-0.092***
	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)	(0.015)
Tier 1 Capital Ratio		-0.030***	-0.008***		-0.028***	-0.008***		-0.029***	-0.010***
		(0.003)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
NPL Ratio		0.024***	0.010***		0.025***	0.012***		0.023***	0.012***
		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)
NCO Rate		0.026***	-0.013**		0.016***	-0.023***		0.017***	-0.018***
		(0.005)	(0.006)		(0.005)	(0.005)		(0.005)	(0.005)
Liquid Assets Ratio			-0.011***			-0.010***			-0.009***
			(0.001)			(0.001)			(0.001)
ROA			-0.155***			-0.160***			-0.151***
			(0.011)			(0.010)			(0.010)
Observations	60373	58657	58657	60373	58657	58657	60373	58657	58657
R^2	0.843	0.846	0.857	0.866	0.868	0.877	0.882	0.883	0.891
Adj R^2	0.843	0.846	0.856	0.866	0.867	0.877	0.874	0.876	0.883
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

	Non-Core Deposit Rate − Core Deposit Rate								
Panel D	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	0.123***	0.127***	0.135***	0.112***	0.120***	0.131***	0.100***	0.109***	0.119***
	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
Log(Assets)	0.028	0.035	0.029	0.036	0.047**	0.040*	0.036	0.047**	0.041*
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Tier 1 Capital Ratio		0.007**	-0.000		0.008**	-0.001		0.008***	0.002
		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)
NPL Ratio		-0.014***	-0.009**		-0.019***	-0.013***		-0.016***	-0.011**
		(0.004)	(0.004)		(0.004)	(0.004)		(0.004)	(0.004)
NCO Rate		-0.011	0.004		-0.008	0.009		-0.006	0.008
		(0.007)	(0.008)		(0.007)	(0.007)		(0.007)	(0.007)
Liquid Assets Ratio			0.004***			0.004***			0.003***
			(0.001)			(0.001)			(0.001)
ROA			0.058***			0.071***			0.061***
			(0.014)			(0.014)			(0.014)
Observations	60369	58653	58653	60369	58653	58653	60369	58653	58653
R^2	0.320	0.330	0.331	0.335	0.346	0.348	0.393	0.400	0.401
Adj R^2	0.319	0.329	0.331	0.334	0.344	0.346	0.351	0.360	0.362
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Table 4: Asset Liquidity

This table presents our estimation results of Regression (3). The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variable is *Liquid Assets Ratio*, the ratio of liquid assets to total assets, where liquid assets include cash, securities, reverse repo and fed funds lending. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. *Log(Assets)* is the natural logarithm of total assets. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *Core Deposit Ratio* is the ratio of core deposits to total assets. Business Model Controls include the following: *C&I Loans (%)*, which is the share of commercial and industrial loans in the bank's loan portfolio; *Real Estate Loans (%)*, which is the share of real estate loans in the bank's loan portfolio; *Small Business C&I Loans (%)*, which is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)*, which is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)*, which is the share of small agricultural/farm loans in the bank's portfolio; and *Unused Commitment Ratio*, which is the ratio of unused commitments to total assets. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Column (1) to (2) include time fixed effects, (3) to (4) include state and time fixed effects, (5) to (6) include state*time fixed effects. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Liquid Assets Ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
Service Quality	-0.735***	-0.535***	-0.855***	-0.590***	-0.922***	-0.631***
	(0.207)	(0.176)	(0.204)	(0.176)	(0.208)	(0.182)
Log(Assets)	0.269	1.608***	-0.228	1.321***	-0.045	1.454***
	(0.434)	(0.374)	(0.424)	(0.365)	(0.437)	(0.371)
Tier 1 Capital Ratio		1.457***		1.425***		1.453***
		(0.049)		(0.048)		(0.051)
Core Deposit Ratio		0.176***		0.174***		0.161***
		(0.017)		(0.017)		(0.018)
Observations	60373	58657	60373	58657	60373	58657
R^2	0.177	0.365	0.229	0.399	0.287	0.447
Adj R^2	0.176	0.364	0.227	0.398	0.239	0.410
Business Model Controls	Y	Y	Y	Y	Y	Y
State FE			Y	Y		
State * Quarter FE					Y	Y
Quarter FE	Y	Y	Y	Y		

Table 5: Bank Lending Channel

The table presents the results of the regression analyses of bank service quality and bank lending in response to changes in the monetary policy stance, captured by the changes in the federal funds rate. The approach is similar to the two-step regression approach from Kashyap and Stein (2000). The first-step (Regression (4), results not reported) is an autoregressive model, AR(4), in which the dependent variable is the log change of a loan category (total loan, real estate loan, or C&I loan) and the independent variables include lagged service quality and state fixed effects. For columns with "Continuous SQ Measure" service quality ("$ServiceQuality_{ist-1}$") is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. For columns with "Discrete SQ Measure", we use a discrete measure of bank-level service quality; $ServiceQuality_{ist} = 1$ if bank i's non-interest expense to asset ratio is above the median among all the sample banks in that time period, and 0 otherwise. This regression is run each quarter and the coefficients on service quality are kept to form a time series. The second-step (Regression (5)) regresses these coefficients on 4 lags of the change in the federal funds rate, and on a time trend. We also include 4 lagged terms of the change in Real GDP as macroeconomic controls, for columns with "Macro Controls; 2nd step". The panels below present estimation results for Total Loans (first panel), Real Estate Loans (second panel), and C&I Loans (third panel). Coefficients on the 4 lags of the change in the federal funds rate (ΔFF_{t-j}, where j = 1,…,4) in the 2nd step, as well as their sum, are reported (i.e., $\sum_{j=1}^{4} \mu_j$ in Regression (5)), as well as p-values for the two-sided t-tests using HAC standard errors in parentheses, where *, **, and *** correspond to below 10%, 5%, and 1% significance, respectively. Sample ranges from 1995:Q1 to 2007:Q2.

Panel A: monetary policy and total loan growth

	Total Loans			
	Continuous SQ Measure		Discrete SQ Measure	
	No Macro Controls; 2nd Step	Macro Controls; 2nd Step	No Macro Controls; 2nd Step	Macro Controls; 2nd Step
Δ(t-1) fed funds rate	0.00120**	0.00124	0.00146**	0.00136
	(0.00046)	(0.00085)	(0.00059)	(0.00085)
Δ(t-2) fed funds rate	0.00040	0.00103	0.00006	0.00052
	(0.00063)	(0.00070)	(0.00074)	(0.00072)
Δ(t-3) fed funds rate	0.00074	0.00028	0.00123**	0.00111*
	(0.00051)	(0.00050)	(0.00051)	(0.00060)
Δ(t-4) fed funds rate	-0.00006	0.00010	0.00039	0.00036
	(0.00041)	(0.00051)	(0.00046)	(0.00058)
Sum of Federal Funds Terms:	.0022823	.0026527	.0031387	.0033517
2-sided p-value:	.05	.02	.04	.08

Panel B: monetary policy and real estate loan growth

	Real Estate Loans			
	Continuous SQ Measure		Discrete SQ Measure	
	No Macro Controls; 2nd Step	Macro Controls; 2nd Step	No Macro Controls; 2nd Step	Macro Controls; 2nd Step
Δ(t-1) fed funds rate	0.00106	0.00091	0.00138**	0.00133
	(0.00064)	(0.00126)	(0.00065)	(0.00102)
Δ(t-2) fed funds rate	0.00003	0.00048	-0.00060	-0.00007
	(0.00075)	(0.00091)	(0.00081)	(0.00099)
Δ(t-3) fed funds rate	0.00126**	0.00064	0.00209***	0.00156
	(0.00053)	(0.00068)	(0.00064)	(0.00097)
Δ(t-4) fed funds rate	0.00029	0.00036	0.00035	0.00045
	(0.00059)	(0.00078)	(0.00048)	(0.00057)
Sum of Federal Funds Terms:	.0026314	.0023949	.0032182	.003275
2-sided p-value:	.02	.32	.02	.09

Panel C: monetary policy and C&I loan growth

	C&I Loans			
	Continuous SQ Measure		Discrete SQ Measure	
	No Macro Controls; 2nd Step	Macro Controls; 2nd Step	No Macro Controls; 2nd Step	Macro Controls; 2nd Step
Δ(t-1) fed funds rate	-0.00090	-0.00061	-0.00177	-0.00087
	(0.00181)	(0.00218)	(0.00333)	(0.00427)
Δ(t-2) fed funds rate	0.00070	0.00088	0.00137	0.00177
	(0.00132)	(0.00168)	(0.00184)	(0.00292)
Δ(t-3) fed funds rate	0.00040	0.00055	-0.00252*	-0.00175
	(0.00128)	(0.00173)	(0.00128)	(0.00227)
Δ(t-4) fed funds rate	0.00020	-0.00072	0.00041	-0.00054
	(0.00235)	(0.00201)	(0.00320)	(0.00265)
Sum of Federal Funds Terms:	.0003851	.0001065	-.0025109	-.001385
2-sided p-value:	.86	.88	.25	.93

Table 6: Deposit Stickiness

The sample ranges from 1995:Q1 to 2007:Q2 and includes only community banks (250 million to 1 billion in assets). For columns with "Continuous SQ Measure," service quality ("$ServiceQuality_{ist-1}$") is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. For columns with "Discrete SQ Measure," we use a discrete measure of bank-level service quality; $ServiceQuality_{ist} = 1$ if bank i's non-interest expense to asset ratio is above the median among all the sample banks in that time period, and 0 otherwise. Panel A reports regression results of Regression (6):

$$\Delta \log(CoreDeposit_{ist}) = \alpha_s + \sum_{j=0}^{4} \mu_j \Delta FF_{t-j} + \beta\, ServiceQuality_{ist-1} + \sum_{j=0}^{4} \lambda_j (ServiceQuality_{ist-1} * \Delta FF_{t-j}) + \varepsilon_{ist}$$

The dependent variable in Panel A is *Core Deposit Growth Rate*, the log change in core deposits. The regression includes service quality (continuous or discrete), 4 lags of the change in the federal funds rate, as well as the contemporaneous change. The main focus is on the sum of the coefficients on the interaction terms ("Sum of Interaction Terms", i.e., $\sum_{j=0}^{4} \lambda_j$); p-values for the two-sided t-tests on the same set of terms are also reported. The analysis shown in Panel B adopts that of Morgan, Rime, and Strahan (2004). The first-step (not shown) regresses the bank-level log change in core deposits on time and state (or bank) fixed effects. We then define "fluctuation" as the absolute value of the residuals from the first step, and regress them on service quality as well as time and state (or bank) fixed effects in the second step. We only report the coefficient on service quality in the second step (i.e. β of Regression (7)), and standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Panel A: monetary policy and core deposit growth rate

	Core Deposit Growth Rate			
	Continuous SQ Measure		Discrete SQ Measure	
Panel A	(1)	(2)	(3)	(4)
Δ(t) fed funds rate	-0.00739***	-0.00860***	-0.00532***	-0.00582***
	(0.00159)	(0.00170)	(0.00055)	(0.00058)
Δ(t-1) fed funds rate	0.00008	-0.00131	-0.00160***	-0.00190***
	(0.00137)	(0.00151)	(0.00051)	(0.00055)
Δ(t-2) fed funds rate	-0.00117	-0.00265*	0.00112**	0.00064
	(0.00144)	(0.00151)	(0.00052)	(0.00054)
Δ(t-3) fed funds rate	-0.00087	-0.00258	-0.00065	-0.00110*
	(0.00161)	(0.00173)	(0.00054)	(0.00058)
Δ(t-4) fed funds rate	0.00074	-0.00055	-0.00089	-0.00120**
	(0.00168)	(0.00177)	(0.00056)	(0.00057)
Service Quality	0.00061	0.00358***	0.00021	0.00168
	(0.00042)	(0.00114)	(0.00062)	(0.00115)
Service Quality *	0.00113**	0.00139**	0.00281***	0.00294***
Δ(t) fed funds rate	(0.00051)	(0.00055)	(0.00081)	(0.00085)
Service Quality *	-0.00080*	-0.00035	-0.00161**	-0.00130
Δ(t-1) fed funds rate	(0.00043)	(0.00048)	(0.00074)	(0.00079)
Service Quality *	0.00098**	0.00142***	0.00129*	0.00183**
Δ(t-2) fed funds rate	(0.00046)	(0.00048)	(0.00072)	(0.00075)
Service Quality *	0.00023	0.00074	0.00101	0.00149*
Δ(t-3) fed funds rate	(0.00051)	(0.00055)	(0.00075)	(0.00081)
Service Quality *	-0.00065	-0.00023	-0.00071	-0.00021
Δ(t-4) fed funds rate	(0.00054)	(0.00057)	(0.00079)	(0.00081)
Observations	19329	19329	19329	19329
R^2	0.021	0.150	0.021	0.150
Adj R^2	0.018	0.071	0.018	0.070
Sum of Interaction Terms	**.0009**	**.003**	**.0028**	**.0047**
2-sided p-value	**.024**	**.004**	**.001**	**0**
Entity FE	N	Y	N	Y
State FE	Y	N	Y	N

Panel B: service quality and core deposit fluctuation

	Core Deposit Fluctuation			
	Residuals (Absolute Value)			
	Continuous SQ Measure		Discrete SQ Measure	
Panel B	(1)	(2)	(3)	(4)
Service Quality	-0.00017	-0.00062*	-0.00100***	-0.00064*
	(0.00027)	(0.00034)	(0.00037)	(0.00038)
Observations	60373	60373	60373	60373
R^2	0.041	0.192	0.041	0.192
Adj R^2	0.039	0.148	0.039	0.148
Time FE	Y	Y	Y	Y
State FE	Y		Y	
Entity FE		Y		Y

Table 7: Asset Quality

The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variable in Panel A is *Assets Interest Rate*, the annualized quarterly interest income normalized by interest-earning assets; the dependent variable in Panel B is *NPL Ratio*, the ratio of non-performing loans to total loans; the dependent variable in Panel C is *NCO Rate*, the annualized quarterly net-charge offs normalized by total loans; the dependent variable in Panel D is *Loan Loss Provision Ratio*, the ratio of quarterly loan loss provisions to total loans; and the dependent variable in Panel E is *Z-score*, measured as the sum of the annualized return on assets (ROA) and the capital ratio, normalized by a rolling 8-quarter standard deviation of ROA. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. *Log(Assets)* is the natural logarithm of total assets. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *Core Deposit Ratio* is the ratio of core deposits to total assets. Business Model Controls include the following: *C&I Loans (%)*, which is the share of commercial and industrial loans in the bank's loan portfolio; *Real Estate Loans (%)*, which is the share of real estate loans in the bank's loan portfolio; *Small Business C&I Loans (%)*, which is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)*, which is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)*, which is the share of small agricultural/farm loans in the bank's portfolio; and *Unused Commitment Ratio*, which is the ratio of unused commitments to total assets. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Column (1) to (3) include time fixed effects, (4) to (6) include state and time fixed effect, (7) to (9) include state*time fixed effects. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Assets Interest Rate								
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	0.116***	0.143***	0.279***	0.078***	0.101***	0.237***	0.078***	0.102***	0.233***
	(0.013)	(0.014)	(0.047)	(0.012)	(0.012)	(0.041)	(0.013)	(0.013)	(0.042)
Log(Assets)	-0.162***	-0.141***	-0.140***	-0.158***	-0.141***	-0.140***	-0.159***	-0.141***	-0.140***
	(0.022)	(0.024)	(0.024)	(0.020)	(0.022)	(0.022)	(0.020)	(0.022)	(0.022)
Tier 1 Capital Ratio	-0.040***	-0.039***	-0.008	-0.042***	-0.042***	-0.012	-0.042***	-0.042***	-0.013
	(0.003)	(0.003)	(0.010)	(0.003)	(0.003)	(0.009)	(0.003)	(0.003)	(0.009)
Core Deposit Ratio		-0.013***	-0.013***		-0.010***	-0.010***		-0.010***	-0.010***
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Service Quality *			-0.011***			-0.011***			-0.011***
Tier 1 Capital Ratio			(0.004)			(0.003)			(0.003)
Observations	58657	58657	58657	58657	58657	58657	58657	58657	58657
R^2	0.848	0.853	0.854	0.866	0.870	0.871	0.881	0.885	0.885
Adj R^2	0.847	0.853	0.854	0.866	0.870	0.870	0.873	0.877	0.877
Business Model Controls		Y	Y		Y	Y		Y	Y
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Panel B	NPL Ratio								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	0.214***	0.237***	0.274***	0.238***	0.269***	0.271***	0.232***	0.264***	0.292***
	(0.024)	(0.025)	(0.082)	(0.026)	(0.026)	(0.083)	(0.027)	(0.027)	(0.083)
Log(Assets)	0.140***	0.017	0.017	0.165***	0.074	0.074	0.191***	0.093	0.093
	(0.053)	(0.059)	(0.059)	(0.051)	(0.057)	(0.057)	(0.052)	(0.058)	(0.058)
Tier 1 Capital Ratio	0.006	-0.009	-0.001	0.010	-0.004	-0.003	0.010	-0.004	0.002
	(0.007)	(0.008)	(0.019)	(0.007)	(0.007)	(0.020)	(0.007)	(0.007)	(0.020)
Core Deposit Ratio		-0.012***	-0.012***		-0.011***	-0.011***		-0.011***	-0.011***
		(0.002)	(0.002)		(0.003)	(0.003)		(0.003)	(0.003)
Service Quality *			-0.003			-0.000			-0.002
Tier 1 Capital Ratio			(0.007)			(0.007)			(0.007)
Observations	58657	58657	58657	58657	58657	58657	58657	58657	58657
R^2	0.224	0.261	0.261	0.259	0.292	0.292	0.341	0.366	0.366
Adj R^2	0.223	0.260	0.260	0.257	0.291	0.291	0.298	0.324	0.324
Business Model Controls		Y	Y		Y	Y		Y	Y
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Panel C	NCO Rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	0.052***	0.057***	0.119***	0.057***	0.063***	0.110***	0.054***	0.061***	0.100***
	(0.007)	(0.008)	(0.026)	(0.007)	(0.008)	(0.025)	(0.007)	(0.008)	(0.025)
Log(Assets)	0.080***	0.049***	0.050***	0.091***	0.069***	0.069***	0.097***	0.073***	0.073***
	(0.014)	(0.016)	(0.016)	(0.013)	(0.015)	(0.015)	(0.013)	(0.015)	(0.015)
Tier 1 Capital Ratio	-0.007***	-0.009***	0.005	-0.005***	-0.008***	0.003	-0.006***	-0.008***	0.001
	(0.002)	(0.003)	(0.007)	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.006)
Core Deposit Ratio		-0.004***	-0.004***		-0.003***	-0.003***		-0.003***	-0.003***
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Service Quality *			-0.005**			-0.004*			-0.003
Tier 1 Capital Ratio			(0.002)			(0.002)			(0.002)
Observations	58657	58657	58657	58657	58657	58657	58657	58657	58657
R^2	0.133	0.144	0.145	0.154	0.166	0.166	0.238	0.246	0.247
Adj R^2	0.132	0.143	0.144	0.152	0.164	0.164	0.187	0.196	0.196
Business Model Controls		Y	Y		Y	Y		Y	Y
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Panel D	Loan Loss Provision Ratio								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	0.006***	0.008***	0.024***	0.006***	0.008***	0.022***	0.006***	0.008***	0.021***
	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.006)
Log(Assets)	0.018***	0.012***	0.012***	0.020***	0.016***	0.016***	0.022***	0.018***	0.018***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
Tier 1 Capital Ratio	-0.003***	-0.003***	0.000	-0.003***	-0.003***	0.000	-0.003***	-0.003***	-0.000
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Core Deposit Ratio		-0.001***	-0.001***		-0.001***	-0.001***		-0.001***	-0.001***
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Service Quality *			-0.001***			-0.001***			-0.001**
Tier 1 Capital Ratio			(0.000)			(0.000)			(0.000)
Observations	58657	58657	58657	58657	58657	58657	58657	58657	58657
R^2	0.189	0.200	0.201	0.215	0.224	0.224	0.293	0.300	0.301
Adj R^2	0.188	0.199	0.200	0.213	0.222	0.222	0.246	0.254	0.254
Business Model Controls		Y	Y		Y	Y		Y	Y
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Panel E	Z-score								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Service Quality	-8.532***	-9.231***	-8.937***	-7.947***	-8.577***	-7.398***	-7.806***	-8.414***	-7.256***
	(0.501)	(0.519)	(2.113)	(0.495)	(0.504)	(2.013)	(0.511)	(0.514)	(2.031)
Log(Assets)	5.449***	8.559***	8.562***	4.498***	6.579***	6.591***	4.325***	6.462***	6.473***
	(1.238)	(1.410)	(1.410)	(1.221)	(1.393)	(1.393)	(1.242)	(1.415)	(1.415)
Tier 1 Capital Ratio	2.297***	2.376***	2.442***	2.122***	2.249***	2.513***	2.146***	2.274***	2.533***
	(0.197)	(0.207)	(0.576)	(0.191)	(0.197)	(0.529)	(0.196)	(0.195)	(0.522)
Core Deposit Ratio		0.302***	0.302***		0.237***	0.236***		0.228***	0.227***
		(0.055)	(0.055)		(0.053)	(0.053)		(0.055)	(0.055)
Service Quality *			-0.024			-0.096			-0.094
Tier 1 Capital Ratio			(0.177)			(0.168)			(0.168)
Observations	58350	58350	58350	58350	58350	58350	58350	58350	58350
R^2	0.161	0.170	0.170	0.197	0.205	0.205	0.255	0.262	0.262
Adj R^2	0.160	0.169	0.169	0.195	0.203	0.203	0.205	0.212	0.212
Business Model Controls		Y	Y		Y	Y		Y	Y
State FE				Y	Y	Y			
State * Quarter FE							Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y	Y			

Table 8: Risk Pricing of Bank Liabilities

The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variables, from left to right, are *Core Deposit Rate - 6-month T-bill*, where *Core Deposit Rate* refers to the annualized quarterly interest expense on core deposits normalized by average total core deposits, and *6-month T-bill* refers to the secondary market rate on 6-month Treasury Bills; *Deposit Rate - 6-month T-bill*, where *Deposit Rate* refers to the annualized quarterly interest expense on deposits normalized by average total deposits, and *6-month T-bill* refers to the aforementioned; and *Liabilities Rate - 6-month T-bill*, where *Liabilities Rate* refers to the annualized quarterly interest expense on liabilities normalized by average total liabilities, and *6-month T-bill* refers to the aforementioned. *Log(Assets)* is the natural logarithm of total assets. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *NPL Ratio* is the ratio of non-performing loans to total loans. *8-Qtr SD of ROA* is the rolling 8-quarter standard deviation of *ROA*. *ROA* is the bank's return on assets, measured as annualized net income normalized by total assets. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. Bank fixed effects are included in all specifications. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Core Deposit Rate - 6-month T-bill				Deposit Rate - 6-month T-bill				Liabilities Rate - 6-month T-bill			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Log(Assets)	1.000***	0.997***	1.002***	1.002***	0.945***	0.941***	0.947***	0.946***	0.964***	0.961***	0.966***	0.965***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
Tier 1 Capital Ratio	0.005	-0.008	-0.007	-0.007	-0.009	-0.024***	-0.024***	-0.023***	-0.017	-0.029***	-0.028***	-0.028***
	(0.015)	(0.006)	(0.006)	(0.006)	(0.015)	(0.006)	(0.006)	(0.006)	(0.015)	(0.006)	(0.006)	(0.006)
NPL Ratio	0.156***	0.252***	0.156***	0.154***	0.140***	0.235***	0.140***	0.138***	0.138***	0.232***	0.138***	0.137***
	(0.008)	(0.025)	(0.008)	(0.008)	(0.008)	(0.024)	(0.008)	(0.008)	(0.008)	(0.024)	(0.008)	(0.008)
8-Qtr SD of ROA	0.062***	0.067***	0.283***	0.065***	0.051***	0.056***	0.272***	0.053***	0.057***	0.062***	0.279***	0.059***
	(0.017)	(0.017)	(0.063)	(0.017)	(0.017)	(0.017)	(0.061)	(0.016)	(0.017)	(0.017)	(0.061)	(0.016)
ROA	-0.383***	-0.385***	-0.385***	-0.699***	-0.388***	-0.390***	-0.390***	-0.685***	-0.387***	-0.389***	-0.389***	-0.680***
	(0.018)	(0.018)	(0.018)	(0.047)	(0.018)	(0.018)	(0.018)	(0.046)	(0.018)	(0.018)	(0.018)	(0.046)
Service Quality	-0.024	-0.030	-0.037	-0.146***	-0.034	-0.045	-0.052*	-0.157***	-0.052	-0.051*	-0.058**	-0.162***
	(0.069)	(0.028)	(0.029)	(0.024)	(0.067)	(0.028)	(0.028)	(0.024)	(0.067)	(0.027)	(0.027)	(0.023)
Service Quality *	-0.005				-0.005				-0.004			
Tier 1 Capital Ratio	(0.005)				(0.005)				(0.005)			
Service Quality *		-0.031***				-0.031***				-0.030***		
NPL Ratio		(0.007)				(0.007)				(0.007)		
Service Quality *			-0.070***				-0.070***				-0.070***	
8-Qtr SD of ROA			(0.020)				(0.019)				(0.019)	
Service Quality *				0.098***				0.092***				0.091***
ROA				(0.012)				(0.012)				(0.012)
Observations	58298	58298	58298	58298	58298	58298	58298	58298	58298	58298	58298	58298
R^2	0.436	0.437	0.437	0.438	0.428	0.429	0.429	0.430	0.432	0.432	0.432	0.433
Adj R^2	0.407	0.407	0.407	0.408	0.398	0.399	0.398	0.400	0.402	0.402	0.402	0.403
Entity FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 9: Robustness (IV Approach)

The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variables are *Core Deposit Ratio*, the ratio of core deposits to total assets; Core *Deposit Rate*, the annualized quarterly interest expense on core deposits normalized by average total core deposits; *Liquid Assets Ratio*, the ratio of liquid assets to total assets, where liquid assets include cash, securities, reverse repo and fed funds lending; and *NPL Ratio*, the ratio of non-performing loans to total loans. *Service Quality* is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets; *Service Quality*$_{1994Q4}$ is the service quality measure as of 1994Q4 and serves as an instrument for contemporaneous service quality. *Log(Assets)* is the natural logarithm of total assets. *Core Deposit Interest Rate* is the annualized quarterly interest expense on core deposits normalized by average core deposits. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *NCO Rate* is the annualized quarterly net-charge offs normalized by total loans. *ROA* is the bank's return on assets, measured as annualized net income normalized by total assets. Business Model Controls include the following: *C&I Loans (%)*, which is the share of commercial and industrial loans in the bank's loan portfolio; *Real Estate Loans (%)*, which is the share of real estate loans in the bank's loan portfolio; *Small Business C&I Loans (%)*, which is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)*, which is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)*, which is the share of small agricultural/farm loans in the bank's portfolio; and *Unused Commitment Ratio*, which is the ratio of unused commitments to total assets. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Core Deposit Ratio				Core Deposit Rate			
	(1)		(2)		(3)		(4)	
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
Service Quality$_{1990s\ Average}$	0.091***		0.092***		0.079***		0.082***	
	(0.020)		(0.021)		(0.020)		(0.021)	
Service Quality		0.885		0.797		-0.187***		-0.211**
		(1.020)		(1.013)		(0.057)		(0.087)
Log(Assets)	-0.126***	-1.187***	-0.111***	-1.097***	-0.107***	-0.104***	-0.098***	-0.108***
	(0.035)	(0.399)	(0.037)	(0.414)	(0.032)	(0.017)	(0.034)	(0.021)
Core Deposit Interest Rate	-0.459***	-1.586***	-0.469***	-1.642***				
	(0.032)	(0.584)	(0.034)	(0.609)				
Tier 1 Capital Ratio					-0.014***	-0.010***	-0.013**	-0.011***
					(0.005)	(0.003)	(0.005)	(0.004)
NPL Ratio					0.023***	0.013***	0.025***	0.011**
					(0.007)	(0.004)	(0.008)	(0.004)
NCO Rate					-0.029**	-0.022***	-0.030**	-0.019***
					(0.013)	(0.005)	(0.013)	(0.006)
Liquid Assets Ratio					-0.008***	-0.008***	-0.008***	-0.008***
					(0.002)	(0.001)	(0.002)	(0.001)
ROA					-0.315***	-0.148***	-0.322***	-0.151***
					(0.023)	(0.022)	(0.025)	(0.032)
Business Model Controls	Y	Y	Y	Y				
Observations	50640	50640	50640	50640	48969	48969	48969	48969
R^2	0.235	0.241	0.291	0.289	0.229	0.890	0.283	0.888
Adj R^2	0.233	0.239	0.235	0.233	0.227	0.889	0.228	0.879
Fixed Effects	State & Quarter	State & Quarter	State * Quarter	State * Quarter	State & Quarter	State & Quarter	State * Quarter	State * Quarter

	Liquid Assets Ratio				NPL Ratio			
	(5)		(6)		(7)		(8)	
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
Service Quality$_{1990s\ Average}$	0.079***		0.081***		0.079***		0.081***	
	(0.020)		(0.021)		(0.020)		(0.021)	
Service Quality		-5.571***		-5.019***		0.415***		0.305**
		(1.739)		(1.244)		(0.150)		(0.141)
Log(Assets)	-0.129***	0.597	-0.116***	0.881**	-0.129***	0.079	-0.116***	0.065
	(0.037)	(0.513)	(0.040)	(0.446)	(0.037)	(0.063)	(0.040)	(0.063)
Core Deposit Ratio	0.018***	0.238***	0.019***	0.220***	0.018***	-0.017***	0.019***	-0.014***
	(0.002)	(0.038)	(0.002)	(0.032)	(0.002)	(0.004)	(0.002)	(0.004)
Tier 1 Capital Ratio	-0.031***	1.240***	-0.032***	1.279***	-0.031***	0.002	-0.032***	-0.000
	(0.005)	(0.086)	(0.005)	(0.071)	(0.005)	(0.009)	(0.005)	(0.009)
Business Model Controls	Y	Y	Y	Y	Y	Y	Y	Y
Observations	48969	48969	48969	48969	48969	48969	48969	48969
R^2	0.215	0.275	0.273	0.448	0.215	0.288	0.273	0.372
Adj R^2	0.213	0.273	0.217	0.404	0.213	0.286	0.217	0.323
Fixed Effects	State & Quarter	State & Quarter	State * Quarter	State * Quarter	State & Quarter	State & Quarter	State * Quarter	State * Quarter

Table 10: Robustness (Alternative Measures)

The sample ranges from 1995:Q1 to 2014:Q4 and includes only community banks (250 million to 1 billion in assets). The dependent variables, from left to right, are *Core Deposit Ratio*, the ratio of core deposits to total assets*; Core Deposit Rate*, which refers to the annualized quarterly interest expense on core deposits normalized by average total core deposits; *Liquid Assets Ratio,* the ratio of liquid assets to total assets; and *NPL Ratio*, the ratio of non-performing loans to total loans. *Service Quality* is the measure of service intensity; Alternative Measure 1 reflects expenses on salaries, fixed assets, advertising, ATM, and postage; Alternative Measure 2, reflects expenses on fixed assets, advertising, ATM, and postage; MSA FE uses MSA fixed effects on regressions using our standard definition of *Service Quality*, which is measured by the annualized ratio of relevant noninterest expenses (including salaries, premises and fixed assets, and "other" non-interest expenses) to total assets. *Log(Assets)* is the natural logarithm of total assets. *Core Deposit Interest Rate* is the annualized quarterly interest expense on core deposits normalized by average core deposits. *Tier 1 Capital Ratio* is the ratio of tier 1 capital to total risk-weighted assets. *NCO Rate* is the annualized quarterly net-charge offs normalized by total loans. *ROA* is the bank's return on assets, measured as annualized net income normalized by total assets. Business Model Controls include the following: *C&I Loans (%)*, which is the share of commercial and industrial loans in the bank's loan portfolio; *Real Estate Loans (%)*, which is the share of real estate loans in the bank's loan portfolio; *Small Business C&I Loans (%)*, which is the share of small business commercial and industrial loans in the bank's loan portfolio; *Small Business CRE Loans (%)*, which is the share of small business commercial real estate loans in the bank's loan portfolio; *Small Farm Loans (%)*, which is the share of small agricultural/farm loans in the bank's portfolio; and *Unused Commitment Ratio*, which is the ratio of unused commitments to total assets. *Senior Share* is the share of people who are above 65 years of age in each MSA, based on Census annual population estimates. All Bank characteristics are measured using quarterly Call Report data. All variables are lagged. Standard errors are clustered on entity and reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Core Deposit Ratio			Core Deposit Rate			Liquid Assets Ratio			NPL Ratio		
	Alt. Measure 1	Alt. Measure 2	MSA FE	Alt. Measure 1	Alt. Measure 2	MSA FE	Alt. Measure 1	Alt. Measure 2	MSA FE	Alt. Measure 1	Alt. Measure 2	MSA FE
Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Service Quality	2.455***	6.879***	1.677***	-0.221***	-0.584***	-0.183***	-0.748***	-0.355	-0.435	0.156***	0.563***	0.292***
	(0.259)	(0.691)	(0.299)	(0.013)	(0.039)	(0.017)	(0.238)	(0.700)	(0.313)	(0.034)	(0.096)	(0.046)
Log(Assets)	-0.916***	-1.098***	-0.293	-0.091***	-0.080***	-0.113***	1.454***	1.506***	1.238**	0.082	0.072	-0.017
	(0.354)	(0.351)	(0.629)	(0.016)	(0.016)	(0.027)	(0.371)	(0.372)	(0.575)	(0.058)	(0.058)	(0.098)
Core Deposit Interest Rate	-2.044***	-2.253***	-2.087***									
	(0.314)	(0.310)	(0.511)									
Core Deposit Ratio							0.160***	0.151***	0.167***	-0.009***	-0.009***	-0.009**
							(0.018)	(0.017)	(0.027)	(0.003)	(0.003)	(0.005)
Tier 1 Capital Ratio				-0.008***	-0.009***	-0.015***	1.462***	1.471***	1.382***	-0.010	-0.009	-0.017
				(0.003)	(0.003)	(0.005)	(0.050)	(0.050)	(0.081)	(0.007)	(0.007)	(0.013)
NPL Ratio				0.006*	0.006**	0.018***						
				(0.003)	(0.003)	(0.005)						
NCO Rate				-0.023***	-0.020***	-0.015*						
				(0.005)	(0.005)	(0.008)						
Liquid Assets Ratio				-0.009***	-0.008***	-0.009***						
				(0.001)	(0.001)	(0.001)						
ROA				-0.134***	-0.134***	-0.147***						
				(0.010)	(0.010)	(0.019)						
Business Model Controls	Y	Y	Y				Y	Y	Y	Y	Y	Y
Observations	60373	60373	40475	58657	58657	39082	58657	58657	39082	58657	58657	39082
R^2	0.303	0.300	0.561	0.888	0.884	0.919	0.446	0.445	0.655	0.356	0.357	0.588
Adj R^2	0.256	0.252	0.259	0.880	0.876	0.865	0.409	0.408	0.420	0.313	0.314	0.309
Fixed Effects	State * Quarter	State * Quarter	MSA * Quarter	State * Quarter	State * Quarter	MSA * Quarter	State * Quarter	State * Quarter	MSA * Quarter	State * Quarter	State * Quarter	MSA * Quarter

Panel B	Core Deposit Ratio		Core Deposit Rate		Liquid Assets Ratio		NPL Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Service Quality	-0.767	-0.323	0.078	0.040	1.627	1.651*	0.413**	0.341***
	(1.423)	(0.930)	(0.095)	(0.060)	(1.524)	(0.930)	(0.173)	(0.118)
Senior Share		-1.896		10.487***		52.678		17.113**
		(47.095)		(2.364)		(46.148)		(6.731)
Senior Share *	21.351*	18.122**	-2.516***	-2.184***	-17.455	-17.911**	-1.691	-1.110
Service Quality	(11.557)	(7.537)	(0.749)	(0.469)	(11.915)	(7.074)	(1.371)	(0.953)
Log(Assets)	-0.550	-0.470	-0.136***	-0.137***	1.175*	1.408***	-0.002	0.029
	(0.682)	(0.444)	(0.032)	(0.022)	(0.642)	(0.450)	(0.083)	(0.059)
Core Deposit Interest Rate	-1.512***	-1.233***						
	(0.512)	(0.327)						
Core Deposit Ratio					0.150***	0.150***	-0.009**	-0.007***
					(0.032)	(0.021)	(0.004)	(0.003)
Tier 1 Capital Ratio			-0.018***	-0.015***	1.347***	1.299***	-0.010	-0.006
			(0.006)	(0.004)	(0.096)	(0.065)	(0.011)	(0.008)
NPL Ratio			0.027***	0.026***				
			(0.008)	(0.005)				
NCO Rate			-0.024**	-0.036***				
			(0.012)	(0.008)				
Liquid Assets Ratio			-0.010***	-0.011***				
			(0.002)	(0.001)				
ROA			-0.195***	-0.190***				
			(0.025)	(0.016)				
Business Model Controls	Y	Y			Y	Y	Y	Y
Observations	30841	30841	29514	29514	29514	29514	29514	29514
R^2	0.590	0.417	0.883	0.831	0.669	0.518	0.593	0.366
Adj R^2	0.302	0.410	0.803	0.829	0.442	0.512	0.313	0.358
Fixed Effects	MSA * Quarter	MSA & Quarter	MSA * Quarter	MSA & Quarter	MSA * Quarter	MSA & Quarter	MSA * Quarter	MSA & Quarter