Deposit Market Competition During the Great Financial Crisis *

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Abstract

This paper investigates competition on the deposit market across banks during the Great Financial Crisis (GFC) of 2007-09. Using branch-level data on U.S. banks, we analyze banks' pricing behavior, in particular, how banks react to changes in competitors' deposit rates. Our findings show that banks reacted more strongly to changes in competitor rates during the crisis, suggesting heightened competition compared to normal times. The intense competition persisted even after the banking sector experienced a substantial deposit inflow starting in the fall of 2008. The aggressive pricing behavior was not only limited to poorly capitalized banks but was widespread across the banking sector. Finally, we find evidence that increases in deposit spreads contributed to higher deposit growth during the crisis, but exclusively for well-capitalized banks after the Lehman collapse, suggesting uneven benefits from the inflow of deposits.

Keywords: deposit market, deposit pricing, banking competition, financial crisis

JEL: D40, G01, G21

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1 Introduction

This paper examines competition in the U.S. deposit market during the Great Financial Crisis (GFC) of 2007-2009. Although banking competition has been extensively studied, during the crisis period it has rarely been studied despite its significant relevance. Excessive competition during a crisis can be detrimental to the stability of the banking sector and impede the effectiveness of monetary and prudential policies.

The existing literature presents mixed view on the intensity of competition during the crisis period. The literature on banks as liquidity providers suggests that deposits tend to flow into the banking system during financial market stress due to their safety and liquidity (Kashyap et al. 2002, Gatev and Strahan 2006, Gatev et al. 2009). Banks thus can benefit from deposit inflows without actively competing for deposits during crises. Consequently, one might argue that competition for deposits across banks should be limited during this period.

However, there is also literature in favor of the opposite view. First, during severe banking crises, such as the initial phase of the GFC, the banking sector itself may experience a liquidity dry-up due to widespread solvency and liquidity concerns (Acharya and Mora 2015). In such environments, banks may aggressively compete for deposits as they desperately seek to secure liquidity. Second, there can be spillover effects from distressed banks (Egan et al. 2017). Distressed banks tend to offer higher deposit rates during financial turmoil to prevent deposit withdrawals or to attract new deposits, as observed by Martin et al. (2018). The aggressive pricing of distressed banks may induce neighboring banks to react and defending themselves by price competition to safeguard their own deposit base, leading to intensified competition across the banking sector. Third, strong banks may also initiate aggressive pricing to capture a larger market share of deposits and take advantage of their solid position, potentially weakening their competitors in difficulty or driving them out of the market. Such predatory behavior during the crisis has been observed in the interbank market by Acharya et al. (2012), suggesting that similar strategies may be pursued in the deposit market.

Hence, it becomes crucial to empirically examine whether banks engage in more aggressive competition for deposits during a crisis. In this study, we analyze the behavior of banks in the U.S. deposit market during the GFC (2007-2009) through the prism of local market competition. For this purpose, we introduce a novel measure of competition - the responsiveness of deposit rates to competitor rates - and compare its dynamics between normal times and the crisis period. The study addresses three key questions: firstly, whether there was heightened competition during the GFC; secondly, whether the behavior varied based on bank characteristics (capital, size) and local market structure; and finally, whether banks that actively bid for deposits were successful in attracting more funds during the crisis.

[Figure 1 about here.]

Preliminary evidence and anecdotes suggest that competition in the U.S. deposit market intensified during this period. One piece of evidence is the notable increase in large-scale promotional campaigns for deposit rates among banks. Figure 1 illustrates the trend, displaying the percentage for promotional rates in certificates of deposits (CD) launched by U.S. depository institutions from 2007 to 2009, based on data from RateWatch. The number of promotional CD products rose significantly after the onset of the crisis in August 2007, reaching a peak of close to 14% in the first quarter of 2009, compared to 7% prior to the crisis. Subsequently, the intensity of promotional activity dropped substantially.

Multiple media anecdotes also support intensified competition. For instance, JP Morgan Chase (JPMC) appears to have competed for deposits with Washington Mutual, which eventually led to the acquisition of the latter by JPMC in September 2008. Similarly, Wells Fargo and Citibank competed to acquire Wachovia in an effort to expand their branch presence and market share. As observed by the business magazine *American Banker* in October 2008: "[Banks] with solid financials are stepping up their efforts to exploit the opportunity created as weaker rivals exit the market. [...] Federal Reserve Board's 50- basis-point cut in its key rate Wednesday [Oct. 8, 2008], to 1.5%, is unlikely to push deposit rates down any time soon." Consistent with this observation, Judson et al. (2014) report that deposit rates fell much more slowly than market rates in the years of the financial crisis. In fact, median time deposit rates (12-month CDs) even increased in the summer of 2008, even though the Fed funds rate did not reverse its downward course (See Figure 2, Panel A).

Against this backdrop, we investigate on the branch level how banks reacted to their neighboring competitors' deposit rate changes over the period 2004-12. In order to take account of the size and physical distance of branches, we use deposit base- and distance-weighted deposit rates of branches in local markets, *i.e.*, on the county-level. We quantify competition by the responsiveness of a branch's deposit spread to changes their local competitors' spread (deposit spread pass-through). Deposit spreads are defined as the difference between the deposit and risk-free interest rate, indicating banks' return on deposits compared to alternative safe investments. Consequently, changes that deposit spread can be seen as a strategic variable for banks and as such the deposit spread pass-through captures the intensity of competition.

A challenge for the validity of our results and identification is that deposit supply and their remuneration could be driven by changes in lending opportunities (Ben-David et al. 2017). For example, lower levels of deposits and higher deposit rates might be caused by deteriorations in lending opportunities, and not by more intense deposit market competition. We address this challenge by exploiting within bank variation of branches in diverse local markets following the literature (Drechsler et al. 2017, 2021, Jiménez et al. 2012, 2014, Peydró et al. 2021). In other words, we estimate the deposit rate responses after controlling for any time-varying factors that affect each bank differently, such as lending opportunities or liquidity needs, by using bank-year fixed effects in our branch-level regressions.

In total, we examine nine different deposit rates on retail deposit products: interest-bearing checking, savings, and small-time deposits with maturities ranging from 3 to 60 months. We also test whether bank responses are different during the various stages of the crisis, and for rate surges versus cuts. We also explore potential variations in bank responses during the GFC conditional on their capitalization and size, as well as local market structure. Lastly, we examine the impact of changes in deposit spreads on deposit growth and test whether this impact differs depending on banks' capitalization.

Our results indicate that deposit spreads reacted stronger to changes in competitor spreads during the crisis compared to normal times. When competing branches raise their deposit spreads by 100 basis points (bps), bank branches increase their spreads by approximately 20 bps during normal times depending on the type of deposit. However, during the crisis, the response to a 100 bps increase is on average 60 bps higher than during normal times. Interestingly, the more intense reaction occurred both, during the first crisis period prior to the Lehman bankruptcy and thereafter. This evidence seems to suggest that more intense competition was not solely driven by the need to counter deposit outflows at the onset of the crisis; rather it continued when the banking sector experienced substantial inflows of deposits. Our evidence also suggests that a larger proportion of branches engaged in "overbidding," with responses exceeding the 1:1 ratio, during the crisis. The percentage of branches exhibiting overbidding increased from 12.7% during normal times to close to 50% during the crisis. This finding supports the hypothesis that banks engaged in more aggressive competition during the crisis period.

When exploring how the reaction of banks varied conditional on their solvency, size and local market structure, we find that the behavior of branches did not significantly depend on the capital ratio of their parent bank. Thus, aggressive pricing behavior was not limited to only poorly capitalized banks. Instead, it indicates that the intense competition for deposits was a more widespread phenomenon across the banking sector, rather than being confined to distressed banks. Concerning bank size, our analysis reveals that branches of small banks exhibited a higher sensitivity to competitor price moves, particularly in the case of small-time deposits. This could be attributed to the disadvantage that small banks face in competing with larger banks in terms of offering checking and savings deposit products of higher quality. Consequently, small banks may have focused their efforts on simpler products like time deposits, where prices are the primary competitive dimension. Additionally, in line with expectations, our findings demonstrate that branches were more responsive to competitors' actions in local markets with lower concentration during the crisis, indicating a higher level of competition in those markets.

Finally, we find evidence that increases in deposit spreads contributed to deposit growth, but this effect was observed exclusively for well-capitalized banks after the Lehman bankruptcy. These results suggest that not all banks equally benefited from the massive inflow of deposits during that period and that only banks with higher capital ratios were successful in attracting more deposits by offering higher deposit spreads.

The remainder of the paper is structured as follows. Section 2 discusses the related literature and section 3 presents the data, summary statistics and econometric setup. Section 4 presents the results the competitive behavior of banks during the crisis. Section 5 investigates the impact of bank characteristics and local market structure on bank behavior, while the impact of the changes in deposit spreads on deposit growth is explored in section 6. In section 7, we conduct robustness checks and in section 8 we provide conclusions.

2 Related Literature

Our analysis is related to several strands of literature. First, our paper is related to the literature on the behavior of depositors and banks during crises. Kashyap et al. (2002) andGatev and Strahan (2006) analyze the role of banks as liquidity providers during crises and highlight the inflow of funds to banks that are viewed as a safe haven due to deposit insurance and government guarantees. Acharya and Mora (2015) provide evidence of the collapse of this mechanism during the GFC, which was subsequently reestablished with explicit government backing following the Lehman collapse. In line with Acharya and Mora (2015), our findings demonstrate that banks engaged in aggressive pricing behavior during the initial phase of the GFC to attract deposits. Moreover, our study reveals that banks actively competed for deposits even after experiencing a massive influx of deposits into the banking sector, rather than remaining passive recipients of funds.

Martin et al. (2018) examine the behavior of a distressed bank using detailed account-level data. They highlight that the distressed bank attempted to attract more insured deposits by offering higher rates given that insured depositors should be less sensitive to bank risk. Egan et al. (2017) develop an equilibrium model of bank competition, showing that competition for insured deposits can lead to higher deposit rates across banks. In their model, distressed banks have an incentive to compete on the market for deposits by setting higher interest rates for insured deposits, leading non-distressed banks to raise their rates to retain their insured deposits. Our results support their theoretical prediction, since we provide evidence that competition for retail deposits during the GFC was a widespread phenomenon and not limited to weakly capitalized banks.

Our study is also related to the literature on the deposit pricing behavior of banks. Previous studies have established a well-known stylized fact on the rigidity of deposit rates. This literature shows that the adjustment of deposit rates following changes in the market interest rate (Fed fund rate) is rigid, slow and asymmetric given that downward adjustments are more flexible than upward adjustments (Craig and Dinger 2014, Diebold and Sharpe 1990, Drechsler et al. 2017, Driscoll and Judson 2013, Hannan and Berger 1991, Neumark and Sharpe 1992, Yankov 2023). Market power in deposit markets has been attributed to such behavior in the literature. Yankov (2023) argues that imperfect information and search costs for depositors contribute to this market power. Drechsler et al. (2017) provide evidence for a deposit channel of monetary policy based on deposit pricing behavior that is driven by market power. In a more recent study, Drechsler et al. (2021) demonstrate that banks pay deposit rates that are lower and insensitive to market interest rates, while aligning the sensitivity of deposit and loan rates to mitigate interest rate risk. Similar to Drechsler et al. (2017), we exploit the potential heterogeneity in pricing behavior at the branch level for U.S. commercial banks. However, our focus is set on the period of unprecedented market turbulence. While we control for the Fed funds rate and allow for non-linear effects of the crisis and variations across markets, our main emphasis is concentrated on the strategic interaction of banks. Our findings suggest that increased competition during times of crisis, often accompanied by a decline in interest rates, may hinder or delay the transmission of monetary policy.

Finally, our paper contributes to the literature on the measurement of banking competition. The most commonly used indicators are market concentration measures, such as the Hirfindahl-Hirschman index (*e.g.*, Assaf et al. 2019, Akins et al. 2016), indicators of market power, such as the Lerner index (Anginer et al. 2014, Berger et al. 2009, Calderon and Schaeck 2016) and H-statistic (Claessens and Laeven 2004, Schaeck et al. 2009), which measure the responsiveness of prices to costs. Jiang et al. (2016, 2019, 2022) employ a regulatory-induced measure of competitive pressure faced by banks. They consider factors such as the degree of branching deregulation, which varies across states and years, and the distance between a bank (or subsidiary) and the state under consideration, inspired by the gravity model framework (Goetz et al. 2013, 2016). We propose an alternative measure of competition, which is based solely on banks' observable behavior without any model-specific assumptions. This measure also enables the assessment of dynamic changes in competition within a relatively short period of time.

3 Data and Methodology

3.1 Data sources

Our study focuses on the US deposit market in the midst of the financial crisis that started in the second half of 2007 and ended in 2009. To have a comparative dimension, we extend our period of analysis by 3 years prior to and after the financial crisis. Our final dataset thus covers the nine-year period starting in 2004 and ending in 2012.

The data on the deposit holdings of bank branches comes from the Summary of Deposits (SoD) published by the Federal Deposit Insurance Corporation (FDIC). It consists of annual information on deposits held by branches of US commercial banks. It also provides information on the geographic location, address, and parent bank or bank holding company (BHC). This data is used to calculate a measure of local deposit market competition, branch sizes and their distances needed for the identification of competitors.

The data on deposit rates come from RateWatch, a commercial data provider collecting branch-level information on weekly deposit rates. It includes the most common interest-bearing checking, savings, and term deposits in the US. Our analysis focuses on the rates of nine common retail deposit products: interest-bearing checking accounts with a minimum balance of $2,500 (checking deposits), money market deposit accounts with a minimum balance of $25,000 (savings deposits), and seven different certificates of deposit accounts with an account size of $10,000 for tenors between 3 and 60 months (time deposits). These retail deposit products are the most commonly offered in each segment of deposits and have the highest number of observations. The data is merged with the SoD database using the FDIC branch identifier.

[Table 1 about here.]

Table 1 provides information on the coverage of the RateWatch data set compared to the SoD data. It covers approximately three quarters of the branches present in the SoD dataset in terms of both numbers and volumes as of 2012. It is important to know that not all branches set actively deposit rates. If they do not, they just follow the rate set by another branch. In order to avoid double counting, we thus limit our analysis on active rate setters. Rate setters are known to exhibit a higher level of reactivity to local market conditions compared to non rate-setters (Dlugosz et al. 2022). This facilitates the identification of strategic decisions at the local market level, which is the primary focus of this paper.

Overall, close to 9% of the branches that are present in the RateWatch data are active rate setters representing more than 7% of SoD branches and about one quarter of SoD deposits as of 2012. Active rate setter branches are thus on average larger than non-rate setters. For illustrative purposes, Figure A1 in the Appendix displays the geographical distribution of branches in the state of Florida, distinguishing between rate setter and non-rate setter branches. The size of each circle represents the deposit base of the branch. Consistent with Table 1, on average, rate setter branches tend to have a larger deposit base compared to non-rate setters. Both types of branches are well-distributed across the state. Our final sample includes 5432 banks with 7142 branches. Geographically, our branches are distributed across 2582 counties located in the U.S. territory.[1]

We use as well bank-level data from the US Call Reports provided by the Federal Reserve Bank of Chicago. This data provides detailed quarterly information on the financial statements and bank ownership information. We merge this data with RateWatch and SoD using the FDIC bank identifier. We collect the Fed funds target and effective rate from the Federal Reserve Economic Data (FRED) provided by the Federal Reserve Bank of Saint Louis.

3.2 Summary statistics

A first inspection of our data in hand provides some insights on the deposit rate setting in the US over the period 2007-2009, see Figure 2. Panel A shows the median rates of checking account along with savings and 12-month time deposits. The median rates at the beginning of 2007 were, respectively, 4.4, 1.9, and 0.5% for time, savings, and checking deposits, indicating that there is a premium for both deposit size and maturity. At the end of 2009, all rates were below 2%, with checking accounts approaching a remuneration of 0%. We observe that deposit rates are stickier than the Fed funds rate, which is presumably due to the existence of market power in the deposit market (Drechsler et al. 2017, Driscoll and Judson 2013, Yankov 2023). It appears that in response to the cuts in the Fed funds rate in the second half of 2007, both checking and savings deposit rates adjust more sluggishly than time deposit rates, in line with the pricing behavior of banks in the aftermath of the deposit rate deregulation in the 1980s (Neumark and Sharpe 1992).

[1]The number of counties in the US territory as of 2012 is 3234 so that our data set covers around 80% of them.

[Figure 2 about here.]

Panel B of Figure 2 shows the corresponding deposit spreads. At the beginning of the financial crisis, deposit spreads were negative meaning that banks paid less to depositors compared to the rate depositors would earn if they invested in Treasury bills. However, once the Fed funds rate decreases, while banks adjust their rates sluggishly, deposit spreads reverse and become positive. In other words, cuts in the Fed funds rate are associated with decreases in deposit rates, but by less than the Fed funds rate, resulting in an opposite movement of the deposit spread and the Fed funds rate. This is in line with Drechsler et al. (2017) who find that the spread between the Fed funds rate and deposit rate (the inverse of our spread measure) is positively related to the Fed funds rate.

[Table 2 about here.]

Table 2 presents summary statistics on deposit spreads at the branch level before, during and after the crisis. The crisis period is divided into two sub-periods that are split by the Lehman collapse. The average deposit spreads decrease in normal times, while they increase during the 2007-09 crisis. The decline in deposit spreads prior to the financial crisis coincides with the rise of the Fed funds rate, while the increase in deposit spread during the financial crisis is accompanied by the decline in the Fed funds rate. These findings are consistent with the existing literature highlighting the rigidity in the adjustment of deposit rates to changes in the Fed funds rate.

It is worth noting that the changes in deposit spreads during the crisis period are higher compared to the pre-crisis period.[2] This observation contradicts the findings in the literature. Following the behavior of upward-sticky, downward-flexible deposit rates, banks would more closely follow the change in the Fed funds rate, resulting in smaller changes in deposit spreads during the crisis period when the Fed funds rate falls, compared to the pre-crisis period when it rises. Thus, this observation suggests that banks did not exercise their market power as they typically would, and instead engaged in more competitive bidding for deposits during the financial crisis.

The bottom of Table 2 shows other related variables. There is clear evidence that the average branch size in terms of deposits increased steadily, nearly doubling in this nine-year period. Branch deposit growth decelerated during the initial crisis period but surged after the Lehman collapse, consistent with existing literature (Acharya and Mora 2015). The government's intervention restored confidence in the banking sector, prompting households and investors to redirect funds from stock and bond markets to banks. Additionally, extensive consolidation and acquisitions during the crisis also contributed to this growth. However, local bank market concentration

[2]This holds true for nearly all deposit spreads, even when comparing them based on a more rigorous measure. Considering that the average change in the Fed funds rate is different before vs. during the financial crisis, a more rigorous approach is to examine the change in the spread per 1 percentage point change in the Fed funds rate. For instance, let us consider a 12-month time deposit. In the pre-crisis period, the deposit spread change per 1 percent Fed rate change is 33 basis points (0.11/0.33), while it amounts to 46 basis points (0.36/0.79) and 53 basis points (0.26/0.49) during the first and second crisis periods, respectively.

(measured by the Herfindahl-Hirschman Index (HHI) specific to each county[3]) showed a weak decline on average. This could be attributed in part to existing banks expanding into new local markets, counterbalancing the process of bank consolidation (Yankov 2023).

3.3 Measure of the degree of competition

For our analysis, we have to calculate the deposit rate set by a branch's competitors in the local market. We determine this rate using a distance and deposit-base weighted average of the deposit rates set by competitor branches. Concretely, it is constructed by the following procedure. We consider the county where branch i is located as its local market perimeter following the literature such as Drechsler et al. (2017, 2021), Girotti and Salvadè (2022), and Li et al. (2023).[4] Then, we take all rate setter branches in the same county belonging to a different bank holding company. The deposit rate of branch i's competitor at time t, R_{-it}, is then calculated as follows:

$$R_{-it} = \sum_{c=1}^{C} \frac{\left(D_{ct}^{i}/d_{c}^{i}\right)}{\sum_{c=1}^{C}\left(D_{ct}^{i}/d_{c}^{i}\right)} R_{ct} \tag{1}$$

where D_{ct}^{i} denotes the deposits held in branch i's competitor c ($c = 1,\ldots,C$), d_{c}^{i} denotes the distance between c and i, and R_{ct} denotes the deposit rate of branch c in quarter t. We measure the distance between branches by the minimum great-circle distance ("distance as the crow flies"). We do thus not measure distance in terms of travel time.[5]

In the regressions, we use deposit spreads to the extent that it is a strategic variable set by banks.[6] It is defined as the difference between the deposit rate, R_{it}, and the effective federal funds rate, $FFER_t$:

$$r_{it} = R_{it} - FFER_{it}. \tag{2}$$

r_{-it} is defined in a similar way. The deposit spread measures the remuneration of deposits relative to what households could earn if they invested in a similar safe asset.[7] Using as Drechsler et al. (2017) the difference between the Fed funds rate and the deposit rate, *i.e.*, the inverse of our

[3] Computed by summing up the squared deposit-market shares of all banks on the level of parent banks and bank holding companies that operate branches in a given county. The higher the HHI, the greater the level of concentration.

[4] In the banking literature, the metropolitan statistical area (MSA) is commonly employed as an alternative unit for analyzing the local market. However, recent research by Célerier and Matray (2019) reveals significant disparities in access to banking services across counties within the same MSA, indicating that the banking market is more local than the MSA.

[5] To ensure the robustness of our model, in Section 7, we also explore alternative local market definitions, such as a 50km perimeter, and estimate a spatial autoregressive model by including all competitors in the state, instead of relying on an arbitrary local market definition.

[6] Banks charge fees on deposits such as payment service fees for transaction accounts, management fees for money market deposit accounts, and early withdrawal penalty for term CDs. Therefore, one might consider that banks compete with these fees as well. However, these fees are usually not explicitly advertised and remain a shrouded attribute of the contract. For example, a popular bank deposit product comparison website, bankrate.com compares mainly deposit rates and minimum amount, which implies that the rate is the banks' main strategic variable. It is also documented that the correlation between rates and non-price terms is generally very low (Yankov 2023).

[7] In Section 7, we perform a robustness check by utilizing deposit spreads derived from Treasury security rates that match the maturity of time deposits.

measure, would give the same results, but the interpretation would be different. It would measure banks' price of deposits in terms of foregone interest income.

3.4 Econometric setup

We are interested in studying how banks respond when competitors change the remuneration of deposit, , and whether the response is different in the time of the crisis. We thus estimate the following baseline regression:

$$\begin{aligned}\Delta r_{it} =& \beta \Delta r_{-it} + \beta^{*} \Delta r_{-it} \times Crisis_t + \rho \Delta FF_t + \rho^{*} \Delta FF_t \times Crisis_t \\ &+ \alpha_{b(i)t} + \sigma_{s(i)t} + \text{other controls} + \varepsilon_{it}\end{aligned} \tag{3}$$

where Δr_{it} is the change in the deposit spread of branch i in quarter t and Δr_{-it} is the deposit-distance weighted change in the deposit spread of competitors as defined in equations (1) and (2). Using first differences means that we implicitly assume that deposit rates adjust contemporaneously to changes in competitors' rates and the Fed funds rate. We interact this variable with a crisis indicator $Crisis_t$. As Acharya and Mora (2015), we use two non-overlapping crisis windows, one starting in the third quarter in 2007 and ending in the quarter before the Lehman collapse in September 2008, and the other starting in the third quarter of 2008 and ending in the second quarter of 2009. We control for changes in the Fed funds rate ΔFF_t and its crisis interaction. We also include bank-time fixed effects, $\alpha_{b(i)t}$, and state-time fixed effects, $\sigma_{s(i)t}$. Other controls include county fixed effects, branch fixed effects as well as time fixed effects.[8] We cluster standard errors at the county level to allow for correlation of the error term within counties.

The bank-time fixed effects absorb time-varying factors that affect each bank differently. We thus exploit within-bank variation of branches' pricing behavior in diverse local markets. It helps us to rule out situations in which deposit supply and remuneration respond to other changes affecting banks, such as lending opportunities or liquidity needs, rather than directly to local deposit market competition. The identification assumption is that banks allocate funds internally to equalize the marginal return of lending across their branches, as in Drechsler et al. (2017). The state-time fixed effects control for differences on the state level such as changes in regulation.

Our main variable of interest, Δr_{-it}, is the change in the deposit spread of branch i's competitors. The coefficient β measures the response in normal times, while the response during the crisis is equal to $\beta + \beta^{*}$. If β^{*} is significant and positive, then banks respond stronger to competitors' spreads during the crisis compared to normal times. We refer to β and $\beta + \beta^{*}$ as the "deposit spread pass-through" in normal times and in the crisis period, respectively.

[8]Branch and county fixed effects drop out from the estimations as they are highly collinear with the other fixed effects.

4 Deposit competition during the crisis

4.1 Branch-level estimation

Before implementing the within-bank estimation, we conduct an analysis of deposit spreads behavior across all branches of all banks. This is achieved by running time-series regressions for each branch i, similar to equation (3) but without incorporating any control variables, that is:

$$\Delta r_{it} = \beta_i \Delta r_{-it} + \beta_i^* \Delta r_{-it} \times Crisis_t + \rho_i \Delta FF_t + \rho_i^* \Delta FF_t \times Crisis_t + \varepsilon_{it} \quad (4)$$

where the coefficient β_i measures branch i's reaction in normal times, while $\beta_i + \beta_i^*$ reflects its response during the crisis. We limit our regression on branches with a minimum of 10 observations.

[Figure 3 about here.]

In Figure 3, we illustrate the distribution of the branch pass-through for key deposit products (checking, savings and 12-month time deposits) during normal and crisis times. We note that the mean of the pass-through in normal times ranges from 44.8 bps (savings) to 67.2 bps (checking), while during the crisis, it increases to between 90.7 bps (savings) and 96.5 bps (checking). This first evidence suggests that the branch's reaction is more sensitive during the crisis than in normal times. Additionally, the proportion of branches reacting by more than 100 bps, an evidence for overbidding, significantly rises during the crisis, from 12,7% in normal times to 50%. Furthermore, we observe that the branch pass-through is less dispersed during the crisis than in normal times, particularly for checking deposits. This suggests that branches' reactions become more similar irrespective of the characteristics of individual branches, resulting in stronger responses to competitor moves during the crisis.

[Table 3 about here.]

Table 3 displays some descriptive statistics of the branch pass-through of deposit spreads for our deposit products during normal times (Panel A) and the crisis (Panel B). In line with our findings in Figure 3, we note that the mean of the pass-through is higher during the crisis for all deposit products, with the difference ranging from 29.3 to 53.0 bps. The differences are significant at the 1% level for all deposit products (Panel C). The median exhibits a pattern similar to the mean. Finally, the standard deviation is lower during the crisis than in normal times, in line with our previous observation.

4.2 Within-bank estimation

We now proceed with our baseline within-bank estimations outlined in section 3.4, equation (3). Table 4 shows the estimation results for our nine different deposit products. In panel A, we report the results without crisis interactions. The first observation is that following a 100 bps change in the deposit spread of competing branches, banks change their spreads by 55 to 81 basis points (bps) in the same quarter, conditional on our controls including the change in the Fed funds rate. The pass-through is strongest for checking accounts suggesting a stronger competition in the retail markets for these deposits.

[Table 4 about here.]

Concerning banks' responses to monetary policy changes, we find that following a 100 bps increase in the Fed funds rate, a bank's branches decrease deposit spreads by 3 to 18 bps depending on the type of deposits. The magnitudes are similar to Drechsler et al. (2017) who find a response in the range from 7 to 14 bps. Savings deposits show the strongest response to the Fed funds rate (18 bps), followed by checking accounts (10 bps) and time deposits with a maturity of less than one year. It could be that households and investors had a high preference for liquidity during our sample period. An important result is that a bank's branches react much stronger to rate changes of competing branches than to Fed funds rate changes This observation implies that banks are more responsive to competitive pressures than to fluctuations in market interest rates.

There is important variation in the responses across normal times and the crisis period, as shown in Panel B. While the pass-through of changes in competitors' spreads is between 8 to 23 bps during normal times, it is by 51 to 73 bps higher during the crisis. This is a clear sign of higher competition for deposits. Banks respond actively and more intensely during the financial turmoil. It is important to highlight that this pattern occurred during both the pre-Lehman bankruptcy crisis period and the subsequent period when the banking sector witnessed substantial inflows of deposits. This indicates that the intensified competition was not solely driven by the necessity to counteract deposit outflows at the beginning of the crisis, but also by other factors such as strategic behavior similar to what is known as "leaning against the wind".

The opposite we observe for the Fed funds rate where the pass-through is much higher during normal times (-39 to -70 bps) than during the crisis since the interaction terms go in opposite direction (ranging from 39 to 66 bps).This is in line with our preliminary findings shown in Figure 2, where it can be seen that banks have been reluctant to decrease their deposit rates as much as the policy rate in the midst of the financial crisis.

Our findings also indicate that the response to changes in Fed funds rate (ΔFF) remained consistent with our priors, with upward stickiness and downward flexibility being observed. We observe a higher pass-through during the crisis periods, coinciding with a decrease in the Fed funds rate, compared to normal times when the Fed funds rate rise. On average, the pass-through is -6 bps ($\rho + \rho^*$) during the crisis, whereas it is -52 bps (ρ) during normal times. This suggests that the sluggish decline in deposit rates relative to the decrease in Fed funds rates during the crisis cannot be attributed to changes in bank behavior due to market interest rate changes. Instead, it is likely driven by a heightened reaction to competitors' actions, as suggested by the coefficient of the change in the competitors' spread.

The highest pass-through of competitor rates is observed for least remunerated checking accounts during the second crisis period. More specifically, the sum of the coefficients, $\beta + \beta^* = 0.187 + 0.729 = 1.015$, suggests that there has been intense competition in this market segment during the most severe crisis period. During normal times, the pass-through of time deposits is increasing with maturity (from 13 to 23 bps) and is lowest for saving deposits (8 bps). The opposite we observe during the two crisis periods where the competition for liquid products (checking, savings, and 3-month time deposits) is more intense than for the other products with a longer maturity.

4.3 Asymmetric response upon the competitors' move

Next, we investigate if bank responses are different when competitors raise versus reduce their spreads. Until now, we implicitly assumed that banks respond symmetrically to positive and negative spread changes. In the context of a liquidity crisis and intense competition, one might expect banks to respond stronger when competitors raise the remuneration of deposits than to reductions if they fear that deposit supply is cross-price elastic. We thus include in our model an indicator variable for competitor spread increases as follows:

$$\begin{aligned}\Delta r_{it} =& \beta\Delta r_{-it} + \beta^{\circ}\Delta r_{-it} \times Rise_{-it} + \beta^{*}\Delta r_{-it} \times Crisis_t + \beta^{**}\Delta r_{-it} \times Crisis_t \times Rise_{-it} \\ &+ \rho\Delta FF_t + \rho^{\circ}\Delta FF_t \times Rise_{-it} + \rho^{*}\Delta FF_t \times Crisis_t + \rho^{**}\Delta FF_t \times Crisis_t \times Rise_{-it} \\ &+ \alpha_{b(it)} + \sigma_{s(it)} + \text{other controls} + \varepsilon_{it} \end{aligned} \quad (5)$$

where $Rise_{-it}$ is a dummy variable equal to one in periods during which competitors increased their spread and zero otherwise.[9] The relationship between a bank's deposit spread and that of the competitor depends now not only on the crisis period but also on the direction of competitors' move.

[Table 5 about here.]

Panel A of Table 5 reports the estimation results and Panel B summarizes the pass-through across normal and crisis times, and spread increases and reductions. While we will focus our discussion on checking accounts to save space, similar patterns can be observed for the other types of deposits. During normal times, when competitor spreads fall, banks adjust the remuneration of checking accounts by 28.9 bps for a 100 bps change in competitor spreads. It is difficult to draw precise conclusions here, but the result could be an indication of little competition to the extent that the pass-through is just 6.9 bps (=28.9-22) in response to a 100 bps increase in normal times. Once the crisis hit and competitors decreased the remuneration of checking accounts, the pass-through is -28.4 in the first crisis period and 6.2 bps in the second crisis period suggesting that

[9] Most increases in competitor spreads have been observed in the first crisis period prior to the Lehman bankruptcy, when the Fed lowered its rate and banks did not follow as much. See Table A1 in the Appendix.

banks increased the spread they offered during the first crisis period when competitors decreased them while they reacted very little during the second crisis period. When the crisis hits and competitors increase the remuneration of checking accounts, the pass-through is 90.5 in the first crisis period and 98.5 bps in the second crisis period. The results highlight that there was intense competition for checking accounts, especially in the period after the Lehman collapse, during which banks have been very sensitive to aligning their rates to those of their competitors.

Concerning the different deposit products, we observe a stronger sensitivity for checking accounts and savings deposits indicating that competition has been more intense in this market segment. An explanation could be that these deposits pay less interest than time deposits, so that complying with competitors' moves is relatively less costly.[10] Moreover, small changes can be large in relative terms when compared to the mean.

5 Impact of the characteristics of banks and local markets

Next, we analyze whether the competitive pricing behavior during the financial crisis varies for different types of banks and across different markets. For this purpose, we conduct regressions using again triple interactions with our key variables of interest:

$$\begin{aligned}\Delta r_{it} =& \beta\Delta r_{-it} + \beta^{\circ}\Delta r_{-it} \times IA_{it} + \beta^{*}\Delta r_{-it} \times Crisis_t + \beta^{**}\Delta r_{-it} \times Crisis_t \times IA_{it} \\ &+ \rho\Delta FF_t + \rho^{\circ}\Delta FF_t \times IA_{it} + \rho^{*}\Delta FF_t \times Crisis_t + \rho^{**}\Delta FF_t \times Crisis_t \times IA_{it} \\ &+ \alpha_{b(it)} + \sigma_{s(it)} + \text{other controls} + \varepsilon_{it} \end{aligned} \tag{6}$$

where IA_{it} is the interaction variable. In different specifications, we examine three dimensions that could affect banks' pricing behavior: (i) the bank capital, (ii) the size of banks, and (iii) the local market structure.

5.1 Bank capital

First, we examine whether banks' pricing behavior during the crisis varies for branches that belong to banks with different level of capitalization. The existing literature highlights the importance of bank capital for bank stability, particularly during periods of market stress and financial crises. Studies indicate that well-capitalized banks are more likely to survive (Berger and Bouwman 2013) and to have more stable stock prices during financial crises (Demirguc-Kunt et al. 2013). Additionally, several papers find a positive relationship between bank capital and deposit growth, particularly during crisis periods (Calomiris and Mason 2003, Calomiris and Powell 2001, Jaremski and Rousseau 2018). Higher capital provides banks buffers and more loss absorbing capacity, re-

[10] When a bank raises its deposit rate, the marginal cost it incurs (intensive margin) remains the same for its existing depositors, regardless of whether the current rate is low or high. However, the marginal cost is higher for new depositors (extensive margin) when the rate is high compared to when it is low. This may explain why the pass-through is higher for checking deposits, as the deposit rate for checking accounts tends to be lower than that of other products.

assuring markets and depositors. Based on these findings, it is reasonable to expect that poorly capitalized banks are more likely to face deposit outflows during crises and, consequently, exhibit greater reactivity to competitors' actions mitigating outflows or attracting new deposits by offering relatively higher deposit spreads. To test this hypothesis, we introduce banks' book capital ratio and its interaction terms.

[Table 6 about here.]

Table 6 presents evidence that does not support the notion of more aggressive pricing behavior of banks with lower capital ratios during the crisis. The interaction terms with capital are not significant indicating that regardless of a bank's solvency, banks have engaged in aggressive competition for deposits, and supporting the argument of Egan et al. (2017) that strong banks respond to increased deposit rates of weaker banks, particularly in the insured deposit segment, to prevent outflows of depositors that seek higher returns. Alternatively, well-capitalized banks may have adopted an aggressive stance to weaken their struggling competitors and to gain market shares, while weak banks struggle to retain their deposits. This may have resulted in widespread competition in the market.

5.2 Bank size

Second, we examine whether there are differences in the pricing behavior of branches that belong to small versus large banks. We classify banks as small if their average total assets during the sample period are lower than the overall median. Small banks typically have less diversified funding sources and smaller branch networks compared to larger banks. Consequently, small banks rely more heavily on local market deposits suggesting that their responses to competitors' price moves are likely to be more pronounced compared to larger banks.

[Table 7 about here.]

Table 7 presents evidence that supports this notion, particularly during the crisis period, for time deposits with longer maturities. Small banks may turn to this segment because they lack a competitive advantage in checking and savings deposits compared to larger banks. Checking accounts are typically bundled with a range of payment services, where larger banks have an advantage in offering a wider variety and more convenient services. Regarding money market deposit accounts, larger banks that benefit from economies of scale manage larger money market funds, leading to lower management costs per unit of funds. This puts smaller banks at a disadvantage. Although time deposits are generally more expensive than checking or savings deposits, depositors face additional costs when switching before maturity, implying a certain level of deposit stability. This could explain why smaller banks prefer to attract term deposits with longer maturities and, consequently, compete more aggressively for them. As a result, the pass-through is higher in this segment for small banks.

5.3 Local market structure

[Table 8 about here.]

Finally, we examine the impact of local market concentration on the pass-through of deposit spreads. We measure this using the Herfindahl-Hirschman Index (HHI), calculated by summing the squared deposit-market shares of all banks (at the bank holding company level) operating branches in a specific county within a given year. The findings are presented in Table 8. Overall, we observe a pattern indicating that during the crisis period, a higher HHI is associated with a lower pass-through of competitors' spreads, particularly in the case of time deposits. This evidence suggests that competition for deposits was relatively less intense in counties characterized by higher market concentration, supporting the structure-conduct-performance (SCP) hypothesis (Bain 1956, Berger and Hannan 1989).

6 Deposit competition and deposit growth

6.1 Impact of deposit spread change on deposit growth

We have provided evidence of more intense competition for deposits during the GFC. In this section, we investigate the potential impact of this intensified competition on deposit growth. Our analysis focuses on estimating the contribution of an increase in deposit spreads to the growth of deposits, employing the following model:

$$\begin{aligned} \Delta log\left(dep\right)_{it} =& \beta \Delta r_{it-1} + \beta^{*} \Delta r_{it-1} \times Crisis_t + \rho \Delta FF_t \times HHI_i + \rho^{*} \Delta FF_t \times HHI_i \times Crisis_t \\ &+ \gamma \Delta \# Branch_{b(i)t} + \gamma^{*} \Delta \# Branch_{b(i)t} \times Crisis_t + \text{other controls} + \varepsilon_{it} \end{aligned} \tag{7}$$

where $\Delta log\left(dep\right)_{it}$ represents the deposit growth, measured as the change in the logarithm of deposits for branch i at year t, r_{it-1} is the branch's change in its deposit spread, ΔFF_t is the contemporaneous change in the Fed funds target rate, HHI_i is the market concentration of the county where branch i is located, $\Delta \# Branch_{b(i)t}$ is the change in the number of branches of bank b which owns branch i in the county where it is located, other controls include branch, time (year), state, county, and bank fixed effects. We use the lagged term of the deposit spread to reduce endogeneity problems between deposit spreads and deposit growth. The change in the number of branches belonging to the same bank in a given county is included to account for the effects of branch divisions or mergers within the same bank, as well as the acquisition of competitors' branches in the county. Our coefficients of interest are β and β^*, with β and $\beta + \beta^*$ indicating the sensitivity of deposit growth to the changes in deposit spreads in normal times and during the crisis, respectively. We use $\Delta FF_t \times HHI_i$, as is in Drechsler et al. (2017), instead of ΔFF_t which is absorbed by time-fixed effects.

The Summary of Deposits data provides the total deposit information at the branch level on an annual basis, without further segmentation details. To estimate the annual average deposit spreads for deposits, we thus calculate the weighted average spread for each branch, taking into account the average share of each deposit segment at the bank level as obtained from the Call Report. Following previous literature (Drechsler et al. 2017, Egan et al. 2017), we consider the most commonly offered products for each deposit type: interest-bearing checking deposits of $2.5K, money market deposit accounts of $25K, 12-month $10K CDs and 12-month $100K CDs, representing checking, savings, small time and large time deposits, respectively. To reduce potential estimation errors arising from using the bank's deposit structure instead of the branch-level structure, we restrict our estimation to branches with at least three core deposit spread quotes for checking, savings, and small time deposits. We also assume that branches without large time deposit rate quotes do not offer large time deposits.[11]

To account for the potential underestimation of deposit changes due to the exclusion of non-rate-setter branches in our branch-level analysis, we perform a robustness check at the bank-county level. [12] In the latter analysis, we aggregate the deposits of all branches reported in the Summary of Deposits, including both rate-setter and non-rate-setter branches of the same bank located within the same county. To compute the deposit spread at the bank-county level, we calculate the average deposit spread of rate-setter branches belonging to the same bank in the same county, weighted by their respective deposit amounts.

[Table 9 about here.]

Columns (1) and (2) of Table 9 present the results of the branch-level estimations. In normal times, an increase in deposit spreads is associated with a positive deposit inflow. Specifically, a 100 bps increase in deposit spreads corresponds to an average branch deposit growth of 3.67% (column 2). However, during the first period of the crisis, this positive relationship disappears in model (2) amounting to -0.01% (3.67-3.68). Subsequently, during the period following the Lehman collapse, the positive relationship reemerges but remains relatively weak at 0.18%. These findings indicate that despite the presence of intense competition, an increase in deposit spreads did not lead to a significant increase in deposits during the crisis, particularly in the period preceding the Lehman bankruptcy. Nevertheless, it appears that banks were successful in defending their deposit base by leaning against the wind. Similar results are observed in the bank-county-level regressions presented in columns (3) and (4), providing further support for these findings.

[11]Our estimation was not restricted to branches that provide rate quotes for large time deposits, as well as all three core deposits. These branches constitute only around 20% of the total branches, and they typically represent larger branches on average. By including only such branches, our sample size would be significantly reduced, and potential selection bias could be introduced.

[12]Rate-setter branches account for 31.8% of all branches reported in RateWatch and 24.3% of all FDIC reporting branches in terms of deposits coverage. See Table 1.

6.2 Effect of bank capital

The results in Table 9 reflect the average effect across the entire sample, while there may be an uneven distribution of deposits across banks in response to changes in deposit spreads. As discussed in Section 5.1, existing empirical literature suggests a positive relationship between capital, market share and survival probability in crisis periods. Therefore, it is worth investigating whether the response of deposits to changes in deposit spreads differs based on the bank's capital level. To do so, we perform a triple interaction regression, incorporating bank capital and a crisis dummy variable together. The results are presented in Table 10, with columns (1) and (2) displaying the branch-level estimation outcomes, while columns (3) and (4) present the bank-county level estimation. The capital variable is measured either as the book capital ratio (columns (1) and (3)) or as a dummy variable (columns (2) and (4)) being equal to 1 for banks in the top decile based on the book capital ratio and zero otherwise.

[Table 10 about here.]

Interestingly, the impact of a higher capital ratio on deposit growth through increased deposit spreads is relatively small or statistically insignificant during normal times and the crisis period before the Lehman bankruptcy. However, it becomes highly significant both economically and statistically in the second phase of the crisis. In the branch level estimations, using book capital ratio (column (1)) as an indicator, for the same 100 bps increase in deposit spreads, a 1% increase in the book capital ratio is associated with an additional deposit growth by 5 times higher during this period compared to normal times (0.20% vs. 0.04%). This indicates that higher capital provides a competitive advantage in collecting deposits in this period. Table 10 column (2) offers a clearer comparison between well- vs poorly capitalized banks. For the branches of the top decile of higher capitalized banks, a 100 bps increase in deposit spreads leads to an average deposit growth of 4.02% (3,61+0.13-3.67+3.95) during the second period of the crisis. In contrast, it is –0.06% (3.61-3.67) for the remaining branches. Similar results are obtained in the bank-county level regressions (columns (3) and (4)).

In conjunction with the findings in section 5.1, our results suggest that despite intensive competition across all banks, only well-capitalized banks were successful in attracting deposits, while poorly capitalized banks struggled to retain their deposits during the second period of the crisis. Conversely, even well-capitalized banks were unable to attract deposits by increasing deposit spreads during the first period of the crisis. This could be attributed to the widespread perception of higher risk associated with bank deposits, which prevailed until the government introduced its large-scale rescue package TARP in late 2008 to restore confidence. The finding is in line with the results of Acharya and Mora (2015). Furthermore, our results add to their findings by suggesting that even after a reversal of deposit inflows into the banking sector during the second period of the crisis, only well-capitalized banks were able to benefit from deposit competition.

7 Robustness check

In this section, we provide some robustness tests regarding the definition of local markets for competition, the measurement of our deposit pricing variable, as well as deposit rates frequency.

7.1 Alternative definition of local market and SAR model

To account for the potential underestimation of competition from neighboring counties, particularly for depositors residing near county borders, we conducted additional robustness checks. First, we use an alternative definition of the local market, including all rate-setter branches of competitors located within a 50km radius. Our main results are robust to this modification, as shown in Table A2 in the Appendix.

Second, we employed a spatial autoregressive (SAR) model considering the interactions among all branches within the same state. The SAR model is specifically designed to account for spatial relationships (Acedanski and Karkowska 2022, Asgharian et al. 2013, Fernandez-Aviles et al. 2012). Following the panel SAR model framework proposed by (Lee and Yu 2010), we estimated the following equation:

$$\Delta \mathbf{r}_t = \lambda W \Delta \mathbf{r}_t + \rho \Delta FF_t + \Gamma + \varepsilon_t \tag{8}$$

where $\Delta \mathbf{r}_t$ is the vector of the changes in the deposit spread of each branch in quarter t, ΔFF_t represents the Federal funds target rate, Γ is the vector of branch fixed effects, and ε_t is the error term. The weighting matrix W is a $N \times N$ matrix for all branches, where the element (i, j), denoted as w_{ij}, is defined by

$$w_{ij} = \frac{D^i_{jt} / d^i_j}{\sum_{j=1}^{N} D^i_{jt} / d^i_j} \tag{9}$$

if branch j does not belong to the same bank and is located in the same state as branch i and 0 otherwise. D^i_{jt} represents the deposits held in branch jj ($j = 1, \ldots, N$), d^i_j represents the minimum great-circle distance between i and j, and N represents the total number of branches. The weighting matrix W is computed based on annual data and the regressions are conducted on an annual basis. To ensure a balanced panel, which is required in the panel SAR model, we limit the regression to branches with no missing observations during the regression period for each year. The coefficient λ in equation (8) corresponds to the coefficient β in our baseline model (3), with the distinction that this SAR model considers all competitor branches within the same state, whereas our baseline model considers only competitor branches within the same county. Table A3 and Figure A2 in the Appendix display the results. Panel A, B, and C in Table A3 present the results for checking deposits, savings deposits and 12-month time deposits, respectively. In line with our main result, the coefficient λ is substantially higher during the GFC compared to normal times.

7.2 Reference rates in deposit spread

Initially, we employed the deposit spread over the effective federal funds rate as a strategic variable, as it measures the remuneration of deposits relative to what households could earn investing in similar safe assets. However, a more appropriate measure for time deposits is the Treasury security rate with the same maturity, considering that the Fed funds rate is an overnight lending rate. Therefore, we re-estimate our baseline regression using Treasury security rates with the same maturity for time deposits. As shown in Table A4 of the Appendix, our results remain robust to this adjustment.

7.3 Deposit rates frequency

The deposit rates obtained from RateWatch are available on a weekly basis. However, for our analysis, we have converted the data to quarterly frequency by taking the average of the available weekly observations within each quarter for a given branch. This approach is widely used in the existing literature. To ensure the robustness of our findings, we also conducted the analysis using monthly averages for key products (checking, savings, and 12-month time deposits). The results, presented in Table A5 of the Appendix, confirm the robustness of our main findings.

8 Conclusion

This paper investigated deposit market competition across U.S. banks during the Great Financial Crisis of 2007-2009. Using branch-level data, we analyzed the pricing behavior of banks and how banks reacted to the changes in their competitors' deposit spread. Our evidence indicates that banks reacted more intensely to competitor price changes during the crisis compared to normal times, indicating that heightened competition in the deposit market. This intensified competition was observed both before and after the Lehman bankruptcy, even in the presence of massive deposit inflows, suggesting that the price competition was not solely driven by the need to counter deposit outflows at the onset of the crisis.

Our findings also suggest that the aggressive pricing behavior was not only limited to poorly capitalized banks and that it was widespread across the banking sector. Small banks exhibited higher sensitivity to competitor moves, particularly in offering time deposits. Additionally, branches in local markets with lower concentration demonstrated a higher level of competition. Finally, increases in deposit spreads contributed to deposit growth at branches, but this effect was observed only for branches of well-capitalized banks after the Lehman bankruptcy, pointing to uneven benefits from the inflow of deposits.

This study offers some policy implications highlighting the importance of understanding and monitoring competition dynamics in deposit markets during times of financial crises, as excessive competition can increase the vulnerability of the banking sector and hinder the effectiveness of monetary policy. Our arguments are particularly relevant in times of digitalization given that depositors might have become more sensitive and aware of price changes of competitors along with reduced switching costs.

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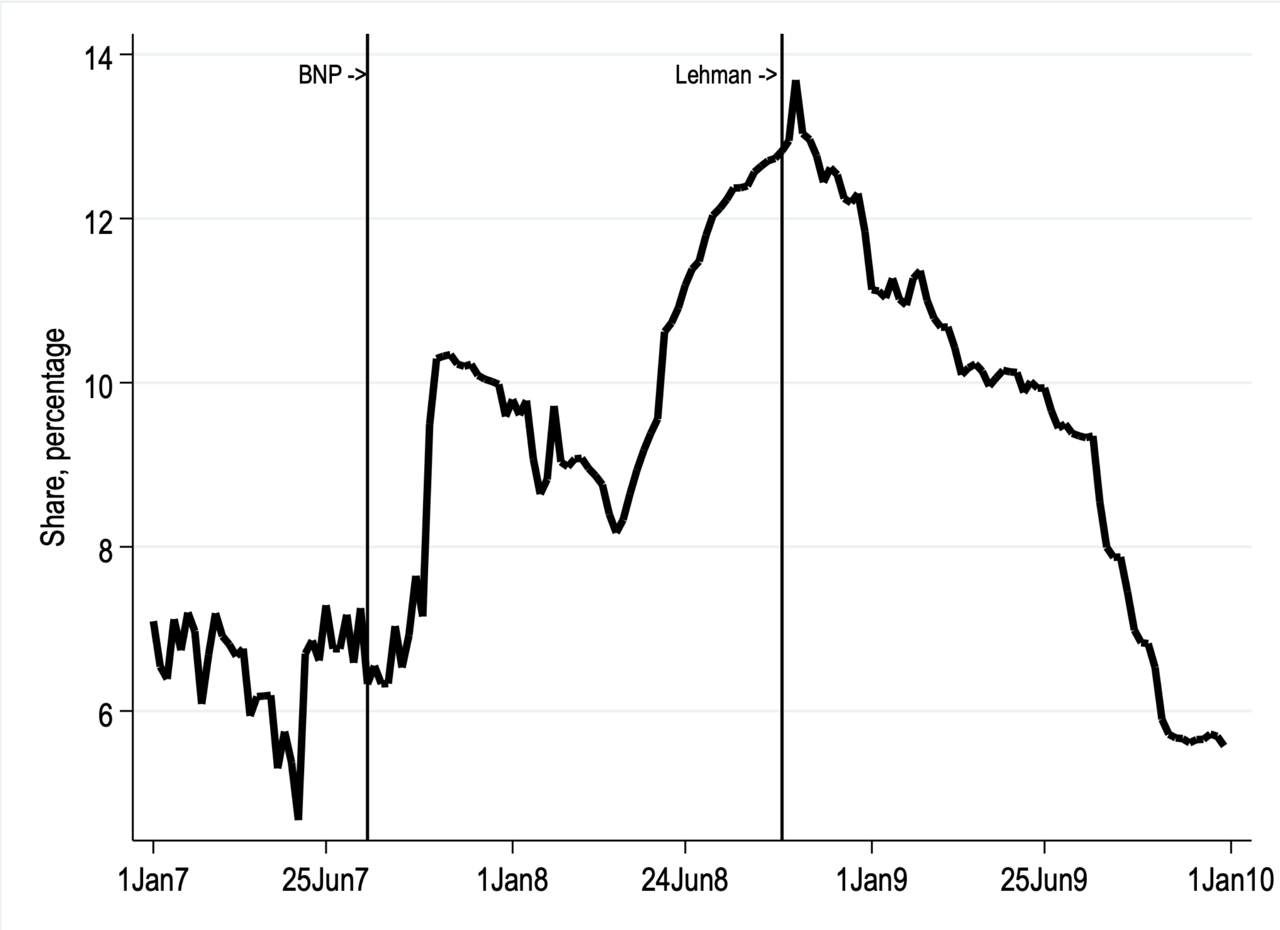
Figure 1. Share of promotional rate CD products during the 2007-2009 crisis

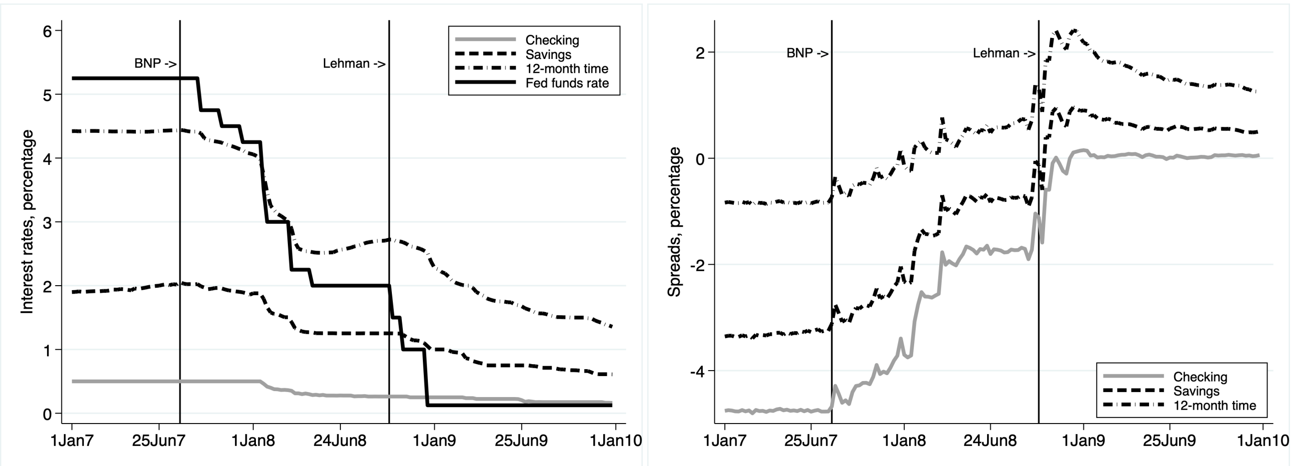


Notes. This figure shows the percentage of limited-time promotional rates for time deposit products (CDs) compared to the total number of quotes surveyed by RateWatch. The data cover the period from 2007q1 to 2010q4 and are presented on a weekly basis. The vertical line indicates the freeze of ABCP by BNP Paribas and the bankruptcy of Lehman Brothers, respectively. The data are from RateWatch.

Figure 2. Weekly changes in deposit rates and spreads during the 2007-2009 crisis

Panel A: Deposit rates

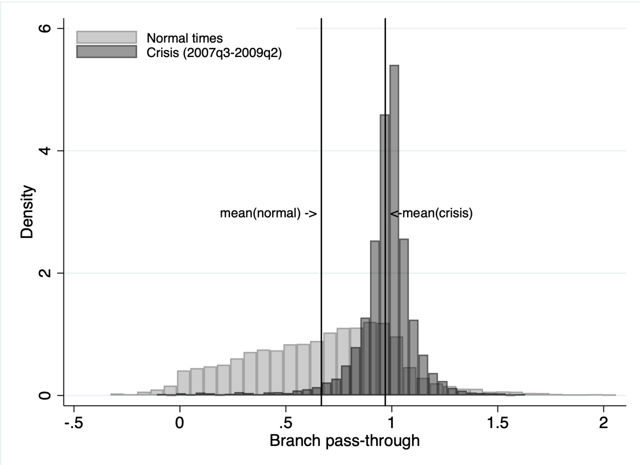
Panel B: Deposit spreads



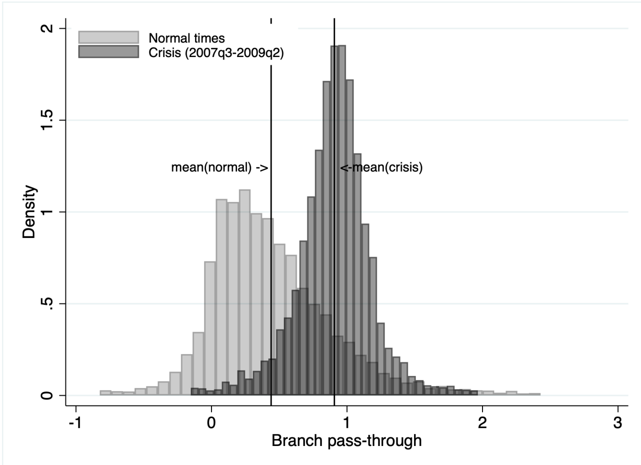
Notes. This figure shows a selection of deposit rates (Panel A) and deposit spreads (Panel B) along with the federal funds target rate during the period 2007-2009. Each panel shows the median rates of $2.5K interest checking accounts (checking), $25K money market deposit accounts (savings), and $10K 12-month certificates of deposits(12-month time). The vertical line indicates the freeze of ABCP by BNP Paribas and the bankruptcy of Lehman Brothers, respectively. The data are from RateWatch.

Figure 3. The distributions of deposit spread pass-through

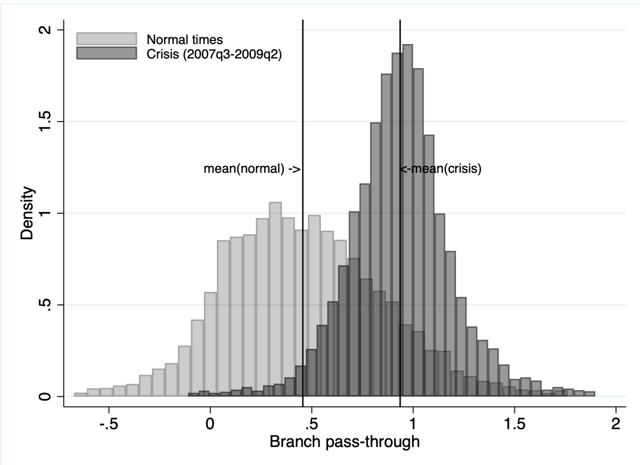
Panel A: Checking deposits



Panel B: Saving deposits



Panel C: 12-month time deposits



Notes. This figure shows the distribution of branch pass-through deposit spreads for checking, savings, and 12-month time deposits. The branch pass-through is estimated by regressing the following equation for each branch: $\Delta r_{it} = \beta_i \Delta r_{-it} + \beta_i^* \Delta r_{-it} \times Crisis_t + \rho_i \Delta FF_t + \rho_i^* \Delta FF_t \times Crisis_t + \varepsilon_{it}$ where β_i and $\beta_i + \beta_i^*$ are referred to as the deposit spread pass-through for branch i in normal times and during the crisis respectively. The sample includes all branches with more than 10 observations. For this figure, the pass-throughs are winsorized and trimmed at the 1% level.

Table 1. Coverage of deposit rates data

	Total deposits ($ billion)	Branch (number)	Bank (number)	BHC (number)
FDIC Summary of Deposits	8,947	97,340	7,225	4,697
RateWatch (all branches)	6,845	78,461	6,017	4,144
Share to SoD (%)	76.5%	80.6%	83.3%	88.2%
RateWatch (only rate setters)	2,178	7,142	5,432	3,871
Share to RateWatch (%)	31.8%	9.1%	90.3%	93.4%
Share to SoD (%)	24.3%	7.3%	75.2%	82.4%

Notes. This table provides the coverage of branches of RateWatch data set compared to branches reported to Summary of Deposits data published by the FDIC as of 2012.

Table 2. Descriptive statistics

	Sample by sub-period				Full sample
	Before (04q1-07q2)	Crisis 1 (07q3-08q2)	Crisis 2 (08q3-09q2)	After (09q3-12q4)	
Δ deposit spread (quarterly change in %)					
Checking	-0.31	0.76	0.42	-0.01	0.01
	(0.23)	(0.47)	(0.57)	(0.06)	(0.45)
Savings	-0.24	0.61	0.34	-0.04	0.00
	(0.29)	(0.52)	(0.62)	(0.09)	(0.43)
Time:					
3-month	-0.16	0.49	0.22	-0.06	-0.00
	(0.28)	(0.50)	(0.71)	(0.10)	(0.40)
6-month	-0.12	0.40	0.23	-0.07	-0.01
	(0.28)	(0.47)	(0.73)	(0.11)	(0.39)
12-month	-0.11	0.36	0.26	-0.09	-0.01
	(0.26)	(0.42)	(0.76)	(0.12)	(0.38)
24-month	-0.15	0.40	0.29	-0.10	-0.02
	(0.25)	(0.39)	(0.75)	(0.13)	(0.39)
36-month	-0.18	0.43	0.31	-0.10	-0.02
	(0.25)	(0.38)	(0.76)	(0.14)	(0.40)
48-month	-0.20	0.45	0.32	-0.10	-0.03
	(0.25)	(0.37)	(0.78)	(0.16)	(0.41)
60-month	-0.22	0.46	0.33	-0.10	-0.03
	(0.26)	(0.37)	(0.77)	(0.17)	(0.42)
Δ FFTR	0.33	-0.79	-0.49	0.00	-0.02
	(0.22)	(0.48)	(0.45)	(0.00)	(0.45)
Branch deposits (mill. $)	137.07	158.85	184.36	242.35	186.31
	(888.7)	(1,143)	(1,624)	(2,514)	(1,800)
Branch deposit growth	6.17	4.86	7.16	3.12	4.96
(annual change in %)	(23.63)	(27.64)	(29.15)	(27.38)	(26.36)
County-HHI	0.24	0.23	0.23	0.22	0.23
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Obs. (branch × quarter)	98,751	27,929	27,993	101,440	256,113

Notes. This table provides summary statistics at the branch level, with mean and standard deviation in parentheses. The breakdown in the table is based on different periods. The data used in the table includes matched observations from RateWatch and FDIC Summary of Deposits, covering the time period from 2004q1 to 2012q4.

Table 3. Branch pass-through in normal times vs. crisis

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
A. Normal times: β_i									
Mean	0.672	0.448	0.466	0.485	0.458	0.418	0.417	0.397	0.387
Std. Dev.	0.404	0.507	0.479	0.445	0.426	0.399	0.407	0.395	0.405
Median	0.698	0.367	0.409	0.459	0.431	0.391	0.381	0.358	0.355
B. Crisis (2007q3-2009q2): $\beta_i + \beta_i^*$									
Mean	0.965	0.907	0.931	0.936	0.935	0.930	0.923	0.927	0.908
Std. Dev.	0.205	0.312	0.322	0.302	0.292	0.314	0.332	0.379	0.365
Median	0.988	0.919	0.926	0.934	0.937	0.929	0.925	0.911	0.902
C. Difference in mean: β_i^*	0.293***	0.460***	0.465***	0.451***	0.477***	0.511***	0.506***	0.530***	0.521***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of branches	7,212	7,088	6,786	7,383	7,391	7,061	6,703	5,660	5,713

Notes. This table shows the summary statistics of branch pass-through of deposit spread by deposit products for normal times (Panel A) and for the crisis period (Panel B), respectively. Panel C provides the difference in average pass-through between the crisis and normal times, along with the result of a t-test (p-value in parentheses). ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table 4. Baseline model

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Panel A: Baseline model									
Δ Spread_competitors	0.807***	0.549***	0.614***	0.630***	0.642***	0.623***	0.611***	0.568***	0.548***
	(0.0118)	(0.0112)	(0.00797)	(0.00767)	(0.00764)	(0.00770)	(0.00719)	(0.00963)	(0.00806)
Δ FFTR	-0.102***	-0.179***	-0.0829***	-0.0514***	-0.0344***	-0.0418***	-0.0483***	-0.0489***	-0.0571***
	(0.00699)	(0.00579)	(0.00354)	(0.00339)	(0.00306)	(0.00335)	(0.00342)	(0.00415)	(0.00390)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.758	0.378	0.348	0.347	0.355	0.339	0.328	0.291	0.274
Panel B: Baseline model with crisis interaction									
Δ Spread_competitors	0.187***	0.0790***	0.131***	0.164***	0.182***	0.199***	0.225***	0.213***	0.226***
	(0.0161)	(0.00795)	(0.00846)	(0.00846)	(0.00853)	(0.00760)	(0.00761)	(0.00800)	(0.00802)
Δ Spread_comp× Crisis1	0.702***	0.589***	0.609***	0.600***	0.614***	0.564***	0.522***	0.496***	0.453***
	(0.0146)	(0.0166)	(0.0128)	(0.0123)	(0.0130)	(0.0162)	(0.0169)	(0.0189)	(0.0184)
Δ Spread_comp × Crisis2	0.729***	0.716***	0.649***	0.613***	0.578***	0.557***	0.515***	0.481***	0.458***
	(0.0173)	(0.0147)	(0.00999)	(0.0100)	(0.00979)	(0.0107)	(0.0117)	(0.0142)	(0.0134)
Δ FFTR	-0.700***	-0.691***	-0.510***	-0.463***	-0.393***	-0.448***	-0.487***	-0.528***	-0.538***
	(0.0142)	(0.00930)	(0.00822)	(0.00791)	(0.00727)	(0.00704)	(0.00735)	(0.00813)	(0.00833)
Δ FFTR × Crisis1	0.632***	0.531***	0.461***	0.462***	0.415***	0.453***	0.494***	0.550***	0.548***
	(0.0141)	(0.0142)	(0.00994)	(0.00915)	(0.00908)	(0.0111)	(0.0110)	(0.0130)	(0.0136)
Δ FFTR × Crisis2	0.660***	0.591***	0.418***	0.358***	0.270***	0.332***	0.381***	0.430***	0.436***
	(0.0142)	(0.0104)	(0.00930)	(0.00918)	(0.00878)	(0.00850)	(0.00874)	(0.00948)	(0.0105)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.798	0.455	0.420	0.421	0.426	0.401	0.383	0.345	0.324

Notes. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively.

Table 5. Response to the rise and fall in competitors' spread

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Panel A: Regression with Rise dummy interaction									
(A) Δ Spread_competitors	0.289***	0.156***	0.201***	0.217***	0.223***	0.251***	0.282***	0.274***	0.282***
	(0.0166)	(0.00982)	(0.00967)	(0.00975)	(0.00952)	(0.00966)	(0.00939)	(0.00968)	(0.00937)
(B) Δ Spread_comp× Crisis1	-0.573***	-0.395***	-0.250***	-0.128***	-0.0591	-0.0863	-0.123	-0.197**	-0.265***
	(0.0538)	(0.0414)	(0.0499)	(0.0453)	(0.0640)	(0.0686)	(0.0805)	(0.0780)	(0.101)
(C) Δ Spread_comp × Crisis2	-0.227***	-0.0284	0.132***	0.153***	0.175***	0.146***	0.0820***	0.00316	0.0100
	(0.0304)	(0.0213)	(0.0162)	(0.0157)	(0.0146)	(0.0170)	(0.0183)	(0.0228)	(0.0221)
(D) Δ Spread_comp × Rise	-0.220***	-0.173***	-0.225***	-0.234***	-0.235***	-0.259***	-0.273***	-0.245***	-0.207***
	(0.0232)	(0.0154)	(0.0175)	(0.0182)	(0.0166)	(0.0169)	(0.0177)	(0.0172)	(0.0173)
(E) Δ Spread_comp × Crisis1 × Rise	1.409***	1.123***	0.981***	0.779***	0.770***	0.817***	0.863***	0.882***	0.883***
	(0.0605)	(0.0480)	(0.0532)	(0.0490)	(0.0652)	(0.0726)	(0.0836)	(0.0834)	(0.103)
(F) Δ Spread_comp × Crisis2 × Rise	1.143***	0.839***	0.422***	0.352***	0.360***	0.411***	0.482***	0.495***	0.446***
	(0.0337)	(0.0376)	(0.0335)	(0.0310)	(0.0262)	(0.0285)	(0.0296)	(0.0300)	(0.0310)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.810	0.476	0.443	0.448	0.450	0.423	0.405	0.373	0.348
Panel B: Spread pass-through (bps per 100 bps change of competitors' spread)									
When competitors' spread rises:									
Normal (A+D)	6.9	-1.7	-2.4	-1.7	-1.2	-0.8	0.9	2.9	7.5
Crisis1 $(A+D+B+E)$	90.5	71.1	70.7	63.4	69.9	72.27	74.9	71.4	69.3
Crisis2$(A+D+C+F)$	98.5	79.4	53.0	48.8	52.3	54.9	57.3	52.7	53.1
When competitors' spread falls:									
Normal (A)	28.9	15.6	20.1	21.7	22.3	25.1	28.2	27.4	28.2
Crisis1 $(A+B)$	-28.4	-23.9	-4.9	8.9	16.4	16.47	15.9	7.7	1.7
Crisis2 $(A+C)$	6.2	12.76	33.3	37.0	39.8	39.7	36.4	27.7	29.2

Notes. Panel A presents the results of regression, including the interaction term with *Rise* dummy (equal to 1 if competitors' spread rises, 0 otherwise). The regressions include the Federal funds rate and the same interactions as the spread of competitors, as well as bank-time, state-time, county, branch, year, and quarter fixed effects. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively. Full regression table including the coefficients of Fed rates and their interaction terms in the Appendix (Table A6). Panel B provides pass-through, which represents the response of branches in bps to a change of 100bps in competitors' spread. Its computation is based on the results in Panel A.

Table 6. Impact of bank capital

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.230***	0.064***	0.129***	0.163***	0.191***	0.211***	0.221***	0.213***	0.219***
	(0.027)	(0.018)	(0.018)	(0.020)	(0.018)	(0.015)	(0.015)	(0.014)	(0.014)
Δ Spread_comp× Crisis1	0.687***	0.602***	0.651***	0.639***	0.654***	0.595***	0.559***	0.557***	0.509***
	(0.026)	(0.026)	(0.027)	(0.026)	(0.025)	(0.026)	(0.025)	(0.028)	(0.027)
Δ Spread_comp × Crisis2	0.697***	0.748***	0.655***	0.609***	0.578***	0.558***	0.520***	0.481***	0.480***
	(0.027)	(0.023)	(0.021)	(0.022)	(0.020)	(0.020)	(0.022)	(0.024)	(0.024)
Δ Spread_comp × Capital	-0.003	0.002	0.001	0.001	0.000	-0.000	0.001	0.000	0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ Spread_comp × Crisis1 × Capital	0.001	0.001	-0.002	-0.002	-0.002	-0.000	-0.000	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ Spread_comp × Crisis2 × Capital	0.002	-0.003*	-0.002	-0.001	-0.001	-0.001	-0.001	-0.002	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Observations	184,047	179,858	170,148	188,995	189,247	178,108	166,496	138,076	137,758
R^2 within	0.794	0.466	0.435	0.437	0.445	0.421	0.405	0.375	0.343

Notes. The variable *Capital* represents the book capital ratio of the bank to which a branch belongs. It is calculated as the average of the pre-crisis period in our sample (04q1-07q2) and winsorized at the 1% level. The regressions include the Federal funds rate and the same interactions as the spread of competitors, as well as bank-time, state-time, county, branch, year, and quarter fixed effects. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively. Full regression table including the coefficients of Fed rates and their interaction terms in the Appendix (Table A7).

Table 7. Response of large vs. small banks

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.166***	0.0608***	0.112***	0.144***	0.160***	0.188***	0.221***	0.207***	0.231***
	(0.0156)	(0.00854)	(0.0100)	(0.0101)	(0.0100)	(0.00911)	(0.00913)	(0.00960)	(0.00956)
Δ Spread_comp× Crisis1	0.709***	0.567***	0.594***	0.577***	0.578***	0.504***	0.456***	0.431***	0.387***
	(0.0169)	(0.0203)	(0.0161)	(0.0157)	(0.0167)	(0.0200)	(0.0193)	(0.0211)	(0.0207)
Δ Spread_comp × Crisis2	0.738***	0.708***	0.659***	0.621***	0.580***	0.545***	0.495***	0.461***	0.432***
	(0.0186)	(0.0165)	(0.0120)	(0.0122)	(0.0116)	(0.0128)	(0.0141)	(0.0168)	(0.0154)
Δ Spread_comp × Small	0.0624**	0.0605***	0.0591***	0.0605***	0.0705***	0.0374***	0.0143	0.0196	-0.0203
	(0.0273)	(0.0163)	(0.0152)	(0.0148)	(0.0142)	(0.0130)	(0.0124)	(0.0131)	(0.0135)
Δ Spread_comp × Crisis1 × Small	-0.0272	0.0544**	0.0340	0.0502**	0.0691***	0.142***	0.168***	0.178***	0.199***
	(0.0279)	(0.0274)	(0.0223)	(0.0199)	(0.0211)	(0.0216)	(0.0209)	(0.0234)	(0.0251)
Δ Spread_comp × Crisis2 × Small	-0.0316	0.0116	-0.0376**	-0.0323*	-0.0207	0.0145	0.0383**	0.0386*	0.0603***
	(0.0294)	(0.0208)	(0.0185)	(0.0175)	(0.0171)	(0.0167)	(0.0178)	(0.0214)	(0.0215)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.798	0.457	0.421	0.423	0.429	0.405	0.388	0.350	0.328

Notes. The variable *Small* is a dummy variable with 1 for the branches of small banks. A small bank is defined as a bank with average total assets lower than the sample median. The regressions include the Federal funds rate and the same interactions as the spread of competitors, as well as bank-time, state-time, county, branch, year, and quarter fixed effects. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively. Full regression table including the coefficients of Fed rates and their interaction terms in the Appendix (Table A8).

Table 8. Impact of local market structure

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.196***	0.048***	0.078***	0.146***	0.145***	0.191***	0.224***	0.203***	0.233***
	(0.031)	(0.016)	(0.019)	(0.017)	(0.017)	(0.016)	(0.016)	(0.018)	(0.018)
Δ Spread_comp× Crisis1	0.715***	0.611***	0.681***	0.655***	0.688***	0.620***	0.571***	0.556***	0.504***
	(0.029)	(0.034)	(0.026)	(0.025)	(0.024)	(0.029)	(0.032)	(0.035)	(0.035)
Δ Spread_comp × Crisis2	0.726***	0.774***	0.700***	0.629***	0.619***	0.580***	0.537***	0.516***	0.463***
	(0.033)	(0.023)	(0.021)	(0.018)	(0.017)	(0.018)	(0.020)	(0.023)	(0.022)
Δ Spread_comp × HHI	-0.043	0.156**	0.253***	0.087	0.178***	0.041	0.009	0.046	-0.037
	(0.105)	(0.071)	(0.085)	(0.066)	(0.067)	(0.065)	(0.067)	(0.075)	(0.073)
Δ Spread_comp × Crisis1 × HHI	-0.061	-0.111	-0.346***	-0.262***	-0.353***	-0.267**	-0.238*	-0.294**	-0.250
	(0.118)	(0.141)	(0.106)	(0.097)	(0.096)	(0.118)	(0.129)	(0.148)	(0.156)
Δ Spread_comp × Crisis2 × HHI	0.013	-0.291***	-0.245***	-0.075	-0.198***	-0.117	-0.112	-0.181**	-0.031
	(0.108)	(0.086)	(0.093)	(0.072)	(0.071)	(0.074)	(0.076)	(0.088)	(0.085)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.798	0.455	0.420	0.421	0.427	0.402	0.384	0.346	0.324

Notes. HHI is calculated as the average value of county-level HHI over the sample period for the branches. The regressions include the Federal funds rate and the same interactions as the spread of competitors, as well as bank-time, state-time, county, branch, year, and quarter fixed effects. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively. Full regression table including the coefficients of Fed rates and their interaction terms in the Appendix (Table A9).

Table 9. Impact of change in spread on deposit growth

	Δlog Deposits			
	Branch level		Bank-County level	
	(1)	(2)	(3)	(4)
$\Delta\text{Spread}_{t-1}$	3.665***	3.665***	3.445***	3.361***
	(0.457)	(0.457)	(0.383)	(0.378)
$\Delta\text{Spread}_{t-1}$ × Crisis1	-3.677***	-3.675***	-3.319***	-3.318***
	(1.059)	(1.060)	(0.827)	(0.818)
$\Delta\text{Spread}_{t-1}$ ×Crisis2	-3.488***	-3.483***	-2.965***	-2.868***
	(0.956)	(0.957)	(0.803)	(0.793)
Δ FFTR × HHI	-3.222***	-3.220***	-2.998***	-2.537***
	(0.969)	(0.969)	(0.669)	(0.665)
Δ FFTR × HHI × Crisis1	2.240	2.234	0.975	0.158
	(1.479)	(1.478)	(1.530)	(1.520)
Δ FFTR × HHI × Crisis2	6.439***	6.462***	5.524***	5.030***
	(1.344)	(1.343)	(1.043)	(1.034)
Δ # Branch		0.064		3.553***
		(1.292)		(0.284)
Δ # Branch × Crisis1		-1.571		-0.391
		(3.892)		(0.504)
Δ # Branch × Crisis2		-2.512		-0.862
		(3.870)		(0.683)
Observations	35,865	35,865	31,078	31,078
R^2 within	0.006	0.006	0.009	0.036

Notes. Columns (1) to (2) present regression results conducted at the branch level, while columns (3) to (4) show results aggregated at the bank-county level. The data frequency is annual. HHI represents the average value of county-level HHI over the sample period for the branches. # Branch refers to the number of branches of the same bank in the branch's county for each period. The regressions include fixed effects for bank, state, county, branch, and year. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table 10. Effect of bank capital on the relationship between the spread change and the deposit growth

	Δlog Deposits			
	Branch level		Bank-County level	
	(1)	(2)	(3)	(4)
$\Delta\text{Spread}_{t-1}$	3.160***	3.611***	2.738***	3.289***
	(0.502)	(0.458)	(0.430)	(0.378)
$\Delta\text{Spread}_{t-1}$ × Capital	0.038**	0.133	0.049***	0.034
	(0.019)	(0.482)	(0.018)	(0.436)
$\Delta\text{Spread}_{t-1}$ × Crisis1	-5.088**	-3.442***	-3.274	-3.040***
	(2.182)	(1.002)	(2.159)	(0.803)
$\Delta\text{Spread}_{t-1}$ × Crisis1 × Capital	0.131	-0.744	0.017	-0.545
	(0.183)	(4.575)	(0.187)	(3.683)
$\Delta\text{Spread}_{t-1}$ × Crisis2	-5.378***	-3.662***	-5.067***	-3.060***
	(1.066)	(0.953)	(0.906)	(0.791)
$\Delta\text{Spread}_{t-1}$ × Crisis2 × Capital	0.165***	3.944***	0.196***	5.720***
	(0.043)	(1.083)	(0.036)	(0.967)
Δ FFTR × HHI	-3.083***	-3.149***	-2.408***	-2.446***
	(0.965)	(0.967)	(0.659)	(0.663)
Δ FFTR × HHI × Crisis1	2.008	2.142	-0.072	0.009
	(1.475)	(1.478)	(1.516)	(1.518)
Δ FFTR × HHI × Crisis2	6.131***	6.131***	4.698***	4.610***
	(1.330)	(1.334)	(1.014)	(1.017)
Δ # Branch	0.073	0.057	3.561***	3.557***
	(1.288)	(1.291)	(0.284)	(0.284)
Δ # Branch × Crisis1	-1.494	-1.475	-0.385	-0.383
	(3.868)	(3.863)	(0.503)	(0.503)
Δ # Branch × Crisis2	-2.403	-2.498	-0.895	-0.905
	(3.877)	(3.881)	(0.678)	(0.672)
Observations	35,865	35,865	31,078	31,078
R^2 within	0.009	0.007	0.042	0.041

Notes. Columns (1) to (2) present regression results conducted at the branch level, while columns (3) to (4) show results aggregated at the bank-county level. The data frequency is annual. In columns (1) and (3), the variable *Capital* represents the book capital ratio. In columns (2) and (4), it is a dummy variable with a value of 1 for banks with a book capital ratio in the top decile and 0 otherwise. The book capital ratio is computed as the average during the pre-crisis period in our sample (04q1-07q2) and winsorized at the 1% level. HHI represents the average value of county-level HHI over the sample period for the branches. # Branch refers to the number of branches of the same bank in the branch's county for each period. The regressions include fixed effects for bank, state, county, branch, and year. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively.

Appendix: Supplementary Figures and Tables

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[Figure A2 about here.]

[Table A1 about here.]

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[Table A3 about here.]

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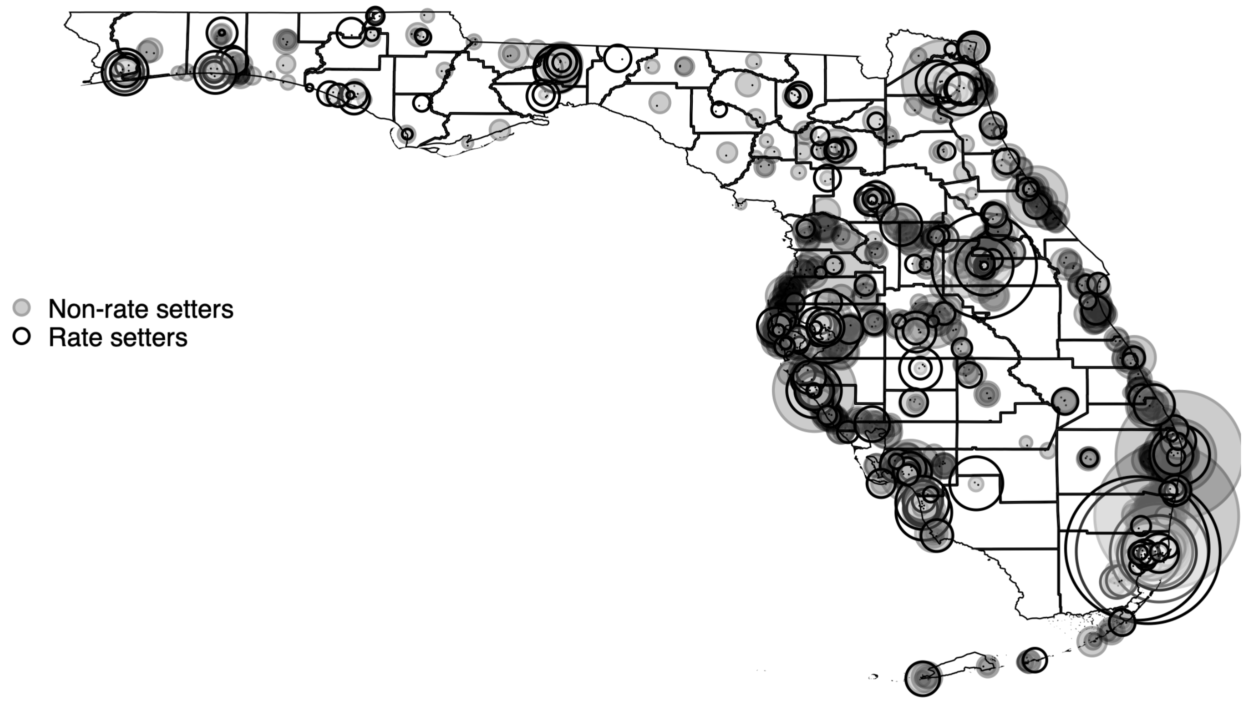
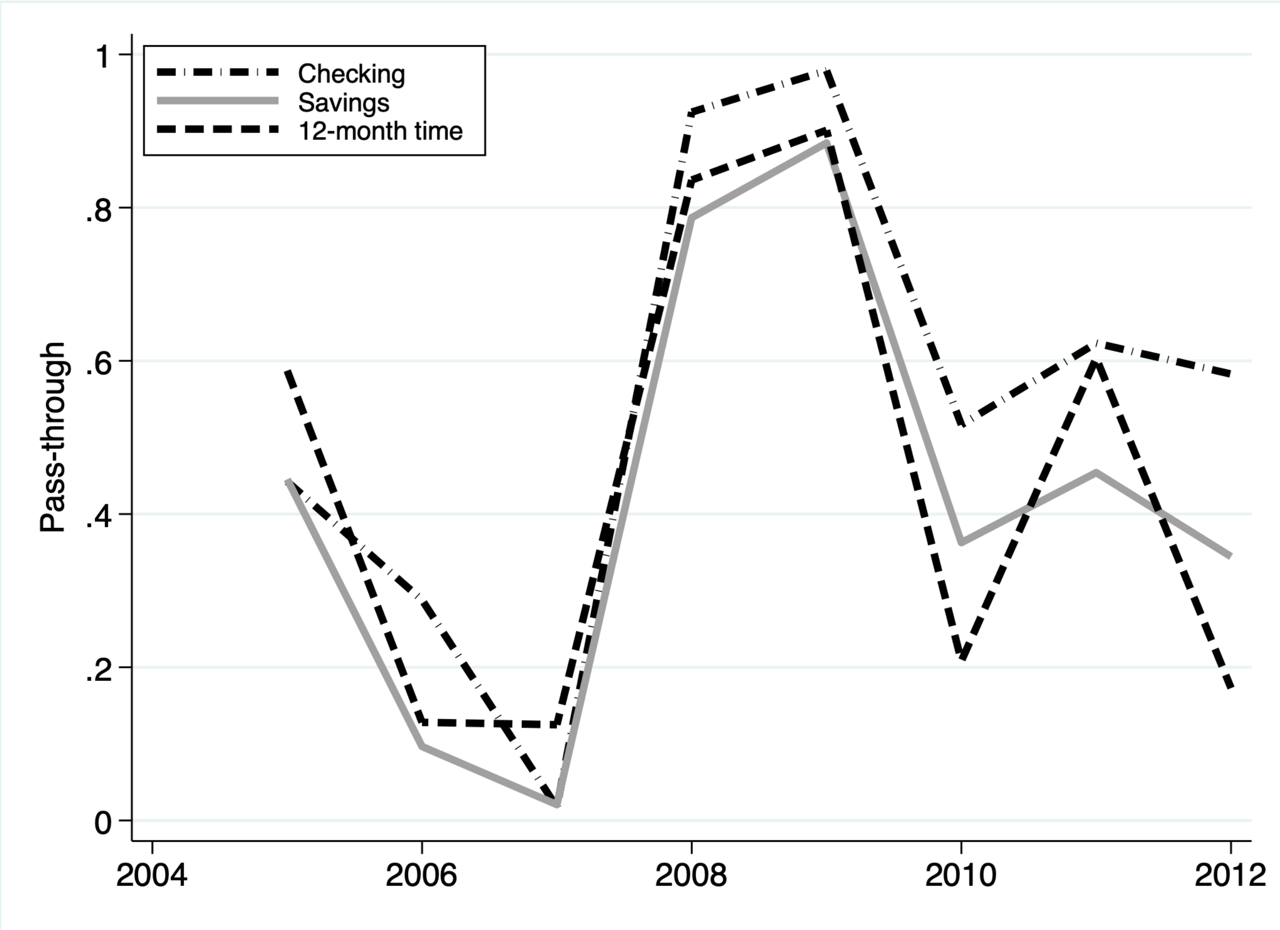
Figure A1. Branch distribution in the state of Florida



Notes. This figure illustrates the spatial distribution of branches within the state of Florida during the first quarter of 2007. Each branch is represented by a circle, with empty circles indicating rate setters and grey-filled circles representing non-rate setters. The size of each circle corresponds to the amount of deposits associated with the respective branch. The data are from RateWatch.

Figure A2. Annual average pass-through based on the SAR model



Notes. This figure presents the pass-through of the competitors' change in deposit spread, estimated through the spatial autoregressive (SAR) model. See Table A3 in the Appendix for regression results in detail.

Table A1. Observations with the rise of competitor's spread and proportion

Observations	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Panel A: Normal times									
$\Delta spread_c > 0$	46289	37668	35699	38155	36347	31011	27521	23366	24015
Total	161030	158149	151202	166559	166762	157880	148602	125687	125821
Proportion (%)	28.7	23.8	23.6	22.9	21.8	19.6	18.5	18.6	19.1
Panel B: Crisis1									
$\Delta spread_c > 0$	22984	21648	19100	19609	19840	19829	19328	16733	16785
Total	23093	22956	21859	23960	23988	22714	21310	18011	17901
Proportion (%)	99.5	94.3	87.4	81.8	82.7	87.3	90.7	92.9	93.8
Panel C: Crisis2									
$\Delta spread_c > 0$	15278	12696	11156	12184	12328	11903	11358	9798	9887
Total	23397	23035	21821	23967	24006	22750	21428	18114	18094
Proportion (%)	65.3	55.1	51.1	50.8	51.4	52.3	53.0	54.1	54.6

Notes. This table presents the number of observations with an increase in competitors' spread and their proportion. Panel A, B, and C correspond to normal times, Crisis1 (2007q3-2008q2), and Crisis2 (2008q3-2009q2), respectively.

Table A2. Regression results using alternative local market definition (50km Radius)

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Panel A: Baseline model									
Δ Spread_competitors	0.867***	0.629***	0.698***	0.715***	0.723***	0.694***	0.686***	0.633***	0.609***
	(0.008)	(0.010)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.010)	(0.008)
Δ FFTR	-0.068***	-0.156***	-0.075***	-0.045***	-0.039***	-0.044***	-0.048***	-0.049***	-0.056***
	(0.005)	(0.006)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	230,107	227,040	218,078	236,743	237,060	225,865	213,557	183,674	184,053
R^2 within	0.789	0.416	0.386	0.385	0.390	0.367	0.357	0.316	0.298
Panel B: Baseline model with crisis interaction									
Δ Spread_competitors	0.260***	0.105***	0.168***	0.213***	0.243***	0.250***	0.285***	0.261***	0.274***
	(0.017)	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
Δ Spread_comp× Crisis1	0.669***	0.634***	0.645***	0.615***	0.619***	0.557***	0.519***	0.499***	0.456***
	(0.015)	(0.016)	(0.012)	(0.013)	(0.013)	(0.018)	(0.018)	(0.019)	(0.019)
Δ Spread_comp × Crisis2	0.686***	0.722***	0.657***	0.606***	0.561***	0.567***	0.515***	0.488***	0.466***
	(0.017)	(0.015)	(0.010)	(0.010)	(0.010)	(0.011)	(0.012)	(0.014)	(0.013)
Δ FFTR	-0.637***	-0.672***	-0.492***	-0.438***	-0.363***	-0.416***	-0.443***	-0.491***	-0.494***
	(0.015)	(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Δ FFTR × Crisis1	0.594***	0.536***	0.457***	0.442***	0.380***	0.398***	0.440***	0.502***	0.495***
	(0.013)	(0.013)	(0.010)	(0.009)	(0.009)	(0.012)	(0.011)	(0.013)	(0.013)
Δ FFTR × Crisis2	0.614***	0.580***	0.399***	0.332***	0.233***	0.288***	0.322***	0.379***	0.373***
	(0.015)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)
Observations	230,107	227,040	218,078	236,743	237,060	225,865	213,557	183,674	184,053
R^2 within	0.816	0.479	0.444	0.442	0.443	0.415	0.398	0.359	0.340

Notes. The table presents the regression results obtained using the alternative definition of the local market, which is defined as a circle with a radius of 50km. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table A3. Regression results of the spatial autoregressive (SAR) model

	(1) 04q3-05q2	(2) 05q3-06q2	(3) 06q3-07q2	(4) 07q3-08q2	(5) 08q3-09q2	(6) 09q3-10q2	(7) 10q3-11q2	(8) 11q3-12q2
Panel A: Checking deposits								
Δ Spread	0.442***	0.288***	0.017	0.925***	0.979***	0.517***	0.623***	0.583***
	(0.009)	(0.013)	(0.015)	(0.003)	(0.001)	(0.010)	(0.009)	(0.007)
Δ FFTR	-0.016	-0.639***	-0.464***	-0.035***	-0.007***	0.000	0.000	0.000
	(0.011)	(0.022)	(0.008)	(0.003)	(0.002)	(.)	(.)	(.)
Observations	25,144	25,236	24,964	24,656	24,668	25,316	25,616	26,296
p-value	0.000	0.000	0.236	0.000	0.000	0.000	0.000	0.000
Panel B: Savings deposits								
Δ Spread	0.445***	0.097***	0.021	0.787***	0.884***	0.363***	0.454***	0.344***
	(0.009)	(0.013)	(0.013)	(0.005)	(0.002)	(0.012)	(0.010)	(0.012)
Δ FFTR	0.090***	-0.868***	-0.236***	-0.100***	-0.075***	0.000	0.000	0.000
	(0.022)	(0.044)	(0.011)	(0.005)	(0.003)	(.)	(.)	(.)
Observations	24,576	24,600	24,912	24,588	24,716	24,956	25,280	26,132
p-value	0.000	0.000	0.107	0.000	0.000	0.000	0.000	0.000
Panel C: 12-month time deposits								
d_spread	0.587***	0.128***	0.125***	0.836***	0.901***	0.208***	0.604***	0.173***
	(0.008)	(0.011)	(0.013)	(0.005)	(0.002)	(0.012)	(0.008)	(0.014)
Δ FFTR	0.276***	-0.632***	0.150***	-0.008**	-0.147***	0.000	0.000	0.000
	(0.033)	(0.051)	(0.010)	(0.004)	(0.004)	(.)	(.)	(.)
Observations	25,644	26,080	26,024	25,628	25,656	25,976	26,328	27,504
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes. This table provides the result of the spatial autoregressive (SAR) model. Branch fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively. p-value is obtained from Wald test of spatial terms.

Table A4. Regression results using alternative reference rates for time deposits (Treasury security rates)

	3-month	6-month	12-month	24-month	36-month	60-month
Panel A: Baseline model						
Δ Spread_competitors	0.344***	0.425***	0.506***	0.513***	0.497***	0.420***
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)
Δ Treasury Rates	-0.520***	-0.427***	-0.372***	-0.419***	-0.442***	-0.493***
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)
Observations	193,667	213,337	213,620	202,139	190,109	160,606
R^2 within	0.476	0.483	0.538	0.642	0.676	0.636
Panel B: Baseline model with crisis interaction						
Δ Spread_competitors	0.091***	0.135***	0.192***	0.197***	0.201***	0.183***
	(0.008)	(0.008)	(0.009)	(0.008)	(0.007)	(0.008)
Δ Spread_comp× Crisis1	0.310***	0.448***	0.518***	0.523***	0.512***	0.488***
	(0.016)	(0.014)	(0.014)	(0.017)	(0.017)	(0.019)
Δ Spread_comp × Crisis2	0.419***	0.377***	0.319***	0.339***	0.333***	0.276***
	(0.011)	(0.013)	(0.012)	(0.014)	(0.014)	(0.016)
Δ Treasury Rates	-0.663***	-0.630***	-0.626***	-0.755***	-0.760***	-0.757***
	(0.009)	(0.011)	(0.010)	(0.009)	(0.008)	(0.008)
Δ Treasury Rates × Crisis1	0.223***	0.355***	0.431***	0.518***	0.510***	0.503***
	(0.014)	(0.013)	(0.015)	(0.018)	(0.017)	(0.016)
Δ Treasury Rates × Crisis2	0.121***	0.121***	0.131***	0.242***	0.244***	0.217***
	(0.012)	(0.013)	(0.013)	(0.015)	(0.015)	(0.014)
Observations	193,667	213,337	213,620	202,139	190,109	160,606
R^2 within	0.508	0.520	0.574	0.668	0.696	0.655

Notes. This table displays the regression results where Treasury security rates with matching maturity of CDs are used as the reference rate instead of Fed rates. The deposit spread is computed as the difference between the deposit rates on each CD and the corresponding Treasury rate. Additionally, in the regression, the Federal Fund Target rate is replaced with Treasury rates. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively.

Table A5. Regression results with monthly average of deposit spreads

	Checking	Savings	Time (12-month)
Δ Spread_competitors	0.506***	0.203***	0.213***
	(0.018)	(0.008)	(0.006)
Δ Spread_comp× Crisis1	0.390***	0.492***	0.528***
	(0.018)	(0.013)	(0.008)
Δ Spread_comp × Crisis2	0.430***	0.595***	0.554***
	(0.017)	(0.017)	(0.008)
Δ FFTR	-0.151***	-0.174***	-0.036***
	(0.006)	(0.004)	(0.004)
Δ FFTR × Crisis1	0.131***	0.155***	0.148***
	(0.007)	(0.008)	(0.006)
Δ FFTR × Crisis2	0.169***	0.220***	0.108***
	(0.006)	(0.005)	(0.007)
Observations	639,137	629,175	662,245
R^2 within	0.694	0.359	0.353

Notes. Bank-time, state-time, county, branch, year, and month fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,** ,* indicate significance at the 1, 5 and 10% level, respectively.

Table A6. Regression results including all coefficients: Response to the rise and fall in competitors' spread (Table 5)

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
(A) Δ Spread_competitors	0.289***	0.156***	0.201***	0.217***	0.223***	0.251***	0.282***	0.274***	0.282***
	(0.0166)	(0.00982)	(0.00967)	(0.00975)	(0.00952)	(0.00966)	(0.00939)	(0.00968)	(0.00937)
(B) Δ Spread_comp× Crisis1	-0.573***	-0.395***	-0.250***	-0.128***	-0.0591	-0.0863	-0.123	-0.197**	-0.265***
	(0.0538)	(0.0414)	(0.0499)	(0.0453)	(0.0640)	(0.0686)	(0.0805)	(0.0780)	(0.101)
(C) Δ Spread_comp × Crisis2	-0.227***	-0.0284	0.132***	0.153***	0.175***	0.146***	0.0820***	0.00316	0.0100
	(0.0304)	(0.0213)	(0.0162)	(0.0157)	(0.0146)	(0.0170)	(0.0183)	(0.0228)	(0.0221)
(D) Δ Spread_comp × Rise	-0.220***	-0.173***	-0.225***	-0.234***	-0.235***	-0.259***	-0.273***	-0.245***	-0.207***
	(0.0232)	(0.0154)	(0.0175)	(0.0182)	(0.0166)	(0.0169)	(0.0177)	(0.0172)	(0.0173)
(E) Δ Spread_comp × Crisis1 × Rise	1.409***	1.123***	0.981***	0.779***	0.770***	0.817***	0.863***	0.882***	0.883***
	(0.0605)	(0.0480)	(0.0532)	(0.0490)	(0.0652)	(0.0726)	(0.0836)	(0.0834)	(0.103)
(F) Δ Spread_comp × Crisis2 × Rise	1.143***	0.839***	0.422***	0.352***	0.360***	0.411***	0.482***	0.495***	0.446***
	(0.0337)	(0.0376)	(0.0335)	(0.0310)	(0.0262)	(0.0285)	(0.0296)	(0.0300)	(0.0310)
Δ FFTR	-0.618***	-0.653***	-0.510***	-0.489***	-0.422***	-0.469***	-0.502***	-0.533***	-0.538***
	(0.0140)	(0.00957)	(0.00893)	(0.00832)	(0.00752)	(0.00756)	(0.00788)	(0.00878)	(0.00876)
Δ FFTR × Crisis1	0.117	0.610***	0.654***	0.719***	0.649***	0.628***	0.607***	0.633***	0.630***
	(0.0785)	(0.0208)	(0.0162)	(0.0148)	(0.0176)	(0.0174)	(0.0183)	(0.0231)	(0.0244)
Δ FFTR × Crisis2	0.634***	0.770***	0.740***	0.678***	0.580***	0.641***	0.708***	0.804***	0.794***
	(0.0148)	(0.0117)	(0.0138)	(0.0133)	(0.0115)	(0.0125)	(0.0136)	(0.0190)	(0.0171)
Δ FFTR × Rise	-0.133***	0.0406**	0.0900***	0.148***	0.139***	0.111***	0.0965***	0.0324*	0.0111
	(0.0366)	(0.0188)	(0.0146)	(0.0122)	(0.0116)	(0.0134)	(0.0162)	(0.0170)	(0.0193)
Δ FFTR × Crisis1 × Rise	0.563***	-0.139***	-0.297***	-0.455***	-0.384***	-0.269***	-0.180***	-0.104***	-0.0794***
	(0.0835)	(0.0293)	(0.0242)	(0.0199)	(0.0230)	(0.0211)	(0.0251)	(0.0287)	(0.0305)
Δ FFTR × Crisis2 × Rise	0.134***	-0.309***	-0.757***	-0.830***	-0.757***	-0.703***	-0.681***	-0.707***	-0.643***
	(0.0382)	(0.0322)	(0.0328)	(0.0282)	(0.0244)	(0.0239)	(0.0252)	(0.0305)	(0.0302)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.810	0.476	0.443	0.448	0.450	0.423	0.405	0.373	0.348

Notes. The variable *Rise* is a dummy variable, which is equal to 1 if competitors' spread rises, 0 otherwise. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table A7. Regression results including all coefficients: Impact of bank capital (Table 6)

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.230***	0.064***	0.129***	0.163***	0.191***	0.211***	0.221***	0.213***	0.219***
	(0.027)	(0.018)	(0.018)	(0.020)	(0.018)	(0.015)	(0.015)	(0.014)	(0.014)
Δ Spread_comp× Crisis1	0.687***	0.602***	0.651***	0.639***	0.654***	0.595***	0.559***	0.557***	0.509***
	(0.026)	(0.026)	(0.027)	(0.026)	(0.025)	(0.026)	(0.025)	(0.028)	(0.027)
Δ Spread_comp × Crisis2	0.697***	0.748***	0.655***	0.609***	0.578***	0.558***	0.520***	0.481***	0.480***
	(0.027)	(0.023)	(0.021)	(0.022)	(0.020)	(0.020)	(0.022)	(0.024)	(0.024)
Δ Spread_comp × Capital	-0.003	0.002	0.001	0.001	0.000	-0.000	0.001	0.000	0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ Spread_comp × Crisis1 × Capital	0.001	0.001	-0.002	-0.002	-0.002	-0.000	-0.000	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ Spread_comp × Crisis2 × Capital	0.002	-0.003*	-0.002	-0.001	-0.001	-0.001	-0.001	-0.002	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Δ FFTR	-0.703***	-0.748***	-0.572***	-0.505***	-0.439***	-0.470***	-0.509***	-0.545***	-0.533***
	(0.022)	(0.030)	(0.028)	(0.026)	(0.021)	(0.020)	(0.021)	(0.023)	(0.023)
Δ FFTR × Crisis1	0.622***	0.504***	0.480***	0.465***	0.446***	0.456***	0.494***	0.541***	0.525***
	(0.027)	(0.035)	(0.029)	(0.028)	(0.023)	(0.025)	(0.026)	(0.029)	(0.029)
Δ FFTR × Crisis2	0.655***	0.638***	0.458***	0.365***	0.291***	0.331***	0.373***	0.404***	0.406***
	(0.022)	(0.031)	(0.029)	(0.027)	(0.022)	(0.022)	(0.024)	(0.026)	(0.026)
Δ FFTR × Capital	0.001	0.005**	0.005*	0.004*	0.005***	0.004**	0.005**	0.004**	0.003
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ FFTR × Crisis1 × Capital	0.000	0.004	-0.000	-0.000	-0.003	-0.002	-0.001	-0.001	0.001
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ FFTR × Crisis2 × Capital	-0.000	-0.004	-0.004	-0.002	-0.004*	-0.004**	-0.005**	-0.004*	-0.003
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	184,047	179,858	170,148	188,995	189,247	178,108	166,496	138,076	137,758
R^2 within	0.794	0.466	0.435	0.437	0.445	0.421	0.405	0.375	0.343

Notes. The variable *Capital* represents the book capital ratio of the bank to which a branch belongs. It is calculated as the average of the pre-crisis period in our sample (04q1-07q2) and winsorized at the 1% level. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table A8. Regression results including all coefficients: Response of large vs. small banks (Table 7)

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.166***	0.0608***	0.112***	0.144***	0.160***	0.188***	0.221***	0.207***	0.231***
	(0.0156)	(0.00854)	(0.0100)	(0.0101)	(0.0100)	(0.00911)	(0.00913)	(0.00960)	(0.00956)
Δ Spread_comp× Crisis1	0.709***	0.567***	0.594***	0.577***	0.578***	0.504***	0.456***	0.431***	0.387***
	(0.0169)	(0.0203)	(0.0161)	(0.0157)	(0.0167)	(0.0200)	(0.0193)	(0.0211)	(0.0207)
Δ Spread_comp × Crisis2	0.738***	0.708***	0.659***	0.621***	0.580***	0.545***	0.495***	0.461***	0.432***
	(0.0186)	(0.0165)	(0.0120)	(0.0122)	(0.0116)	(0.0128)	(0.0141)	(0.0168)	(0.0154)
Δ Spread_comp × Small	0.0624**	0.0605***	0.0591***	0.0605***	0.0705***	0.0374***	0.0143	0.0196	-0.0203
	(0.0273)	(0.0163)	(0.0152)	(0.0148)	(0.0142)	(0.0130)	(0.0124)	(0.0131)	(0.0135)
Δ Spread_comp × Crisis1 × Small	-0.0272	0.0544**	0.0340	0.0502**	0.0691***	0.142***	0.168***	0.178***	0.199***
	(0.0279)	(0.0274)	(0.0223)	(0.0199)	(0.0211)	(0.0216)	(0.0209)	(0.0234)	(0.0251)
Δ Spread_comp × Crisis2 × Small	-0.0316	0.0116	-0.0376**	-0.0323*	-0.0207	0.0145	0.0383**	0.0386*	0.0603***
	(0.0294)	(0.0208)	(0.0185)	(0.0175)	(0.0171)	(0.0167)	(0.0178)	(0.0214)	(0.0215)
Δ FFTR	-0.725***	-0.695***	-0.511***	-0.479***	-0.406***	-0.481***	-0.524***	-0.565***	-0.569***
	(0.0144)	(0.0113)	(0.0105)	(0.0105)	(0.00985)	(0.00929)	(0.00993)	(0.0108)	(0.0109)
Δ FFTR × Crisis1	0.648***	0.528***	0.456***	0.475***	0.431***	0.486***	0.530***	0.584***	0.572***
	(0.0173)	(0.0178)	(0.0131)	(0.0120)	(0.0123)	(0.0143)	(0.0142)	(0.0173)	(0.0171)
Δ FFTR × Crisis2	0.681***	0.585***	0.440***	0.390***	0.304***	0.401***	0.464***	0.519***	0.517***
	(0.0147)	(0.0127)	(0.0124)	(0.0120)	(0.0114)	(0.0113)	(0.0118)	(0.0132)	(0.0139)
Δ FFTR × Small	0.0706***	0.0210	0.0111	0.0449***	0.0402***	0.0873***	0.0993***	0.109***	0.0928***
	(0.0231)	(0.0182)	(0.0159)	(0.0153)	(0.0140)	(0.0137)	(0.0141)	(0.0158)	(0.0161)
Δ FFTR × Crisis1 × Small	-0.0484*	0.00342	0.00913	-0.0366**	-0.0456***	-0.0832***	-0.0917***	-0.0920***	-0.0646***
	(0.0256)	(0.0261)	(0.0207)	(0.0184)	(0.0177)	(0.0190)	(0.0194)	(0.0243)	(0.0247)
Δ FFTR × Crisis2 × Small	-0.0583**	0.00875	-0.0614***	-0.0860***	-0.0892***	-0.180***	-0.222***	-0.253***	-0.243***
	(0.0246)	(0.0201)	(0.0180)	(0.0171)	(0.0164)	(0.0172)	(0.0191)	(0.0214)	(0.0219)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.798	0.457	0.421	0.423	0.429	0.405	0.388	0.350	0.328

Notes. The variable *Small* is a dummy variable with 1 for the branches of small banks. A small bank is defined as a bank with average total assets lower than the sample median. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.

Table A9. Regression result including all coefficients: Impact of local market structure (Table 8)

	Checking	Savings	Time						
			3-month	6-month	12-month	24-month	36-month	48-month	60-month
Δ Spread_competitors	0.196***	0.048***	0.078***	0.146***	0.145***	0.191***	0.224***	0.203***	0.233***
	(0.031)	(0.016)	(0.019)	(0.017)	(0.017)	(0.016)	(0.016)	(0.018)	(0.018)
Δ Spread_comp× Crisis1	0.715***	0.611***	0.681***	0.655***	0.688***	0.620***	0.571***	0.556***	0.504***
	(0.029)	(0.034)	(0.026)	(0.025)	(0.024)	(0.029)	(0.032)	(0.035)	(0.035)
Δ Spread_comp × Crisis2	0.726***	0.774***	0.700***	0.629***	0.619***	0.580***	0.537***	0.516***	0.463***
	(0.033)	(0.023)	(0.021)	(0.018)	(0.017)	(0.018)	(0.020)	(0.023)	(0.022)
Δ Spread_comp × HHI	-0.043	0.156**	0.253***	0.087	0.178***	0.041	0.009	0.046	-0.037
	(0.105)	(0.071)	(0.085)	(0.066)	(0.067)	(0.065)	(0.067)	(0.075)	(0.073)
Δ Spread_comp × Crisis1 × HHI	-0.061	-0.111	-0.346***	-0.262***	-0.353***	-0.267**	-0.238*	-0.294**	-0.250
	(0.118)	(0.141)	(0.106)	(0.097)	(0.096)	(0.118)	(0.129)	(0.148)	(0.156)
Δ Spread_comp × Crisis2 × HHI	0.013	-0.291***	-0.245***	-0.075	-0.198***	-0.117	-0.112	-0.181**	-0.031
	(0.108)	(0.086)	(0.093)	(0.072)	(0.071)	(0.074)	(0.076)	(0.088)	(0.085)
Δ FFTR	-0.695***	-0.706***	-0.518***	-0.466***	-0.405***	-0.457***	-0.498***	-0.549***	-0.543***
	(0.028)	(0.017)	(0.015)	(0.014)	(0.013)	(0.013)	(0.014)	(0.016)	(0.017)
Δ FFTR × Crisis1	0.648***	0.537***	0.479***	0.479***	0.434***	0.477***	0.518***	0.586***	0.578***
	(0.027)	(0.028)	(0.019)	(0.016)	(0.016)	(0.018)	(0.020)	(0.026)	(0.026)
Δ FFTR × Crisis2	0.662***	0.609***	0.418***	0.348***	0.277***	0.343***	0.398***	0.458***	0.442***
	(0.027)	(0.019)	(0.018)	(0.018)	(0.016)	(0.016)	(0.017)	(0.019)	(0.022)
Δ FFTR × HHI	-0.027	0.076	0.038	0.012	0.057	0.043	0.055	0.106*	0.027
	(0.094)	(0.068)	(0.061)	(0.055)	(0.050)	(0.054)	(0.055)	(0.063)	(0.067)
Δ FFTR × Crisis1 × HHI	-0.084	-0.035	-0.088	-0.083	-0.088	-0.110	-0.112	-0.177*	-0.149
	(0.101)	(0.111)	(0.078)	(0.066)	(0.058)	(0.070)	(0.076)	(0.097)	(0.096)
Δ FFTR × Crisis2 × HHI	-0.010	-0.092	0.005	0.053	-0.032	-0.054	-0.089	-0.150*	-0.031
	(0.092)	(0.075)	(0.074)	(0.070)	(0.063)	(0.069)	(0.070)	(0.080)	(0.090)
Observations	206,311	202,976	193,667	213,337	213,620	202,139	190,109	160,626	160,606
R^2 within	0.798	0.455	0.420	0.421	0.427	0.402	0.384	0.346	0.324

Notes. HHI is calculated as the average value of county-level HHI over the sample period for the branches. Bank-time, state-time, county, branch, year, and quarter fixed effects are included. Standard errors are clustered at the county level and shown in parentheses. ***,**,* indicate significance at the 1, 5 and 10% level, respectively.