Bank Liquidity Shortages and Local Economic Activity*

Rajkamal Iyer† Shohini Kundu‡ Nikos Paltalidis§

Abstract

This paper examines the role of deposit rates as a key indicator of regional economic risks, emphasizing their utility in identifying liquidity shortages that precede economic downturns. We argue that deposit rates, reflecting the balance between deposit supply and demand, serve as a sufficient statistic for bank liquidity conditions. During economic slowdowns, banks facing constrained deposit growth raise rates to attract funds, signaling a liquidity squeeze. Our findings reveal that these rising deposit rates not only indicate tightening liquidity but also serve as a forward-looking measure with strong predictive power for regional economic contractions, outperforming other indicators.

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†Rajkamal Iyer is at the Imperial College and CEPR. email: r.iyer@imperial.ac.uk

‡Shohini Kundu is at the Anderson School of Management, University of California, Los Angeles and CEPR. email: shohini.kundu@anderson.ucla.edu

§Nikos Paltalidis is at the Durham University Business School. email: nikos.e.paltalidis@durham.ac.uk

1 Introduction

One of the prevailing theories behind recessions posits that rapid credit expansions systematically precede economic downturns or financial crises. However, our analysis reveals that large credit expansions are neither necessary nor sufficient for recessions to occur.

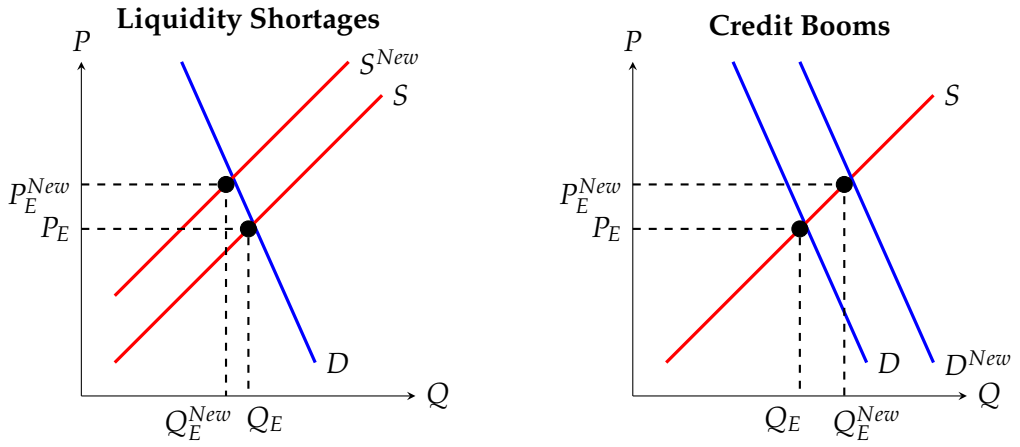
What then drives credit growth? A significant gap persists in our understanding of the underlying forces shaping credit cycles. This paper offers new evidence demonstrating that credit cycles can be driven by deposit cycles. We introduce deposit rates as an asset pricing measure of deposit scarcity, reflecting the balance between deposit supply and demand. In this context, deposit rates act as a sufficient statistic for bank liquidity conditions. Higher rates indicate a scarcity of deposits relative to loan demand, constraining banks' capacity to expand credit through the money multiplier effect. This slowdown in credit can dampen economic growth. The deposit rate captures nuances about liquidity shortages that are not apparent from deposit growth alone, due to the relative inelasticity of deposit demand and the greater elasticity of deposit supply.[1]

The challenge lies in analyzing liquidity-induced shortages at the national level, where factors like monetary policy can obscure the true drivers of credit growth. To identify this, we shift our focus to county-level data. Our within-country analysis provides a valuable setting for studying regional economic growth in a setting that is not confounded by differences in legal or regulatory regimes, and economic environments that likely correlate with fundamental drivers of recessions.

Importantly, our analysis highlights the significant role of liquidity shortages in driving local recessions. While rising deposit rates can signal both liquidity and credit-demand driven pressures, we find that liquidity shortages can explain almost half of all regional recessions, challenging the dominance of the demand-driven channel (e.g., Mian and Sufi (2009), Schularick and Taylor (2012), Jordà et al. (2013), Jordà et al. (2016), Mian et al. (2017), López-Salido et al. (2017), Baron and Xiong (2017), Bordalo et al. (2018), Mian et al. (2019)). Deposit growth slows before credit growth, demonstrating that liquidity constraints emerge as a leading indicator of economic contractions. Thus, by exploiting granular geographic data, we demonstrate that liquidity conditions are a major determinant of local economic outcomes, addressing a critical

[1]Banks rely on deposits to meet reserve requirements, fund loans, and manage liquidity, and they face limited substitutes for deposit funding. This makes their demand for deposits relatively inelastic (e.g., Diamond and Dybvig (1983); Bernanke and Blinder (1988); Kashyap et al. (2002)). In contrast, households and businesses can more easily substitute deposits with alternative investment options, such as mutual funds or equities, making deposit supply more elastic (Hannan and Berger (1997); Amromin and Sharpe (2014)).

challenge identified by Friedman and Schwartz (1963) – namely, the need for a more detailed understanding of how changes in money and credit translate into real economic outcomes.



To this end, we capture regional variation in bank liquidity shortages using deposit rates offered by local banks operating within a geography. Our findings reveal that when regional banks in a county raise their deposit rates, it is associated with a slowdown in economic activity in that region up to two years ahead. This relationship allows us to create a measure that captures a region's vulnerability to economic shocks. Specifically, we find that an increase in county deposit rates serves as an early indicator of changes in economic activity across various dimensions such as lower GDP growth, lower employment growth, reduced business formation, and lower wages. Overall, the model's ability to predict future GDP growth, as assessed by the Area under the Receiver Operating Characteristic Curve (AUC), is 0.73.[2]

Importantly, even in periods without monetary policy changes, credit booms, or imminent national recessions, increases in county deposit rates are associated with slower economic activity within those regions. While monetary policy changes can influence deposit rates offered by banks, our results remain robust even after controlling for time-specific effects. Additionally, we find that even during periods of virtually no changes in monetary policy rates – from 2011 through 2015 – increases in county-level deposit rates are linked to declines in future county economic activity. Notably, there were no significant credit expansions or impending national recessions during this period, suggesting that the predictive power of deposit rates is not merely an artifact of these factors.

[2]The Area under the Receiver Operating Characteristic Curve (AUC) allows us to diagnose the accuracy of our model. An AUC of 1 indicates that a classifier can perfectly distinguish recessions from non-recessions and an AUC of 0 indicates that a classifier predicts all non-recessions as recessions and all recessions as non-recessions. To benchmark this estimate, Schularick and Taylor (2012) report that prostate cancer diagnostic tests find AUCs of about 0.75; Iyer et al. (2016) report that AUCs of 0.6 or greater indicates strong predictive value in information-scarce environments, and AUCs of 0.7 or greater indicates strong predictive value in more information-rich environments.

It is worth noting that we do not claim that bank liquidity directly *causes* changes in economic activity. Even in areas where local bank lending is a small fraction of overall lending, we observe a negative relationship between deposit rates and economic activity. This suggests that bank lending is unlikely to be the primary driver of economic contractions. Instead, our findings indicate that deposit rates capture unique information about economic activity beyond credit supply fluctuations. Further tests confirm that credit supply does not drive the deposit rate-GDP growth relationship. Hence, we propose that banks act as important conduits for economic activity, making regional deposit rates valuable indicators of underlying economic conditions. In this context, banks' deposit rates can be viewed as useful aggregators of regional economic conditions, providing valuable insights into the state of the local economy.

To further investigate the mechanism behind our results, we examine whether banks that raise deposit rates experience liquidity stress. Our findings show that banks increasing deposit rates tend to experience a decline in deposit growth in the preceding quarters, suggesting liquidity stress. This slowdown is evident for both insured and uninsured deposits.[3] In addition, as an economic downturn approaches, banks tend to increase their reliance on insured deposits to support their balance sheets, narrowing the gap between uninsured and insured deposit rates. We validate that these deposit rate increases are not driven by increased loan demand, as loan growth declines following deposit rate hikes.

To address the challenge of pinpointing the exact timing when deposit rates respond to economic downturns, we leverage a quasi-natural experiment: the Federal Reserve's enforcement of the Wells Fargo asset cap. This unprecedented regulatory intervention, which capped Wells Fargo's total assets at their 2017 levels, creates a unique setting to assess the impact of deposit supply shocks. The asset cap, being orthogonal to factors like monetary policy and credit booms, provides a clean framework for identifying the causal relationship between bank liquidity shortages and deposit rates.

Using a difference-in-differences approach, we compare counties with significant Wells Fargo presence to those without, before and after the asset cap's enforcement. Our analysis reveals that the cap constrained Wells Fargo's deposit growth, leading to increased deposit rates and reduced local credit availability, particularly for small businesses. This contraction in deposit supply, as reflected in higher deposit rates, demonstrates the broader economic implications of liquidity shortages, highlighting deposit rates as a key indicator of regional economic risks. Moreover, we use county exposure to the economic impact payment program

[3]To complement these findings on bank deposit growth, we also analyze aggregate deposit growth at the county level. We find that counties experiencing a more pronounced economic downturn exhibit lower deposit growth compared to others, one year before the decline.

to trace how a positive deposit shock permeates through the local economy, shedding light on the underlying mechanism.

An important question is whether deposit rates demonstrate superior predictive power compared to other bank-level variables.[4] For instance, one might consider using deposit growth directly at the county level instead of deposit rates. To address this comparison, we conduct estimations using deposit growth and compute the AUCs. We find that the predictive power when using deposit growth is notably lower than that achieved by using deposit rates alone. Similarly, we also find that the predictive power of deposit rates is higher than credit growth. We further validate that deposit rates are a robust leading indicator of regional business cycles by showing that deposit rates outperform other leading economic indicators such as auto sales, unemployment insurance claims, and job openings. This is consistent with the idea that deposit rates, as a forward-looking measure that incorporates banks' expectations of future economic activity, are better predictors compared to other variables that are backward-looking.

Lastly, we extend our examination to the state level. We find the results estimated at the county level also hold at the state level. Moreover, at the state level, we investigate whether liquidity squeezes, as indicated by deposit rates, are associated with a higher risk of bank failures.[5] Our analysis reveals that a higher deposit rates in 2006 are, indeed, linked to a higher incidence of bank failures on both the extensive and intensive margin during the subsequent crisis period from 2008 through 2012. By examining the association between deposit rates and bank failures at the state level, we further strengthen the case for deposit rates being informative of regional economic vulnerability. Overall, our findings underscore the significance of deposit rates offered by banks in a region as a valuable measure of economic vulnerability at the regional level.

1.1 Related Literature

Our results contribute to several strands of the literature.

The predictive power of deposit rates draws on both the money view and credit view of business cycles, integrating the roles of monetary aggregates and credit growth in driving economic activity. While the money view posits that a decrease in money growth heralds economic contractions (Friedman and Schwartz (1963)), the credit view stresses the significance of

[4] As discussed earlier, one of the issues with other bank variables is the frequency at which they are available and the granularity. Generally, most of the bank balance sheet variables are available at the holding company level.

[5] Due to the low occurrence of bank failures at the county level, this particular analysis is conducted at the state level.

credit growth in explaining economic fluctuations (Mishkin (1978)).[6]. Our approach leverages deposit rates as a key indicator, aggregating information from both slowing money growth and credit market conditions across banks. Notably, deposit rates exhibit broader predictive power for economic downturns, including those not preceded by credit booms, unlike credit growth, which is primarily focused on predicting financial crises (e.g., Mian and Sufi (2009), Schularick and Taylor (2012), Jordà et al. (2013), Jordà et al. (2016), Mian et al. (2017), López-Salido et al. (2017), Baron and Xiong (2017), Bordalo et al. (2018), Mian et al. (2019), Krishnamurthy and Muir (2017), Müller and Verner (2021), and Greenwood et al. (2022)).[7] This advantage stems from deposit rates' forward-looking nature, capturing information about both slowing money growth and changing credit conditions, making them a valuable measure for capturing money growth dynamics, particularly at the regional level where measuring money supply growth is challenging.[8]

Importantly, this study demonstrates the utility of local deposit rates for measuring economic risks at the local level, addressing a large gap in the existing literature. While numerous studies have established the predictive power of the Treasury yield curve slope and corporate bond spreads for national recessions (e.g., Estrella and Hardouvelis (1991), Estrella and Mishkin (1998), Ang et al. (2006), Rudebusch and Williams (2009), and Engstrom and Sharpe (2019)), few have focused on local-level prediction.[9] Our study contributes to the literature in three key ways. First, we explore the measurement of economic risks across counties and states, leveraging regional variation in economic activity. Second, our findings indicate that a deposit rates are a sufficient statistic for accurate prediction of regional economic and financial risks, providing a useful measure to incorporate in existing forecasting models. Finally, our work aligns with recent research emphasizing the importance of real-time economic measures (Chetty et al. (2020)), as deposit rates provide a readily available and reliable indicator of future economic activity.

First, there is a large body of work that examines the factors that help predict financial crises. Recent empirical research indicates that excessive credit expansion fueled by financial intermediaries may result in financial crises, and thus, in severe economic recessions (e.g.,

[6]Following the seminal work by Friedman and Schwartz (1963), several papers have highlighted the association between a decrease in money growth and recessions including Romer et al. (1990), King and Plosser (1984), Baker et al. (2018). Other papers in support of the credit view include Bernanke (1983), Gertler (1988), Schularick and Taylor (2012)

[7]Boissay et al. (2016) point out that it is difficult for the literature predicting financial crises to predict other types of recessions that are not accompanied by an expansion in credit. See also Muir (2017).

[8]Our findings are consistent with the literature that examines the relation between banks and business cycles, e.g., King and Plosser (1984); Morgan et al. (2004)

[9]Several papers use financial indicators such as stock returns, stock price volatility, and stock market liquidity to predict economic growth. See Fama (1990), Schwert (1990), Campbell et al. (2001), Levine and Zervos (1998).

Mian and Sufi (2009), Schularick and Taylor (2012), Jordà et al. (2013), Jordà et al. (2016), Mian et al. (2017), López-Salido et al. (2017), Baron and Xiong (2017), Bordalo et al. (2018), Mian et al. (2019), Krishnamurthy and Muir (2017), Müller and Verner (2021), and Greenwood et al. (2022)). Our research contributes to the literature in several ways. First, we focus on measuring economic risks across counties and states, exploiting regional variations in economic activity. There is very limited empirical work on measuring risks at the regional level in a parsimonious manner. Furthermore, in contrast to the extant literature that focuses on credit, our paper finds that increases in deposit rates offered by banks are followed by contractions in economic activity, regardless of whether a downturn is preceded by a credit boom. Additionally, deposit rates demonstrate the ability to predict smaller economic contractions that are difficult to anticipate using credit growth alone.[10] This may be because deposit rates are a forward-looking variable that aggregates information from both the slowdown in money growth (as proxied by deposit growth) and the credit positions across banks in an economy, unlike credit growth, which is a backward-looking variable.

Second, our paper contributes to the literature on recessions. A significant body of work documents that the slope of the Treasury yield curve (term premium) and corporate bond spreads can predict the likelihood of a near-term recession (e.g., Estrella and Hardouvelis (1991), Estrella and Mishkin (1998), Ang et al. (2006), Rudebusch and Williams (2009), and Engstrom and Sharpe (2019)).[11] We add to this literature in several ways. First, we focus on measuring economic risks at the regional level. Second, our results suggest that a simple model using bank deposit rates can accurately predict regional economic risks, providing a useful measure for incorporation into existing forecasting models. Finally, our work also contributes to the recent literature emphasizing the importance of real-time measures of economic activity (Chetty et al. (2020)). Deposit rates are readily available in real-time and offer a reliable barometer of future economic activity.

Third, our results contribute to the literature on money growth and recessions. Several papers have argued that money growth plays a significant role in the dynamics of business cycles. Following the seminal work by Friedman and Schwartz (1963), several papers have highlighted the association between a decrease in money growth and recessions. Our results are consistent with this literature, especially the work that relates banks to business cycles (King and Plosser (1984); Morgan et al. (2004)). Our paper adds to this literature by demonstrating that the deposit rates offered by banks help aggregate information about money growth.

[10] Boissay et al. (2016) point out that it is difficult for the literature predicting financial crises to predict other types of recessions that are not accompanied by an expansion in credit. See also Muir (2017).

[11] Several papers use financial indicators such as stock returns, stock price volatility, and stock market liquidity to predict economic growth. See Fama (1990), Schwert (1990), Campbell et al. (2001), Levine and Zervos (1998).

Given the challenges in measuring money supply growth at the regional level, our results suggest that deposit rates could be a valuable measure that captures money growth dynamics.

Fourth, our paper contributes to the literature on the role of bank liquidity in economic activity. Previous studies have demonstrated that bank liquidity can affect real economic activity (e.g., Jayaratne and Strahan (1996); Morgan et al. (2004); Gilje et al. (2016); Cortés and Strahan (2017); Kundu et al. (2021)). We add to this literature by showing that deposit rates, which reflect liquidity conditions of banks, can be a useful indicator of regional economic activity. While we do not claim that our findings are causal, they are consistent with the hypothesis that bank liquidity shortages can contribute to economic contractions to some degree through a reduction in credit supply.

Finally, our paper also contributes to the literature that finds banks increase their deposit rates in response to liquidity shocks to shore up funding (e.g., Acharya and Mora (2015); Cortés and Strahan (2017); Egan et al. (2017)). This literature primarily focuses on shocks to bank liquidity during crises. We complement these findings by showing that deposit rates offered by banks in a region can be used as a proxy for the liquidity position of banks in that region, in turn, reflecting economic conditions. Additionally, our findings highlight that banks increase their reliance on insured deposits at the onset of a downturn. This relates to the literature that emphasizes the importance of proper deposit insurance schemes and the need to regulate banks due to moral hazard concerns (e.g., Laeven (1983), Demirgüç-Kunt et al. (2008), Calomiris and Jaremski (2019)).

The rest of this paper is organized as follows. Section 2 presents an overview of the datasets used in this study. Section 4 explores the relation between bank deposit rates and economic activity. Section 5 presents our main findings and validates that deposit rates effectively capture the liquidity stress of banks during economic contractions through two quasi-natural experiments. Section 6 explains the mechanism linking bank liquidity shortages and deposit rates. Finally, Section 7 concludes.

2 Data

This project employs several datasets, which are described below. Further details about the data can be found in Appendix Section A.

Deposit Rates We use data on deposit rates from S&P Ratewatch. S&P Ratewatch provides depository interest rate coverage on banks and credit unions in the US for more than 70 standard retail banking products, ranging from deposit products to consumer loan and

mortgages at the weekly frequency. Deposit rates are available at a granular geographic level with zip code, county, and state identifiers. We focus on the deposit rates for 12-month certificates of deposit ($10K 12-month CDs) with a minimum account size of $10,000 because this is the most common deposit product. Our sample period is 2001 through 2020. Our dataset covers 8,361 distinct banks and 2,897 distinct counties (approximately 90% of all US counties).

Gross Domestic Product We obtain Gross Domestic Product (GDP) data from the Bureau of Economic Analysis (BEA) at the county, state, and national levels. State GDP is available at the quarterly frequency from 2005Q1. County GDP data is available at the annual frequency from 2001.

Business Formation We use data on annual new business applications by county from the US Census Business Formation Statistics (BFS).

Mortgage Delinquency We collect data on early stage delinquencies at the county level from the National Mortgage Database, conducted in collaboration with the Federal Housing Finance Agency (FHFA).

Industry Activity: We use data on industry activity from the Quarterly Census of Employment and Wages (QCEW), produced by the Bureau of Labor Statistics (BLS). The QCEW tabulates data on the number of establishments, employment, and quarterly wages. We collapse the data to create a panel at the county *times* industry $\times$ year level. This panel is used to identify the dominant industry in the last ten years, measured by total employment.

Supplementary Measure of Economic Activity We use data on unemployment rates across counties from the BLS. We also use data on the consumer price index (CPI) for metro areas from the BLS. The BLS reports the monthly estimates of CPI for 23 metro areas. We use the annual CPI data for these metro counties.

Bank Balance Sheet, Income Statements and Deposits Data We extract bank balance sheet and income statement information from the Reports of Condition and Income (Call Reports) sourced from the Federal Reserve Bank of Chicago. We supplement data from the call reports using quarterly data on banks' insured and uninsured deposits from the FDIC Statistics

on Depository Institutions (SDI). The FDIC SDI reports the total volume of insured and uninsured deposits and insured deposits, at the bank level, for all FDIC insured banks. We also utilize data on branch-level bank deposits sourced from the FDIC. This data is from the annual survey conducted by the FDIC, covering all FDIC-insured institutions. In addition, we use quarterly data on non-performing loans from S&P Market Intelligence.

Small Business Lending and Mortgage Lending We use data on small business lending, collected under the Community Reinvestment Act (CRA). We use data on mortgage lending, collected under the Home Mortgage Disclosure Act (HMDA). We aggregate the CRA and HMDA data to the bank $\times$ county $\times$ year level from 2001 and 2020.

Other Financial Data We use data on spreads on credit default swaps and equity prices for a subset of banks. The high-frequency data on CDS spreads is obtained from Markit, while equity returns are sourced from CRSP. To combine these datasets and identify the common set of banks present in both the CDS and equity data, we perform a manual merge.

Other Leading Economic Indicators We supplement our baseline analysis with other leading indicators of local business cycle fluctuations at the state level. These indicators include state auto sales, unemployment claims, and job openings. Data on auto sales comes from from RL Polk, which reports zip code-monthly data. Data on state monthly unemployment claims comes from the Department of Labor. Data on state job openings comes from the BLS.

Rural-Urban Continuum Codes We use data on Rural-Urban continuum codes from the US Department of Agriculture Economic Research Service (USDA ERS). The Rural-Urban Continuum Codes are a classification scheme that distinguishes metropolitan counties by population size of their metropolitan area and non-metropolitan counties by the degree of urbanization and adjacency to a metropolitan county. Metro counties are counties with a 1993 USDA ERS Rural-Urban Continuum Codes of 0 or 1.

Bank Failures We retrieve the list of failed banks from the Federal Deposit Insurance Corporation (FDIC). We examine bank failures from 2008 to 2012; there were 25 bank failures in 2008, 140 in 2009, 157 in 2010, 92 in 2011, and 51 in 2012.

Business Cycle Expansions and Contractions We use data on business cycles from the Na-

tional Bureau of Economic Research (NBER) US Business Cycle Expansions and Contractions. We highlight recessions between 2001 and 2020 throughout our analysis.

3 Local Recessions

We begin by begin by showing that there is substantial spatial and temporal heterogeneity in recessions at the local level. Figure B.1 presents the timing and duration of recessions at the county level. For simplicity, we define a county to be in a recession if its GDP growth between two consecutive years is below -2%. Figure B.1a indicates that the percent of counties in recession increased from 16% in 2005 to 50% in 2009. Figure B.1b presents a density probability plot of the percent of years in the sample period (2001-2020) that a county was in a recession. On average, counties were in recessions 25% of the sample period with a standard deviation of 12.45%. Similarly, we examine the timing and duration of recessions at the state level. Appendix Figure B.9b shows that states were in recessions 5.18% of quarters in the sample period (2005-2020) with a standard deviation of 3.10% The statistics reported above highlight that the occurrence of economic contractions exhibits wide heterogeneity across counties and states.[12] A similar pattern emerges when examining economic expansions.

Next, we examine the liquidity dynamics surrounding recessions. We plot the regression coefficients from regressions of annual deposit growth (Panel B.14a) and deposit rates (Panel B.14b) on a recession indicator at the county level. To control for time-invariant, county-specific factors and time-varying macroeconomic conditions, we include county and year fixed effects. Our results show a gradual decline in deposit growth in the years leading up to a recession, reaching its lowest point during the recession itself. In the years that follow, deposit growth remains low but slowly returns to its typical level. This cumulative decline in deposit growth around recessions is significant. Additionally, deposit rates are notably higher before a recession, stabilizing to their typical levels once the recession begins.

To investigate whether the increase in deposit rates is driven by changes in demand or supply, we analyze credit growth in the three years leading up to a recession. If the average credit growth over this period is negative, it is classified as a contraction; if positive, it is classified as an expansion. We find that 48% of county recessions were preceded by credit contractions.[13] This suggests that a significant portion of recessions are not caused by large credit expansions.

[12] The onset and duration of local recessions depend on factors that differ in each business cycle such as the industrial composition of the region or idiosyncratic shocks (e.g., Hamilton and Owyang (2012); Brown (2017)).

[13] This result holds across various measures of credit growth, including total mortgage lending, small business lending, and the combined total of both.

This finding prompts us to further explore recessions induced by liquidity shortages and to assess whether deposit rates can predict economic contractions, especially those not driven by credit growth.

4 Bank Deposit Rates and Economic Activity

This section explores the spatial disparities in bank deposit rates and economic activity across different regions. By examining these geographic variations, we shed light on how deposit rates and economic conditions differ across banks and regions.

We primarily focus our analysis on banks which offer the 12-month certificate of deposit (CD) with a minimum account size of $10,000 – the most frequently updated deposit product in the RateWatch database. However, our findings are robust to other types of deposit accounts as well as other maturities of CDs. We examine the number of such banks that operate in each county from 2001 through 2020. Appendix Figure B.8 presents a heatmap of the average number of banks per county between 2001 and 2020. On average, three to four banks operate in each county while 83% of counties report more than one bank.

4.1 Deposit Rates and Economic Activity

To examine the relationship between regional deposit rates and regional economic downturns, we leverage the geographic variation in deposit rates across banks, focusing on single-state banks that operate across distinct regional markets. The advantage of using single-state banks is that their deposit base and lending are more regional (Berger and Udell (1995); Petersen and Rajan (1994)), mirroring regional economic conditions.

Differences in regional economic conditions are reflected in the deposit rates of single-state banks. For illustration, Appendix Figure B.11 presents heatmaps of deposit rates for several single-state banks in 2007, including the Bank of Colorado, Colony Bank, Citizens National Bank of Meridian Bank Seacoast National Bank, BancFirst, and Limestone Bank. These heatmaps reveal that at the same point in time, these banks offered higher rates in certain areas and lower rates in others. This intrastate variation in deposit rates is consistent with previous research by Heitfield (1999), Biehl (2002), and Heitfield and Prager (2004), which found that smaller banks, unlike larger ones, set deposit rates based on regional competitive conditions. This suggests that regional market dynamics play a significant role in shaping deposit rates at single-state banks.

Variation in average deposit rates across regions can be influenced by differences in the

composition of banks or by variation in rates within individual banks. To better understand the sources of this variation, we investigate whether differences in branch deposit rates are primarily driven by time-invariant bank-specific factors, branch-specific factors, time-specific factors, bank- and year-specific factors, or bank-year interactions. In Table B.2, we report the R^2 values from regressions of branch deposit rates for single-state banks, using different sets of fixed effects: bank fixed effects (column 1), branch fixed effects (column 2), year fixed effects (column 3), bank and year fixed effects (column 4), and bank$\times$year fixed effects (column 5). Our findings show that, unsurprisingly, the majority of the variation in branch deposit rates is driven by time fixed effects. However, it is important to note that bank$\times$year fixed effects do not account for all of the variation, suggesting that geography-related factors may also play a role in driving differences in deposit rates within individual banks, as illustrated earlier in Figure B.11.

Moreover, we find that only 13% of state banks report no variation in deposit rates across their branches in any given month. On an annual basis, this figure drops to just 0.5%, indicating that most single-state banks exhibit heterogeneous deposit rates across different geographies.

To understand where the variation in single-state bank deposit rates come from, we employ data from the American Community Survey (ACS) to examine the relationship between county-specific demographic and economic characteristics and bank deposit rates. The granularity of the survey data allows us to include high-dimensional fixed effects, enabling comparisons of deposit rates across counties within the same month and year, in the same state. Table B.14 presents the results. Our findings show that regions with a higher share of unemployed individuals and a larger proportion of the population employed in the services industry tend to have higher deposit rates. To further explore the connection between regional economic activity and deposit rates, we use data from Barrot et al. (2022) and implement an instrumental variable strategy, which combines regional industry composition with industry-specific shipping costs as a proxy for import competition. Our results, detailed in Appendix Section **??**, indicate that banks, indeed, set higher deposit rates in regions projected to experience greater economic contraction. In Section 5, we examine the relationship between deposit rates and banks' balance sheet conditions, showing that banks facing greater liquidity constraints – indicated by a higher credit-to-deposits ratio – tend to raise their deposit rates.

We aggregate branch deposit rates at the county level and then at the state level to demonstrate their effectiveness as indicators of local economic activity. Figure B.2 presents a heatmap of the average deposit rates by county between 2001 and 2020. We construct the av-

erage deposit rates by exploiting the geographic variation in deposit rates across banks. First, we create a panel at the bank × county × month-year level, using the deposits rate data. Then, we compute the average deposit rate across banks for each county in each month. The annual county deposit rate is computed by averaging across the monthly county deposit rates in each year. Figure B.3 presents heatmaps of county deposit rates in 2006, 2009, and 2017.[14] We observe that deposit rates offered by banks exhibit regional variation at any given point in time. Interestingly, there is also temporal variation in regions with higher deposit rates. These heatmaps emphasize two key findings: (1) there is meaningful variation in deposit rates across regions, and (2) the variation in deposit rates is unlikely to be driven solely by banking structures, as different regions have higher rates at different points in time despite little change in bank concentration.

Given the spatial and temporal variation in economic activity and deposit rates across geographic regions, we further investigate the relationship between deposit rates and county economic activity. We start by examining whether higher deposit rates in 2006 are associated with lower GDP growth two years ahead in 2008. As shown in Figure B.6, there is a clear association between deposit rates and future GDP growth. We find that higher deposit rates offered by banks are associated with lower GDP growth. Moreover, in Figure B.5, we sort regions into quintiles based on the deposit rate offered by banks in 2006 and explore whether recession risk is higher in regions with higher deposit rates.[15] Again, we observe a meaningful association between deposit rates and recession risk, where higher quintiles of deposit rates in 2006 are linked to a higher risk that a region experiences a larger than 2% drop in GDP in 2008.

Importantly, these patterns extend beyond the Great Financial Crisis. As shown in Figure B.6, the significant negative relationship between deposit rates and future GDP growth persists throughout the entire sample. This holds true even after accounting for county and year fixed effects in Figure B.6a, and state and quarter-year fixed effects in Figure B.6b.

5 Main Results

In this section, we rigorously examine the relationship between our regional vulnerability index and regional economic activity.

[14] Appendix Figure B.10 presents heatmaps of state deposit rates in 2006, 2009, and 2017.

[15] The lowest quintile represents regions with the lowest deposit rates, while the highest quintile includes regions offering the highest rates.

5.1 Baseline Effects

Table B.1 provides summary statistics for the main variables of interest from 2001 through 2020. Average annual county GDP growth is 1.25% with a standard deviation of 7.80%. Average state GDP growth at the quarterly frequency is 0.37% with a standard deviation of 1.75%. We compute the average deposit rate as well as the dispersion (standard deviation) of deposit rates at the county and state levels. We find that across these measures, the average county deposit rate is 1.52% with a standard deviation of 1.27% across the sample.

We start our empirical framework with the most basic geographic unit: the county-level. We begin our analysis by focusing on metropolitan (metro) counties as these regions exhibit a competitive banking structure.[16] Moreover, metro counties comprise nearly 60% of the national GDP. In the final reporting month of every year, we calculate the average deposit rate for each county.[17] Using this data, we estimate a OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity.

$$Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t} \tag{1}$$

where Y denotes the measure of economic activity, such as GDP growth, business formation, or county delinquency rate in our baseline specification, and $Rate$ denotes the average bank deposit rate. We report county clustered standard errors.[18]

Our key empirical finding, presented in Table B.3, is that the deposit rate within a county serves as a significant indicator of economic activity. To address time-invariant county-specific factors, we include county fixed effects, and we incorporate time fixed effects to control for the possibility that the observed relationship between economic activity and deposit rates is driven by unobserved, time-varying aggregate factors. In columns (1)-(6), the dependent variables represent economic activity one through six years ahead, respectively. The independent variables are standardized for ease interpretation.

In Panel A, we explore the relationship between future GDP growth and deposit rates. Our findings show that larger increases in deposit rates are followed by larger contractions in economic activity. While higher deposit rates are linked to declines in economic growth

[16] Note that for metro regions, banking concentration remains stable over the entire sample period. Later, we report the results for all counties and also conduct the analysis at state level.

[17] Our empirical findings are robust to alternate methods of constructing the average deposit rate, such as averaging over different time horizons and using a variety of deposit rates.

[18] Our findings are also robust to Conley (1999) standard errors, adjusted for spatial dependence within 100 kilometers.

over a period of 1-6 years, the strongest association is observed two to three years ahead. Specifically, we find that higher deposit rates are associated with a contraction in economic growth two to three years in the future. Column (2) shows that a one standard deviation increase in deposit rates is associated with a 0.69 percentage point decrease in GDP growth two years later. Column (3) shows that a one standard deviation increase in deposit rates is linked to a 1.35 percentage point decline in GDP growth three years ahead.

While our findings suggest that there is a strong relation between deposit rates and future economic growth, it is unclear whether the effect may be reverse causal. That is, one may be concerned that there is autocorrelation in GDP growth, and that changes in deposit rates *lag* changes in economic conditions rather than lead. To mitigate this concern and establish that the effect between deposit rates and future GDP growth are not confounded by past economic growth, we incorporate several lags of economic growth into our baseline analysis in Table B.4. By including these lagged variables, we aim to control for the influence of past economic growth on the current and future state of the economy. Our results demonstrate that even after accounting for the historical trajectory of economic growth, deposit rates continue to exhibit a significant predictive power for future economic growth. The point estimates presented in Table B.4 are remarkably similar to our baseline estimates in Table B.3, further reinforcing the notion that deposit rates are a reliable indicator of future economic trends, independent of historical economic performance.[19]

While GDP growth measures the value of goods and services produced, it can be influenced by external factors like trade and may not fully reflect how the benefits are distributed. For example, increased productivity or investment can boost GDP without necessarily creating more jobs. To capture a more direct measure of economic growth, we turn to employment growth in Panel B of Table B.3. Employment growth provides insight into job creation and destruction within the economy. Our findings show that local labor markets tend to tighten following larger increases in deposit rates over a 1-6 year horizon. Specifically, a one standard deviation increase in deposit rates is associated with a 0.55 to 0.94 percentage point decline in employment growth two to five years ahead. The effects on employment are strongest three years ahead, mirroring the effects on GDP growth: a one standard deviation increase in deposit rates is linked to a 0.94 percentage point decline in employment growth three years later. These magnitudes are substantial, especially when compared to the average county employment growth of 0.71%. We also use the unemployment rate and payroll growth as alternative

[19] It is worth noting that our analysis also reveals that higher past economic growth is associated with lower future economic growth.

measures of economic activity and find consistent results in Panels A and B of Appendix Table B.26.

To further investigate the relationship between deposit rates and economic activity, we explore additional measures of economic conditions. In Panel C of Table B.3, we focus on future new business formation, measured as the natural-log transformed number of new businesses.[20] Consistent with our earlier findings, which show a negative association between deposit rates and economic activity, we observe that an increase in deposit rates is linked to a decline in new business formation. While the number of applications provides direct insight into the creation of new businesses each year, a limitation of this measure is that the dataset begins in 2005. For completeness, we show that the results are robust in Panel C of Appendix Table B.26.

We supplement this measure of business activity with a measure of household income, specifically wage growth, in Panel D of Table B.3. Wage growth directly reflects household income, which in turn affects the overall supply of deposits and potential liquidity shortages. Our findings indicate that higher deposit rates are associated with lower wage growth, particularly two to four years later, with the strongest effects observed three years ahead. We further supplement this analysis with the mortgage delinquency rate—an indicator of consumer financial health—in Panel D of Table B.26. The 30-89 day mortgage delinquency rate serves as an early signal of the health of the mortgage market, capturing borrowers who have missed one or two payments. Our results show that higher deposit rates are associated with an increased risk of credit losses.

Lastly, for a subset of counties with available data on inflation, our analysis reveals a significant negative relationship between deposit rates and the CPI growth rate, as shown in Panel E of Appendix Table B.26. Overall, the findings from various measures of economic activity consistently indicate that higher deposit rates are linked to a future contraction in economic activity.

One key observation is that while the effects of higher deposit rates on employment growth and GDP are relatively quick to materialize, other outcomes, such as business formation and delinquencies, take longer to adjust. This difference can be attributed to the nature of the variables involved: GDP and employment are flow variables that respond swiftly to changes in credit conditions. In contrast, business formation and delinquency rates, for example, are stock-driven outcomes, which are more influenced by sustained credit conditions and prolonged economic stress rather than by short-term fluctuations.

[20] The number of new businesses is measured as the number of applications for an employee identification number in the US Census Business Formation Statistics.

5.1.1 Are the findings driven by failed banks?

A potential concern is that the observed relationships between economic indicators and bank lending are driven by the behavior of banks that eventually fail. To address this concern, we investigate whether our findings are influenced by the rate-setting behavior of failed banks. Appendix Table B.27 shows that our results are robust to the exclusion of failed banks. Hence, the relationships we document are not driven by the anomalous behavior of banks that ultimately fail.

5.1.2 Are the findings driven by the choice of deposit product?

We further assess the robustness of our baseline findings by considering alternative deposit products. Specifically, we re-estimate the results in Table B.3 using the deposit rate on money market accounts, with a minimum account size of $10,000. The results, presented in Appendix Table B.28, show similar statistical significance and direction to those in the baseline analysis. However, the economic magnitudes are smaller when using money market accounts, consistent with the findings of Martin et al. (2018), who argue that time deposits are more sensitive to bank risk.

Additionally, we explore the term structure of CDs by examining the relationship between deposit rates on 1-month, 6-month, 12-month, 24-month, and uninsured CDs and GDP growth three years ahead, as shown in Table B.29. While the relationship between the 12-month CD rate and GDP growth three years later is the strongest, these results further demonstrate the robustness of our findings across various deposit products.

Lastly, in Section **??**, we use the deposit rate for single-state banks from the Call Reports and show that the average deposit interest expense of single-state banks can predict future GDP growth at the state level.

5.1.3 Are the findings driven by monetary policy changes?

An important question that arises is whether the relation between regional deposit rates and regional economic activity are mainly driven by monetary policy changes (Drechsler et al. (2017); Drechsler et al. (2022); Jiménez et al. (2022)). Thus far, we have established that our results are robust to the inclusion of time fixed effects, which account for monetary policy changes at the national level. However, to further ensure that our findings are not solely influenced by monetary policy, we conduct a subsample analysis over the period from 2010 through 2015 – a period characterized by relatively stable short-term interest rates. In Table B.46, we replicate the results reported in Table B.3 for this specific period. We find qualitatively similar results

during this period, when the short-rate remained stable.[21] The estimated magnitudes of the relationship between deposit rates and changes in economic activity are quantitatively higher. Panel A of Table B.46 shows that a one standard deviation increase in deposit rates is associated with a 5.49 percentage points decrease in GDP growth two years ahead. The estimated magnitudes are also larger for changes in employment growth, business formation and wage growth.

5.1.4 Can deposit rates predict in the cross-section?

The baseline estimation incorporates a temporal element, as our analysis spans several years. To assess whether deposit rates have predictive value in a cross-sectional context, we estimate the relationship between deposit rates in 2006 and GDP growth one, two, and three years ahead. The results are reported in Panel A of Appendix Table B.30. We find that the relationship between deposit rates and GDP growth reverses at the two-year horizon, becoming negative. This suggests that high deposit rates are associated with a contraction in economic activity over the longer term, rather than reflecting short-term fluctuations.

This intuition is further supported when we examine the relationship between 2006 deposit rates and future employment growth (Panel B of Appendix Table B.30) and inflation (Panel C of Appendix Table B.30). In both cases, the predictive value of deposit rates tends to be stronger at longer horizons.[22]

Overall, these cross-sectional findings align with those reported in Table B.3, which also suggest that the predictive value of deposit rates is stronger at a two-year horizon compared to a one-year horizon.

5.1.5 Are the results driven by bank composition or within-bank effects?

As discussed in Section 4, the deposit rates averaged across banks in a given county capture two key factors: (1) the bank composition effect and (2) the within-bank effect. The bank composition effect accounts for variations due to the types of banks operating in each county, which may inherently offer higher or lower deposit rates. In contrast, the within-bank effect re-

[21] Moreover, we show that the regional deposit rate remains a strong predictor of regional economic activity in this period, even after accounting for changes in deposit rates due to monetary policy and market power. This finding is corroborated in unreported regressions controlling for the Fed Funds rate and deposit spreads.

[22] Precautionary savings typically rise at the onset of recessions, which may weaken the predictive power of deposit rates for short-term contractions. Specifically, during the early stages of a recession, deposit inflows may be driven more by precautionary savings than by changes in economic activity. For example, Levine et al. (2021) find that the surge in precautionary savings during the initial months of the COVID-19 pandemic led to increased deposit inflows.

flects how individual banks adjust their deposit rates in response to localized supply-demand imbalances.

To isolate these effects, we assign each bank's average deposit rate to all its branches, regardless of location, and then aggregate these bank-level rates to the county level. This approach effectively captures variations driven by differences in the types of banks present, while eliminating within-bank responses to local economic conditions. We replicate our baseline analysis in Table B.3 using this composition-driven rate to determine whether our results are driven by the types of banks in each county or by within-bank rate adjustments.

Interestingly, despite this methodological distinction, both the composition-driven and scarcity-driven deposit rates produce similar predictive results for regional economic outcomes. This high correlation arises because the banks in our sample predominantly operate within single states, making their rate adjustments more sensitive to localized funding dynamics. While the within-bank variation remains significant, it highlights the broader role that both bank composition and local economic conditions play in shaping regional economic activity.

Single-state banks, which lack the extensive internal capital markets of large national banks, are more likely to adjust their deposit rates across all branches in response to localized economic pressures. As a result, these banks exhibit greater sensitivity to regional funding conditions, and their deposit rate adjustments can be a meaningful signal of local economic dynamics. Our findings, reported in Appendix Table B.16, are consistent with those in Table B.3, showing that both local funding conditions and the types of banks operating in a region have a significant impact on regional GDP growth. This suggests that credit supply constraints – whether due to local deposit scarcity or the structural composition of banks – play an important role in driving economic activity.

However, it is important to recognize that the within-bank variation in deposit rates also plays a key role in these dynamics. Large multi-state banks, with their extensive internal capital markets, tend to set uniform deposit rates across regions. When these banks experience localized economic pressures, their internal capital markets allow them to smooth these shocks, preventing significant rate adjustments at the national level (e.g., Stein (1997); Granja and Paixao (2019); Morgan et al. (2004)). As a result, we hypothesize that the deposit rates of multi-state banks – characterized by low spatial heterogeneity – will have limited predictive power for future local economic activity.

To test this, we first measure the standard deviation in deposit rates across multi-state banks within a given year and then average this standard deviation across years to produce an average by multi-state bank. We replicate our baseline analysis for this subset of banks in Ap-

pendix Table B.17 and find that the deposit rates of large multi-state banks have significantly less predictive power for local economic activity.

5.1.6 Does the presence of multi-state banks matter?

Thus far, our analysis has focused on local banks. An important question is how the baseline findings would differ in areas where larger banks are more dominant. We hypothesize that local banks may face increased competition in areas with a greater presence of larger banks. To examine how the share of large banks in a county affects the relationship between the county deposit rate of single-state banks and future GDP growth, we define a bank as "large" if it operates in more than one state.[23] Appendix Table B.31 shows that the coefficient associated with the county average deposit rate is quantitatively and statistically similar to that of our baseline findings in Table B.3, regardless of the share of large banks. However, the relationship between the deposit rate and future economic growth is stronger in counties with a larger share of large banks, as indicated by the interactions between the county deposit rate and the quartile of the share of large banks.[24] This suggests that the deposit rate is a stronger indicator of future economic growth in areas with greater competition for deposits. We discuss this result further in Section 5.3.

In counties dominated by large, multi-state banks, we find that the deposit rates set by single-state banks remain a significant predictor of lower future GDP growth. This finding is important for two reasons: First, it highlights the relevance of single-state bank deposit rates as indicators of regional market conditions. Second, it suggests that the relationship between deposit rates and GDP growth operates independently of credit growth. These findings are explored in greater detail in Section 5.5.

5.1.7 Predictive value of deposit rates

To further understand the predictive value of deposit rates, we estimate a Receiver Operating Characteristic (ROC) curve. We use an efficient, rank-based algorithm known as the Area under the ROC Curve (AUC) which measures the model's predictions.[25] An AUC of 1 indicates that a classifier can perfectly distinguish recessions from non-recessions points; an AUC of 0

[23] Begenau and Stafford (2022) find that large banks are likely to use uniform rate setting policies.

[24] See Supera (2021) for how market power affects the transmission of monetary policy to business lending via time deposits.

[25] The AUC measures the ability of a classifier to distinguish between positive and negative points. It is a diagnostic test of accuracy and discrimination that represents the probability that a randomly chosen recession case is ranked as more likely to be in a recession than a randomly chosen non-recession case. Essentially, the separation between the distributions of recessions and non-recessions give a prediction model its classification ability, as assessed by the AUC.

indicates that a classifier predicts all non-recessions as recessions and all recessions as non-recessions. An AUC between 0.5 and 1 suggests that the classifier has greater predictive value than a coin toss. There is no "gold-standard" for the AUC benchmark because it is context-specific. As Iyer et al. (2016) note, an AUC of 0.6 or greater indicates strong predictive value in information-scarce environments, and an AUC of 0.7 or greater indicates strong predictive value in more information-rich environments.

To this end, we estimate the relation between deposit rates and county recessions using a logit model. We define a county to be in a recession if its GDP growth between two consecutive years is below -2%.[26] The unconditional probability of a county recession is 14.45% over the sample period. We estimate the likelihood of a recession in county c in year $t+k$ as a function of the average deposit rate within a county in year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity.

$$logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \epsilon_{c,t} \tag{2}$$

where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $Rate$ denotes the average bank deposit rate. We assume that $\epsilon_{c,t}$ is well-behaved.

Our results in Panel A of Table B.6 demonstrate that an increase in the deposit rate within a county significantly raises the probability of a recession. Specifically, Column (1) shows that a one standard deviation increase in the deposit rate raises the likelihood of a recession occurring one year ahead by 12%. In Column (2), the same increase in deposit rate raises the probability of a recession occurring two years ahead by 34%. Column (3) indicates that a one standard deviation increase in the deposit rate raises the likelihood of a recession occurring three years ahead by 29%. These estimates are both economically meaningful and statistically significant at the 1% level across all forecasting horizons. Additionally, diagnostic tests confirm that the covariates are jointly statistically significant. The two-year forecast model yields an AUC of 0.61, outperforming a random coin toss classifier.

We contrast these findings with a naive logit model that uses lagged GDP growth to predict recession likelihood in Panel B. We find that lagged GDP growth does not predict the likelihood of a recession one to two years ahead. In Column (3), we observe that higher past GDP growth is associated with an increased likelihood of a recession, though this effect is contrary to expectations. The naive classifier yields AUC values ranging from 0.50 to 0.56 across Columns (1) through (3).

In Panel C, we conduct a horse race between deposit rates and lagged GDP growth.

[26] The results are robust to using other thresholds.

Our analysis yields two key takeaways. First, deposit rates remain a significant predictor of future recessions. Column (2) in Panel C shows that a one standard deviation increase in the deposit rate raises the likelihood of a recession occurring two years ahead by 40%, with the AUC improving to 0.66 from 0.61. Second, lagged GDP growth loses its predictive power in the three-year classifier.

In Appendix Table B.7, we include county fixed effects.[27] Our results remain consistent with those in Table B.6. Deposit rates continue to be a significant predictor of forthcoming recessions and outperform lagged GDP growth. The two-year forecast model with county fixed effects produces an AUC of 0.74, which indicates a strong predictive value.

5.2 Generalizability and Implications for Financial Risk

To assess the generalizability of our findings beyond the county level, we conduct a parallel analysis at the state level and explore the out-of-sample predictive performance of deposit rates. We then examine whether the accumulation of economic risk at the state level is associated with an increase in the risk of financial institution failures. The findings of this analysis further help validate deposit rates as a useful vulnerability index for assessing regional economic risks.

State GDP data is available at the quarterly frequency from 2005, allowing us to investigate whether deposit rates can forecast economic activity on a quarterly basis at the state level. We calculate the average deposit rate for each state, through aggregation of county characteristics. That is, we construct the state deposit rate by taking an average of the county deposit rate in the last reporting month of each quarter.

Appendix Table B.45 reports the relation between deposit rates and economic activity at the state level. Consistent with our baseline findings at the county level, our results demonstrate that deposit rates are a salient indicator of future economic activity at the state level. Further, we evaluate the predictive value of state deposit rates in Appendix Table B.44, using a logit specification. We find that a one standard deviation increase in deposit rates raises the likelihood of a GDP drop greater than 2% eight quarters ahead by nearly 50%, both with and without state fixed effects. Furthermore, the estimated AUC (Area Under the Curve) at the two-year horizon is 0.68 without fixed effects and 0.72 with state fixed effects.

We further assess the predictive performance of deposit rates out-of-sample using k-fold cross-validation, examining how well the model generalizes to independent datasets. Specifically, our dataset is partitioned into k subsamples of equal size. $k-1$ subsamples are used as

[27] The inclusion of county fixed effects follows Schularick and Taylor (2012) who incorporate country fixed effects throughout their logit analysis.

the training set while one subsample is retained as the validation or testing set in which we evaluate the predictive performance (AUC). We estimate the AUC iteratively k times, so that each of the k subsamples is used as the testing set once. We plot the k-fold ROC curves and estimate the cross-validated AUC across the k-folds for statistical inference. Our default number for k is 10. k-fold cross-validation is a powerful tool that tests a model's ability to generalize to new cases that were not used in the estimation process. This allows us to flag issues such as overfitting and selection bias and produce realistic estimates of predictive value. Appendix Figure B.13 in the appendix reports the k-fold ROC curves and summarizes the cross-validated AUC from the logit model used in Panel A of Table B.44. We find that our predictive model generalizes well to independent datasets and reports a high model prediction performance. Specifically, we find that the cross-validated AUC is 0.68 for recessions, eight quarters ahead.[28]

To ensure that our findings are not driven by potential mismeasurement of the deposit rate, we compute the average deposit rate across all deposits from the Call Reports. The advantage of using Call Reports data is that it provides the deposit rate at the bank level, rather than for a specific deposit product. This measure captures both the reliance on different deposit types and the associated rates. Additionally, using Call Reports data mitigates potential bias from RateWatch coverage, particularly in areas experiencing economic decline. We apply this measure to single-state banks and demonstrate that it can predict future GDP growth at the state level. Specifically, we find that a one standard deviation increase in the average deposit interest expense of single-state banks is associated with a decline in future GDP growth of 0.46 to 0.48 percentage points one to two years ahead.

5.2.1 Implications for financial risk

The results presented above indicate a strong relation between deposit rates and the build-up of economic risk at the state level. This build-up of economic risk also carries implications for the risk of financial institution failures. To explore this further, we delve into the relationship between deposit rates and financial risk at the state level. Specifically, we examine the association between state deposit rates in 2006 and bank failures between 2008 and 2012.[29] Our findings reveal a clear pattern where higher deposit rates at the state level correspond to greater incidence of bank failures, both on the extensive and intensive margins as presented in Figure B.7. On the extensive margin, Figure B.7a illustrates a positive association between state deposit rates in 2006 and the likelihood of a state experiencing any bank failures during the crisis period of 2008-2012. Additionally, on the intensive margin, Figure B.7b presents a

[28] The cross-validated AUC at the county level is 0.60 for recessions two years ahead.
[29] Most bank failures between 2001 and 2023 occurred in the crisis period defined between 2008 and 2012.

binscatter plot that demonstrates a strong positive relationship between quantiles of state deposit rates in 2006 and the percentage of bank failures in each quantile during the 2008-2012 period.[30]

These relationships are not only statistically significant but also economically meaningful. Specifically, a one standard deviation increase in state deposit rates in 2006 is associated with a 19 percentage points increase in the likelihood that a state experiences any bank failure during the crisis period. Moreover, it corresponds to a 0.66 percentage points increase in the share of failed banks in a state, corresponding to 0.43 standard deviations. These findings demonstrate that deposit rates can also serve as an early indicator of solvency risk, as evidenced by the likelihood and severity of bank failures during the 2008-2012 crisis period. However, it is important to note that liquidity shortages of banks do not always lead to solvency risk. The association between increased liquidity risk and solvency risk is observed only in certain instances.[31] Therefore, while our analysis reveals that banks' deposit rates tend to increase in response to liquidity shortages, this association with bank failures is limited to extreme cases.

5.3 Heterogeneous Effects of Bank Liquidity Shortages

We examine the properties of regional deposit rates as a vulnerability index of regional economic risk. We propose that the deposit rates offered by banks within a county increase when certain banks face liquidity shortages. This conjecture is built on two assumptions: (1) there is competition for deposits among banks within a county, and (2) there is variation in liquidity needs among banks within a county. To delve deeper into the impact of these cross-sectional dimensions of heterogeneity, we first examine whether these effects are more pronounced in regions with a higher concentration of banks.

First, we hypothesize that deposit rates are better predictors of economic activity in areas with more competition. In competitive markets, banks cannot afford to keep deposit rates static or uncompetitive without risking the loss of depositors to other institutions. This competitive pressure ensures that deposit rates reflect real-time market dynamics and underlying economic conditions. To test this hypothesis, we examine whether deposit rates predict county recessions more effectively in concentrated markets, as shown in Appendix Table B.33. We find that in large metropolitan counties, a one standard deviation increase in deposit rates is associated with a 17% to 19% increase in the likelihood of a recession two years ahead. In contrast,

[30] The percentage of bank failures is computed as the ratio of the number of failed banks to the total number of banks in each quantile.

[31] See Goldstein and Pauzner (2005) for a related theoretical model.

this effect is much smaller in small urban counties (5% to 6%), and deposit rates do not predict recessions in rural counties. We observe a monotonic decline in both the point estimate and the AUC as we move from large metro counties to rural counties. The AUC is 0.73 for large metro counties, compared to 0.64 for rural counties, as shown in Panel B. Furthermore, Appendix Table B.32 replicates our baseline analysis for all counties, and Appendix Table B.34 does the same for the sample of counties, showing that the point estimates attenuate in less competitive areas.

Second, we hypothesize that banks with weaker balance sheets are more likely to increase their deposit rates by a larger margin compared to banks with stronger balance sheets. While economic contraction within a county is generally associated with an increase in the average deposit rates of banks operating in the area, the composition and strength of banks' balance sheets can vary significantly. This variability can leave certain banks more vulnerable to liquidity shortages, leading to divergent responses in their deposit rates. In Appendix Table B.35, we show that banks facing greater constraints tend to increase their rates more significantly. Specifically, we find that banks with overstretched balance sheets – such as those with higher credit-to-deposit ratio – raise their rates more in the subsequent period. Additionally, banks with lower liquidity, as indicated by ratios like cash-to-assets and dividends-to-assets, also tend to raise their rates more. Furthermore, banks with a smaller share of securities in their portfolios report higher deposit rates, consistent with findings from Kundu et al. (2024). These results highlight that the magnitude of deposit rate increases is closely linked to the balance sheet strength and liquidity conditions of the banks.

5.4 Validation from the Wells Fargo Asset Cap

While our previous analysis indicates a correlation between higher deposit rates and economic contractions, determining the exact timing of these events remains challenging. Specifically, it is difficult to identify when deposit rates start responding to an impending economic downturn. Moreover, other factors such as monetary policy, precautionary savings motives, banking structures, and credit booms could influence these results. To address these issues, we use a quasi-natural experiment to directly assess how deposit rates reflect liquidity shortages.

Specifically, we use enforcement of the Wells Fargo asset cap by the Federal Reserve to study the effects of a binding constraint on a major financial institution. This policy intervention, unprecedented in its scope, restricted the total assets of Wells Fargo to the level recorded at the end of 2017. This constraint effectively limited the bank's ability to grow its balance sheet, creating a natural experiment for assessing the impact of deposit supply shocks on re-

gional economic outcomes. In addition, the asset cap shock is orthogonal to monetary policy shocks, precautionary savings motives, banking structures, and credit booms. Therefore, it provides a clean setting for identifying the relationship between bank liquidity shortages and deposit rates.

To evaluate the economic effects of the asset cap, I exploit its exogenous nature as a regulatory intervention unrelated to the underlying economic conditions in specific regions. The analysis uses a difference-in-differences framework, comparing counties with a significant Wells Fargo presence to those with minimal or no exposure, before and after the imposition of the cap. This approach leverages county-level data on deposit growth, lending activity, and economic performance, accounting for both county and year fixed effects to isolate the causal impact of the asset cap.

We begin by comparing the deposit growth and asset growth of Wells Fargo to that of Bank of America, JPMorgan Chase, and Citibank, as shown in Figure B.15, following the methodology of Ruan and Vij (2024). In Figure B.15b and Figure B.15a, we scale the total deposits and total assets by their 2017 values. These figures reveal a stark contrast: while the other three major banks have experienced substantial growth in both assets and deposits since the imposition of the asset cap, Wells Fargo's ability to attract and retain deposits has been effectively constrained by the cap, limiting its growth relative to its peers.

The central hypothesis is that deposit rates effectively reflect liquidity shortages. We argue that areas with a significant Wells Fargo presence prior to the imposition of the asset cap experienced a contraction in the local supply of deposits after the cap was enforced. This contraction in deposit supply led to an increase in deposit rates, which in turn had cascading effects on credit availability, particularly for small businesses that heavily rely on local banks for financing. Figure B.16 illustrates Wells Fargo's share of deposits in each county in 2017, showing considerable variation in the bank's presence across the country.

To investigate this, we employ a difference-in-differences approach, comparing the economic outcomes of counties with a significant Wells Fargo presence to those without, both before and after the asset cap was imposed. We include county fixed effects to control for time-invariant county characteristics and time fixed effects to account for macroeconomic trends. The model is specified as:

$$Y_{c,t} = \beta_1 \mathbb{1}_{\text{WF County},c} \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t} \tag{3}$$

where Y refers to outcome variables including deposit grwoth, deposit rate and credit growth, $\mathbb{1}_{\text{WF County}}$ is an indicator for whether the county had a Wells Fargo in 2017, and *Post* is an

indicator for the post-enforcement period, after 2017. The sample period spans 2012 through 2023.

To assess the validity of the parallel trends assumption, we examine the pre-trend behavior of deposit growth and deposit rates for counties with and without Wells Fargo presence prior to the asset cap in Figure B.17. We find that, in general, deposit growth (Figure B.17a) declines after the imposition of the asset cap for counties with Wells Fargo, except during the COVID period, when deposit growth temporarily increased for these counties. However, following the initial increase during COVID, deposit growth in Wells Fargo counties fell sharply. Similarly, deposit rates (Figure B.17b) exhibit a similar pattern: they rise after the asset cap, decline during the COVID period, and then begin spiking again after 2021 for counties with Wells Fargo. These findings suggest that the trends for counties with Wells Fargo were moving in parallel to those without it before the asset cap was imposed, lending support to the parallel trends assumption. Our inclusion of county and time fixed effects ensures that any differences in the outcomes between the treated and control counties can be attributed to the asset cap rather than other confounding factors.

Next, we examine the impact of the asset cap on county deposit growth in Panel A of Table B.47. Column (1) presents the results without any fixed effects, while Column (2) includes county fixed effects, Column (3) adds year fixed effects, and Column (4) includes both county and year fixed effects. We find that county deposit growth declines by up to 1.08 percentage point in counties with a Wells Fargo presence after the asset cap, indicating that the supply of deposits contracted and that substitution effects are imperfect. This decline represents approximately 27% of the average deposit growth.[32] Turning to the county deposit rate in Panel B, we observe that the deposit rate increases by 5.70% in counties with a Wells Fargo presence following the asset cap, which accounts for up to 9% of the deposit rate in these counties. These results suggest that the asset cap significantly affected both deposit growth and deposit rates in counties where Wells Fargo had a strong presence.

We argue that the regulatory-induced liquidity shortage resulting from the asset cap translates into lower small business lending in these counties. Small businesses, which typically rely on local bank branches for financing (see Petersen and Rajan (1994)), face greater difficulty securing loans after the asset cap, thereby stifling local economic activity and growth. In Table B.48, we test this hypothesis. Panel A compares small business lending in counties with a Wells Fargo presence before and after the asset cap. We find that these counties experience a decline in small business lending ranging from 6.49% to 8.78%. This reduction in lending

[32]Note that the decline in deposit growth is not solely driven by the closure of Wells Fargo branches. Even after excluding Wells Fargo from the calculation, we observe a decline at the county level.

is accompanied by a corresponding decline in GDP, with up to a 0.43 percentage point drop in future GDP growth. In Appendix Figure B.18, we study the impulse responses of deposit growth, deposit rate, small business lending, and GDP growth at the county level, observing that while deposit growth and deposit rates show an immediate effect following the asset cap, small business lending declines later, followed by a reduction in GDP growth.

Overall, these findings illustrate how economic contractions can be driven by liquidity stress experienced by banks in response to economic shocks, leading to an increase in deposit rates. As such, deposit rates serve as a heuristic for assessing regional economic risks, highlighting how liquidity shortages manifest in practice. We replicate the entire analysis using county exposure to the economic impact payments during COVID-19 to examine how a positive deposit shock permeates through the local economy, and refer readers to Section B.1 for a detailed discussion.

5.5 Deposit Rates Outperform Other Leading Indicators

An important question is how the predictive value of regional deposit rates, as a vulnerability index, compares to that of other variables. Specifically, does the information aggregated in deposit rates capture underlying economic conditions that may not be accounted for by other variables?

5.5.1 Deposit rates vs. deposit growth

Our primary conjecture is that deposit rates serve as an asset pricing measure of deposit scarcity, reflecting the balance between deposit supply and demand. In this context, deposit rates act as a sufficient statistic for bank liquidity conditions. We demonstrate that this pricing measure of liquidity shortages captures underlying economic conditions not directly accounted for by deposit growth alone, making it a valuable vulnerability index for assessing economic risks. Appendix Table B.23 illustrates this point. Panel A examines the predictive value of deposit growth on county recessions, while Panel B adds deposit rates. The results show that the deposit growth alone yields an AUC of 0.68 (Panel A), lower than the 0.73 obtained with deposit rates (Panel B) at the two-year forecasting horizon – a substantial difference. Furthermore, the point estimates associated with deposit growth are unstable, with fluctuating signs and statistical significance across Panels A and B. In contrast, the point estimates associated with deposit rates remain consistently statistically and economically significant, even after controlling for deposit growth between Panel B and our baseline specification

(Table B.6). Notably, the predictive value, as measured by the pseudo R^2 and AUC, remains largely unchanged with the addition of deposit growth.[33]

5.5.2 Deposit rates vs. credit growth

The extant literature on credit booms highlights that periods of excessive credit growth are often followed by periods of large contractions in economic activity (Schularick and Taylor (2012)). Our evidence suggests that the forecasting power of deposit rates operates independently of credit booms. First, our results from 2010-2015 show that deposit rates predict economic activity even during periods of stagnant credit growth, extending their forecasting power beyond expansionary credit phases. Second, our quasi-natural experimental design, which exploits natural disasters unrelated to credit booms, reveals that counties experience liquidity strain following disasters, signaling impending economic contractions. Building on these findings, we further explore how the predictive value of deposit rates compares to various credit growth measures.

To directly compare the predictive value of county deposit rates and credit growth (small business lending growth in Panel A, mortgage lending growth in Panel B, and total lending growth in Panel C), we conduct a horse-race analysis in Table B.8. Deposit rates remain an economically meaningful and statistically significant indicator of economic contractions. Specifically, we find that even after accounting for various measures of credit growth, a one standard deviation increase in the deposit rate is associated with a decline in future economic growth by 0.47 to 0.50 percentage points. This is remarkably similar to our baseline estimate of 0.44 percentage points. Notably, we find that higher credit growth is *positively* associated with GDP growth. These findings are consistent with existing literature, which suggests that large credit expansions are unreliable predictors of non-financial recessions (Boissay et al. (2016)) and instead only demonstrate predictive value for financial crises. Further, the inclusion of credit growth measures does not alter the relationship between deposit rates and economic growth, as indicated by the coefficient, does not add explanatory power, as indicated by the change in the pseudo R^2, nor does it substantially improve the predictive value, as evidenced by the change in the AUC in Appendix Table B.18.[34]

To complement these comparisons between the predictive value of deposit rates and measures of credit growth, we conduct two additional tests. The findings of these tests rule

[33] These findings are robust under an OLS specification, as shown in Appendix Table B.9, which examines the relationship between deposit growth, deposit rates, and GDP growth.

[34] Appendix Table B.20 reports the estimation results, using credit growth measures alone. The AUC is approximately 0.70 – lower than the AUC obtained with deposit rates.

out the possibility that our proposed channel of liquidity shortages operates through the credit channel.

First, to isolate the liquidity shortage channel and demonstrate the predictive power of deposit rates, independent of credit supply, we examined regions where single-state lending accounts for less than 10% of all lending. Our analysis, presented in Table **??**, reveals that even in these areas, where single-state banks have a limited presence in the small business lending (Panel A), mortgage lending (Panel B), and total lending (Panel C) markets, their deposit rates remain a significant predictor of economic activity. The fact that we can predict economic activity in regions with minimal single-state lending share highlights the importance of the liquidity shortage channel and the independent predictive power of deposit rates.

Second, to further establish the predictive power of deposit rates, we employ a residual analysis that controls for the effects of fluctuations in credit supply. This approach allows us to isolate the unique information embedded in deposit rates about economic activity, independent of credit supply. We first regress deposit rates on contemporaneous and lagged measures of credit growth. The resulting residual deposit rates, purged of credit supply influences, are then used to predict future economic growth. The results, presented across Panels A, B, and C of Appendix Table B.36, reveal a statistically and economically significant relationship between the residual deposit rates and GDP growth. This indicates that the predictive power of deposit rates increases after accounting for credit supply. The findings suggest that credit supply does not drive the deposit rate-GDP growth relationship; instead, deposit rates capture unique information about economic activity beyond credit supply fluctuations. This reinforces our previous conclusions, highlighting the potential of deposit rates as an independent indicator of economic activity. Section 6 examines the interplay between rate hikes and lending growth, revealing that banks that raise rates more substantially do so to strengthen their balance sheets, rather than expand lending.

5.5.3 Deposit rates vs. other leading indicators

While our findings suggest that deposit rates offer valuable insights compared to other bank measures, a key question remains: do they outperform established leading indicators of regional business cycle fluctuations? This comparison is important to validate deposit rates as a reliable forecasting tool for regional business cycles. To this end, we compare the predictive value of deposit rates (column (1)) to other leading economic indicators of recessions including the natural-log transformed number of auto sales (column (2)), unemployment insurance

claims (column (3)), and job openings (column (4)) at the state level.[35] We study the relation between each of these indicators and future economic growth, eight quarters ahead in Panel A of Table B.10. Using a within-state estimator, we find that there is no statistically distinguishable relation between the auto sales or unemployment insurance claims on future economic growth. Although there is a strong relation between job openings and future economic growth, it bears a negative correlation. This implies that an increase in job openings in the present is associated with *weaker* economic growth in the future, potentially indicating mean reversion. To assess predictive value, we compare the R^2 values across all four specifications. Notably, the deposit rate demonstrates the highest explanatory power for future economic growth, accounting for 6.03% of the variation in column (1).[36] In comparison, the natural-log transformed number of auto sales, unemployment insurance claims, and job openings explain 3.77%, 3.65%, and 4.31% of the variation in columns (2)-(4), respectively.

We further validate that state deposit rates are a robust leading indicator of regional business cycles by running a horse-race analysis between our measure of state deposit rates and other leading economic indicators of regional business cycle activity in Panel B of Table B.10. The dependent variables in columns (1) through (3) are the changes in state GDP four quarters ahead, eight quarters ahead, and twelve quarters ahead, respectively. Using a within-state estimator, we find that only the state deposit rate can robustly predict future state GDP growth in any statistical or quantitative sense; the point estimates and standard errors of the other indicators are unstable across the forecasting horizon. Furthermore, the combined inclusion of the natural-log transformed number of auto sales, unemployment insurance claims, and job openings adds only an additional 0.89% to the R^2, beyond the 6.03% explained by the deposit rate alone.

Deposit rates may exhibit better predictive value compared to other variables, as they are forward-looking rather than backward-looking. Additionally, deposit rates are readily available in the public domain in real time, unlike many other variables. Overall, these results underscore the comparative predictive value of deposit rates as a valuable indicator of economic downturns, outperforming other measures in this context.

[35] Due to data availability limitations at the county level, we conduct this analysis at the state level.

[36] Relatedly, Khan and Ozel (2016) show that bank accounting measures are associated with changes in the state coincident index.

6 How do Liquidity Shortages Affect Deposit Rates?

Thus far, we have established a robust relation between deposit rates and economic activity. This section delves into the mechanism underlying these findings.

At the core of our analysis lies the premise that that as an economy enters a downturn, banks face liquidity squeezes, prompting them to raise deposit rates in response to funding pressure. Building upon this premise, we begin by exploring the relation between changes in deposit rates and the growth of insured and uninsured deposits. To this end, we sort banks based on their quarterly changes in deposit rates into quartiles. First, we calculate the average deposit rate for banks in each quarter across all counties. Then, we determine the quarterly changes in banks' deposit rates, enabling us to gain insights into their dynamic adjustments over time.

Our empirical framework regresses bank b's outcome variable on the quartile indicators at time t (quarter-year).

$$\begin{aligned}\Delta ln(Y)_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} \\ + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}\end{aligned} \tag{4}$$

where $\Delta ln(Y)$ denotes growth in the outcome variable, $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, and fourth quartile of the change in bank's deposit rates between two consecutive quarters, respectively, and k denotes the lead/lag of the dependent variable and ranges from -3 to +3 quarters. Our regression specification includes quarter-year fixed effects to control for aggregate shocks.

Table B.37 presents the dynamics of the relation between the deposit growth rates for insured and uninsured deposits and the quarterly change in banks' deposit rates. In Panel A, the dependent variable is the growth in banks' insured deposits. In Panel B, the dependent variable is the growth in banks' uninsured deposits. It is worth noting that the vast majority of depositor households maintain deposits below the insured limit, with more than 99 percent of deposit accounts falling under the $250,000 deposit insurance limit (Federal Deposit Insurance Corporation (2023)). Uninsured depositors typically encompass large depositors, such as non-financial or financial corporations, along with wealthy individuals or entities exceeding the deposit insurance limit.

Our analysis yields several noteworthy observations. Firstly, we discover a decline in the growth of insured deposits in the quarters leading up to rate changes. This decline is observed across all banks, irrespective of the magnitude of deposit rate adjustments. Similarly, we also

observe a slowdown in the growth of uninsured deposits during this period. However, our findings indicate that banks, which eventually raise rates to a greater extent, also experience a more substantial decline in the growth of uninsured deposits. In simpler terms, banks facing significant withdrawals of uninsured deposits tend to raise their deposit rates by a larger margin in the subsequent quarter. Unsurprisingly, we also find higher growth in both insured and uninsured deposits in the quarter immediately following the rate change.[37]

In Table B.38, we directly investigate the growth in the ratio of insured to uninsured deposits to gain insights into the funding composition dynamics surrounding deposit rate changes. Generally, we find that the growth in the ratio of insured to uninsured deposits is stable over time and across banks. However, consistent with our findings in Table B.37, we observe a noteworthy increase in the growth of insured to uninsured deposits for banks in the fourth quartile (of rate changes) during the quarter preceding the rate change. This increase is primarily driven by a decline in uninsured deposits.

To further understand whether the change in the ratio of insured to uninsured deposits is a mechanical response or a deliberate choice by banks to adjust their deposit composition, we explore the gap between uninsured and insured deposit rates at the county level in Appendix Table B.42. Our analysis reveals that the gap between uninsured and insured deposit rates narrows as banks approach a county recession. This suggests that, on average, banks tend to raise their insured deposit rates more significantly compared to their uninsured deposit rates as they approach a county recession, thereby, attracting more insured deposit funding. Further, we note a substantial increase in the dispersion of deposit rates before country recessions, consistent with our findings on the predictive value of the dispersion of deposit rates in Section 5.3.

We also examine the relation between the growth in lending with changes in deposit rates to understand the assets side adjustments of banks' balance sheet. This analysis allows us to test whether deposit rate increases are driven by increased loan demand. Table B.39 presents our findings regarding lending growth. Notably, we observe that higher lending growth precedes higher rate changes. Specifically, banks in the fourth quartile exhibit higher lending growth in the quarters leading up to rate changes. However, after the rate change, lending growth slows down, and the differential lending growth among banks in different quartiles starts to converge. This suggests that banks that raise their rates by a larger margin, do so, primarily to strengthen their balance sheets rather than to expand their lending activities. Further, in Appendix Table **??**, we examine the growth rates of non-performing loans

[37] Unreported, these banks also increase the rate on uninsured deposits.

(NPL). We find no significant differences across banks in terms of NPL growth following rate changes. Together, these findings validate that these deposit rate increases are not driven by increased loan demand, as loan growth declines following deposit rate hikes.

Overall, our findings suggest the following channel is at work. As a county approaches an economic downturn, insured deposit growth decreases across all banks. Uninsured depositors decrease their deposits more for riskier banks. As a result, county deposit growth declines. Indeed, we observe a decline in total deposit growth at the county level one year before a recession in Appendix Table **??**. In order to offset the funding shortfall and bolster their balance sheets, banks respond by increasing deposit rates to attract funds from insured depositors. However, the magnitude of the increase in deposit rates is contingent on the level of competition for bank deposits and the balance sheet conditions of banks within a county as discussed earlier in Section 5.3.

Considering the aforementioned mechanism, it is necessary to ascertain whether the results stem from informed depositors withdrawing from risky banks prior to a downturn or if the slower deposit growth primarily originates from an overall slowdown in economic activity preceding the downturn. Our findings strongly support the latter explanation, as we observe a deceleration in insured deposit growth. Insured deposits, by their nature, are not influenced by bank riskiness and are, therefore, less sensitive to recession risk. Moreover, Appendix Table B.27 shows that our baseline findings are not driven by the rate-setting policies of failed banks. Nevertheless, we explore bank credit default swap spreads and equity returns over several business cycles to gauge bank risk in Appendix Figure B.12. Interestingly, we do not find any significant spikes in CDS spreads or declines in bank equity prices until after national recessions occur. In contrast, we observe an increase in the deposit rate years in advance. This suggests that it is less likely that "smart money" had anticipated the recession in advance, as such expectations would likely be reflected in the prices of other tradable instruments as well.

7 Conclusion

This paper proposes a vulnerability index for assessing the build-up of economic risks at the regional level. We find that an increase in deposit rates offered by banks operating within a region is associated with a contraction in future economic activity in that region. Deposit rates effectively capture the susceptibility of regional economies to economic shocks, serving as a valuable indicator of regional economic risk. By leveraging spatial variation in bank liquidity, deposit rates provide a robust vulnerability index for assessing the build-up of regional economic risks.

We examine the mechanism behind the predictive power of deposit rates and find that banks which experience an outflow of deposits increase deposit rates in the following quarter. These banks raise deposit rates to attract deposits and support their balance sheets in response to funding shortages. Consequently, our results indicate that, at the onset of an economic contraction, banks increase their deposit rates in response to a liquidity squeeze. As a result, an increase in deposit rates can serve as a predictive signal for an impending economic contraction.

The granularity of our indicator – the deposit rates – allows for prediction of localized downturns at regional levels. Our market-based measure is both easy to construct and utilize, providing a valuable early warning signal of impending downturns that complements existing metrics.

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8 Figures and Tables

For Online Publication:

Bank Liquidity Shortages and Local Economic Activity

Contents

A Data Appendix **43**

B Appendix Figures and Tables **46**

B.1 Case Study: COVID Household Stimulus 112

Appendix A Data Appendix

This project employs several datasets. We describe the sources in detail below.

Deposit Rates We use data on deposit rates from S&P Ratewatch. S&P Ratewatch provides depository interest rate coverage on banks and credit unions in the US for more than 70 standard retail banking products, ranging from deposit products to consumer loan and mortgages at the weekly frequency. Deposit rates are available at a granular geographic level with zip code, county, and state identifiers. We focus on the deposit rates for 12-month certificates of deposit ($10K 12-month CDs) with a minimum account size of $10,000 because this is the most common deposit product. Our sample period is 2001 through 2020. Our dataset covers 8,361 distinct banks and 2,897 distinct counties (approximately 90% of all US counties).

Gross Domestic Product We obtain Gross Domestic Product (GDP) data from the Bureau of Economic Analysis (BEA) at the county, state, and national levels. GDP is the BEA's National Income and Product Accounts signature piece, measuring the value of the nation's output across various dimensions. The BEA estimates GDP at the national level for each quarter-year from 1947Q1. This data is reported at annual rates, for ease of comparison and is seasonally adjusted to remove the effects of yearly patterns such as holidays, inclement weather or factory production schedules. The BEA estimates the value of goods and services produced in each state (and DC), county, metropolitan areas and other statistical areas. State GDP data is available at the quarterly frequency from 2005Q1. County GDP data is available at the annual frequency from 2001.

Business Formation We use data on annual new business applications by county from the US Census Business Formation Statistics (BFS). The BFS measures business initiation activity as indicated by applications for an employee identification number (EIN). All requests for an EIN are accounted for except for those related to tax liens, estates, trusts, certain financial filings, applications lacking state-county geocodes, applications with specific NAICS codes in sectors 11 (agriculture, forestry, fishing and hunting) or 92 (public administration) that have low transition rates, and applications in particular industries such as private households and civic and social organizations. The county BFS data is available at the annual frequency from 2005.

Mortgage Delinquency We collect data on early stage delinquencies at the county level from the National Mortgage Database, conducted in collaboration with the Federal Housing Finance Agency (FHFA). The 30-89 day mortgage delinquency rate serves as an early indicator of the overall health of the mortgage market, capturing borrowers who have missed one or two payments. According to the Consumer Financial Protection Bureau (CFPB), this rate is sensitive to temporary economic shocks. To add to our analysis, we supplement this data with data on the 90-day delinquency rate, which measures serious delinquencies, capturing borrowers who have missed three or more payments. This particular measure reflects more severe economic distress. Mortgage delinquency data is available at the annual frequency from 2008.

Industry Activity: We use data on industry activity from the Quarterly Census of Employment and Wages (QCEW), produced by the Bureau of Labor Statistics (BLS). At the national level, the program publishes data for nearly every North American Industry Classification System (NAICS) industry. At the state, county, and Metropolitan Statistical Area (MSA) levels, the QCEW program offers more granular data, publishing establishment, employment, and wage information down to the 6-digit NAICS industry level. Specifically, this includes quarterly

and annual establishment counts and wage data, as well as monthly and annual employment data. Additionally, the QCEW program produces data on establishments, employment, and wages stratified by establishment size for the first quarter of each year. This richly detailed information enables in-depth analysis of local economies and industry trends. QCEW reports data, starting at the 6-digit NAICs level to higher industry levels and to the county, MSA, State, and national levels. We collapse the data to create a panel at the county *times* industry $\times$ year level. This panel is used to identify the dominant industry in the last ten years, measured by total employment.

Supplementary Measure of Economic Activity We use data on unemployment rates across counties from the Bureau of Labor Statistics (BLS). The BLS provides monthly estimates of total employment and unemployment for over 7,600 areas. We use annual unemployment rate data at the county level as an alternative measure of local economic conditions to GDP growth. We also use data on the consumer price index (CPI) for metro areas from the Bureau of Labor Statistics (BLS). The BLS reports the monthly estimates of CPI for 23 metro areas. We use the annual CPI data for these metro counties.

Bank Balance Sheet, Income Statements and Deposits Data We extract bank balance sheet and income statement information from the Reports of Condition and Income (Call Reports) sourced from the Federal Reserve Bank of Chicago. This data is provided for most FDIC-insured institutions and is reported at the quarterly frequency from 1976. The data of all bank filings are regulated by the Federal Reserve System, FDIC, and the Comptroller of the Currency. We supplement data from the call reports using quarterly data on banks' insured and uninsured deposits from the FDIC Statistics on Depository Institutions (SDI). The FDIC SDI reports the total volume of insured and uninsured deposits and insured deposits for all FDIC insured banks. We also utilize data on branch-level bank deposits sourced from the FDIC. The FDIC conducts an annual survey, covering all FDIC-insured institutions. The *Summary of Deposits* gathers branch-specific information, including total deposits and parent bank details as of June 30th of each year. In addition, we use quarterly data on non-performing loans from S&P Market Intelligence. Our sample ranges from 2001 through 2020.

Small Business Lending and Mortgage Lending We use data on small business lending, collected under the Community Reinvestment Act (CRA). The CRA is intended to demonstrate whether depository institutions to meet the credit needs of communities in which they operate, including low- and moderate-income neighborhoods. A small business loan is defined as a commercial & industrial loan of $1 million or less. All FDIC- and Federal Reserve-supervised financial institutions are subject to CRA requirements if they have assets above a prespecified threshold in two of the previous calendar years. Banks report the number and dollar amounts of lending across loan, applicant, and geographic characteristics. We use data on mortgage lending, collected under the Home Mortgage Disclosure Act (HMDA). The HMDA is intended to demonstrate whether lenders are serving the housing needs of their communities. Financial institutions are required to collect, record, and report any HMDA data on closed-end mortgage loans or open-end lines of credit above prespecified thresholds in two of the previous calendar years. Banks report the number and dollar amounts of lending across loan, applicant, and geographic characteristics. We aggregate the CRA and HMDA data to the bank $\times$ county $\times$ year level between 2001 and 2020.

Natural Disaster and Fracking We use data on natural disasters from the Spatial Hazard Events and Losses Database for the United States (SHELDUS). SHELDUS provides detailed data on losses at the county level. SHELDUS sources information on natural disasters from the "Storm Data and Unusual Weather Phenomena" published by the National Climatic

Data Center (NCDC). We restrict our sample to large natural disasters that last fewer than 31 days with total damages above $1 bn 2018 dollars. The SHELDUS disaster dataset spans from 1960 through 2018. We use data on horizontal wells from Enverus (DrillingInfo), which offers comprehensive analytics on oil and gas. The database includes historical and current information on various well-related data, such as well type, well construction, active rig locations, well-level production, leases, units, permits, completions, and well logs, for a wide range of wells, including oil, gas, and geothermal wells. The Enverus dataset is available from 1994.

Other Financial Data We use data on spreads on credit default swaps and equity prices for a subset of banks. The high-frequency data on CDS spreads is obtained from Markit, while equity returns are sourced from CRSP. To combine these datasets and identify the common set of banks present in both the CDS and equity data, we perform a manual merge.

Other Leading Economic Indicators We supplement our baseline analysis with other leading indicators of local business cycle fluctuations at the state level. These indicators include state auto sales, unemployment claims, and job openings. Data on auto sales comes from from RL Polk, which reports zip code-monthly data. Data on state monthly unemployment claims comes from the Department of Labor. Data on state job openings comes from the Bureau of Labor Statistics.

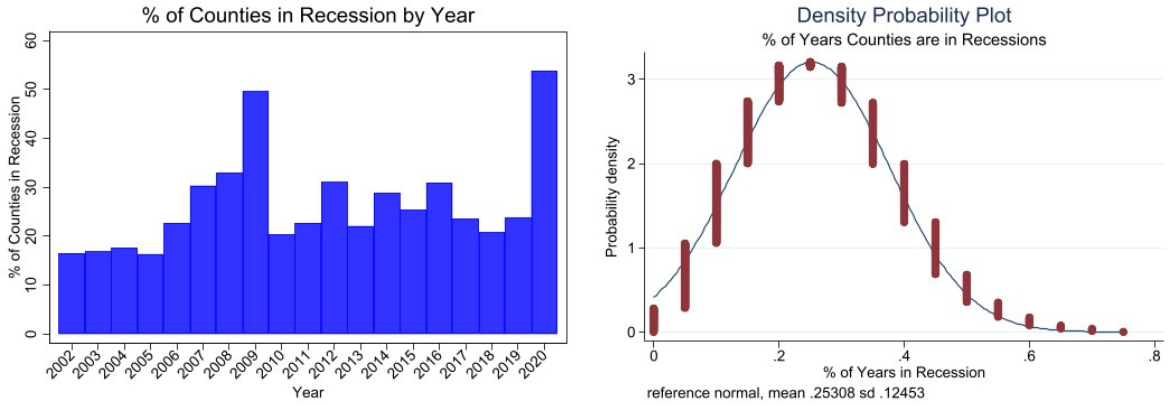
Rural-Urban Continuum Codes We use data on Rural-Urban continuum codes from the US Department of Agriculture Economic Research Service (USDA ERS). The Rural-Urban Continuum Codes are a classification scheme that distinguishes metropolitan counties by population size of their metropolitan area and non-metropolitan counties by the degree of urbanization and adjacency to a metropolitan county. There are three categories of metropolitan counties and six categories of non-metropolitan counties. The Rural-Urban Continuum Codes were developed in 1974 and have been updated each decennial (1983, 1993, 2003, 2013) with a slight revision in 1988. We use the 1993 Rural-Urban Codes and identify metro counties as counties that report a Rural-Urban Code of 0 or 1.

Bank Failures We retrieve the list of failed banks from the Federal Deposit Insurance Corporation (FDIC). The Failed Bank List includes banks which have failed since October 1, 2000. The dataset reports the bank name, location, acquiring institution, closing date, and insurance fund number. A bank failure refers to the closure of a bank by a federal or state banking regulatory authority. Typically, a bank is closed down when it becomes incapable of fulfilling its obligations to depositors and other stakeholders. We examine bank failures from 2008 to 2012; there were 25 bank failures in 2008, 140 in 2009, 157 in 2010, 92 in 2011, and 51 in 2012.

Business Cycle Expansions and Contractions We use data on business cycles from the National Bureau of Economic Research (NBER) US Business Cycle Expansions and Contractions. The NBER's Business Cycle Dating Committee maintains a chronology of US business cycles, identifying the peak and trough months of economic activity. The NBER defines a recession as a decline in economic activity that is spread across the economy and lasts more than a few months. There are three criteria used to determine a recession – depth, diffusion, and duration, albeit, exceptional circumstances in one criteria can partially offset weaker indications from other criteria. We highlight recessions between 2001 and 2020 throughout our analysis.

Appendix B Appendix Figures and Tables

Figure B.1: Recessions Across Counties and Time

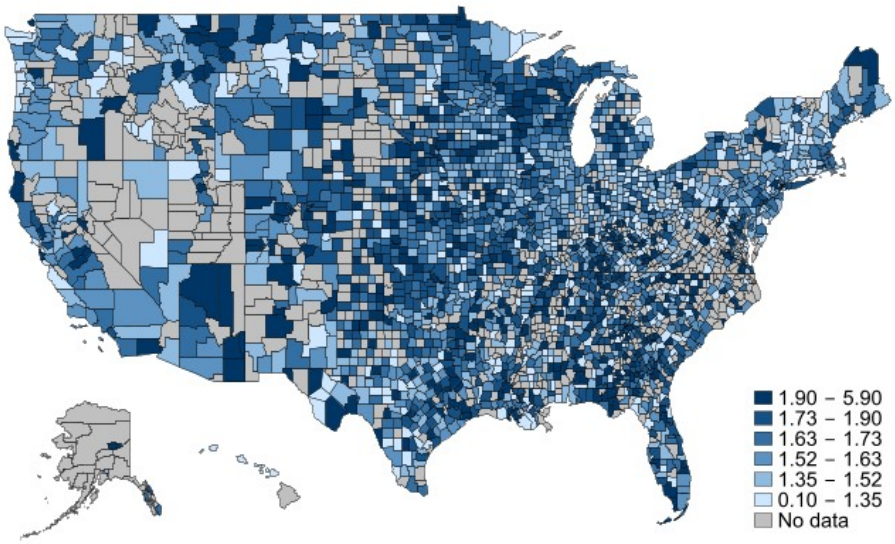


(a) % of Counties in Recession

(b) % of Recessions within Counties

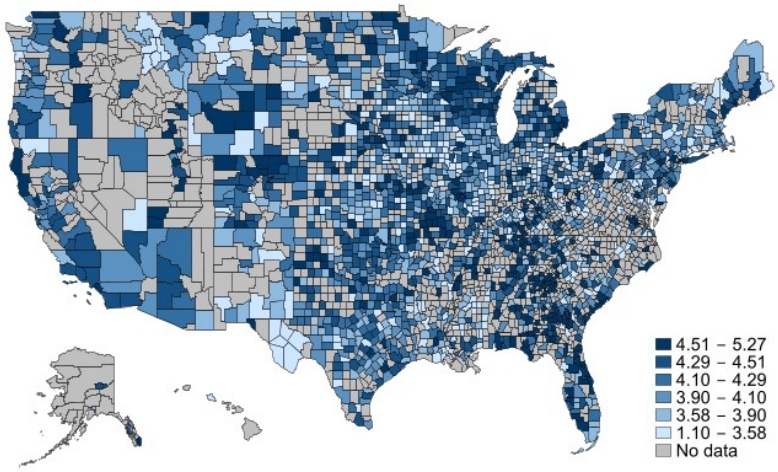
Notes: This figure presents the percentage of counties in recessions by year in Figure B.1a, and a density probability plot of the percent of year counties are in recessions in Figure B.1b based on county GDP data. A county is in a recession if its GDP growth between two consecutive years is below -2%.

Figure B.2: Deposit Rates by County (2001-2020)

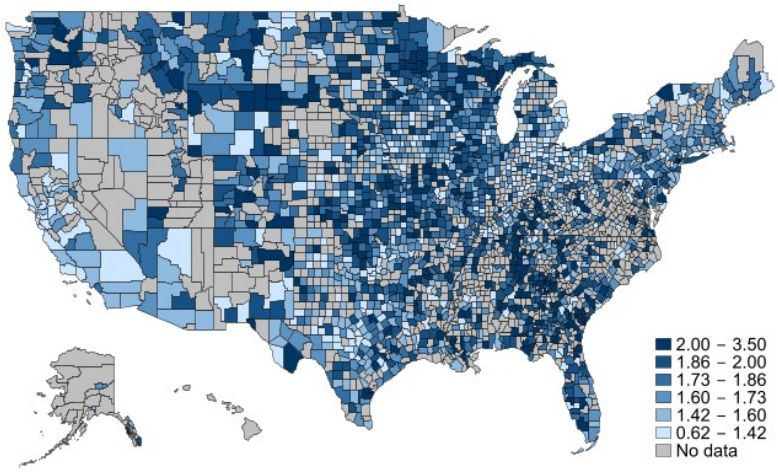


Notes: This figure uses RateWatch data to present a heatmap of the average deposit rate (12-month, $10K CDs) in each county from 2001 to 2020. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is computed as the average of the monthly county deposit rates in each year. We present the time-series average of these annual county deposit rates. The analysis is restricted to single-state banks. The intensity of the blue shading represents the quantile range of the deposit rate.

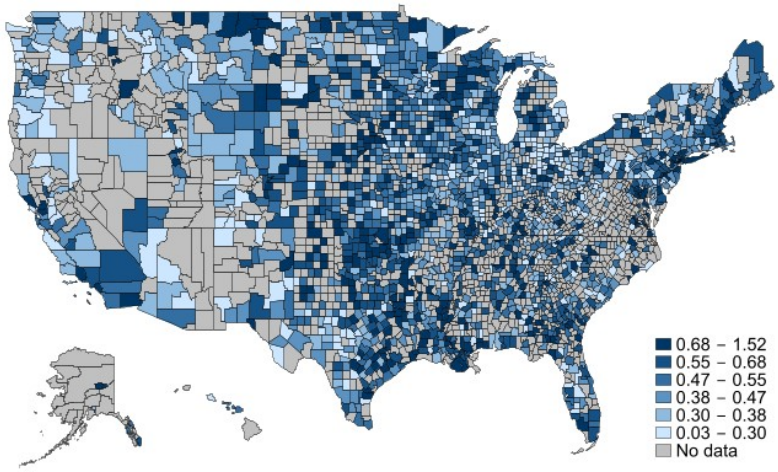
Figure B.3: Deposit Rate Across Counties and Time



(a) 2006



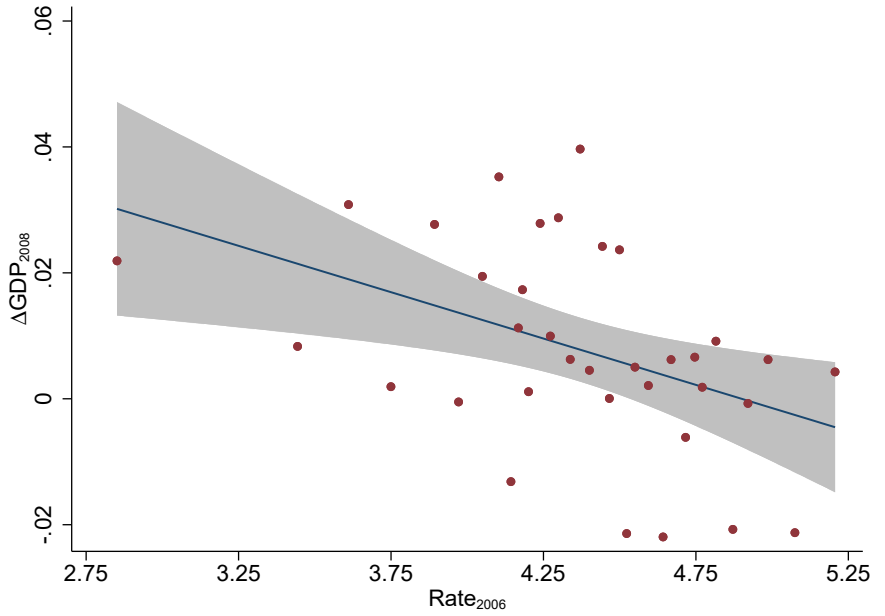
(b) 2009



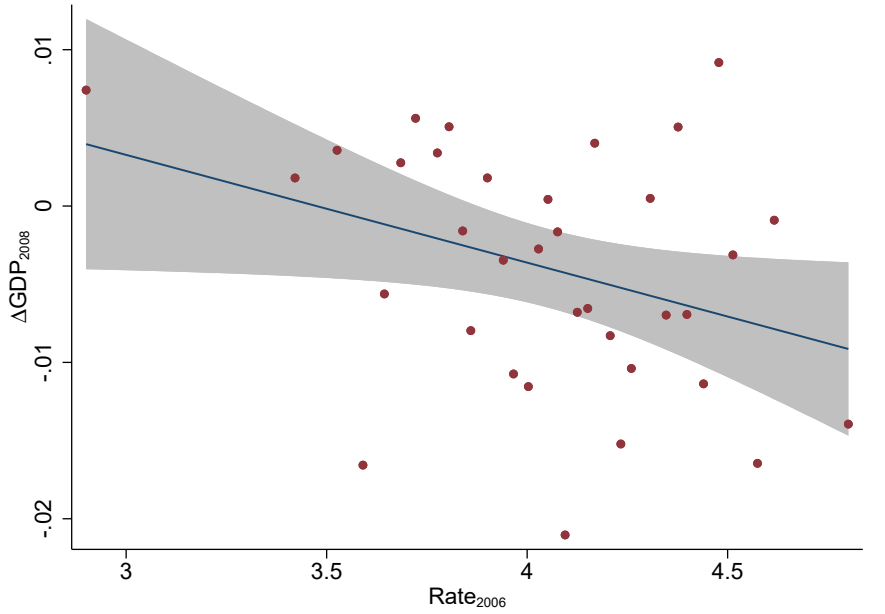
(c) 2017

Notes: This figure uses RateWatch data to present a heatmap of county deposit rates (12-month, $10K CDs). Figure B.3a presents county deposit rates in 2006; Figure B.3b presents county deposit rates in 2009; Figure B.3c presents county deposit rates in 2017. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. The intensity of the blue shading represents the quantile range of the deposit rate. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is computed as the average of the monthly county deposit rates in each year. The analysis is restricted to single-state banks. The intensity of the blue shading represents the quantile range of the deposit rate.

Figure B.4: 2006 Deposit Rates Predict 2008 GDP Growth



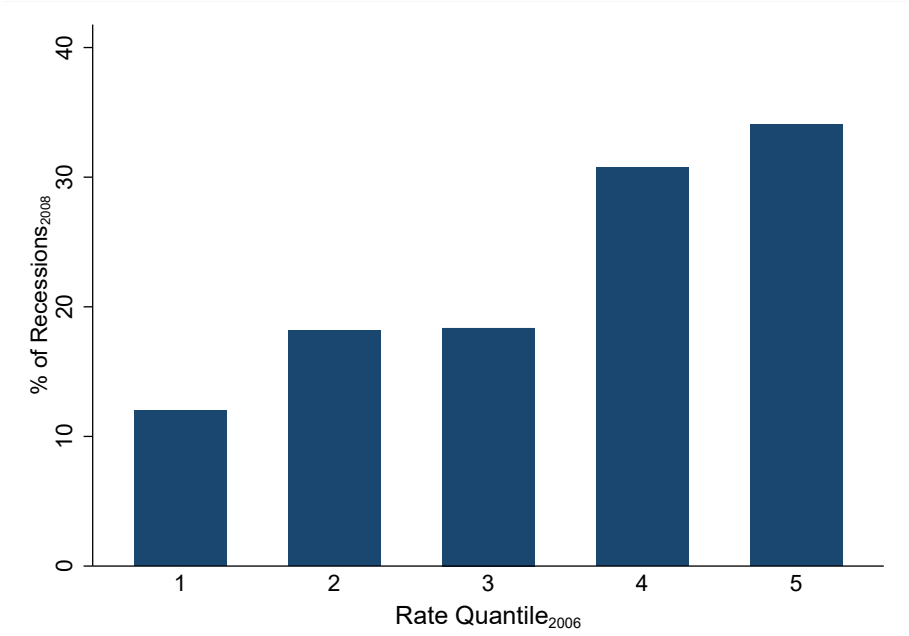
(a) County



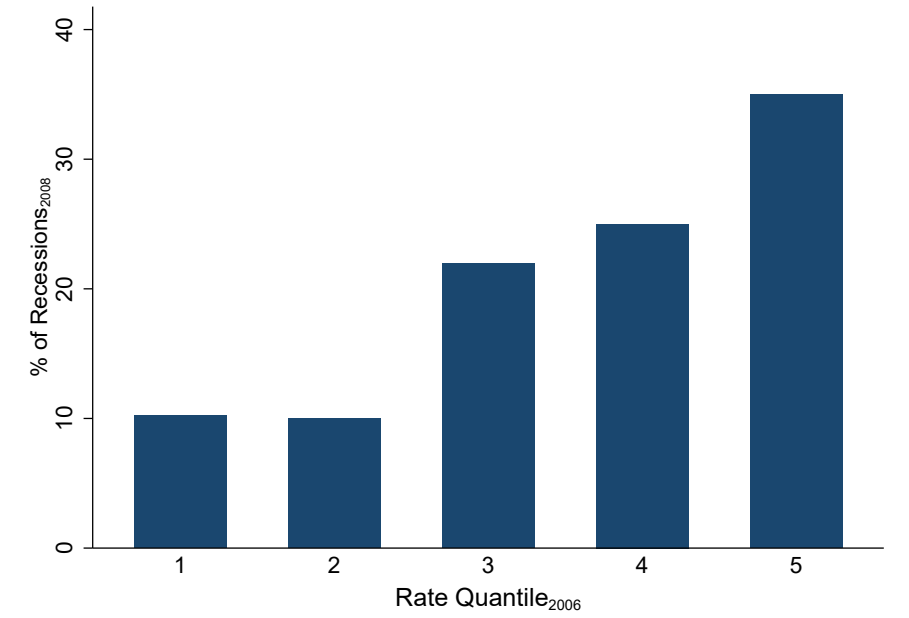
(b) State

Notes: This figure illustrates the binned bivariate averages ("binscatter") of the 2008 GDP growth rates at the county and state levels plotted against the 2006 deposit rates at the county and state levels. Figure B.4a presents the binscatter (35 bins) of the annual county GDP growth in 2008 against the annual county deposit rates in 2006 for metro counties. Figure B.4b presents the binscatter (35 bins) of the quarterly state GDP growth in 2008 against the quarterly state deposit rates in 2006. The red dots represent the bins, the blue line graphs the 2008 GDP growth against rates, as well as the confidence interval (gray shading). The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The analysis is restricted to single-state banks.

Figure B.5: 2006 Deposit Rates Predict 2008 Recessions



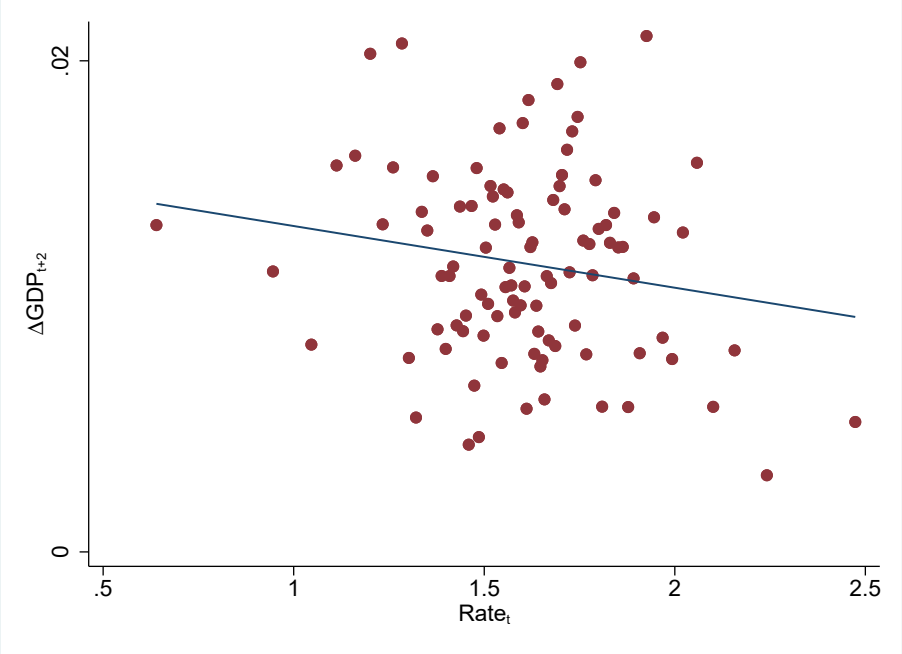
(a) County



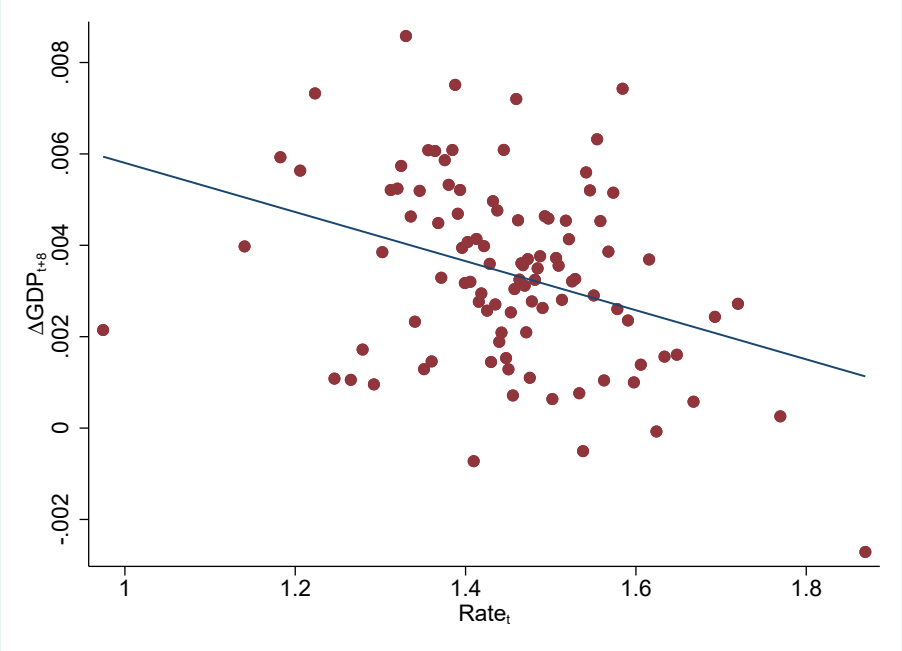
(b) State

Notes: This figure presents bar graphs of the percent of metro county-years (state-quarters) in recession in 2008, categorized by the rate quintile of deposit rates across county-years (state-quarters) in 2006 in Figure B.5a and Figure B.5b, respectively. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The analysis is restricted to single-state banks. A state is in a recession if its GDP growth between two consecutive quarters is below -2%.

Figure B.6: Deposit Rates Predict Future GDP Growth



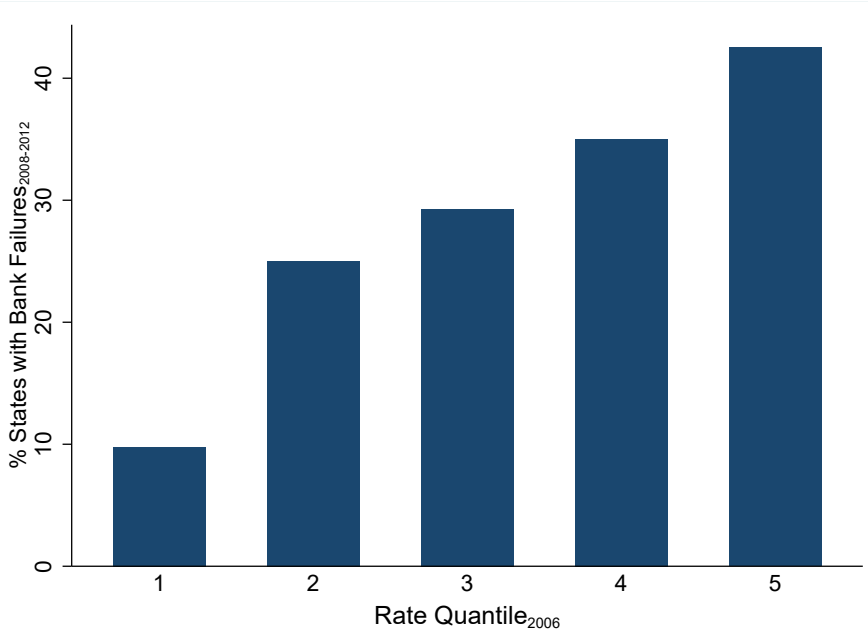
(a) County



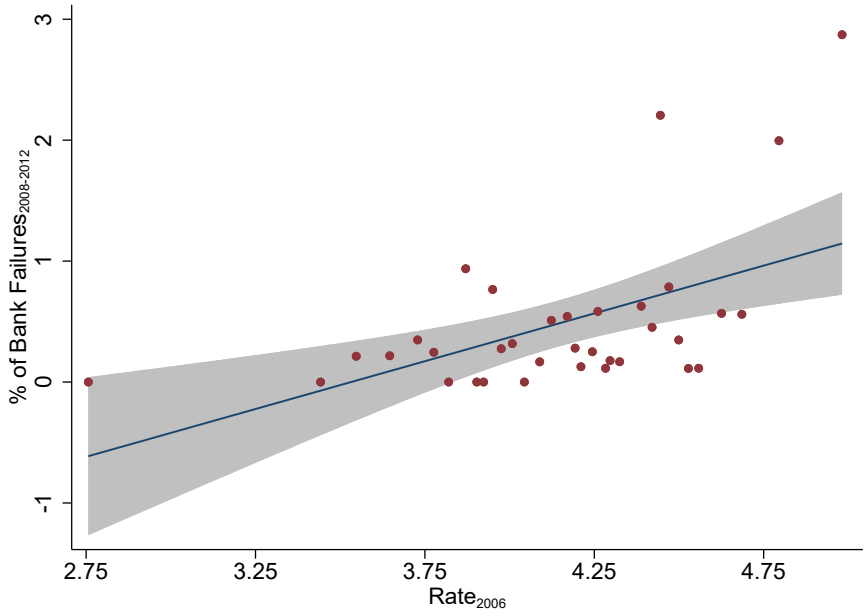
(b) State

Notes: This figure illustrates the binned bivariate averages ("binscatter") of GDP growth rates at the county and state levels plotted against the deposit rates at the county and state levels. Figure B.6a presents the binscatter (1000) of the annual county GDP growth in year $t+2$ against the annual county deposit rates in t, after absorbing county and year fixed effects. Figure B.6b presents the binscatter (35 bins) of the quarterly state GDP growth in quarter-year $t+8$ against the quarterly state deposit rates in quarter-year t after absorbing state and quarter-year fixed effects. The red dots represent the bins, the blue line graphs the GDP growth. The deposit rate is the rate on the 12-month certificate of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The analysis is restricted to single-state banks.

Figure B.7: Deposit Rates Predict Bank Failures



(a) Extensive Margin



(b) Intensive Margin

Notes: The figures present the relation between deposit rates and financial risk at the state level. Figure B.7a and Figure B.7b present the association between state deposit rates in 2006 and bank failures between 2008 and 2012. Figure B.7a presents a bar graph of the percent of states that experienced a bank failure between 2008 and 2012, categorized by the rate quintile of deposit rates across state-quarters in 2006. Figure B.7b illustrates the binned bivariate averages ("binscatter") of the percent of banks that fail between 2008 and 2012 against the quarterly deposit rate at the state level. The figure presents the binscatter (35 bins) of the percent of banks that experienced failure between 2008 and 2012 against the quarterly state deposit rates in 2006. The red dots represent the bins, the blue line graph the predicted 2020 GDP growth rates from a linear regression, as well as the confidence interval (gray shading). The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The analysis is restricted to single-state banks.

Table B.1: Summary Statistics (2001-2020)

	N	P25	Median	P75	Mean	SD
Monthly Bank Deposit Rate	464,467	0.4875	1.1750	2.4750	1.6203	1.3603
Annual Deposit Rate	39,732	0.4500	1.0815	2.2500	1.5194	1.2744
Annual GDP Growth	59,127	-2.2974	1.2247	4.5548	1.2544	7.8028
Quarterly State Deposit Rate	4,135	0.4610	1.0281	2.4228	1.5497	1.3008
Quarterly State GDP Growth	3,213	-0.2359	0.4504	1.1118	0.3694	1.7483

Notes: The table summarizes the key measures of the level and dispersion of bank deposit rates, as well as GDP growth. The columns, left to right, denote the variable of interest, number of observations, 25^{th} percentile value, median, 75^{th} percentile value, mean, and standard deviation in Columns 2-7. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks.

Table B.2: Variation in Branch Deposit Rates across Banks

	(1)	(2)	(3)	(4)	(5)
	Bank FE	Branch FE	Year FE	Bank+Year FE	Bank$\times$ Year FE
R^2	0.0973	0.1560	0.8949	0.9277	0.9521
adj. R^2	0.0438	0.0813	0.8949	0.9234	0.9242
N	114,258	113,384	114,701	114,258	33,233

Notes: This table reports the R^2, adj R^2 and number of observations from regressing the 12-month certificate of deposit rate at the Branch $\times$ Bank $\times$ Year level on bank fixed effects (column 1), branch fixed effects (column 2), year fixed effects (column 3), bank and year fixed effects (column 4), and bank$\times$ year fixed effects (column 5). Using the deposits rate data from RateWatch, we construct a panel at the branch $\times$ month-year level. The annual branch deposit rate is the branch deposit rate in the last reporting month of each year. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks.

Table B.3: County Economic Activity and Deposit Rate

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0026	-0.0069**	-0.0135***	-0.0048	-0.0035	0.0000
	(0.0032)	(0.0034)	(0.0042)	(0.0038)	(0.0036)	(0.0043)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,578	4,292	4,029	3,775	3,513	3,258
R^2	0.2668	0.2757	0.2795	0.2711	0.2687	0.2739
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0023	-0.0055***	-0.0094***	-0.0088***	-0.0059***	-0.0025
	(0.0016)	(0.0016)	(0.0018)	(0.0017)	(0.0017)	(0.0016)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,638	4,347	4,079	3,820	3,553	3,291
R^2	0.6299	0.6468	0.6648	0.6743	0.6870	0.6964
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0018	-0.0160	-0.0320*	-0.0359**	-0.0341*	-0.0377*
	(0.0144)	(0.0162)	(0.0164)	(0.0181)	(0.0189)	(0.0202)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	3,923	3,640	3,378	3,112	2,851	2,591
R^2	0.9933	0.9935	0.9935	0.9935	0.9938	0.9937
Panel D: Wage Growth						
Δln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0012	-0.0064***	-0.0116***	-0.0098***	-0.0037	-0.0003
	(0.0025)	(0.0023)	(0.0024)	(0.0025)	(0.0026)	(0.0027)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,638	4,330	4,056	3,795	3,533	3,271
R^2	0.4836	0.5104	0.5244	0.5252	0.5290	0.5177

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log of the number of new business applications in Panel C, and the wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71%, average employment growth is 0.71%, average log-transformed # of applications is 3.23%, and average wage growth of 3.53% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.4: County Economic Activity and Deposit Rate with GDP Lags

$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0057	-0.0092***	-0.0142***
	(0.0035)	(0.0035)	(0.0041)
Δ ln(GDP)$_{t-1}$	-0.0060***	-0.0090***	-0.0094***
	(0.0023)	(0.0027)	(0.0020)
Δ ln(GDP)$_{t-2}$	-0.0089***	-0.0085***	-0.0024
	(0.0026)	(0.0019)	(0.0019)
Δ ln(GDP)$_{t-3}$	-0.1365***	-0.0614***	-0.0345
	(0.0316)	(0.0207)	(0.0314)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	3,488	3,231	2,980
R^2	0.3055	0.3018	0.3038

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \beta_2 \cdot \Delta ln(GDP)_{c,t-1} + \beta_3 \cdot \Delta ln(GDP)_{c,t-2} + \beta_4 \cdot \Delta ln(GDP)_{c,t-3} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.52% from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.5: County Economic Activity and Deposit Rate: 2010-2015

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0175	-0.0549***	-0.0169	-0.0011	0.0348**	-0.0037
	(0.0210)	(0.0171)	(0.0169)	(0.0154)	(0.0173)	(0.0174)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	1,456	1,437	1,424	1,415	1,406	1,168
R^2	0.2491	0.2441	0.2505	0.2659	0.4372	0.4876
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0123	-0.0185***	-0.0221***	-0.0137**	-0.0071	0.0035
	(0.0076)	(0.0061)	(0.0084)	(0.0064)	(0.0069)	(0.0094)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	1,477	1,457	1,442	1,430	1,420	1,178
R^2	0.4623	0.4876	0.5107	0.5401	0.8095	0.8205
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0486	-0.0152	-0.1238***	-0.1134***	-0.1474***	-0.2247***
	(0.0339)	(0.0403)	(0.0453)	(0.0386)	(0.0552)	(0.0697)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	1,477	1,457	1,442	1,430	1,420	1,412
R^2	0.9983	0.9981	0.9978	0.9979	0.9960	0.9943
Panel D: Wage Growth						
Δ ln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0155	-0.0161*	-0.0123	-0.0084	0.0145	0.0193
	(0.0119)	(0.0098)	(0.0142)	(0.0119)	(0.0113)	(0.0128)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	1,477	1,455	1,435	1,421	1,413	1,171
R^2	0.4035	0.4378	0.4563	0.4532	0.5275	0.5354

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log transformed number of new business applications in Panel C, and wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.83%, average employment growth is 1.40%, average log-transformed # of applications is 1.63%, and average wage growth of 3.65% for metro counties from 2010 through 2015. The independent variables are standardized. The sample period is from 2010 through 2015. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.6: Forecasting County Recessions

Panel A: Deposit Rates			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0183***	0.0490***	0.0445***
	(0.0048)	(0.0050)	(0.0054)
N	4,579	4,296	4,034
pseudo R^2	0.0033	0.0259	0.0206
AUC	0.5548	0.6054	0.5882
Overall test statistic, χ^2	14.3698	90.1792	65.1959
p-value	0.0002	0.0000	0.0000
Panel B: GDP Growth Lags			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
L1.Δ ln(GDP)	0.1012	0.2061	0.4492***
	(0.1697)	(0.1964)	(0.1499)
L2.Δ ln(GDP)	0.2058	0.1382	0.0851
	(0.1836)	(0.2792)	(0.1171)
L3.Δ ln(GDP)	0.1195	0.1545	0.4079***
	(0.2513)	(0.2963)	(0.1378)
N	3,492	3,234	2,982
pseudo R^2	0.0016	0.0020	0.0076
AUC	0.5065	0.5310	0.5591
Overall test statistic, χ^2	3.9357	3.8807	17.2911
p-value	0.2685	0.2746	0.0006
Panel C: GDP Growth Lags and Deposit Rates			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0277***	0.0603***	0.0521***
	(0.0054)	(0.0055)	(0.0058)
L1.Δ ln(GDP)	0.0218	0.0010	0.2518*
	(0.1728)	(0.1812)	(0.1502)
L2.Δ ln(GDP)	0.1127	-0.0562	-0.0538
	(0.1605)	(0.1504)	(0.1008)
L3.Δ ln(GDP)	0.0354	-0.0511	0.1869
	(0.1992)	(0.1637)	(0.1418)
N	3,492	3,234	2,982
pseudo R^2	0.0085	0.0391	0.0348
AUC	0.5957	0.6565	0.6306
Overall test statistic, χ^2	34.2555	127.6021	100.3784
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: Panel A: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 Rate_{c,t} + \alpha_c + \epsilon_{c,t+k}$; Panel B: $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta ln(GDP)_{c,t-1} + \beta_2 \cdot \Delta ln(GDP)_{c,t-2} + \beta_3 \cdot \Delta ln(GDP)_{c,t-3} + \alpha_c + \epsilon_{c,t+k}$; Panel C: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 \cdot \Delta ln(GDP)_{c,t-1} + \beta_3 \cdot \Delta ln(GDP)_{c,t-2} + \beta_4 \cdot \Delta ln(GDP)_{c,t-3} + \alpha_c + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(GDP)$ denotes GDP growth, *Rate* denotes the average bank deposit rate, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. The independent variable is standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.7: Forecasting County Recessions with County Fixed Effects

Panel A: Deposit Rates			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0202***	0.0546***	0.0481***
	(0.0049)	(0.0053)	(0.0057)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0768	0.1028	0.0957
AUC	0.7009	0.7307	0.7240
Overall test statistic, χ^2	277.8121	384.2369	316.4925
p-value	0.0866	0.0000	0.0006
Panel B: GDP Growth Lags			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(GDP)$_{t-1}$	0.4431***	0.4831***	0.8556***
	(0.1439)	(0.1572)	(0.1746)
Δ ln(GDP)$_{t-2}$	0.4030***	0.3776	0.3674**
	(0.1445)	(0.2309)	(0.1518)
Δ ln(GDP)$_{t-3}$	0.3649	0.3659	0.6551***
	(0.2884)	(0.2891)	(0.1729)
County FIPS FE	✓	✓	✓
N	3,293	3,039	2,790
pseudo R^2	0.0819	0.0795	0.0855
AUC	0.7015	0.7007	0.7107
Overall test statistic, χ^2	237.5858	211.4627	197.5873
p-value	0.4771	0.8628	0.9458
Panel C: GDP Growth Lags and Deposit Rates			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0251***	0.0609***	0.0509***
	(0.0056)	(0.0057)	(0.0063)
Δ ln(GDP)$_{t-1}$	0.3604**	0.2601*	0.6119***
	(0.1401)	(0.1375)	(0.1600)
Δ ln(GDP)$_{t-2}$	0.3215***	0.1763	0.2011*
	(0.1247)	(0.1345)	(0.1220)
Δ ln(GDP)$_{t-3}$	0.2673	0.1394	0.3775**
	(0.2430)	(0.1385)	(0.1545)
County FIPS FE	✓	✓	✓
N	3,293	3,039	2,790
pseudo R^2	0.0873	0.1154	0.1097
AUC	0.7106	0.7425	0.7369
Overall test statistic, χ^2	269.1455	352.0962	285.6236
p-value	0.0808	0.0000	0.0094

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: Panel A: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 Rate_{c,t} + \alpha_c + \epsilon_{c,t+k}$; Panel B $logit(p_{c,t+k}) = \beta_0 + \beta_1 \Delta ln(GDP)_{c,t-1} + \beta_2 \Delta ln(GDP)_{c,t-2} + \beta_3 \Delta ln(GDP)_{c,t-3} + \alpha_c + \epsilon_{c,t+k}$; Panel C: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 \Delta ln(GDP)_{c,t-1} + \beta_3 \Delta ln(GDP)_{c,t-2} + \beta_4 \Delta ln(GDP)_{c,t-3} + \alpha_c + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(GDP)$ denotes GDP growth, *Rate* denotes the average bank deposit rate, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. The independent variable is standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.8: County Economic Activity and Deposit Rates after Accounting for Credit

Panel A: Small Business Lending Growth			
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(SBL)	0.0054*	0.0029*	-0.0024
	(0.0029)	(0.0016)	(0.0021)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	4,578	4,292	4,029
R^2	0.1617	0.2496	0.1924
Panel B: Mortgage Lending Growth			
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Mortgages)	0.0060*	0.0028	0.0017
	(0.0033)	(0.0021)	(0.0022)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	4,578	4,292	4,029
R^2	0.1603	0.2487	0.1919
Panel C: Total Lending Growth			
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Total)	0.0067**	0.0034*	0.0011
	(0.0033)	(0.0019)	(0.0019)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	4,578	4,292	4,029
R^2	0.1607	0.2490	0.1918

Notes: This table presents the relation between county deposit rates and economic activity in metro counties, after controlling for credit growth. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \beta_2 \cdot \Delta ln(Credit)_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth, *Rate* denotes the average bank deposit rate, and $\Delta ln(Credit)$ denotes credit growth. Credit growth is measured as the natural-log difference of small business lending in Panel A, natural-log difference of mortgages in Panel B, and natural-log difference of total lending (small business+mortgage) in Panel C. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.9: GDP Growth and Deposit Growth

Panel A: Deposit Growth

$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Deposits)	-0.0004	-0.0020***	-0.0000
	(0.0012)	(0.0007)	(0.0008)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	4,578	4,292	4,029
R^2	0.1589	0.2496	0.1918

Panel B: Deposit Rate and Growth

$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	-0.0032	-0.0074*	-0.0199**
	(0.0037)	(0.0039)	(0.0085)
Δ ln(Deposits)	-0.0004	-0.0019***	0.0001
	(0.0012)	(0.0007)	(0.0008)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	4,578	4,292	4,029
R^2	0.1590	0.2506	0.1961

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity. The regression specification in Panel A is $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot \Delta ln(Deposits)_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$. The regression specification in Panel B is $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \beta_2 \cdot \Delta ln(Deposits)_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$. $\Delta ln(GDP)$ denotes GDP growth, *Rate* denotes the average bank deposit rate, and $\Delta ln(Deposits)$ denotes deposit growth. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.10: Horse Race: State Deposit Rate vs. Other Leading Indicators

Panel A: Univariate				
$\Delta ln(\text{GDP})$	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead
Rate	-0.0081***			
	(0.0024)			
ln(Auto Sales)		-0.0117**		
		(0.0057)		
ln(UI Claims)			0.0036	
			(0.0021)	
ln(Job Openings)				-0.0108***
				(0.0037)
State FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
N	2,020	2,020	2,020	2,020
R^2	0.2530	0.2542	0.2498	0.2562

Panel B: Multivariate			
$\Delta ln(\text{GDP})$	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	-0.0024	-0.0063*	-0.0077***
	(0.0030)	(0.0033)	(0.0024)
ln(Auto Sales)	-0.0020	-0.0037	-0.0067
	(0.0036)	(0.0036)	(0.0045)
ln(UI Claims)	-0.0031	-0.0004	0.0017
	(0.0022)	(0.0020)	(0.0020)
ln(Job Openings)	-0.0038	-0.0093***	-0.0087***
	(0.0033)	(0.0031)	(0.0027)
State FE	✓	✓	✓
Year FE	✓	✓	✓
N	2,428	2,224	2,020
R^2	0.2279	0.2477	0.2630

Notes: This table presents the relation between state deposit rates and economic activity. Panel A presents the results from estimating an OLS model of the change in economic activity in state s in quarter-year $t+12$ as a function of the average deposit rate within a county at quarter-year t. We consider twelve-quarter lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{s,t+12} = \beta_1 \cdot X_{s,t} + \alpha_s + \alpha_t + \epsilon_{s,t}$ where $\Delta ln(GDP)$ denotes GDP growth. X denotes the independent variable at the state-quarterly frequency - the average deposit rate in column 1, natural-log of auto sales in column 2, natural-log of the number of unemployment insurance claims in column 3, and natural-log of the number of job openings in column 4. Panel B presents the results from estimating an OLS model of the change in economic activity in state s in quarter-year $t+k$ as a function of the average deposit rate within a county at quarter-year t. We consider up to twelve-quarter (k = 4, 8, 12) lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{s,t+k} = \beta_1 \cdot Rate_{s,t} + \beta_2 \cdot ln(\text{Auto Sales})_{s,t} + \beta_3 \cdot ln(\text{UI Claims})_{s,t}) + \beta_4 \cdot ln(\text{Job Openings})_{s,t} + \alpha_s + \alpha_t + \alpha_t + \epsilon_{s,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the average bank deposit rate. $ln(\text{Auto Sales})$ denotes the natural-log of auto sales. $ln(\text{UI Claims})$ denotes the natural-log of the number of unemployment insurance claims. $ln(\text{Job Openings})$ denotes the natural-log of the number of job openings. Average GDP growth is 0.37% for states from 2005Q1 through 2017Q4. The independent variables are standardized. The sample period is from 2005Q1 through 2017Q4. State clustered standard errors are reported in parentheses.

Table B.11: Insured and Uninsured Deposit Growth and Bank Rate Changes

Panel A: Insured Deposit Growth

$\Delta ln(\text{Insured})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
Δ Rate	-0.0007	-0.0054**	-0.0118***	0.0049***	0.0149***	0.0071***	0.0019
	(0.0015)	(0.0022)	(0.0020)	(0.0017)	(0.0021)	(0.0013)	(0.0016)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	234,296	238,782	243,571	243,714	238,978	234,508	230,172
R^2	0.0484	0.0549	0.0537	0.0533	0.0568	0.0596	0.0610

Panel B: Uninsured Deposit Growth

$\Delta ln(\text{Uninsured})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
Δ Rate	0.0031	0.0070	-0.0219***	-0.0044	0.0162***	0.0044	-0.0048
	(0.0041)	(0.0052)	(0.0048)	(0.0052)	(0.0046)	(0.0055)	(0.0068)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	233,084	237,548	242,312	242,464	240,887	239,551	238,319
R^2	0.0689	0.0703	0.0700	0.0703	0.0703	0.0706	0.0708

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $\Delta ln(Y)_{b,t+k} = \beta_0 + \beta_1 \Delta \text{Rate}_{b,t} + \alpha_t + \epsilon_{b,t}$ where $\Delta ln(Deposits)_{b,t+k}$ denotes growth in insured deposits (Panel A) and uninsured deposits (Panel B), and ΔRate denotes the change in the deposit rate. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.12: Ratio of Insured to Uninsured Deposit Growth and Bank Rate Changes

$\Delta ln(\frac{\text{Insured}}{\text{Uninsured}})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
Δ Rate$_t$	-0.0028	-0.0122**	0.0103**	0.0092*	-0.0015	0.0024	0.0070
	(0.0042)	(0.0060)	(0.0051)	(0.0055)	(0.0045)	(0.0059)	(0.0070)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	228,690	233,080	237,696	242,462	240,885	239,376	238,072
R^2	0.0825	0.0828	0.0822	0.0819	0.0810	0.0812	0.0815

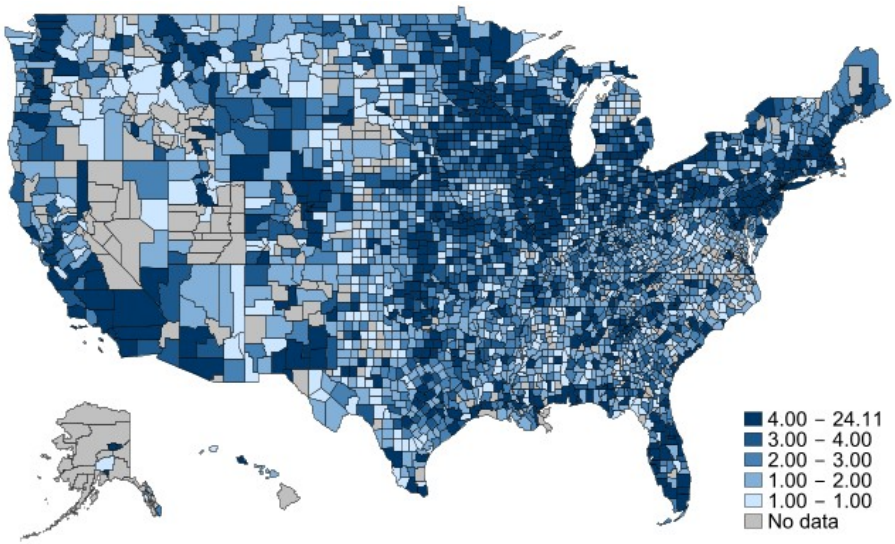
Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \Delta \text{Rate}_{b,t} + \alpha_t + \epsilon_{b,t}$
where Y is $\Delta ln(\frac{Uninsured}{Insured})_{b,t+k}$, denoting the growth in the ratio of insured to uninsured deposits, and ΔRate denotes the change in the deposit rate. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.13: Loan Growth and Bank Rate Changes

$\Delta ln(\text{Loans})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
Δ Rate$_t$	-0.0029	-0.0004	0.0067***	0.0062***	0.0015	0.0016	0.0018*
	(0.0020)	(0.0022)	(0.0021)	(0.0017)	(0.0013)	(0.0010)	(0.0011)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	212,897	217,267	221,913	222,368	218,083	213,718	209,460
R^2	0.0225	0.0222	0.0217	0.0226	0.0261	0.0306	0.0316

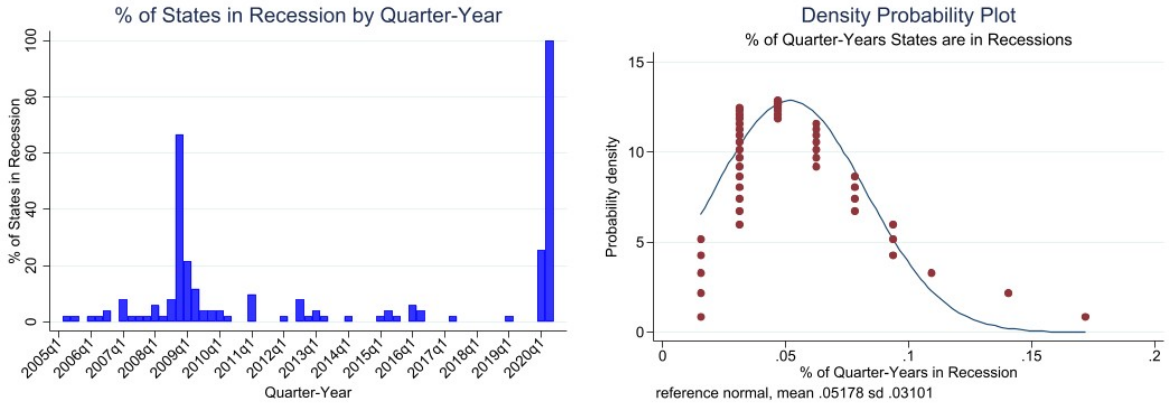
Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \Delta \text{Rate}_{b,t} + \alpha_t + \epsilon_{b,t}$
where Y is $\Delta ln(Loans)_{b,t+k}$, denoting lending growth, ΔRate denotes the change in the deposit rate. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Figure B.8: Number of Banks per County (2001-2020)



Notes: This figure presents a heatmap of the average number of banks that offer 12-month certificates of deposit of at least $10,000 in each county from 2001 to 2020. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the total number of banks in each county for each month is computed. Then, the mean number of banks is computed across the sample period. The intensity of the blue shading represents the number of banks operating in a particular county.

Figure B.9: Recessions Across States and Time

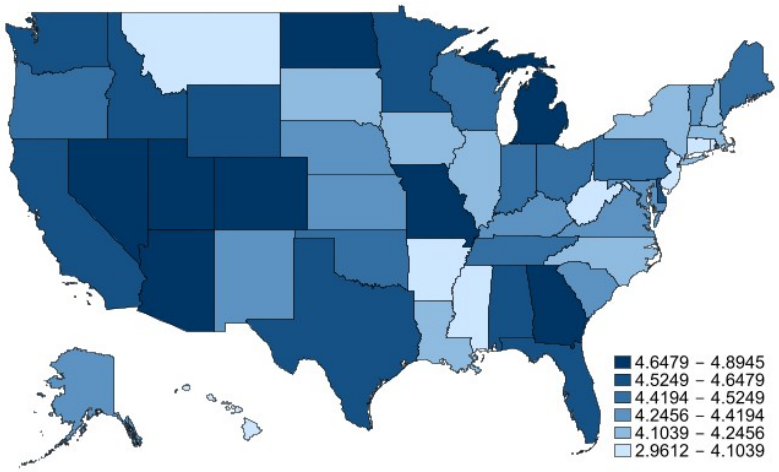


(a) % of States in Recession

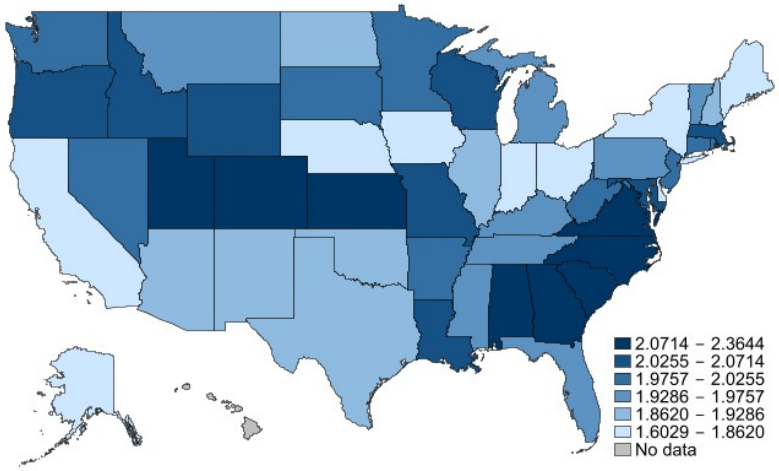
(b) % of Recessions within States

Notes: This figure presents the percentage of states in recessions by quarter-year in Figure B.9a, and a density probability plot of the percent of quarter-years states are in recessions in Figure B.9b based on state GDP data. A state is in a recession if its GDP growth between two consecutive quarters is below -2%.

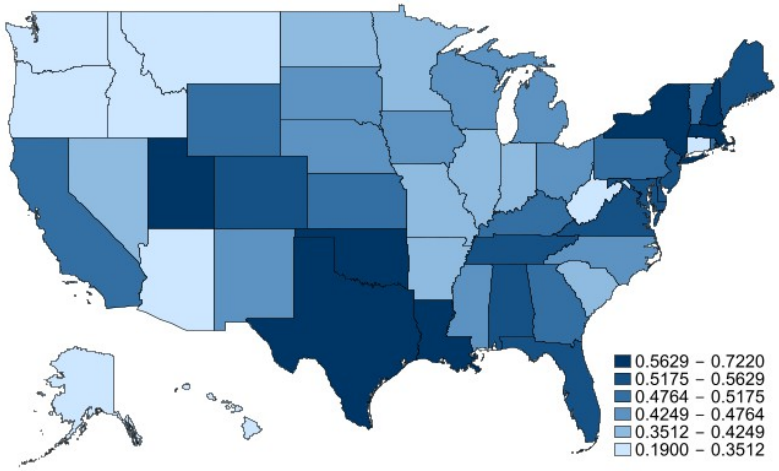
Figure B.10: Deposit Rate Across States and Time



(a) 2006Q4



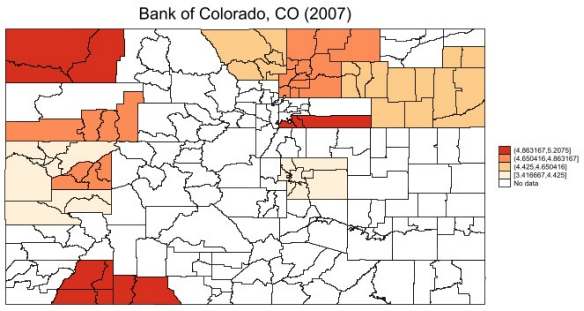
(b) 2009Q1



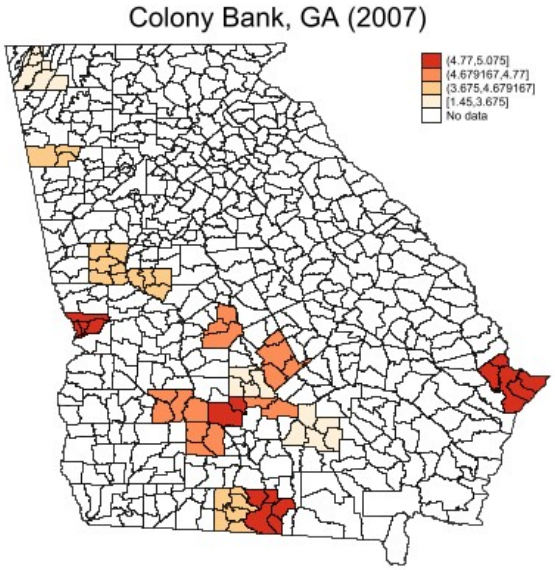
(c) 2017Q1

Notes: This figure uses RateWatch data to present a heatmap of state deposit rates (12-month, $10K CDs). Figure B.10a presents state deposit rates in 2006Q4; Figure B.10b presents state deposit rates in 2009Q1; Figure B.10c presents state deposit rates in 2017Q1. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. The intensity of the blue shading represents the quantile range of the deposit rate. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is computed as the average of the monthly county deposit rates in each year. The analysis is restricted to single-state banks. The intensity of the blue shading represents the quantile range of the deposit rate.

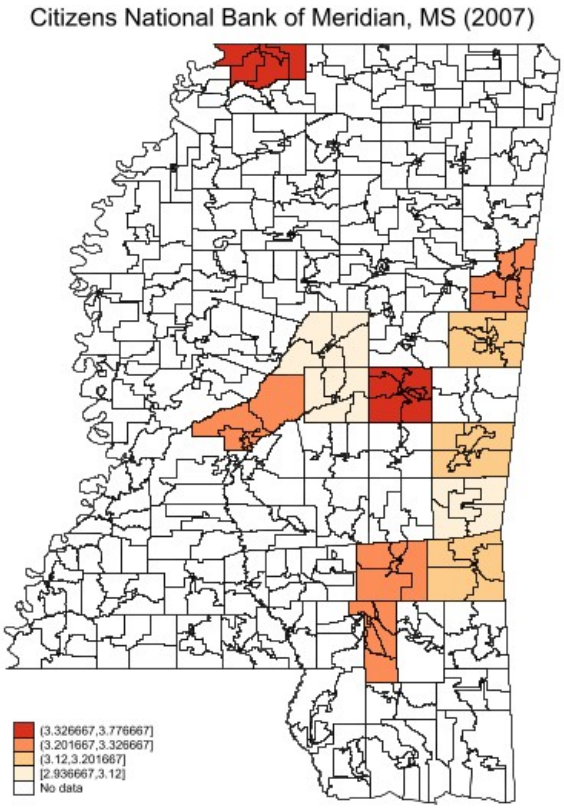
Figure B.11: Bank Deposit Rates: 2007



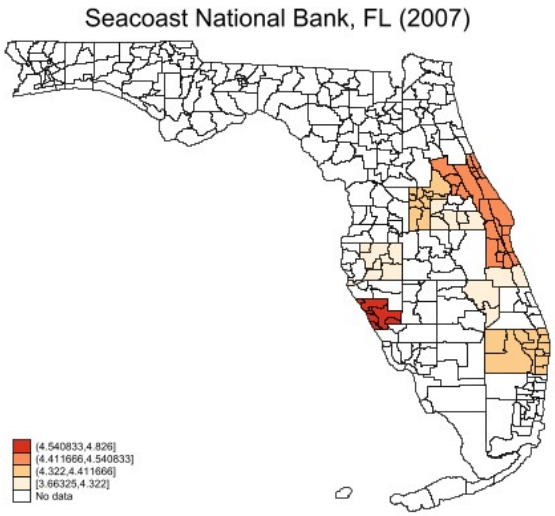
(a) Bank of Colorado



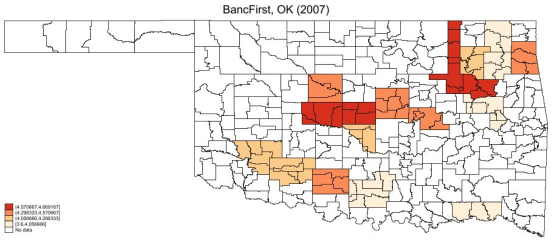
(b) Colony Bank



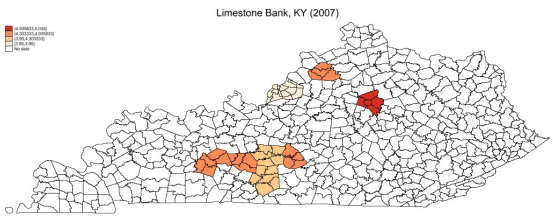
(c) Citizens National Bank of Meridian



(d) Seacoast National Bank



(e) BancFirst (OK)



(f) Limestone Bank

Notes: This figure uses RateWatch data to present a heatmap of county deposit rates (12-month, $10K CDs) in 2007. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the annual bank deposit rate in each county is computed as the average of the monthly bank-county deposit rates in each year. Heatmaps of the deposit rates are presented for the following banks in 2007: Bank of Colorado (Appendix Figure B.11a), Colony Bank (Appendix Figure B.11b), Citizens National Bank of Meridian Bank (Appendix Figure B.11c), Seacoast National Bank (Appendix Figure B.11d), BancFirst (Appendix Figure B.11e), and Limestone Bank (Appendix Figure B.11f). The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. The intensity of the blue shading represents the quantile range of the deposit rate.

Table B.14: What Explains Variation in Single-State Bank Deposit Rates?

Rate_t	(1)	(2)	(3)	(4)	(5)
Unemployed_{t-1}	0.9327**	0.7428*	0.7428*	0.9084**	0.9408**
	(0.4043)	(0.3998)	(0.3997)	(0.4336)	(0.4461)
Services_{t-1}		0.0639***	0.0639***	0.0602***	0.0613***
		(0.0184)	(0.0184)	(0.0178)	(0.0181)
$\text{Black/Hispanic}_{t-1}$				-0.0289	-0.0258
				(0.0438)	(0.0422)
Female_{t-1}				-0.0018	-0.0022
				(0.0211)	(0.0213)
Married_{t-1}				-0.0068	-0.0118
				(0.0175)	(0.0185)
$\text{Post-Secondary}_{t-1}$				0.0176	0.0107
				(0.0202)	(0.0220)
$\ln(\text{Fam. Inc.})_{t-1}$					0.0057
					(0.0164)
$\ln(\text{Poverty})_{t-1}$					0.0127
					(0.0364)
Bank × Month-Year FE	✓	✓	✓		
State FE		✓			
State × Month-Year FE			✓		
Bank × Month-Year × State FE				✓	✓
N	68,171	68,171	68,171	68,171	68,171
R^2	0.9685	0.9685	0.9685	0.9685	0.9685

Notes: This table presents the relation between various county-specific demographic and economic characteristics and bank deposit rates. The table presents regressions of bank deposit rates on county characteristics, measured in the previous year. The regression specification is the following: $\text{Deposit Rate}_{b,c,t} =_1 \cdot \text{X}_{c,t-1} + \alpha_{b,s,t} + \epsilon_{b,c,t}$ where Rate denotes bank b's deposit rate in county c of state s measured in month-year t, X represents a vector of demographic and economic characteristics in county c measured in year $t-1$. The annual demographic and economic characteristics are sourced from the American Community Survey (ACS), conducted by the U.S. Census Bureau, which began in 2005. These county-level variables include the unemployed share, the share of the population employed in the services industry, the proportion of Black and Hispanic individuals, the share of females, the share of married individuals, the proportion with post-secondary education, the average log of family income, and the average log of poverty (measured as family income relative to the poverty threshold). Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. The sample period is 2005 through 2020. The analysis is restricted to single-state banks. Two-way commuting zone and month-year clustered standard errors are reported in parentheses.

We investigate the key mechanism that links bank deposit rates to regional economic activity using an instrumental variable strategy. Our analysis builds on the findings of Autor et al. (2013), Autor et al. (2014), Acemoglu et al. (2016), Pierce and Schott (2016) among others, which demonstrate the adverse effects of import competition on US local labor markets and household balance sheets. Rising import penetration is associated with lower domestic out-

put, value-added, higher unemployment, lower labor force participation, and reduced wages in local labor markets. Overall, regions with higher import competition experience more substantial economic contractions. As a result, we hypothesize that banks increase deposit rates in regions that are more vulnerable to import competition as these regions are expected to experience greater economic contraction.

We use data on shipping costs from Barrot et al. (2022) to identify the link between regional economic activity and deposit rates.[38] The unit of analysis is the commuting zone (CZ), which are clusters of counties characterized by strong commuting connections within the cluster and weaker connections between clusters. These CZs serve as representations of local labor markets. Within this context, local labor markets can be seen as subeconomies that experience varying trade shocks based on their specialization in different industries (Autor et al. (2013)). Barrot et al. (2022) measure the exposure of an industry to import competition using the 1998 physical shipping costs obtained from import data. A CZ's exposure to import competition is constructed by combining the industry shipping costs with the industry composition in each commuting zone, expressed in labor share.

We examine the effect of import competition on deposit rates within-bank. Specifically, we investigate whether banks set higher deposit rates in regions that face greater import competition between 2001 and 2007, according to the following regression specification:

$$\text{Deposit Rate}_{b,z,t} = \beta_1 \cdot \text{Shipping Costs}_z + X_z + \alpha_{b,s,t} + \epsilon_{b,z,t} \tag{B.1}$$

where Rate denotes bank b's deposit rate at the commuting zone level z of state s measured in month-year t, Shipping Costs denotes the shipping costs at the commuting zone level, and X is a vector of controls including total employment, the share of manufacturing employment, total income, logarithm of total debt, the 1991-1999 change in loan originations, and the 1991-1999 change in net Chinese import penetration, as well as quintiles of the change in house prices between 1999 and 2007. We measure deposit rates at the CZ level by collapsing the bank $\times$ county $\times$ month-year panel data on deposit rates to the bank $\times$ CZ $\times$ month-year level using county GDP weights.

Table B.15 reports our results. Our estimation includes bank $\times$ month-year $\times$ state fixed effects, allowing us to identify how banks differentially set deposit rates within in the same state and time period, by exploiting variation in shipping costs across commuting zones. We find that a one standard deviation increase in shipping costs is associated with up to a 0.02 pp increase in the deposit rate (see column (1)). The point estimate remains stable and statistically significant at the 1% level even after saturating the model with control variables and fixed effects. Overall, our findings indicate that banks set higher deposit rates in regions that face stiffer import competition (lower shipping costs).

[38] Barrot et al. (2022) measure the exposure of an industry to import competition using the 1998 physical shipping costs obtained from import data. A CZ's exposure to import competition is constructed by combining the industry shipping costs with the industry composition in each commuting zone, expressed in labor share. Controls include total employment, the share of manufacturing employment, total income, logarithm of total debt, the 1991-1999 change in loan originations, and the 1991-1999 change in net Chinese import penetration, as well as quintiles of the change in house prices between 1999 and 2007.

Table B.15: Instrumental Variable Regression: Shipping Costs and Single-State Bank Deposit Rates

Rate	(1)	(2)	(3)	(4)	(5)
Shipping Costs	-0.0159**	-0.0153**	-0.0153**	-0.0153**	-0.0144*
	(0.0074)	(0.0074)	(0.0074)	(0.0074)	(0.0075)
log Employment					0.0351
					(0.0215)
Manufacturing Employment (%)					-0.0192*
					(0.0104)
log Income					-0.0040
					(0.0237)
log Debt					-0.0515**
					(0.0237)
Δ_{91-99}HMDA Loan Orig.					-0.0512***
					(0.0127)
Δ_{91-99} Net CH Import		0.0125	0.0125	0.0125	0.0140
		(0.0096)	(0.0096)	(0.0096)	(0.0085)
Bank × Month-Year FE	✓	✓	✓		
State FE		✓			
State × Month-Year FE			✓		
Bank × Month-Year × State FE				✓	✓
Quintiles HP Growth					✓
N	67,538	67,538	67,538	67,538	67,538
R^2	0.9375	0.9375	0.9375	0.9375	0.9388

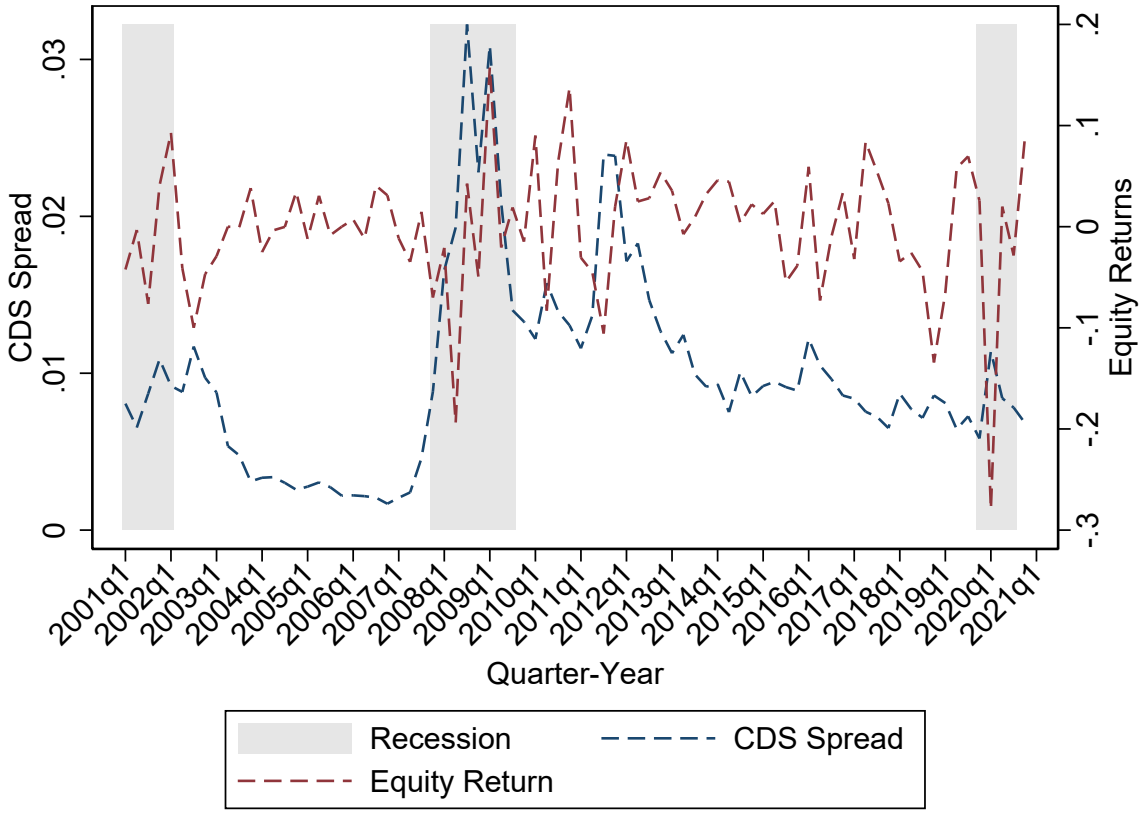
Notes: This table presents the relation between shipping costs and bank deposit rates. The table presents regressions of bank deposit rates from 2001 to 2007 on shipping costs at the commuting zone level. The regression specification is the following: $\text{Deposit Rate}_{b,z,t} = \beta_1 \cdot \text{Shipping Costs}_z + X_z + \alpha_{b,s,t} + \epsilon_{b,z,t}$ where Rate denotes bank b's deposit rate at the commuting zone level z of state s measured in month-year t, Shipping Costs denotes the shipping costs at the commuting zone level, and X is a vector of controls including total employment, the share of manufacturing employment, total income, logarithm of total debt, the 1991-1999 change in loan originations, and the 1991-1999 change in net Chinese import penetration, as well as quintiles of the change in house prices between 1999 and 2007. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the rate is constructed at the commuting level by taking a weighted average of the bank deposit data, weighted by a county's share of a commuting zone's GDP. The independent variables used in this regression come from Barrot et al. (2022). We refer readers to Barrot et al. (2022) for construction of the independent variables. The independent variables are standardized. The sample period is 2001 through 2007. The analysis is restricted to single-state banks. Two-way commuting zone and month-year clustered standard errors are reported in parentheses.

Table B.16: Alternative Specification: Economic Activity and Deposit Rate

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0030	-0.0076*	-0.0160***	-0.0069*	-0.0049	0.0011
	(0.0033)	(0.0039)	(0.0046)	(0.0041)	(0.0041)	(0.0048)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,578	4,292	4,029	3,775	3,513	3,258
R^2	0.2668	0.2757	0.2803	0.2714	0.2689	0.2739
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0021	-0.0055***	-0.0102***	-0.0100***	-0.0070***	-0.0025
	(0.0018)	(0.0018)	(0.0020)	(0.0019)	(0.0020)	(0.0017)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,638	4,347	4,079	3,820	3,553	3,291
R^2	0.6299	0.6467	0.6648	0.6746	0.6873	0.6963
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0060	-0.0274	-0.0451**	-0.0465**	-0.0430**	-0.0484**
	(0.0164)	(0.0184)	(0.0188)	(0.0205)	(0.0216)	(0.0224)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	3,923	3,640	3,378	3,112	2,851	2,591
R^2	0.9933	0.9935	0.9935	0.9935	0.9938	0.9937
Panel D: Wage Growth						
Δ ln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0018	-0.0070***	-0.0124***	-0.0105***	-0.0049*	0.0005
	(0.0028)	(0.0025)	(0.0027)	(0.0029)	(0.0028)	(0.0030)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,638	4,330	4,056	3,795	3,533	3,271
R^2	0.4837	0.5105	0.5244	0.5252	0.5292	0.5177

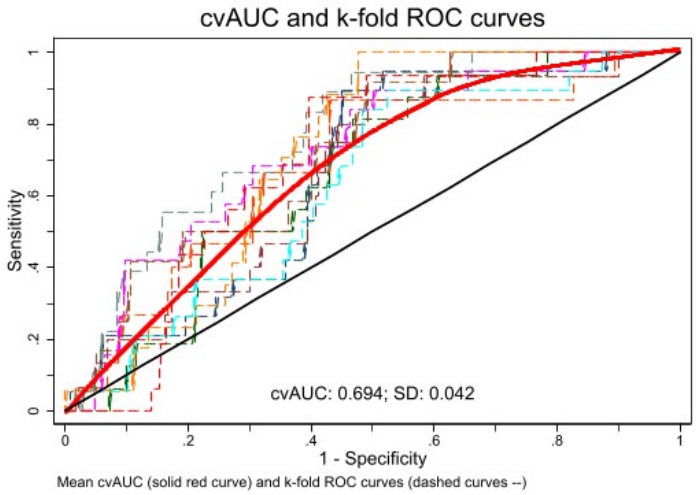
Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log of the number of new business applications in Panel C, and wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel of deposit rates at the bank $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed, by taking an average of the bank-level rates, so the within-county variation is driven purely by bank composition. Average GDP growth is 1.71%, average employment growth is 0.71%, average log-transformed # of applications is 3.23%, and average wage growth of 3.53% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Figure B.12: CDS Spreads and Equity Returns

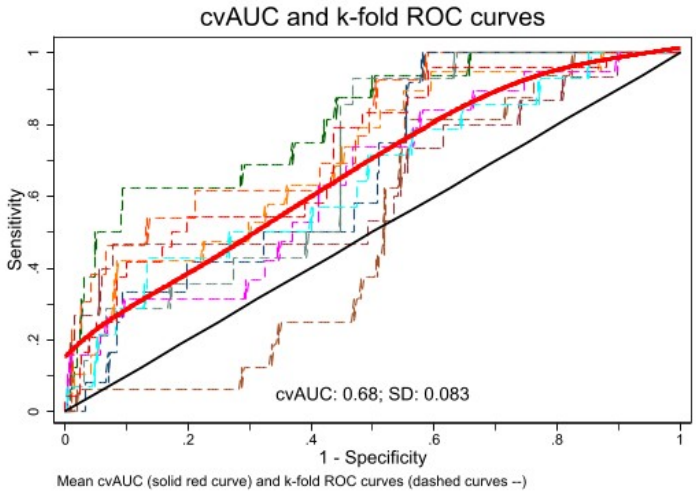


Notes: This figure presents a time-series plot of the quarterly average credit default swap spread and quarterly equity returns for a subset of banks that issue both equity and credit default swaps. The left y-axis indicates CDS spreads. The rigth y-axis indicates equity returns. The gray bars indicate national recessions, according the NBER Business Cycle Dating Committee. The data is at the quarterly frequency and spans from 2001Q1 through 2020Q4. The analysis is restricted to single-state banks.

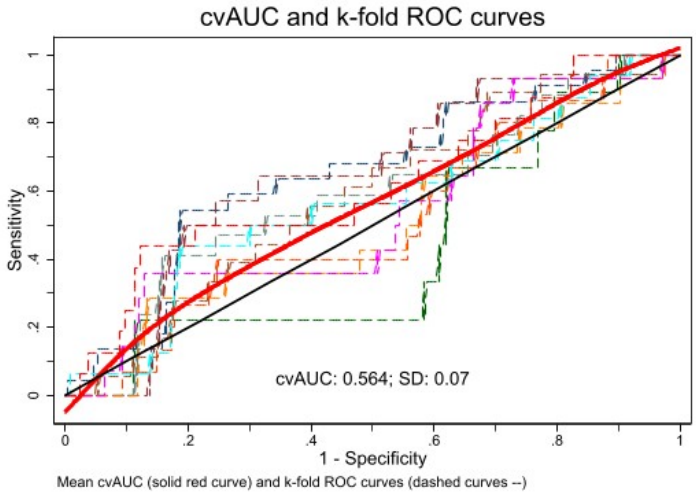
Figure B.13: Out-of-Sample Estimation: Deposit Rates Predict State Recessions



(a) Recession in 4 Quarters



(b) Recession in 8 Quarters



(c) Recession in 12 Quarters

Notes: This figure presents the k-fold cross-validated ROC curves and AUC. The dataset is partitioned into k subsamples of equal size. $k-1$ subsamples are used as the training set while one subsample is retained as the validation or testing set in the AUC is evaluated. The AUC iteratively k times, so that each of the k subsamples is used as the testing set once. Each fold is analyzed using the following logistic regression: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \epsilon_{c,t}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate. We assume that $\epsilon_{c,t}$ is well-behaved. We consider up to 24-quarter (k = 4, 8, 12, 16, 20, 24) lead indicators of economic activity. The cross-validated AUCs are averaged from each fold. 10 folds are used to produce these figures. Figure B.13a, Figure B.13b, and Figure B.13c reports the cross-validated AUCs using the 4-quarter, 8-quarter, 12-quarter forecast classifiers. The likelihood of a state being in a recession is 5.18% from 2005Q1 through 2020Q4. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks.

Table B.17: County Economic Activity and Deposit Rate of Large Banks

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0029	-0.0017	0.0014	-0.0030	-0.0007	0.0022
	(0.0034)	(0.0032)	(0.0035)	(0.0030)	(0.0035)	(0.0043)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	2,171	1,949	1,760	1,575	1,412	1,291
R^2	0.4321	0.4362	0.4526	0.4562	0.4126	0.4296
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0026	-0.0020	-0.0022	-0.0014	-0.0011	0.0017
	(0.0018)	(0.0021)	(0.0021)	(0.0021)	(0.0019)	(0.0021)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	2,198	1,972	1,781	1,594	1,429	1,305
R^2	0.7072	0.7293	0.7486	0.7554	0.7706	0.7786
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0267*	-0.0272	-0.0286	-0.0237	-0.0230	-0.0446**
	(0.0162)	(0.0207)	(0.0184)	(0.0159)	(0.0180)	(0.0197)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	1,861	1,667	1,489	1,328	1,166	1,029
R^2	0.9937	0.9937	0.9938	0.9936	0.9935	0.9934
Panel D: Wage Growth						
Δln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0003	-0.0015	-0.0018	-0.0042*	-0.0015	0.0028
	(0.0026)	(0.0031)	(0.0030)	(0.0025)	(0.0026)	(0.0029)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	2,198	1,953	1,754	1,564	1,395	1,258
R^2	0.5365	0.5609	0.5966	0.6068	0.6170	0.6203

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The analysis is limited to multi-state banks – those that operate in more than one state – with an average dispersion (standard deviation) in deposit rates below the 25$^{\text{th}}$ percentile for the sample. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log of the number of new business applications in Panel C, and the wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71%, average employment growth is 0.71%, average log-transformed # of applications is 3.23%, and average wage growth of 3.53% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. County clustered standard errors are reported in parentheses.

Table B.18: Deposit Rates Predict County Recessions Accounting for Credit Growth

Panel A: Small Business Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0212***	0.0505***	0.0457***
	(0.0050)	(0.0051)	(0.0054)
Δ ln(SBL)	-0.0339***	-0.0152**	-0.0110*
	(0.0057)	(0.0061)	(0.0064)
N	4,579	4,296	4,034
pseudo R^2	0.0113	0.0275	0.0215
AUC	0.5885	0.6124	0.5934
Overall test statistic, χ^2	44.8559	97.8137	68.1517
p-value	0.0000	0.0000	0.0000
Panel B: Mortgage Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0177***	0.0502***	0.0453***
	(0.0047)	(0.0052)	(0.0052)
Δ ln(Mortgages)	-0.0306***	0.0296***	-0.0454***
	(0.0053)	(0.0058)	(0.0055)
County FIPS FE	✓	✓	✓
N	4,579	4,296	4,034
pseudo R^2	0.0112	0.0338	0.0347
AUC	0.5689	0.6320	0.6391
Overall test statistic, χ^2	41.6821	123.5814	132.2330
p-value	0.0000	0.0000	0.0000
Panel C: Total Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0178***	0.0497***	0.0455***
	(0.0047)	(0.0051)	(0.0052)
Δ ln(Total)	-0.0310***	0.0260***	-0.0456***
	(0.0055)	(0.0058)	(0.0056)
County FIPS FE	✓	✓	✓
N	4,579	4,296	4,034
pseudo R^2	0.0111	0.0319	0.0344
AUC	0.5683	0.6280	0.6388
Overall test statistic, χ^2	40.7898	118.4363	132.4512
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 \cdot \Delta ln(Credit)_{c,t} + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate, $\Delta ln(Credit)$ denotes credit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. Credit growth is measured as the natural-log difference of small business lending in Panel A, natural-log difference of mortgages in Panel B, and natural-log difference of total lending (small business+mortgage) in Panel C. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The independent variables are standardized. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.19: Deposit Rates Predict County Recessions Accounting for Credit Growth: With County Fixed Effects

Panel A: Small Business Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0212***	0.0505***	0.0457***
	(0.0050)	(0.0051)	(0.0054)
Δ ln(SBL)	-0.0339***	-0.0152**	-0.0110*
	(0.0057)	(0.0061)	(0.0064)
N	4,579	4,296	4,034
pseudo R^2	0.0113	0.0275	0.0215
AUC	0.5885	0.6124	0.5934
Overall test statistic, χ^2	44.8559	97.8137	68.1517
p-value	0.0000	0.0000	0.0000
Panel B: Mortgage Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0177***	0.0502***	0.0453***
	(0.0047)	(0.0052)	(0.0052)
Δ ln(Mortgages)	-0.0306***	0.0296***	-0.0454***
	(0.0053)	(0.0058)	(0.0055)
County FIPS FE	✓	✓	✓
N	4,579	4,296	4,034
pseudo R^2	0.0112	0.0338	0.0347
AUC	0.5689	0.6320	0.6391
Overall test statistic, χ^2	41.6821	123.5814	132.2330
p-value	0.0000	0.0000	0.0000
Panel C: Total Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0178***	0.0497***	0.0455***
	(0.0047)	(0.0051)	(0.0052)
Δ ln(Total)	-0.0310***	0.0260***	-0.0456***
	(0.0055)	(0.0058)	(0.0056)
County FIPS FE	✓	✓	✓
N	4,579	4,296	4,034
pseudo R^2	0.0111	0.0319	0.0344
AUC	0.5683	0.6280	0.6388
Overall test statistic, χ^2	40.7898	118.4363	132.4512
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \beta_2 \cdot \Delta ln(Credit)_{c,t} + \alpha_c + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate, $\Delta ln(Credit)$ denotes credit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. Credit growth is measured as the natural-log difference of small business lending in Panel A, natural-log difference of mortgages in Panel B, and natural-log difference of total lending (small business+mortgage) in Panel C. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.20: Credit Growth and Recessions

Panel A: Small Business Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(SBL)	-0.0318***	-0.0081	-0.0044
	(0.0058)	(0.0063)	(0.0066)
N	4,579	4,296	4,034
pseudo R^2	0.0070	0.0004	0.0001
AUC	0.5811	0.5131	0.5074
Overall test statistic, χ^2	30.6497	1.6702	0.4313
p-value	0.0000	0.1962	0.5114
Panel B: Mortgage Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Mortgages)	-0.0308***	0.0282***	-0.0432***
	(0.0053)	(0.0057)	(0.0055)
N	4,579	4,296	4,034
pseudo R^2	0.0080	0.0071	0.0125
AUC	0.5619	0.5454	0.5890
Overall test statistic, χ^2	33.6249	24.6360	62.7308
p-value	0.0000	0.0000	0.0000
Panel C: Total Credit Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Total)	-0.0312***	0.0255***	-0.0432***
	(0.0055)	(0.0057)	(0.0056)
N	4,579	4,296	4,034
pseudo R^2	0.0079	0.0056	0.0121
AUC	0.5613	0.5431	0.5854
Overall test statistic, χ^2	32.4155	20.1481	61.4210
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta ln(Credit)_{c,t} + \alpha_c + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(Credit)$ denotes credit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. Credit growth is measured as the natural-log difference of small business lending in Panel A, natural-log difference of mortgages in Panel B, and natural-log difference of total lending (small business+mortgage) in Panel C. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.21: Credit Growth and Recessions with County Fixed Effects

Panel A: Small Business Lending Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(SBL)	-0.0282***	-0.0039	-0.0005
	(0.0057)	(0.0059)	(0.0063)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0787	0.0725	0.0729
AUC	0.7041	0.6837	0.6843
Overall test statistic, χ^2	296.0532	240.2963	232.6894
p-value	0.0176	0.5007	0.6028
Panel B: Mortgage Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Mortgages)	-0.0316***	0.0324***	-0.0443***
	(0.0055)	(0.0060)	(0.0056)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0811	0.0814	0.0855
AUC	0.7022	0.7040	0.7102
Overall test statistic, χ^2	281.7599	292.1490	314.7861
p-value	0.0635	0.0135	0.0007
Panel C: Total Credit Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Total)	-0.0317***	0.0302***	-0.0443***
	(0.0058)	(0.0060)	(0.0057)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0808	0.0798	0.0850
AUC	0.7019	0.7024	0.7090
Overall test statistic, χ^2	280.6678	287.6307	310.0895
p-value	0.0694	0.0212	0.0013

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ in metro counties: $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta ln(Credit)_{c,t} + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(Credit)$ denotes credit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. Credit growth is measured as the natural-log difference of small business lending in Panel A, natural-log difference of mortgages in Panel B, and natural-log difference of total lending (small business+mortgage) in Panel C. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.22: Deposit Rate Predicts Recessions Accounting for Deposit Growth

Panel A: Deposit Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Deposit)	-0.0227***	-0.0090*	-0.0024
	(0.0062)	(0.0052)	(0.0051)
N	4,579	4,296	4,034
pseudo R^2	0.0040	0.0006	0.0000
AUC	0.5905	0.5485	0.5069
Overall test statistic, χ^2	13.3450	3.0575	0.2120
p-value	0.0003	0.0804	0.6452
Panel B: Deposit Rate and Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0200***	0.0499***	0.0450***
	(0.0049)	(0.0051)	(0.0054)
Δ ln(Deposit)	-0.0242***	-0.0134**	-0.0065
	(0.0066)	(0.0054)	(0.0049)
N	4,579	4,296	4,034
pseudo R^2	0.0079	0.0274	0.0210
AUC	0.5925	0.6120	0.5917
Overall test statistic, χ^2	27.3545	95.9340	68.3068
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit models of a county recession in county c at time (year) $t+k$ in metro counties. In Panel A, we estimate $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta ln(Deposit)_{c,t} + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$. In Panel B, we estimate $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta Rate_{c,t} + \beta_2 \cdot \Delta ln(Deposit)_{c,t} + \alpha_c + \epsilon_{c,t+k}$. $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(Deposits)$ denotes deposit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.23: Deposit Rate Predicts Recessions after Accounting for Deposit Growth

Panel A: Deposit Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Δ ln(Deposit)	-0.0183***	0.0006	0.0129*
	(0.0063)	(0.0065)	(0.0068)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0750	0.0724	0.0738
AUC	0.6981	0.6823	0.6913
Overall test statistic, χ^2	267.6699	240.1727	236.2742
p-value	0.1749	0.5029	0.5377
Panel B: Deposit Rate and Growth			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0212***	0.0549***	0.0477***
	(0.0049)	(0.0053)	(0.0057)
Δ ln(Deposit)	-0.0198***	-0.0052	0.0077
	(0.0063)	(0.0060)	(0.0062)
County FIPS FE	✓	✓	✓
N	4,337	4,037	3,793
pseudo R^2	0.0792	0.1030	0.0960
AUC	0.7025	0.7307	0.7237
Overall test statistic, χ^2	293.9763	386.6196	317.4426
p-value	0.0239	0.0000	0.0006

Notes: The table presents the average marginal effects of the covariates estimated from the following logit models of a county recession in county c at time (year) $t+k$ in metro counties. In Panel A, we estimate $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta ln(Deposit)_{c,t} + \alpha_c + \epsilon_{c,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$. In Panel B, we estimate $logit(p_{c,t+k}) = \beta_0 + \beta_1 \cdot \Delta Rate_{c,t} + \beta_2 \cdot \Delta ln(Deposit)_{c,t} + \alpha_c + \epsilon_{c,t+k}$. $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, $\Delta ln(Deposits)$ denotes deposit growth, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. The independent variables are standardized. The likelihood of a county being in a recession is 15.12% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.24: Real Indicators of Recessions

Panel A: No Fixed Effects				
$\mathbb{1}_{Recession}$	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0304***			
	(0.0046)			
ln(Auto Sales)		-0.0111**		
		(0.0048)		
ln(UI Claims)			-0.0123***	
			(0.0047)	
ln(Job Openings)				-0.0112**
				(0.0049)
N	2,020	2,020	2,020	2,020
pseudo R^2	0.0713	0.0078	0.0101	0.0076
AUC	0.7151	0.5726	0.5819	0.5706
Overall test statistic, χ^2	64.6570	5.4797	7.2825	5.4219
p-value	0.0000	0.0192	0.0070	0.0199
Panel B: State Fixed Effects				
$\mathbb{1}_{Recession}$	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0349***			
	(0.0053)			
ln(Auto Sales)		0.0841***		
		(0.0269)		
ln(UI Claims)			-0.0384**	
			(0.0196)	
ln(Job Openings)				0.0743***
				(0.0212)
State FE	✓	✓	✓	
N	1,720	1,720	1,720	1,720
pseudo R^2	0.1363	0.0719	0.0653	0.0747
AUC	0.8069	0.6988	0.7002	0.7086
Overall test statistic, χ^2	197.5445	49.3590	50.3406	59.5572
p-value	0.0000	0.2340	0.2057	0.0478

Notes: The table presents the average marginal effects of the covariates estimated from the following logit models of a county recession in county c at time (year) $t+k$ in metro counties. In Panel A, we estimate $logit(p_{s,t+k}) = \beta_0 + \beta_1 \cdot \Delta X_{s,t} + \epsilon_{s,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$. In Panel B, we add state fixed effects. X denotes the independent variable at the state-quarterly frequency - the average deposit rate in column 1, natural-log of auto sales in column 2, natural-log of the number of unemployment insurance claims in column 3, and natural-log of the number of job openings in column 4. A state is in a recession if its GDP growth between two consecutive years is below -2%. The independent variables are standardized. The sample period is from 2005Q1 through 2017Q4. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.25: Deposit Rate Predicts Recessions after Accounting for Real Indicators

Panel A: No Fixed Effects			
$\mathbb{1}_{Recession}$	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0318***	0.0447***	0.0352***
	(0.0047)	(0.0065)	(0.0057)
ln(Auto Sales)	-0.0150	-0.0117	0.0126
	(0.0153)	(0.0163)	(0.0174)
ln(UI Claims)	0.0153*	0.0164*	0.0080
	(0.0080)	(0.0092)	(0.0094)
ln(Job Openings)	-0.0123	-0.0172	-0.0361**
	(0.0142)	(0.0154)	(0.0164)
N	2,428	2,224	2,020
pseudo R^2	0.0957	0.1485	0.0894
AUC	0.7580	0.8026	0.7521
Overall test statistic, χ^2	111.3559	103.7804	102.2571
p-value	0.0000	0.0000	0.0000
Panel B: State Fixed Effects			
$\mathbb{1}_{Recession}$	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0324***	0.0428***	0.0341***
	(0.0047)	(0.0061)	(0.0063)
ln(Auto Sales)	-0.0256	-0.0424	0.0375
	(0.0377)	(0.0431)	(0.0494)
ln(UI Claims)	0.0800***	0.0704***	0.0147
	(0.0235)	(0.0237)	(0.0293)
ln(Job Openings)	0.0949***	0.1174***	-0.0043
	(0.0320)	(0.0371)	(0.0381)
State FE	✓	✓	✓
N	2,064	1,892	1,720
pseudo R^2	0.1600	0.2195	0.1372
AUC	0.8324	0.8604	0.8075
Overall test statistic, χ^2	215.2556	215.1488	202.0207
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit models of a county recession in county c at time (year) $t+k$ in metro counties. In Panel A, we estimate $logit(p_{s,t+k}) = \beta_0 + \beta_1 \cdot Rate_{s,t} + \beta_2 \cdot ln(\text{Auto Sales})_{s,t} + \beta_3 \cdot ln(\text{UI Claims})_{s,t}) + \beta_4 \cdot ln(\text{Job Openings})_{s,t} + \epsilon_{s,t+k}$ where $logit(p) = ln(\frac{p}{1-p})$. In Panel B, we add state fixed effects. *Rate* denotes the average bank deposit rate. $ln(\text{Auto Sales})$ denotes the natural-log of auto sales. $ln(\text{UI Claims})$ denotes the natural-log of the number of unemployment insurance claims. $ln(\text{Job Openings})$ denotes the natural-log of the number of job openings. A state is in a recession if its GDP growth between two consecutive years is below -2%. The independent variables are standardized. The sample period is from 2005Q1 through 2017Q4. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.26: Additional Measures of Economic Activity and Deposit Rate

Panel A: Unemployment Rate						
Unemployment	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.1955**	0.2111**	0.3829***	0.4067***	0.3523***	0.3530***
	(0.0798)	(0.0850)	(0.0941)	(0.1123)	(0.1211)	(0.1223)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,867	4,570	4,302	4,039	3,775	3,516
R^2	0.8619	0.8661	0.8732	0.8792	0.8810	0.8818
Panel B: Payroll Growth						
Δ ln(Payroll)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0046	0.0011	-0.0086***	-0.0130***	-0.0025	-0.0073**
	(0.0034)	(0.0029)	(0.0028)	(0.0029)	(0.0028)	(0.0033)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,876	4,566	4,290	4,028	3,765	3,502
R^2	0.3590	0.3855	0.4041	0.4138	0.4213	0.4196
Panel C: Establishment Growth						
Δln(# Establishments)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0004	-0.0000	-0.0034***	-0.0062***	-0.0039**	-0.0058***
	(0.0013)	(0.0013)	(0.0013)	(0.0016)	(0.0015)	(0.0015)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,876	4,566	4,290	4,028	3,765	3,502
R^2	0.5301	0.5436	0.5520	0.5523	0.5551	0.5629
Panel D: Delinquency Rate						
Delinquency (30-89 days)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0511	0.0794**	0.0698*	0.0807**	0.0901**	0.0808*
	(0.0323)	(0.0344)	(0.0401)	(0.0350)	(0.0392)	(0.0441)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	2,356	2,337	2,146	1,959	1,770	1,585
R^2	0.9280	0.9263	0.9239	0.9195	0.9145	0.9105
Panel E: CPI Growth						
CPI (% Chg.)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.2284***	-0.2182***	-0.3003***	-0.4220***	-0.3923***	-0.3022***
	(0.0706)	(0.0727)	(0.0756)	(0.0790)	(0.0823)	(0.0749)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	2,570	2,558	2,424	2,295	2,164	2,033
R^2	0.7845	0.8817	0.8880	0.9069	0.9103	0.9195

Notes: This table presents the relation between county deposit rates and unemployment rates (Panel A), establishment growth (Panel B), inflation (Panel C), payroll growth (Panel D), and delinquency rate (Panel E) in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+k$ as a function of the average deposit rate within a county at year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \epsilon_{c,t}$ where Y denotes the unemployment rate in Panel A, estbalishment growth in Panel B, inflation in Panel C payroll growth in Panel D, and delinquency rate in Panel E. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The average unemployment rate, establishment growth, annual CPI growth, payroll growth, and delinquency rate is 5.79%, 0.84%, 3.38%, 1.94%, and 2.53% respectively, for metro counties from 2001 to 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.27: County Economic Activity and Deposit Rate: Excluding Failed Banks

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0037	-0.0048	-0.0134***	-0.0041	-0.0054*	-0.0008
	(0.0034)	(0.0032)	(0.0041)	(0.0040)	(0.0032)	(0.0037)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,521	4,245	3,995	3,745	3,489	3,241
R^2	0.2696	0.2752	0.2804	0.2766	0.2761	0.2828
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0043**	-0.0059***	-0.0096***	-0.0104***	-0.0064***	-0.0014
	(0.0018)	(0.0019)	(0.0019)	(0.0018)	(0.0017)	(0.0014)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,560	4,280	4,029	3,776	3,516	3,265
R^2	0.6388	0.6526	0.6701	0.6797	0.6889	0.7003
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	0.0007	-0.0171	-0.0343**	-0.0322*	-0.0194	-0.0176
	(0.0143)	(0.0170)	(0.0169)	(0.0181)	(0.0184)	(0.0205)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	3,890	3,617	3,367	3,112	2,854	2,602
R^2	0.9931	0.9932	0.9933	0.9933	0.9935	0.9935
Panel D: Wage Growth						
Δln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0043	-0.0074***	-0.0140***	-0.0115***	-0.0052**	0.0004
	(0.0027)	(0.0026)	(0.0026)	(0.0027)	(0.0025)	(0.0024)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,560	4,260	4,000	3,752	3,496	3,243
R^2	0.4854	0.5090	0.5248	0.5229	0.5218	0.5179

Notes: This table presents the relation between county deposit rates and economic activity in metro counties, excluding the sample of failed banks. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, natural-log of the number of new business applications in Panel B, and the 30-89 day mortgage delinquency rate in Panel C. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71%, average employment growth is 0.71%, average log-transformed # of applications is 3.23%, and average wage growth of 3.53% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.28: County Economic Activity and Money-Market Deposit Rate

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0024	-0.0055***	-0.0039**	-0.0031*	-0.0033*	-0.0024
	(0.0016)	(0.0017)	(0.0018)	(0.0017)	(0.0018)	(0.0021)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,454	4,177	3,922	3,674	3,422	3,180
R^2	0.2679	0.2794	0.2782	0.2730	0.2697	0.2781
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0017*	-0.0039***	-0.0039***	-0.0018*	-0.0011	-0.0007
	(0.0009)	(0.0010)	(0.0010)	(0.0009)	(0.0009)	(0.0009)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,514	4,232	3,972	3,719	3,462	3,213
R^2	0.6326	0.6539	0.6700	0.6790	0.6939	0.7047
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0096	-0.0059	-0.0054	-0.0068	-0.0082	-0.0090
	(0.0077)	(0.0077)	(0.0078)	(0.0079)	(0.0080)	(0.0089)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	3,811	3,538	3,284	3,032	2,778	2,526
R^2	0.9932	0.9934	0.9934	0.9934	0.9936	0.9936
Panel D: Wage Growth						
Δln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0018	-0.0043***	-0.0039***	-0.0024*	-0.0008	-0.0010
	(0.0013)	(0.0013)	(0.0014)	(0.0013)	(0.0013)	(0.0014)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,514	4,212	3,946	3,693	3,441	3,187
R^2	0.4855	0.5143	0.5246	0.5269	0.5325	0.5230

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log of the number of new business applications in Panel C, and the wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on money market accounts at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71%, average employment growth is 0.71%, average log-transformed # of applications is 3.23%, and average wage growth of 3.53% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.29: County Economic Activity and the Term Structure of Certificates of Deposits

Δ ln(GDP)$_{t+3}$	1-Month	6-Month	12-month	24-Month	Uninsured
Rate	0.0008	-0.0069**	-0.0103***	-0.0088**	-0.0036
	(0.0184)	(0.0034)	(0.0033)	(0.0036)	(0.0031)
County FIPS FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
N	1,141	4,156	4,177	4,127	2,197
R^2	0.3241	0.2660	0.2672	0.2684	0.3907

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t+2$ as a function of the average deposit rate within a county at year t. The regression specification is the following: $\Delta ln(GDP)_{c,t+2} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the average bank deposit rate on 1-month certificates of deposit of at least \$10,000 in column 1, 6-month certificates of deposits of at least \$10,000 in column 2, 12-month certificates of deposits of at least \$10,000 in column 3, 24-month certificates of deposits of at least \$10,000 in column 4, and uninsured 12-month certificates of deposit of at least \$100,000 from 2001 through September of 2008, and at least \$250,000 thereafter. We restrict the sample to counties that report all of these rates. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.30: County Economic Activity and Deposit Rate: 2006

Panel A: GDP Growth			
Δ ln(GDP)	2007	2008	2009
Rate_{2006}	0.0149**	-0.0158**	-0.0022
	(0.0063)	(0.0062)	(0.0067)
N	241	242	239
R^2	0.0143	0.0182	0.0004
Panel B: Employment Growth			
Δ ln(Employment)	2007	2008	2009
Rate_{2006}	0.0089**	-0.0022	-0.0102***
	(0.0039)	(0.0031)	(0.0036)
N	244	245	242
R^2	0.0146	0.0016	0.0316
Panel C: CPI Growth			
CPI (% Chg.)	2007	2008	2009
Rate_{2006}	-0.0568	-0.3390***	-0.6492***
	(0.1326)	(0.1294)	(0.1627)
N	124	123	124
R^2	0.0008	0.0568	0.0842

Notes: This table presents the relation between county deposit rates in 2006 and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \epsilon_{c,t}$ where Y denotes GDP growth, employment growth in Panel B, and the annual percentage change in CPI in Panel B. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 0.38%, average employment growth is 0.21%, and average inflation is 2.16% for metro counties from 2006 through 2009. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.31: County Economic Activity, Deposit Rate, and Share of Large Banks

Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0004	-0.0072**	-0.0138***	-0.0091**	-0.0027	0.0006
	(0.0034)	(0.0036)	(0.0040)	(0.0038)	(0.0035)	(0.0043)
$\mathbb{1}_{\text{Share of Large Banks} \leq P25} \times$ Rate	0.0014	0.0044	0.0065**	0.0066**	0.0047	0.0013
	(0.0030)	(0.0032)	(0.0030)	(0.0027)	(0.0033)	(0.0039)
$\mathbb{1}_{P25 < \text{ Share of Large Banks} \leq P50} \times$ Rate	-0.0026	-0.0010	0.0023	0.0033**	0.0023	0.0005
	(0.0018)	(0.0018)	(0.0015)	(0.0015)	(0.0016)	(0.0016)
$\mathbb{1}_{P50 < \text{Share of Large Banks} \leq P75} \times$ Rate	-0.0002	-0.0001	0.0004	0.0009	0.0008	0.0003
	(0.0023)	(0.0020)	(0.0016)	(0.0016)	(0.0017)	(0.0016)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,466	4,192	3,937	3,690	3,436	3,187
R^2	0.2765	0.2832	0.2894	0.2828	0.2766	0.2764

Notes: This table presents the relation between county deposit rates and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot Rate_{c,t} \times \mathbb{1}_{\text{Share of Large Banks} \leq P25} + \beta_2 \cdot Rate_{c,t} \times \mathbb{1}_{P25 < \text{Share of Large Banks} \leq P50} + \beta_3 \cdot Rate_{c,t} \times \mathbb{1}_{P50 < \text{Share of Large Banks} \leq P75} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the average bank deposit rate, and $\mathbb{1}_{\text{Share of Large Banks} \leq P25}$, $\mathbb{1}_{P25 < \text{Share of Large Banks} \leq P50}$, and $\mathbb{1}_{P50 < \text{Share of Large Banks} \leq P75}$ denote whether the county's share of non-single state ("'large") banks is in the first, second, or third quartiles, respectively. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The *Rate* variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.32: County Economic Activity and Deposit Rate: All Conuties

Panel A: GDP Growth						
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0021	-0.0024	-0.0086***	-0.0098***	-0.0048**	-0.0007
	(0.0016)	(0.0018)	(0.0020)	(0.0021)	(0.0020)	(0.0021)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	36,483	34,087	31,830	29,688	27,621	25,595
R^2	0.1024	0.1046	0.1060	0.1078	0.1095	0.1154
Panel B: Employment Growth						
Δln(Employment)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0027***	-0.0042***	-0.0057***	-0.0060***	-0.0045***	-0.0015*
	(0.0008)	(0.0008)	(0.0009)	(0.0010)	(0.0009)	(0.0009)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	36,650	34,232	31,955	29,801	27,719	25,676
R^2	0.3516	0.3639	0.3739	0.3828	0.3909	0.3944
Panel C: Business Formation						
ln(Applications)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0099	-0.0215***	-0.0383***	-0.0465***	-0.0400***	-0.0350***
	(0.0068)	(0.0077)	(0.0077)	(0.0081)	(0.0083)	(0.0086)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	30,932	28,658	26,474	24,372	22,306	20,273
R^2	0.9880	0.9882	0.9883	0.9885	0.9888	0.9889
Panel D: Wage Growth						
Δln(Annual Wages)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Rate	-0.0012	-0.0064***	-0.0116***	-0.0098***	-0.0037	-0.0003
	(0.0025)	(0.0023)	(0.0024)	(0.0025)	(0.0026)	(0.0027)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,638	4,330	4,056	3,795	3,533	3,271
R^2	0.4836	0.5104	0.5244	0.5252	0.5290	0.5177

Notes: This table presents the relation between county deposit rates and economic activity in all counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $Y_{c,t+k} = \beta_1 \cdot Rate_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y denotes GDP growth in Panel A, employment growth in Panel B, natural-log of the number of new business applications in Panel C, and the wage growth in Panel D. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.25%, average employment growth is 0.00%, average log-transformed # of applications is 2.08%, and wage growth is 2.98% for all counties from 2001 through 2020. The independent variable is standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.33: Deposit Rates Predict County Recessions Better in Concentrated Markets

Panel A: No Fixed Effects					
$\mathbb{1}[Recession]_{t+2}$	Large Metro	Small Metro	Large Urban	Small Urban	Rural
Rate_t	0.0478***	0.0463***	0.0239***	0.0136***	-0.0091
	(0.0049)	(0.0042)	(0.0070)	(0.0039)	(0.0063)
N	4,296	7,066	3,319	13,704	5,749
pseudo R^2	0.0259	0.0190	0.0037	0.0008	0.0003
AUC	0.6053	0.5741	0.5228	0.5052	0.5166
Overall test statistic, χ^2	90.2024	115.1499	11.4203	11.9883	2.0344
p-value	0.0000	0.0000	0.0007	0.0005	0.1538
Panel B: County Fixed Effects					
$\mathbb{1}[Recession]_{t+2}$	Large Metro	Small Metro	Large Urban	Small Urban	Rural
Rate_t	0.0533***	0.0546***	0.0269***	0.0170***	-0.0087
	(0.0051)	(0.0044)	(0.0073)	(0.0040)	(0.0064)
County FIPS FE	✓	✓	✓		
N	4,037	6,554	3,191	13,553	5,685
pseudo R^2	0.1028	0.0950	0.0595	0.0618	0.0494
AUC	0.7307	0.7162	0.6710	0.6637	0.6444
Overall test statistic, χ^2	384.2455	579.1674	182.1187	880.7135	310.9590
p-value	0.0000	0.0000	0.6840	0.2797	0.9831

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+2$: $logit(p_{c,t+2}) = \beta_0 + \beta_1 Rate_{c,t} + \epsilon_{c,t+k}$ in Panel A and $logit(p_{c,t+2}) = \beta_0 + \beta_1 Rate_{c,t} + \epsilon_{c,t+k}$ in Panel B. where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate, t denotes the current year. A county is in a recession if its GDP growth between two consecutive years is below -2%. Column (1) limits the sample to metro areas with populations of 1 million or more (1993 USDA ERS Rural-Urban Continuum Codes 0 or 1). Column (2) focuses on metro areas with populations under 1 million (1993 USDA ERS Rural-Urban Continuum Codes 2 or 3). Column (3) narrows the sample to urban areas with populations exceeding 20,000 (1993 USDA ERS Rural-Urban Continuum Codes 4 or 5). Column (4) restricts the sample to urban areas with populations below 20,000 (1993 USDA ERS Rural-Urban Continuum Codes 6 or 7). Column (5) focuses on rural areas with populations under 2,500 (1993 USDA ERS Rural-Urban Continuum Codes 8 or 9). The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The independent variable is standardized. The likelihood of a county being in a recession is 15.12% for large metro counties, 17.23% for small metro counties, 20.10% for large urban counties, 27.47% for small urban counties, and 32.92% for rural counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.34: Deposit Rates Predict County Recessions: All Counties

Panel A: No Fixed Effects			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0043*	0.0243***	0.0141***
	(0.0023)	(0.0023)	(0.0024)
N	36,556	34,152	31,886
pseudo R^2	0.0001	0.0030	0.0010
AUC	0.5042	0.5248	0.5104
Overall test statistic, χ^2	3.6912	109.8920	33.9931
p-value	0.0547	0.0000	0.0000
Panel B: County Fixed Effects			
$\mathbb{1}_{Recession}$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate	0.0060***	0.0277***	0.0161***
	(0.0023)	(0.0024)	(0.0025)
N	35,438	33,038	30,854
pseudo R^2	0.0799	0.0826	0.0805
AUC	0.6916	0.6946	0.6911
Overall test statistic, χ^2	2696.1749	2751.1782	2468.5764
p-value	0.0000	0.0000	0.0000

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a county recession in county c at time (year) $t+k$ for all counties: $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \epsilon_{c,t+k}$ in Panel A and $logit(p_{c,t+k}) = \beta_0 + \beta_1 Rate_{c,t} + \alpha_c + \epsilon_{c,t+k}$ in Panel B, where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate, t denotes the current year, and k denotes the number of leading years ($k = 1, 2, 3$). A county is in a recession if its GDP growth between two consecutive years is below -2%. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The independent variable is standardized. The likelihood of a county being in a recession is 25.34% for metro counties from 2001 through 2020. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.35: What Balance Sheet Characteristics Predict Deposit Rates?

Rate_t	(1)	(2)
$\text{Credit/Deposits}_{t-1}$	0.0444***	0.0261***
	(0.0036)	(0.0074)
Cash/Assets_{t-1}		-0.0165***
		(0.0033)
$\text{Dividends/Assets}_{t-1}$		-0.0059***
		(0.0020)
$\text{Deposits/Assets}_{t-1}$		-0.0037
		(0.0036)
$\text{Securities/Assets}_{t-1}$		-0.0189***
		(0.0071)
$\ln(\text{Assets})_{t-1}$		-0.0102
		(0.0068)
Bank FE	✓	✓
Year FE	✓	✓
N	94,259	94,259
R^2	0.9416	0.9416

Notes: The table presents the relation between deposit rates and bank characteristics. The regression specification is the following: $\text{Rate}_{b,t} = \mathbb{B}X_{b,t-1} + \alpha_b + \alpha_t + \epsilon_{b,t}$ where Rate represents the average deposit rate of bank b in year t, X represents a vector of bank characteristics for bank b in year $t-1$. This vector includes the average loan balance divided by total deposits, total cash holdings divided by total bank assets, total dividend on common stocks divided by total assets, total deposits divided by total assets, total securities divided by total assets, and the natural-log of total assets. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County-clustered standard errors are reported in parentheses.

Table B.36: County Economic Activity and Residual Deposit Rates

Panel A: Small Business Lending Growth			
$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate Residual	-0.0009	-0.0018**	-0.0029***
	(0.0008)	(0.0008)	(0.0010)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	3,716	3,454	3,202
R^2	0.2495	0.2478	0.2521
Panel B: Mortgage Lending Growth			
$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate Residual	-0.0009	-0.0019**	-0.0029***
	(0.0008)	(0.0008)	(0.0010)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	3,716	3,454	3,202
R^2	0.2495	0.2478	0.2520
Panel C: Total Lending Growth			
$\Delta ln(\text{GDP})$	1 Year Ahead	2 Years Ahead	3 Years Ahead
Rate Residual	-0.0009	-0.0019**	-0.0029***
	(0.0008)	(0.0008)	(0.0010)
County FIPS FE	✓	✓	✓
Year FE	✓	✓	✓
N	3,716	3,454	3,202
R^2	0.2495	0.2478	0.2520

Notes: This table presents the relation between the residual of county deposit rates, after partialling out the effects of contemporaneous and lagged values of credit growth and economic activity in metro counties counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to three-year (k = 1, 2, 3) annual lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot \text{Rate Residual}_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth. Rate Residual represents the predicted residual from a regression model that estimates the relationship between the deposit rate and annual credit growth, according to the following specification $Rate_{c,t} = \beta_1 \cdot \text{Credit Growth}_{c,t-1,t} + \beta_2 \cdot \text{Credit Growth}_{c,t-2,t-1} + \beta_3 \cdot \text{Credit Growth}_{c,t-3,t-2} + \beta_4 \cdot \text{Credit Growth}_{c,t-4,t-3} + \alpha_c + \alpha_t + \epsilon_{c,t}$. Credit growth is measured as small business lending growth in Panel A, mortgage lending growth in Panel B, and total lending growth (small business lending+mortgage) in Panel C. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. County clustered standard errors are reported in parentheses.

Table B.37: Insured and Uninsured Deposit Growth and Quartiles of Bank Rate Changes

Panel A: Insured Deposit Growth

Δln(Insured)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0001	-0.0015*	-0.0035***	-0.0015**	0.0031***	0.0008	0.0013**
	(0.0007)	(0.0008)	(0.0007)	(0.0008)	(0.0008)	(0.0007)	(0.0005)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0007	-0.0024***	-0.0044***	0.0000	0.0053***	0.0025***	0.0009
	(0.0006)	(0.0008)	(0.0010)	(0.0008)	(0.0007)	(0.0005)	(0.0008)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0016**	0.0000	-0.0037***	0.0044***	0.0080***	0.0045***	0.0022***
	(0.0007)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0006)	(0.0007)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	234,296	238,782	243,571	243,714	238,978	234,508	230,172
R^2	0.0484	0.0549	0.0534	0.0536	0.0567	0.0597	0.0611

Panel B: Uninsured Deposit Growth

Δln(Uninsured)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0033	0.0014	-0.0036	-0.0010	0.0057**	-0.0056**	-0.0003
	(0.0029)	(0.0028)	(0.0030)	(0.0031)	(0.0026)	(0.0028)	(0.0033)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	0.0047*	0.0032	-0.0061*	-0.0036	0.0070**	0.0017	-0.0031
	(0.0024)	(0.0038)	(0.0036)	(0.0027)	(0.0029)	(0.0032)	(0.0037)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0032	0.0032	-0.0117***	-0.0009	0.0085***	0.0019	-0.0002
	(0.0025)	(0.0025)	(0.0031)	(0.0034)	(0.0025)	(0.0028)	(0.0028)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	233,084	237,548	242,312	242,464	240,887	239,551	238,319
R^2	0.0689	0.0703	0.0699	0.0703	0.0703	0.0707	0.0708

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $\Delta ln(Y)_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$ where $\Delta ln(Deposits)_{b,t+k}$ denotes growth in insured deposits (Panel A) and uninsured deposits (Panel B), $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, or fourth quartile of a bank's deposit rate change between two consecutive quarters, respectively. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.38: Ratio of Insured to Uninsured Deposit Growth and Quartiles of Bank Rate Changes

$\Delta ln(\frac{\text{Insured}}{\text{Uninsured}})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	0.0031	-0.0021	0.0003	-0.0003	-0.0028	0.0063**	0.0020
	(0.0029)	(0.0032)	(0.0031)	(0.0032)	(0.0027)	(0.0028)	(0.0032)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0051**	-0.0050	0.0018	0.0035	-0.0019	0.0007	0.0044
	(0.0024)	(0.0041)	(0.0039)	(0.0028)	(0.0029)	(0.0032)	(0.0037)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	-0.0016	-0.0030	0.0081***	0.0053	-0.0007	0.0025	0.0027
	(0.0026)	(0.0028)	(0.0031)	(0.0035)	(0.0025)	(0.0030)	(0.0030)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	228,690	233,080	237,696	242,462	240,885	239,376	238,072
R^2	0.0825	0.0828	0.0822	0.0819	0.0810	0.0813	0.0815

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$ where Y is $\Delta ln(\frac{Uninsured}{Insured})_{b,t+k}$, denoting the growth in the ratio of insured to uninsured deposits. $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, or fourth quartile of a bank's deposit rate change between two consecutive quarters, respectively. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.39: Loan Growth and Quartiles of Bank Rate Changes

$\Delta ln(\text{Loans})$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0012*	-0.0004	0.0008	0.0010	-0.0004	0.0003	0.0009*
	(0.0006)	(0.0008)	(0.0005)	(0.0008)	(0.0006)	(0.0005)	(0.0005)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0029***	-0.0007	0.0023***	0.0016**	0.0000	0.0005	0.0010**
	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0006)	(0.0005)	(0.0005)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0017*	0.0028***	0.0058***	0.0052***	0.0019***	0.0018***	0.0022***
	(0.0009)	(0.0009)	(0.0010)	(0.0008)	(0.0007)	(0.0006)	(0.0005)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	212,897	217,267	221,913	222,368	218,083	213,718	209,460
R^2	0.0227	0.0223	0.0221	0.0229	0.0262	0.0306	0.0317

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$ where Y is $\Delta ln(Loans)_{b,t+k}$, denoting lending growth. $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, or fourth quartile of a bank's deposit rate change between two consecutive quarters, respectively. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.40: Bank Capital and Quartiles of Bank Rate Changes

Tier 1 Ratio	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0046	0.0025**	0.0075	-0.0016	-0.0038	0.0050	0.0021*
	(0.0074)	(0.0011)	(0.0053)	(0.0044)	(0.0064)	(0.0032)	(0.0012)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0010	0.0059	0.0014	-0.0038	-0.0011	0.0020	0.0008
	(0.0031)	(0.0042)	(0.0012)	(0.0056)	(0.0028)	(0.0014)	(0.0011)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	-0.0042*	-0.0013	-0.0033**	-0.0042*	-0.0050**	-0.0027**	-0.0046***
	(0.0025)	(0.0012)	(0.0013)	(0.0025)	(0.0024)	(0.0011)	(0.0016)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	178,888	181,199	183,631	184,796	183,506	182,379	179,177
R^2	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$ where Y is $\frac{\text{Tier 1 Capital}}{\text{Risk-Weighted Assets}}$, denoting the tier 1 capital ratio. $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, or fourth quartile of a bank's deposit rate change between two consecutive quarters, respectively. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.41: Non-Performing Loans and Quartiles of Bank Rate Changes

Δ ln(NPL)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	t-3	t-2	t-1	t	t+1	t+2	t+3
$\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$	-0.0034	-0.0033	0.0079	-0.0009	0.0068	0.0020	-0.0087
	(0.0064)	(0.0060)	(0.0068)	(0.0056)	(0.0052)	(0.0047)	(0.0059)
$\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$	-0.0045	-0.0091	0.0011	0.0048	0.0097*	0.0053	0.0021
	(0.0069)	(0.0071)	(0.0065)	(0.0063)	(0.0057)	(0.0054)	(0.0066)
$\mathbb{1}_{\text{Dep Rate Change}>P75}$	0.0044	0.0009	-0.0019	0.0031	0.0104*	-0.0061	0.0043
	(0.0064)	(0.0056)	(0.0065)	(0.0062)	(0.0059)	(0.0052)	(0.0052)
Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓
N	165,314	168,233	171,285	171,690	169,033	166,507	164,031
R^2	0.0064	0.0064	0.0063	0.0062	0.0063	0.0064	0.0064

Notes: The table presents the coefficients estimated from the following regression for bank b at time t (quarter-year): $Y_{b,t+k} = \beta_0 + \beta_1 \mathbb{1}_{P25<\text{Dep Rate Change}\leq P50,b,t} + \beta_2 \mathbb{1}_{P50<\text{Dep Rate Change}\leq P75,b,t} + \beta_3 \mathbb{1}_{\text{Dep Rate Change}>P75,b,t} + \alpha_t + \epsilon_{b,t}$ where Y is Δ ln(Non-performing Loans), denoting the non-performing loan growth. $\mathbb{1}_{P25<\text{Dep Rate Change}\leq P50}$, $\mathbb{1}_{P50<\text{Dep Rate Change}\leq P75}$, $\mathbb{1}_{\text{Dep Rate Change}>P75}$ denote the second, third, or fourth quartile of a bank's deposit rate change between two consecutive quarters, respectively. k denotes the number of lead/lag quarters. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across counties for each bank in each month is computed. The quarterly bank deposit rate is the bank deposit rate in the last reporting month of quarter. This rate is used to compute the quarterly change in banks' deposit rates. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks. Two-way bank and quarter-year clustered standard errors are reported in parentheses.

Table B.42: Gap Between Uninsured and Insured Rate by Years from County Recession

	N	P25	Median	P75	Mean	SD
L3.Gap	4,168	-0.1323	0.05	0.225	0.0492	0.3272
L2.Gap	4,645	-0.1617	0.0393	0.242	0.0382	0.4214
L1.Gap	5,416	-0.175	0.04	0.25	0.0392	0.422
Gap	6,164	-0.1285	0.0667	0.2722	0.0795	0.3959
F1.Gap	4,654	-0.1333	0.0582	0.2617	0.0749	0.396
F2.Gap	3,925	-0.142	0.065	0.2875	0.0833	0.4185
F3.Gap	3,638	-0.1433	0.0652	0.2876	0.0728	0.4214

Notes: This table summarizes the gap between uninsured and insured deposit rates by years from county recessions. The uninsured deposit rate is the rate on uninsured 12-month certificates of deposit of at least $100,000 from 2001 through September of 2008, and at least $250,000 thereafter. The insured deposit rate is the rate on 12-month certificates of deposit of at least $10,000. The table reports the gap (uninsured rate-insured rate) at the county level in the three years before and after a county recession. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average uninsured and insured deposit rates across banks for each county in each month are computed. The annual uninsured and insured county deposit rates are the county deposit rates in the last reporting month of each year. A county is in a recession if its GDP growth between two consecutive years is below -2%. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks.

Table B.43: GDP Growth and State Deposit Rate

Δln(GDP)	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead	16 Qtrs Ahead	20 Qtrs Ahead	24 Qtrs Ahead
Rate	-0.0015	-0.0046***	-0.0059***	-0.0041**	-0.0019	-0.0028*
	(0.0018)	(0.0017)	(0.0017)	(0.0018)	(0.0021)	(0.0014)
State FE	✓	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓	✓
N	3,244	3,091	2,887	2,685	2,481	2,277
R^2	0.6424	0.6607	0.6768	0.7150	0.7449	0.7576

Notes: This table presents the relation between state deposit rates and economic activity. The table presents the results from estimating an OLS model of the change in economic activity in state s in quarter-year $t+k$ as a function of the average deposit rate within a county at quarter-year t. We consider up to twelve-quarter (k = 4, 8, 12) lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{s,t+k} = \beta_1 \cdot Rate_{s,t} + \alpha_s + \alpha_t + \epsilon_{s,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The state deposit rate is then constructed as the weighted average of the county deposit rate for each state in the last reporting month of each quarter, weighted by the 2004 county GDP. The independent variable is standardized. Average quarterly GDP growth is 0.30% from 2005 through 2020. The sample period is from 2005Q1 through 2020Q4. The analysis is restricted to single-state banks. State clustered standard errors are reported in parentheses.

Table B.44: Deposit Rates Predict State Recessions

Panel A: No Fixed Effects			
$\mathbb{1}_{Recession}$	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0239***	0.0257***	0.0143***
	(0.0034)	(0.0040)	(0.0039)
N	3,040	2,836	2,632
pseudo R^2	0.0353	0.0399	0.0111
AUC	0.6990	0.6812	0.5827
Overall test statistic, χ^2	61.9248	47.3748	13.9552
p-value	0.0000	0.0000	0.0002
Panel B: State Fixed Effects			
$\mathbb{1}_{Recession}$	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead
Rate	0.0242***	0.0262***	0.0147***
	(0.0034)	(0.0039)	(0.0039)
State FE	✓	✓	✓
N	3,040	2,836	2,632
pseudo R^2	0.0708	0.0786	0.0488
AUC	0.7260	0.7191	0.6747
Overall test statistic, χ^2	0.0754	0.0803	0.0492
p-value	0.0000	0.0002	0.3555

Notes: The table presents the average marginal effects of the covariates estimated from the following logit model of a state recession in state s at time (quarter-year) $t+k$: $logit(p_{s,t+k}) = \beta_0 + \beta_1 Rate_{s,t} + \beta_2 Rate_{s,t} + \epsilon_{s,t+k}$ in Panel A and $logit(p_{s,t+k}) = \beta_0 + \beta_1 Rate_{s,t} + \beta_2 Rate_{s,t} + \alpha_s + \epsilon_{s,t+k}$ in Panel B where $logit(p) = ln(\frac{p}{1-p})$ denotes the log of the odds ratio, *Rate* denotes the average bank deposit rate, t denotes the current year, and k denotes the number of leading quarters ($k = 4, 8, 12$). A state is in a recession if its GDP growth between two consecutive quarters is below -2%. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The state deposit rate is then constructed as the weighted average of the county deposit rate for each state in the last reporting month of each quarter, weighted by the 2004 county GDP. The likelihood of a state being in a recession is 5.18% from 2001 through 2020. The sample period is from 2005Q1 through 2020Q4. The analysis is restricted to single-state banks. Heteroskedacticity-robust standard errors are reported in parentheses.

Table B.45: GDP Growth and State Deposit Rate using Call Reports Data

Δln(GDP)	4 Qtrs Ahead	8 Qtrs Ahead	12 Qtrs Ahead	16 Qtrs Ahead	20 Qtrs Ahead	24 Qtrs Ahead
Rate	-0.0048***	-0.0046***	-0.0019	0.0016	0.0005	0.0029***
	(0.0014)	(0.0013)	(0.0016)	(0.0016)	(0.0008)	(0.0008)
State FE	✓	✓	✓	✓	✓	✓
Quarter-Year FE	✓	✓	✓	✓	✓	✓
N	2,907	2,703	2,499	2,295	2,091	1,887
R^2	0.2537	0.2682	0.2770	0.2847	0.2973	0.3065

Notes: This table presents the relation between state deposit rates and economic activity. The table presents the results from estimating an OLS model of the change in economic activity in state s in quarter-year $t+k$ as a function of the average deposit rate within a county at quarter-year t. We consider up to 24-quarter (k = 4, 8, 12, 16, 20, 24) lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{s,t+k} = \beta_1 \cdot Rate_{s,t} + \alpha_s + \alpha_t + \epsilon_{s,t}$ where $\Delta ln(GDP)$ denotes GDP growth. *Rate* denotes the bank deposit rate computed from the call reports as the annualized interest expense on domestic deposits divided by total domestic deposits. The independent variable is standardized. Average quarterly GDP growth is 0.30% from 2005 through 2020. The sample period is from 2005Q1 through 2020Q4. The analysis is restricted to single-state banks. State clustered standard errors are reported in parentheses.

It turns out that nearly half of recessions are preceded by a *contraction* in credit, rather than an expansion. I define a county as being in a recession if its annual GDP growth falls below 2%. To examine credit growth, I analyze the preceding three years. If the average credit growth over this period is negative, I classify it as a contraction; if positive, it is classified as an expansion. I find that 48% of county-years that experienced recessions were preceded by contractions. This result remains robust, regardless of whether the focus is on total mortgage lending, small business lending, or the combined total of both.

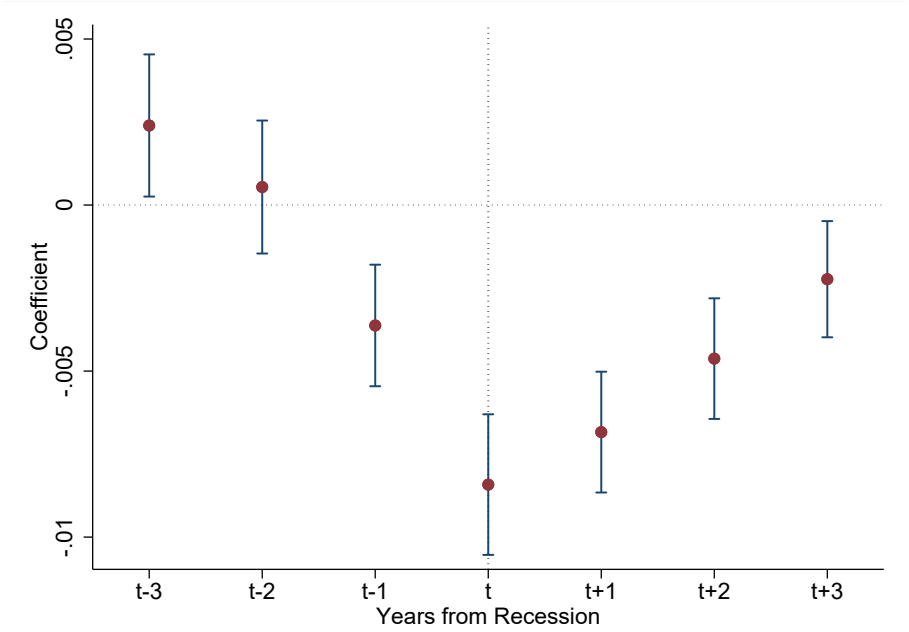
I redo the baseline analysis to assess whether deposit rates can predict economic contractions in regions with a three-year average total credit growth in the bottom quartile (more than 7.75% decline in credit) prior to recessions. Specifically, I aim to determine if deposit rates are more effective at predicting contractions in this subset of counties, which are more likely to experience recessions driven by factors other than credit booms.

Table B.46: County Economic Activity and Deposit Rate in Low vs. High Credit Growth Counties

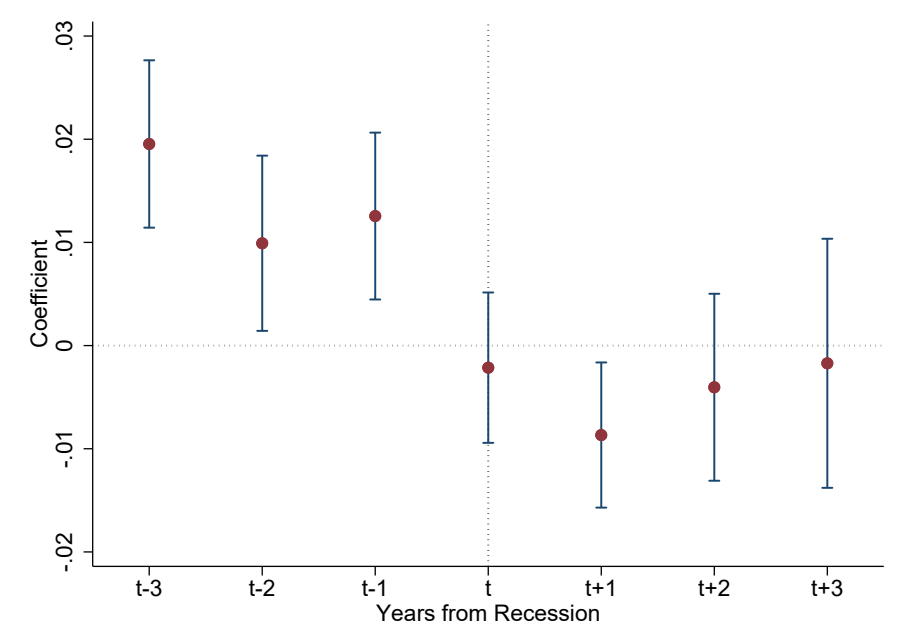
Δln(GDP)	1 Year Ahead	2 Years Ahead	3 Years Ahead	4 Years Ahead	5 Years Ahead	6 Years Ahead
Low Credit Growth × Rate	-0.0037**	-0.0038**	-0.0032***	-0.0036***	-0.0034**	-0.0031**
	(0.0016)	(0.0015)	(0.0012)	(0.0012)	(0.0015)	(0.0015)
Rate	-0.0000	-0.0040	-0.0113**	-0.0011	0.0001	0.0031
	(0.0036)	(0.0037)	(0.0045)	(0.0041)	(0.0038)	(0.0044)
County FIPS FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
N	4,390	4,123	3,875	3,634	3,387	3,145
R^2	0.2615	0.2710	0.2747	0.2669	0.2663	0.2728

Notes: This table presents the relation between county deposit rates, credit growth and economic activity in metro counties. The table presents the results from estimating an OLS model of the change in economic activity in county c in year $t + k$ as a function of the average deposit rate within a county at year t. We consider up to six-year (k = 1, 2, 3, 4, 5, 6) annual lead indicators of economic activity. The regression specification is the following: $\Delta ln(GDP)_{c,t+k} = \beta_1 \cdot \text{Low Credit Growth} \times \text{Rate}_{c,t} + \beta_2 \cdot \text{Rate}_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where $\Delta ln(GDP)$ denotes GDP growth, Low Credit Growth × Rate is the interaction of the county deposit rate and an indicator for counties with a three-year average total credit growth in the bottom quartile prior to a recession over the sample period, *Rate* denotes the average bank deposit rate. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. Average GDP growth is 1.71% for metro counties from 2001 through 2020. The independent variables are standardized. The sample period is from 2001 through 2020. The analysis is restricted to single-state banks operating in metro counties that experienced at least one recession during the sample period. County clustered standard errors are reported in parentheses.

Figure B.14: Dynamics around Recessions



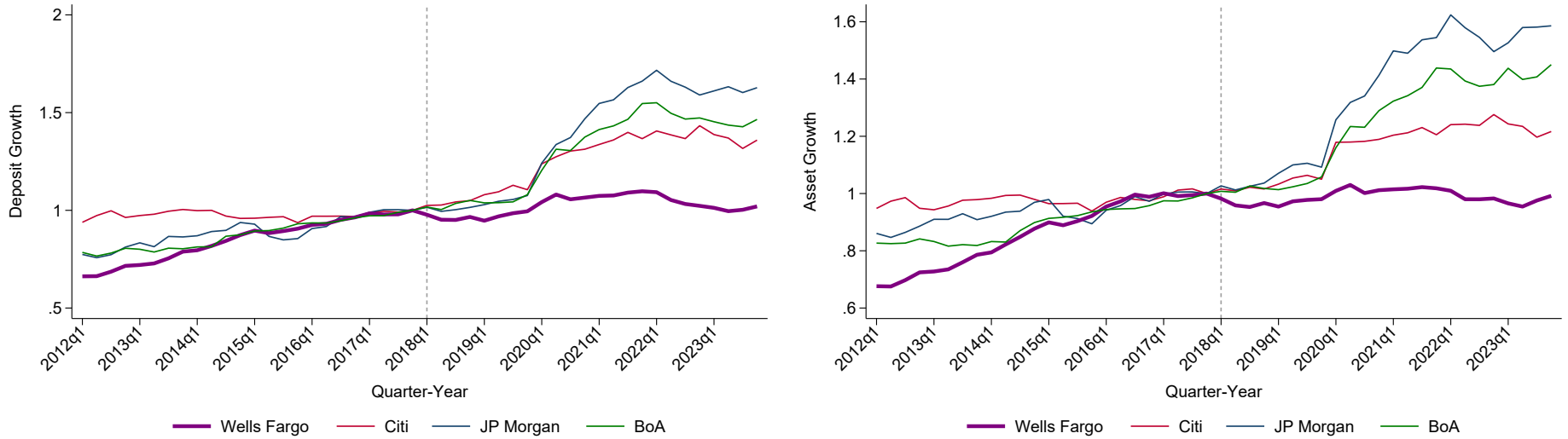
(a) Δln(Deposits)



(b) Deposit Rate

Notes: This figure plots the dynamics for deposit growth and deposit growth. The figures plot the coefficients from estimating the following regression: $Y_{c,t+k} = \beta \mathbb{1}[Recession]_{c,t} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is deposit growth in Panel B.14a and deposit rate among single-state banks in Panel B.14b. $\mathbb{1}[Recession]$ is an indicator for a county-recession, t denotes the current year, and k denotes the number of years before/after recession, ranging from -3 to +3. A county is in a recession if its GDP growth between two consecutive quarters is below -2%. The sample period is from 2001 through 2020. County-clustered standard errors are reported in parentheses.

Figure B.15: Wells Fargo Deposit and Asset Growth around Active Enforcement

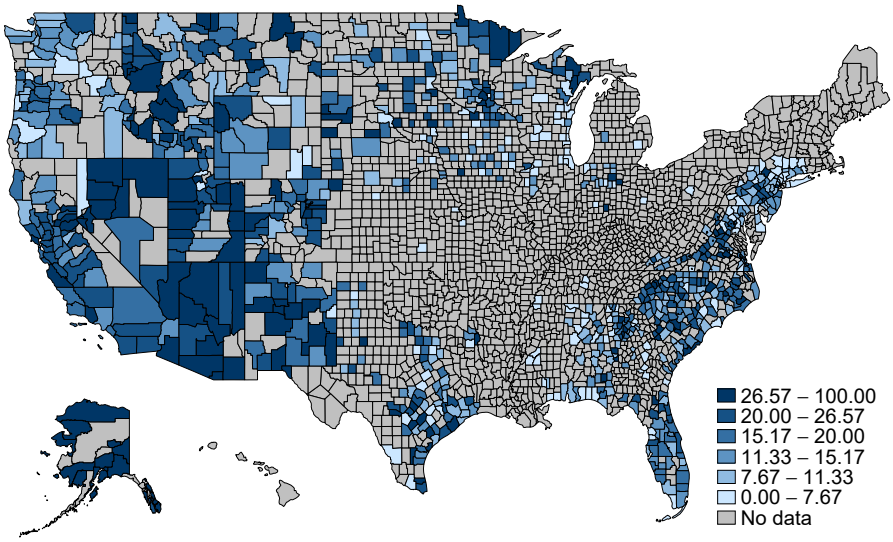


(a) Deposit Growth

(b) Asset Growth

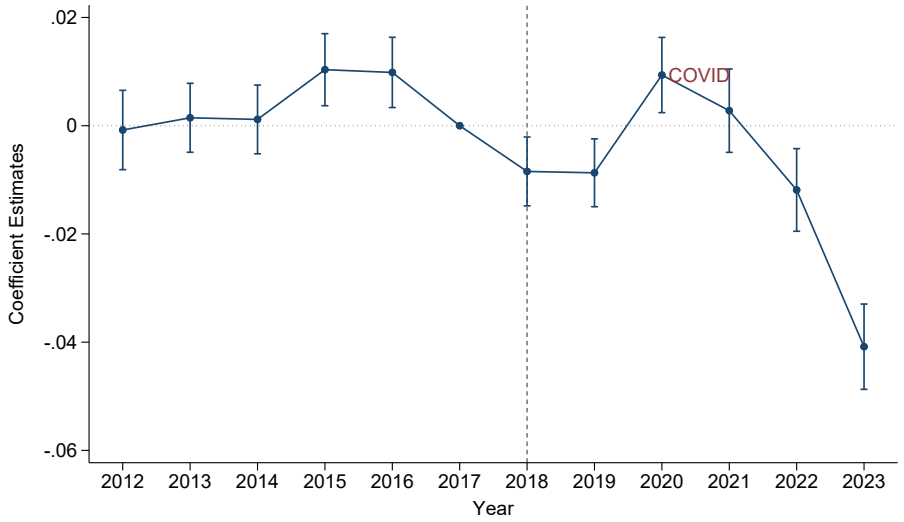
Notes: This figure illustrates plots the deposit growth (Panel B.15a) and asset growth (Panel B.15b) of Wells Fargo (purple), Citibank (red), JP Morgan Chase (green), and Bank of America (blue) between 2012Q1 and 2023Q4. Deposit and asset growth are measured relative to their 2017 values, which are normalized to 1.

Figure B.16: Wells Fargo Deposit Share in 2017

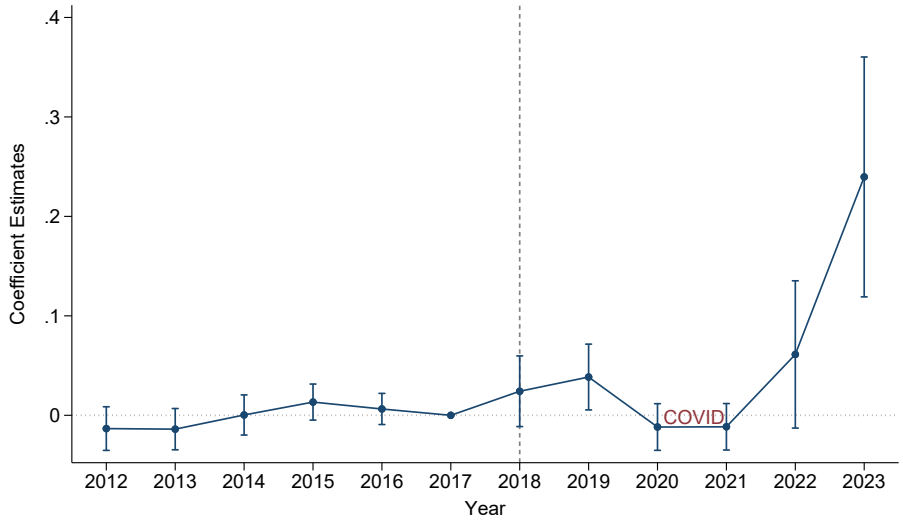


Notes: This figure presents a heatmap of Wells Fargo's share of deposits (%) in each county in 2017, using the FDIC's Summary of Deposits data. The intensity of the blue shading represents the quantile range of the deposit rate.

Figure B.17: County Deposit Growth and Deposit Rate around Active Enforcement



(a) Deposit Growth



(b) Rate

Notes: The figure presents the trend in county deposit growth and deposit rate in counties with a Wells Fargo. The regression specification is the following $Y_{c,t} = \sum_{\substack{k=-6 \\ k\neq -1}}^{6} \beta_k \cdot \mathbb{1}_{\text{WF County},c} \times \mathbb{1}_{t=k+2018} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is the deposit growth (Δ ln(Deposits)) in Panel B.17a and the deposit rate (Rate) in Panel B.17b of county c in year t, $\mathbb{1}_{\text{WF County}}$ is an indicator for whether a county had a Wells Fargo in 2017. The dashed line demarcates the pre and post periods. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposit rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across single-state banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The sample period is from 2012 through 2023.

Table B.47: County Deposit Activity around Wells Fargo Active Enforcement

Panel A: Deposit Growth

Δln(Deposits)	(1)	(2)	(3)	(4)
WF County × Post	-0.0108***	-0.0108***	-0.0106***	-0.0104***
	(0.0017)	(0.0018)	(0.0017)	(0.0018)
WF County	0.0153***		0.0153***	
	(0.0014)		(0.0014)	
Post	0.0313***	0.0309***		
	(0.0009)	(0.0009)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	22,833	22,833	22,833	22,833
R^2	0.0422	0.1216	0.2914	0.3703

Panel B: Deposit Rate

Rate	(1)	(2)	(3)	(4)
WF County × Post	0.0641***	0.0642***	0.0588***	0.0570***
	(0.0196)	(0.0196)	(0.0195)	(0.0194)
WF County	0.0050		0.0048	
	(0.0074)		(0.0074)	
Post	0.6209***	0.6185***		
	(0.0114)	(0.0113)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	22,833	22,833	22,833	22,833
R^2	0.1689	0.2917	0.5877	0.7086

Notes: This table presents the relation between deposit activity in counties with a Wells Fargo around the Wells Fargo Active Enforcement. The table presents the results from estimating following model: $Y_{c,t} = \beta_1 \mathbb{1}_{\text{WF County},c} \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is deposit growth in Panel A and deposit rate in Panel B, $\mathbb{1}_{\text{WF County}}$ is an indicator for whether the county had a Wells Fargo in 2017, and *Post* is an indicator for the post-enforcement period, after 2017. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across single-state banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The sample period is from 2012 through 2023. County clustered standard errors are reported in parentheses.

Table B.48: County Economic Activity around Wells Fargo Active Enforcement

Panel A: Small Business Lending

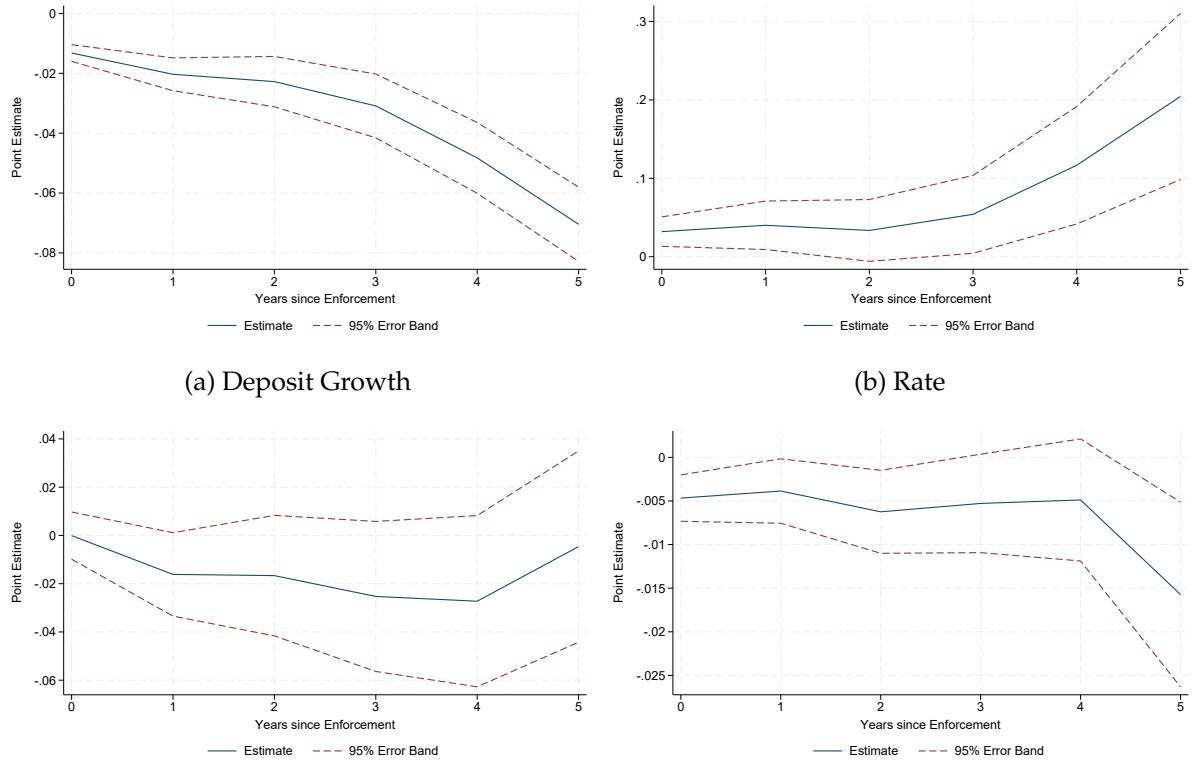
ln(SBL)	(1)	(2)	(3)	(4)
WF County × Post	-0.0877***	-0.0656***	-0.0872***	-0.0649***
	(0.0215)	(0.0141)	(0.0216)	(0.0141)
WF County	1.9952***		1.9950***	
	(0.0806)		(0.0806)	
Post	0.3675***	0.3337***		
	(0.0143)	(0.0102)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	22,833	22,833	22,833	22,833
R^2	0.2328	0.9723	0.2371	0.9763

Panel B: GDP Growth

Δln(GDP)	(1)	(2)	(3)	(4)
WF County × Post	-0.0042**	-0.0041**	-0.0043**	-0.0042**
	(0.0018)	(0.0019)	(0.0018)	(0.0019)
WF County	0.0115***		0.0115***	
	(0.0016)		(0.0016)	
Post	0.0072***	0.0073***		
	(0.0012)	(0.0013)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	22,833	22,833	22,833	22,833
R^2	0.0048	0.0989	0.0440	0.1380

Notes: This table presents the relation between log-small business lending, and GDP growth in counties with a Wells Fargo around the Wells Fargo Active Enforcement. The table presents the results from estimating following model: $Y_{c,t} = \beta_1 \mathbb{1}_{\text{WF County},c} \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is log-small business lending in Panel A and GDP growth in Panel B, $\mathbb{1}_{\text{WF County}}$ is an indicator for whether the county had a Wells Fargo in 2017, and *Post* is an indicator for the post-enforcement period, after 2017. The sample period is from 2012 through 2023. County clustered standard errors are reported in parentheses.

Figure B.18: Heterogeneous Dynamics in Response to Wells Fargo Active Enforcement: Jordà Linear Projections



(a) Deposit Growth

(b) Rate

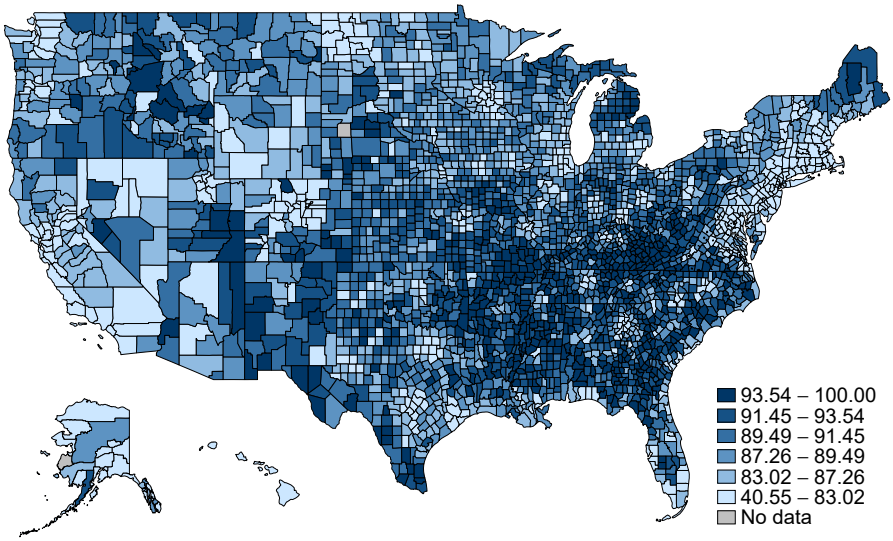
(c) Small Business Lending

(d) GDP Growth

Notes: The figure plots the coefficients and the associated 95% confidence intervals of the interaction term from the following **?** style projection regression: $Y_{f,t+h} - Y_{f,t} = \beta_1 \mathbb{1}_{\text{WF County},c} \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is deposit growth (Panel B.18a), deposit rate (Panel B.18b), log-small business lending (Panel B.18c), GDP growth (Panel B.18d), of county c in year t, and h denotes the steps (years) of the projection. The x-axis indicates the years since the shock. $\mathbb{1}_{\text{WF County}}$ is an indicator for whether the county had a Wells Fargo in 2017, and *Post* is an indicator for the post-enforcement period, after 2017. The sample period is from 2012 through 2023. The y-axis indicates the point estimate associated β_1 estimate. County clustered standard errors are reported in parentheses.

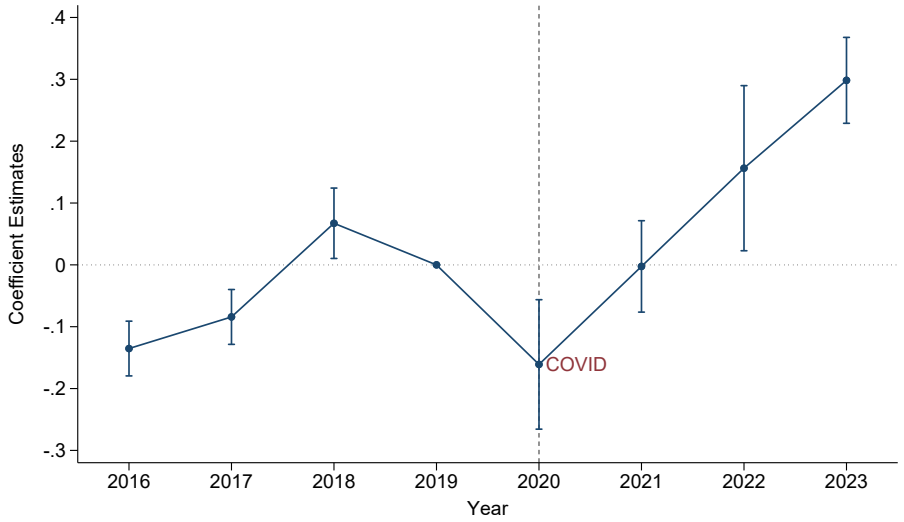
B.1 Case Study: COVID Household Stimulus

Figure B.19: Share of Eligible Households for Economic Impact Payments

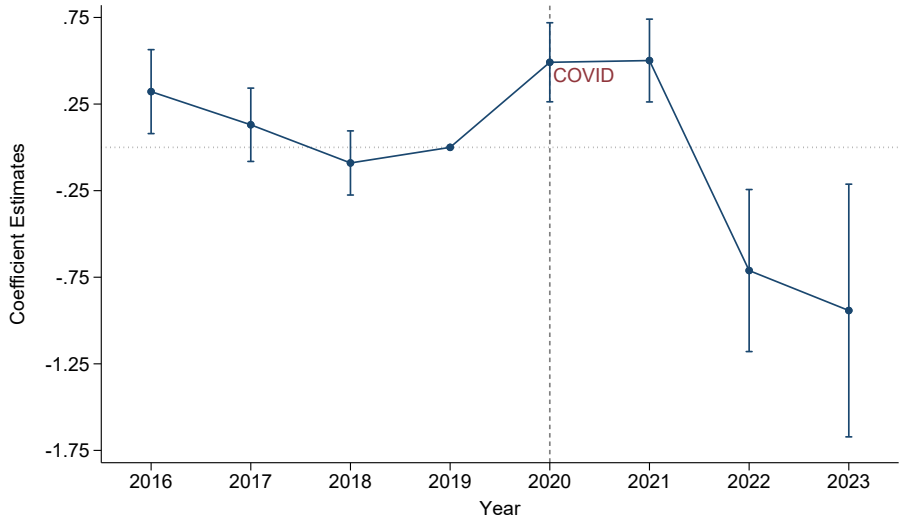


Notes: This figure presents a heatmap of the share of eligible households for economic impact payments. The eligible share is measured using the 2019 wave of the 5-year American Community Survey (ACS), administered by the US Census. The intensity of the blue shading represents the quantile range of the deposit rate.

Figure B.20: County Deposit Growth and Deposit Rate around COVID Stimulus



(a) Deposit Growth



(b) Rate

Notes: The figure presents the trend in county deposit growth and deposit rate for counties with a higher eligible share for the Economic Impact Program. The regression specification is the following $Y_{c,t} = \sum_{\substack{k=-4 \\ k\neq -1}}^{3} \beta_k \cdot \text{Eligible Share} \times \mathbb{1}_{t=k+2020} + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is the deposit growth (Δ ln(Deposits)) in Panel B.17a and the deposit rate (Rate) in Panel B.17b, Eligible Share is county's share of households that are eligible for economic impact payments. The eligible share is measured using the 2019 wave of the 5-year American Community Survey (ACS), administered by the US Census. The deposit rate is the rate on the 12-month certificate of deposit of at least $10,000. Using the deposit rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. Then, the average deposit rate across single-state banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The sample period is from 2016 through 2023.

Table B.49: County Deposit Activity around COVID Stimulus

Panel A: Deposit Growth

Δln(Deposits)	(1)	(2)	(3)	(4)
Eligible Share × Post	0.1009***	0.0962***	0.0984***	0.0930***
	(0.0130)	(0.0130)	(0.0129)	(0.0130)
Eligible Share	-0.1222***		-0.1222***	
	(0.0102)		(0.0102)	
Post	-0.0459***	-0.0417***		
	(0.0113)	(0.0114)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	14,970	14,970	14,970	14,970
R^2	0.0771	0.1667	0.3462	0.4353

Panel B: Deposit Rate

Rate	(1)	(2)	(3)	(4)
Eligible Share × Post	-0.2793**	-0.2915**	-0.2533*	-0.2474*
	(0.1357)	(0.1353)	(0.1353)	(0.1343)
Eligible Share	-0.3302***		-0.3197***	
	(0.0974)		(0.0972)	
Post	0.5768***	0.5827***		
	(0.1217)	(0.1217)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	14,970	14,970	14,970	14,970
R^2	0.0365	0.2052	0.5500	0.7156

Notes: This table presents the relation between county deposit activity around the COVID stimulus. The table presents the results from estimating following model: $Y_{c,t} = \beta_1 \text{Eligible Share}_c \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is deposit growth in Panel A and deposit rate in Panel B, Eligible Share is county's share of households that are eligible for economic impact payments, and Post is an indicator for the post-COVID period, after 2019. The eligible share is measured using the 2019 wave of the 5-year American Community Survey (ACS), administered by the US Census. The deposit rate is the rate on 12-month certificates of deposit of at least $10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank × county × month-year level. Then, the average deposit rate across single-state banks for each county in each month is computed. The annual county deposit rate is the county deposit rate in the last reporting month of each year. The sample period is from 2016 through 2023. County clustered standard errors are reported in parentheses.

Table B.50: County Economic Activity around COVID Stimulus

Panel A: Small Business Lending

ln(SBL)	(1)	(2)	(3)	(4)
Eligible Share × Post	0.4145***	0.3074***	0.4064***	0.2985***
	(0.1196)	(0.0683)	(0.1191)	(0.0682)
Eligible Share	-16.4287***		-16.4267***	
	(0.5395)		(0.5396)	
Post	-0.0737	0.0130		
	(0.1029)	(0.0572)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	14,970	14,970	14,970	14,970
R^2	0.3969	0.9785	0.4003	0.9821

Panel B: GDP Growth

Δln(GDP)	(1)	(2)	(3)	(4)
Eligible Share × Post	0.0838***	0.0811***	0.0841***	0.0821***
	(0.0103)	(0.0104)	(0.0103)	(0.0104)
Eligible Share	-0.1142***		-0.1139***	
	(0.0090)		(0.0090)	
Post	-0.0638***	-0.0616***		
	(0.0087)	(0.0087)		
County FIPS FE		✓		✓
Year FE			✓	✓
N	14,970	14,970	14,970	14,970
R^2	0.0113	0.1265	0.0787	0.1937

Notes: This table presents the relation between county small business lending and GDP growth around the COVID stimulus. The table presents the results from estimating following model: $Y_{c,t} = \beta_1 \text{Eligible Share}_c \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is log-small business lending in Panel A and GDP growth in Panel B, Eligible Share is county's share of households that are eligible for economic impact payments, and Post is an indicator for the post-COVID period, after 2019. The eligible share is measured using the 2019 wave of the 5-year American Community Survey (ACS), administered by the US Census. The sample period is from 2012 through 2023. County clustered standard errors are reported in parentheses.

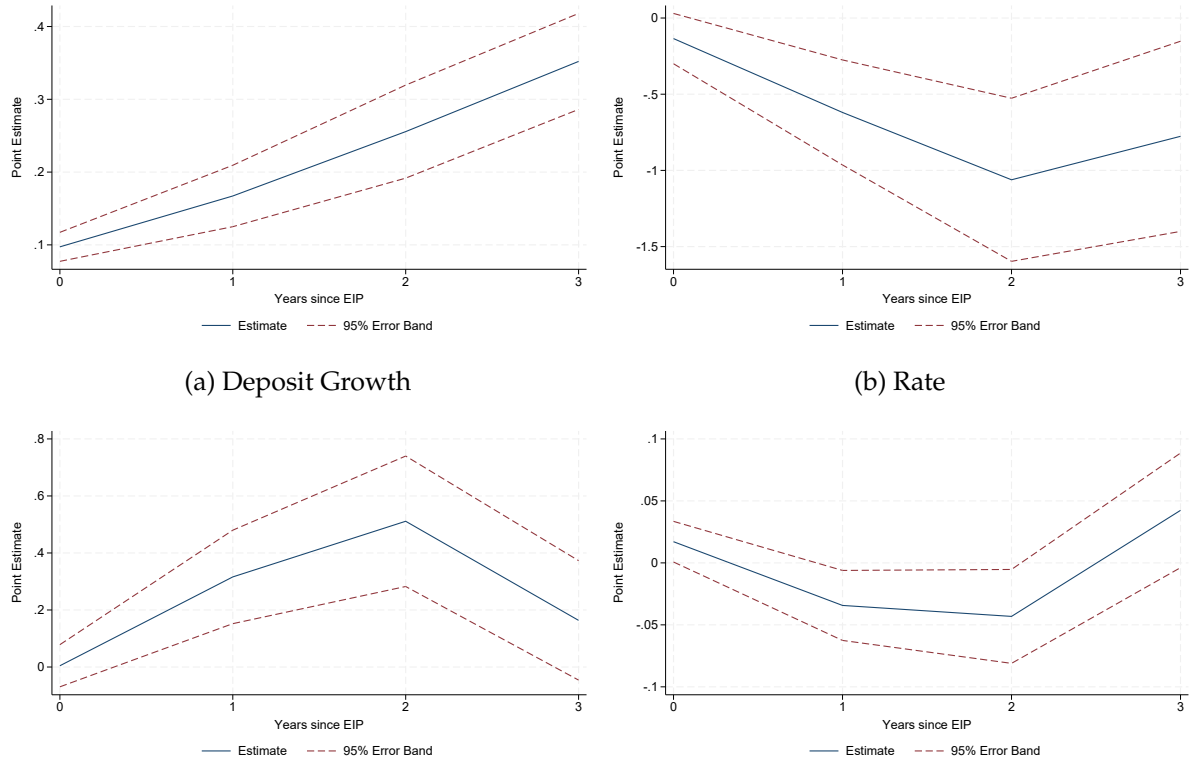
Thus far, the analysis has employed a reduced-form instrumental variable design, using the share of the population eligible for economic impact payments as a proxy for receiving these payments. This is effectively an intention-to-treat (ITT) analysis. However, as with any ITT analysis, there may be concerns that other systematic factors could create a gap between the share of eligible households and the share of households that ultimately received the stimulus. To address these concerns, I directly examine the effect of the total amount of EIP payments in Round 1. I focus on Round 1 because it preceded the PPP program and was unanticipated in its timing and unprecedented in its scope. A limitation of this analysis, however, is that the total amount of EIP payments is available only at the state level, which limits statistical power. Despite this limitation, the findings are revealing and corroborate the county-level analysis.

Table B.51: State Economic Activity and COVID Stimulus

	(1)	(2)	(3)	(4)
	Δ ln(Deposits)	Rate	ln(SBL)	Δ ln(GDP)
ln(EIP)	0.0214*	-0.0152	0.9969***	0.0074***
	(0.0125)	(0.0110)	(0.0345)	(0.0022)
Constant	-0.1613	0.5365***	0.4923	-0.0574*
	(0.1935)	(0.1674)	(0.5308)	(0.0329)
N	51	51	51	51
R^2	0.0184	0.0453	0.9540	0.1533

Notes: This table presents the relation between the total amount of household stimulus and deposit and economic activity at the state-level in 2020. The independent variable of interest is the log-amount of economic impact payments. The table presents the results from estimating following cross-sectional regression in 2020: $Y_s = \alpha + \beta ln(\text{EIP})_s + \epsilon s$ where Y is deposit growth (Δln(Deposits)) in column (1), deposit rate in column (2), log-small business lending (ln(SBL)) in column (3), and GDP growth (Δln(GDP)) in column (4), ln(EIP) is the log-amount of economic impact payments. The deposit rate is the rate on 12-month certificates of deposit of at least \$10,000. Using the deposits rate data from RateWatch, we construct a panel at the bank $\times$ county $\times$ month-year level. The average deposit rate across banks for each county in each month is computed. The state deposit rate is then constructed as the average of the county deposit rate for each state in the last reporting month of each quarter. Heteroskedacticity-robust standard errors are reported in parentheses.

Figure B.21: Heterogeneous Dynamics in Response to COVID Stimulus: Jordà Linear Projections



(a) Deposit Growth

(b) Rate

(c) Small Business Lending

(d) GDP Growth

Notes: The figure plots the coefficients and the associated 95% confidence intervals of the interaction term from the following **?** style projection regression: $Y_{f,t+h} - Y_{f,t} = \beta_1 \text{Eligible Share}_c \times Post_t + \alpha_c + \alpha_t + \epsilon_{c,t}$ where Y is deposit growth (Panel B.21a), deposit rate (Panel B.21b), log-small business lending (Panel B.21c), GDP growth (Panel B.21d), of county c in year t, and h denotes the steps (years) of the projection. Eligible Share is county's share of households that are eligible for economic impact payments, and Post is an indicator for the post-COVID period, after 2019. The eligible share is measured using the 2019 wave of the 5-year American Community Survey (ACS), administered by the US Census. The sample period is from 2012 through 2023. The x-axis indicates the years since the shock. The y-axis indicates the point estimate associated β_1 estimate. County clustered standard errors are reported in parentheses.