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Deposit Competition and Mortgage Securitization

We study how deposit competition affects a bank's decision to securitize mortgages. Exploiting the state-specific removal of deposit market caps across the U.S. as a source of competition, we find a 7.1 percentage point increase in the probability that banks securitize mortgage loans. This result is driven by an 11 basis point increase in deposit costs and corresponding reductions in banks' deposit holdings. Our results are strongest among banks that rely more on deposit funding. These findings highlight a hitherto undocumented and unintended regulatory cause that motivates banks to adopt the originate-to-distribute model.

JEL codes: G21, G28, K21
Keywords: originate-to-distribute, securitization, deposits, competition

We investigate the importance of competition in deposit markets for banks' propensity to securitize mortgage loans. A bank can fund a loan using deposits or, alternatively, through securitization, with funds from capital markets. Although many financial assets have been securitized in recent years, deposits continue to finance between 25% and 70% of loan amounts across consumer lending

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markets (Gorton and Metrick 2013). Despite the significance of deposits for funding bank lending, there is little understanding of the role that deposit market competition plays in motivating banks to securitize loans. Prior studies offer numerous explanations for the growth in securitization (Loutskina and Strahan 2009, Keys et al. 2010, Loutskina 2011, Keys, Seru, and Vig 2012, Ghent and Valkanov 2016, McGowan and Nguyen 2023). We contribute to this literature by showing that deposit market competition plays a significant and hitherto undocumented role for banks' incentives to securitize mortgages.

To illustrate the role of deposit competition for securitization, we isolate a factor that intensifies deposit competition within a market via an exogenous regulatory change in the 1990s and early 2000s: the removal of deposit concentration limits as part of the Interstate Banking and Branching Efficiency Act of 1994 (IBBEA). This law enabled individual states in the United States to relax a cap that prevents interstate bank mergers where the target institution holds at least 30% of statewide deposits. Removing the deposit cap lowers entry barriers for out-of-state (multistate) banks. This change harms incumbent single-state banks because they must now compete for deposits with multistate entrants. In contrast, deregulation benefits multistate banks as they have access to a new deposit source upon entering a new state.

Intensifying deposit market competition may provoke an increase in securitization by single-state banks through two channels. First, as the aggregate quantity of deposits in a market is fixed at a given point in time, when multistate banks enter a new state, they capture deposit market share from incumbent single-state banks. This reduces incumbents' deposit holdings and limits their ability to finance lending using deposits. Securitization offers an alternative source of funding that allows incumbents to maintain credit supply (Han, Park, and Pennacchi 2015, Drechsler, Savov, and Schnabl 2017). Second, in markets featuring tough deposit competition, the opportunity cost of using deposits to finance lending is high because incumbents must set higher equilibrium deposit rates to prevent a drain of liquidity. Securitization therefore provides a bank with a cheaper funding source because securitized loans do not appear on the bank's balance sheet, and also allows it to avoid issuing relatively expensive equity to comply with capital regulations (Pennacchi 1988, Gorton and Pennacchi 1995).

Our results highlight two key issues. First, the removal of limits on deposit market caps triggers statistically and economically significant increases in single-state banks' funding costs and corresponding reductions in deposits. Second, this shortage of deposit funding motivates banks to significantly increase securitization of mortgages. Using bank-level data, we document a 7.1 percentage point (pp) increase in the probability that a bank securitizes mortgage loans after deposit market caps are removed. Tests that exploit mortgage loan-level data provide corroborating evidence that deposit competition significantly raises the odds that a bank securitizes a mortgage loan.

Further analyses reveal heterogeneity in the data. Banks that rely more heavily on deposits to finance lending, and are thus exposed to a greater competitive shock, are significantly more likely to turn to securitization in the face of tougher deposit

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competition. Moreover, we find that single-state banks experience an 11 basis point increase in average deposit costs and their branches lose 10% of their deposit holdings. In contrast, there is no significant change in multistate banks' deposit costs, and unlike single-state banks, they exhibit no significant change in the probability of securitizing mortgages. Our findings are also externally valid: we obtain similar results using alternative measures of deposit market competition during the period 2010 to 2019.

We rule out that our results are driven by confounding events and measurement issues. Placebo tests indicate that securitization activities in nonbanks that operate in the same lending environment as banks, but do not rely on deposits to finance loans, do not respond to the removal of deposit market caps. Similarly, there is no change in securitization status among banks in contiguous states that experience no change in deposit competition. Further sensitivity checks confirm that regulatory reforms implemented through the Gramm-Leach-Bliley Act of 1999 (GLBA), Basel II requirements, intrastate branching deregulation, and adjustments in supervisory authorities' regulatory intensity do not affect our inferences. The results are also robust to shocks to monetary policy and deposit market concentration (Drechsler, Savov, and Schnabl 2017,,2020), borrower quality, house prices, and shifting demand patterns among mortgage-backed securities' investors. A final set of checks demonstrates that the documented contraction in deposit supply does not arise from alternative demand or supply shocks.

Our results are important for three reasons. First, we offer novel evidence of an unintended regulatory factor that motivates banks to move away from the originate-to-hold to the originate-to-distribute (OTD) model. Theories predict that securitization distorts lenders' monitoring incentives because banks have less skin in the game relative to holding loans on their balance sheets (Gorton and Pennacchi 1995, Parlour and Winton 2013). At the same time, securitization can provide cheap funding sources for banks when they are in need of liquidity (Loutskina 2011). To mitigate the adverse effects and promote the benefits of securitization activities, one has to understand the incentives that motivate banks to opt for the OTD model in the first place.

Second, policymakers and the media have long argued that the origins of the securitization boom and the subsequent financial crisis are rooted in regulatory changes. For example, by repealing restrictions on the separation of retail and investment banking, the GLBA triggered an increase in bank risk taking. Various other statutory changes, including the partial repeal of the Glass-Steagall Act in 1999, the enactment of the Commodity Futures Modernization Act of 2000, and the American Dream Downpayment Act of 2003, created arbitrage conditions in favor of subprime mortgages and potentially encouraged securitization activities by banks and financial companies (Blundell-Wignall, Atkinson, and Lee 2009).[1] We show that the removal of deposit market caps as part of the deregulation of state banking markets via the IBBEA increased banks' securitization activities.

1. While these deregulation episodes likely contributed to developments within securitization markets, they are federal in nature and therefore do not confound our estimates.

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Third, unlike prior work that focuses on large multistate banks (Rice and Strahan 2010, Favara and Imbs 2015), we highlight a missing piece of the puzzle on the role of deposit market cap deregulation in affecting small local banks that play a crucial role in funding households and small businesses.

This paper relates to several strands of literature. One area of research examines the rise and fall of securitization around the financial crisis. These studies mainly consider demand-side explanations for the pre-2007 securitization boom. A common theme running through these papers is the view that investors neglected the risk of nationwide house price downturns and the belief that diversified exposures to residential mortgages were almost riskless (Gerardi, Lehnert, and Sherlund 2008, Gennaioli, Shleifer, and Vishny 2012, Chernenko, Hanson, and Sunderam 2016). This fueled demand and inflated credit ratings for mortgage-backed securities. Other contributions focus on regulatory arbitrage and rating bias (Griffin and Tang 2012). Unlike these studies, our paper offers new insights into supply-side forces. To this extent, we complement the supply-side mechanism documented by Drechsler, Savov, and Schnabl (2020). They show that monetary tightening between 2003 and 2006 provoked a shift toward nonagency lending by nonbank institutions. In contrast to their work, we find an increase in banks' securitization activity that predates the monetary tightening episode, in line with the upward trend in securitization from the mid-1990s shown in Figure 1 when deposit market competition began to intensify.[2]

Another strand of literature documents how advancements in securitization have changed the nature of banking. Loutskina (2011) reports links between credit supply and the liquidity of bank loans. By providing a new source of funds, securitization reduces the sensitivity of banks' willingness to supply credit to the availability of deposits and liquid funds. Further studies by Loutskina and Strahan (2009), Mian and Sufi (2009), Demyanyk and Van Hemert (2011), and Keys, Seru, and Vig (2012) evaluate how securitization affects loan origination decisions.

Our paper differs from this literature by focusing on banks' incentives to securitize loans. Closest to our research are the contributions by Han, Park, and Pennacchi (2015) and McGowan and Nguyen (2022). The former develop a model showing that deposit competition increases the attractiveness of loan sales and support their predictions with empirical evidence that securitization is more likely in high-tax environments. The latter show that lenders use securitization to mitigate credit risk when constraints prevent pricing credit risk into mortgage contracts. A unique contribution of our work is to shed new light on the question of why mortgage securitization accelerated in the late 1990s by establishing a link between the relaxation of deposit market caps, deposit supply, and an increase in securitization.

Moreover, this paper speaks to the literature on deposit competition. Since deposits account for the majority of U.S. banks' funding, changes in deposit competition directly influence banks' funding models (Pennacchi 1988, Gorton and Pennacchi 1995), risk taking (Hellmann, Murdock, and Stiglitz 2000, Allen and Gale

2. Robustness checks show that our findings are not driven by the period of monetary tightening from 2003.

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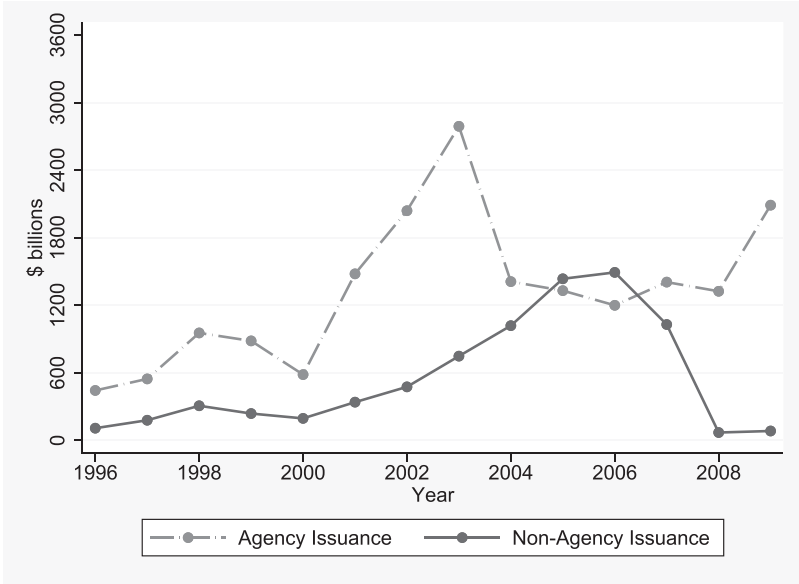

Fig 1. Quarterly Issuance of Agency and Nonagency Securitizations.

NOTES: This figure shows the semiannual issuance of agency and nonagency mortgage-related securities between 1996 and 2008. Agency mortgage-related securities are issued by Government Sponsored Enterprises (GSEs). Nonagency mortgage-related securities are issued by private entities. The data source is the Securities Industry and Financial Markets Association (SIFMA). The *y*-axis measures securitization in billions of U.S.$.

2004, Egan, Hortaçsu, and Matvos 2017), and credit supply (Arping 2017). Drechsler, Savov, and Schnabl (2017) show that deposit competition influences the transmission of monetary policy through bank balance sheets. Li, Loutskina, and Strahan (2019) find that banks operating in more concentrated deposit markets are able to extend longer maturity loans. Our findings complement this literature by showing that the effect of deposit competition goes beyond credit supply, and motivates banks to change their business model by moving from the originate-to-hold to the OTD model.

Our research also offers new insights into the effects of deregulating banking markets. Berger et al. (2022) find that deregulation raises banks' cost of capital. Several studies link deregulation to improvements in bank performance (Jayaratne and Strahan 1998, Stiroh and Strahan 2003, Jiang, Levine, and Lin 2016) and stability (Goetz 2018). Keil and Müller (2020) show that out-of-state banks' deposit market share increases from 2.5% in 1994 to 45.8% in 2011 after the removal of interstate branching restrictions. We extend this literature and shed light on a largely unexplored dimension of deregulation by illustrating how it incentivizes banks to change business models.

Finally, our study informs policymakers about the substitution effect between traditional deposit taking and nontraditional securitization activities beyond the U.S.

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For example, the 2020 EU Securitization Regulation applies across 19 EU member states and introduces a framework for simple, transparent, and standardized synthetic securitization activities for EU banks. This raises the possibility that banks may move toward an OTD model when they face competition in deposit markets.

1. CONCEPTUAL FRAMEWORK

The removal of state-level deposit market caps has implications for banks' ability to source deposits and the cost of funds. The mechanism that operates via banks' funding costs may also have consequences for the likelihood that banks engage in securitization activities and for bank lending.

A key feature of this specific type of deregulation is its differential effect on single-state incumbent banks and out-of-state multimarket banks. Removing deposit market caps provides opportunities for multimarket banks to increase their geographic reach by expanding into new states to enlarge their deposit sources and lending activity. However, this adversely affects single-state banks that traditionally depend on lending and deposit taking in geographically delimited markets. While single-state banks were previously shielded from out-of-state competition, they must now compete for core deposit funding sources to not only sustain current but also future lending activities. Deregulation therefore disadvantages single-state banks and hands a competitive advantage to multimarket entrants.

Evidence shows that following the removal of deposit market caps, the equilibrium number of banks competing in deregulated markets increases as multistate banks enter and capture deposit market share (Keil and Müller 2020). This leads to higher demand for inelastically supplied deposits within the state. Faced with a drain of liquidity that could ultimately provoke liquidation of loans and assets, single-state banks set higher equilibrium deposit rates to retain deposits, leading to narrower net interest margins and lower profits.

Against a background of rising deposit costs, contracting profits, and reallocations of deposit market shares that potentially undermine lending, single-state banks have incentives to look for ways to lower the cost of funding. A plausible strategy, documented by Pennacchi (1988), Gorton and Pennacchi (1995), Loutskina and Strahan (2009), and Han, Park, and Pennacchi (2015), is to fund loans through securitization rather than using deposits. The funds acquired through loan sales do not appear as costly deposits on the balance sheet. A further benefit of securitization is that banks do not need to issue expensive equity to meet capital adequacy requirements or hold interest-bearing liabilities against these funds.

The effect of lifting the deposit market cap on lending is ambiguous. Single-state banks may reduce credit supply if they cannot compensate for the funding shortfall triggered by the erosion of their deposit base either through securitization or obtaining other funding sources to support lending. However, where single-state banks can secure sufficient funding via securitization, they may sustain current lending levels. In this case, a single-state bank continues to supply the same amount

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of credit but pivots from funding loans through deposits to securitization. Prior work by Jayaratne and Strahan (1996) shows that bank branching deregulation did not increase the amount of bank lending, but instead only improved the quality of lending.

2. DATA

We obtain quarterly bank-level data for commercial and savings banks in the U.S. from their consolidated reports on Condition and Income (Call Reports) for the period between 1994Q1 to 2006Q4. The Call Reports provide information on bank balance sheet items, income, and expenses. The Call Reports also provide us with information about bank size (total assets), equity capital ratios, return on assets (ROAs), and information we use to calculate the Z-score, an accounting-based measure of the distance to default.[3] To ensure that the data set only contains viable commercial and savings banks, we exclude banks with no deposits, no loans, and zero or negative equity capital in the current or previous year. This results in a sample of 438,212 bank-quarter observations for 14,574 banks. Given that we are interested in how incumbent banks respond to deposit competition, the sample for single-state banks contains 433,809 bank-quarter observations for 13,011 banks.[4]

To classify whether a bank securitizes mortgage loans, we generate an OTD dummy variable that equals 1 if a bank reports that it sells mortgage loans during the quarter or if it receives mortgage servicing fees, 0 otherwise. Table 1 lists the Call Report items we use to establish whether a bank securitizes mortgages. We also complement our OTD measure by merging information on mortgage securitization from the HMDA database. If any of these items from Call Reports have a nonzero value, or if any bank in our sample reports a securitization of their mortgages in HMDA data, the bank sells mortgage loans, and we code the OTD indicator 1.[5]

The IBBEA sets a deposit market cap that prevents interstate mergers where the target holds at least 30% of statewide deposits. However, the law grants states authority to set a higher threshold or remove the cap entirely, thereby reducing entry barriers for multistate banks and intensifying deposit market. To capture deposit competition, we exploit state-level removal of the 30% deposit cap. We retrieve quarterly information on the statewide deposit cap limit from Rice and Strahan (2010) and generate a dummy variable, DC_{st}, which equals 1 if state s has a deposit cap limit above the 30% ratio, 0 otherwise.

3. The Z-score is calculated at an annual frequency using the equation: $Z_{bt} = (ROA_{bt} + ETA_{bt})/ROASD_{bt}$ where ROA_{bt}, ETA_{bt}, and $ROASD_b$ are ROAs, the ratio of equity to total assets, and the standard deviation of returns on assets over the 3 year rolling window for bank b, respectively.

4. Mergers and acquisitions (M&A) are treated in the standard way in the literature. We artificially create a new identification number for the new bank after the M&A that is independent from the two banks that entered the M&A transaction.

5. Call Reports document the total bank-level value of securitization during a quarter. It is not possible to disentangle the value into securitization of loans during the quarter and previously originated loans.

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TABLE 1

VARIABLE DESCRIPTIONS

Variable	Description	Source
Financial institution-level data		
OTD	A dummy variable equal to 1 if a bank reports any mortgage securitization in its quarterly Call Report or HMDA data, 0 otherwise. Specifically, if any of the Call Report items RCFD3164, RCFDB705, RCFDB706, RIADB493, RCFD3431, RCFD5500, RCFD5501, RCFD5502, RCFD5503, RCFD5504, RCFD5505, RCFD5371, RCFDB804, RCFDB805, RCFDA590, RCFDA591, RCFDB705, RCFDB706, RCFDB776, RCFDB777, RCFDA590, and RCFDA591 are nonzero, or if the bank reports mortgage loans securitization in the HMDA database.	FFIEC 031 Call Report & HMDA
Loan growth	The quarterly growth rate of total outstanding loans	
Bank size	Natural logarithm of a bank's total assets	FFIEC 031 Call Report
ROA (%)	Ratio of profits to total assets	FFIEC 031 Call Report
Capital ratio (%)	Ratio of bank equity capital to total assets	FFIEC 031 Call Report
Z-score (Ln)	The logarithm of the Z-score	FFIEC 031 Call Report and authors' calculation
High deposit share	A dummy that equals 1 if the ratio of deposits over total assets of a bank before the state removal of deposit caps is above the median, 0 otherwise	FFIEC 031 Call Report
High wholesale share	A dummy that equals 1 if the ratio of wholesale funding over total assets of a bank before the state removal of deposit caps is above the median, 0 otherwise	FFIEC 031 Call Report
High loans-to-deposits	A dummy that equals 1 if the ratio of loans over total deposits of a bank before the state removal of deposit caps is above the median, 0 otherwise	FFIEC 031 Call Report
High capital	A dummy that equals 1 if the equity over total asset ratio of a bank before the state removal of deposit caps is above the median, 0 otherwise	FFIEC 031 Call Report
Larger bank	A dummy that equals 1 if total assets of a bank before the state removal of deposit caps is above the median, 0 otherwise	FFIEC 031 Call Report
Bank-HHI	The weighted average of branch-HHIs across all of its branches	FDIC SoD and Authors' Calculation
Mortgage volume	The natural logarithm of total mortgages that a bank originates in a year	HMDA

(*Continued*)

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TABLE 1

(CONTINUED)

Variable	Description	Source
Mortgage growth	The annual growth rate of mortgage amount that a bank originates	HMDA
Mortgage applications (Ln)	The natural logarithm of total number of mortgage applications that a bank receives in a year	HMDA
Single state bank	Dummy variable that equals 1 if a bank operates in one state only, 0 otherwise	FFIEC 031 Call Report
NII (%)	Net interest income margin	FFIEC 031 Call Report
Securitization of nonbanks	Ratio of securitized mortgages to total originated mortgages by a nonbank	HMDA
Loan-level data		
Securitization	A dummy variable that equals 1 if a mortgage loan is securitized, 0 otherwise	HMDA
Female	A dummy variable that equals 1 if the mortgage applicant is female, 0 otherwise	HMDA
LTI Ratio	The loan-to-income ratio of a mortgage loan	HMDA
Accept	A dummy variable that equals 1 if the mortgage is accepted, 0 otherwise	HMDA
Mortgage amount (Ln)	The natural logarithm of mortgage amount	HMDA
Year level data		
Fed rates (%)	The annual effective Fed funds rate	NY Fed
Branch-level data		
Average Deposit Rate (%)	Quarterly average interest rate that a branch pays for its depositors for three main savings products including Certificate of Deposits 12 months, Money Markets 25k, and Interest Checking Accounts	RateWatch.com
CD12M Rate (%)	Quarterly average interest rate that a branch pays for its depositors for the savings product Certificate of Deposits 12 months	RateWatch.com
MM25K Rate (%)	Quarterly average interest rate that a branch pays for its depositors for the savings product Money Markets 25K	RateWatch.com
Deposit Growth (%)	The yearly growth rate in deposits of a branch	SoD
Branch HHI	A sum of squared deposit market shares for all bank branches operating in a given county	SoD and Authors' Calculation

(*Continued*)

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TABLE 1

(CONTINUED)

Variable	Description	Source
State-level data		
DC	Dummy variable that equals 1 if a state relaxes the deposit market cap for interstate mergers to above 30%, 0 otherwise	Rice and Strahan (2010)
BE index	Interstate branching expansion Index	Rice and Strahan (2010)
De novo branching	Dummy variable that equals 1 if the host state allows de novo branching, 0 otherwise	Rice and Strahan (2010)
Branching acquisition	Dummy variable that equals 1 if the host state allows acquisition of an existing local branch, 0 otherwise	Rice and Strahan (2010)
Age limit	Dummy variable that equals 1 if the host state allows the age of a bank prior to its acquisition in an interstate bank merger of less than 5 years, 0 otherwise	Rice and Strahan (2010)
Time since intrastate deregulation	The number of quarters since a state-liberalized intrastate deregulation.	Jayaratne and Strahan (1996)
HPI	Average quarterly state-level rate of change in house prices	FHFA
Mortgage applications (ln)	The natural logarithm of the total number of mortgage applications that all banks in a state receive in a year	HMDA
Jumbo share (%)	Ratio of jumbo loans originated to total originated loans	HMDA
LTI ratio	Average loan-to-income ratio of mortgage loans originated	HMDA
Denial (debt-to-income)	Average denial rates of mortgage loans in a state	HMDA
Denial (employment history)	Average denial rates of mortgage loans due to employment reasons in a state	HMDA
Denial (collateral)	Average denial rates of mortgage loans due to collateral in a state	HMDA
Denial (insufficient cash)	Average denial rates of mortgage loans due to insufficient cash in a state	HMDA
Denial (missing information)	Average denial rates of mortgage loans due to missing information in a state	HMDA
Acceptance Rate	Average acceptance rates of mortgage loans in a state	HMDA
Third Party Purchases	The ratio of mortgage loans purchased by a third party in a state over total originated mortgages	HMDA

(*Continued*)

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TABLE 1

(CONTINUED)

Variable	Description	Source
GSE Purchases	The ratio of mortgage loans purchased by a GSE in a state over total originated mortgages	HMDA
Private Purchases	The ratio of mortgage loans purchased by a non-GSE in a state over total originated mortgages	HMDA
Refinancing	The ratio of mortgage refinancing applications to total applications in a state	HMDA
Homestead exemptions (Ln)	The natural logarithm of the amount of home equity that homeowners in a state are entitled to retain in the bankruptcy proceedings	Corradin et al. (2016)
Renegotiation rate (%)	The percentage of mortgages that default and successfully renegotiate terms with the mortgage service	Fannie Mae Single Family Loan
State corporate tax (%)	The state corporate income tax rate where the loan is originated	Tax Foundation
County-level data		
Unemployment rate (%)	The unemployment rate in the county where the bank is located	U.S. Census
Poverty rate (%)	The percentage of people who live under the poverty threshold in a county	U.S. Census
Net job creation rate (%)	The net job creation rate in the county where the bank is located	U.S. Census
Population growth (%)	The growth rate of population in a county	U.S. Census
Senior population (%)	The percentage of people who are 65 years old and above in a county	U.S. Census
Relocation rate (%)	The percentage of people who relocate over total population in a county	U.S. Census
Mortgage Default (%)	Average mortgage default rates of mortgage loans in a county	HUD
County-HHI	An average of all bank HHIs operating in the county	SoD and Authors' Calculation

NOTE: This table defines each variable in the data set and the data source. FFIEC 031 Call Report denotes the Federal Financial Institutions Examination Council 031 consolidated reports of condition and income database. "Chicago Fed" denotes the Federal Reserve Bank of Chicago. "FDIC" denotes the Federal Deposit Insurance Corporation. "SoD" denotes the Summary of Deposits database. "HMDA" denotes the Home Mortgage Disclosure Act database. "HUD" denotes the US Department of Housing and Urban Development. "FHFA" denotes the Federal Housing Finance Agency. "NY Fed" denotes the Federal Reserve Bank of New York.

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Ratewatch.com provides monthly, bank branch-level information from 1997 on the interest rate paid on each deposit product. Using this data, we follow Drechsler, Savov, and Schnabl (2017) and construct the quarterly average interest rate paid on (1) all main deposit products (i.e., 12 month certificates of deposit products [CD], money market 25k funds [MM], and interest checking accounts), (2) 12 month CD, and (3) MM 25k funds.[6] We also collect annual branch-level deposit data from the FDIC Summary of Deposits (SoD). This source allows us to measure each branch's total deposit holdings, deposit growth rate, and construct the deposit concentration Herfindahl–Hirshman index (HHI) at the branch, bank, and county levels.

We complement the bank-level securitization tests using loan-level data between 1994 and 2006 from the Home Mortgage Disclosure Act (HMDA) database. This data set contains approximately 95% of all mortgage loan applications. For each loan, we observe whether the loan is originated, the census tract where the property is located, the lender, various borrower, and loan characteristics, whether the loan is eligible for sale to a Government Sponsored Entity (GSE), and whether the loan is securitized or remains on the lender's balance sheet. Using this information, we construct a dummy variable that equals 1 if a loan is securitized, 0 otherwise; a dummy variable that equals 1 if the borrower is female, 0 otherwise; and, to measure risk, the loan-to-income (LTI) ratio.

We restrict the sample to observations of loans originated by banks (deposit-taking institutions). Moreover, to ensure a homogeneous unit of observation, we restrict the sample to observations of first-lien loans originated by single-state banks for home purchases. This provides a sample containing approximately 4.6 million observations.

Table 1 describes each variable in the data set. Table 2 tabulates summary statistics. Between 1994Q1 and 2006Q4, 28% banks in our sample operate an OTD model and the average bank pays an interest rate of 2.06% on its deposits.

3. INSTITUTIONAL BACKGROUND AND EMPIRICAL STRATEGY

Historically, U.S. banks were prohibited from branching both within and across state lines. These restrictions protected banks from entry on the grounds that allowing banks to expand freely could damage financial stability, and adversely affect economic development. Beginning in the 1970s with developments in communications technology and the invention of automatic teller machines, the geographical boundary between banks and customers weakened as states removed intrastate entry barriers between 1970 and 1994 (Kroszner and Strahan 1999).

Lawmakers passed the IBBEA of 1994 to allow interstate branching (Kroszner and Strahan 1999). While the legislation applies to all states, it granted state authorities

6. We focus on these products because Drechsler, Savov, and Schnabl (2017) show they account for the majority of deposits held by most banks. They are therefore representative of the average cost of deposits that a bank faces. We use quarterly rather than monthly data to mirror the frequency of the bank-level information.

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TABLE 2

SUMMARY STATISTICS

Variable	Mean	Std. dev.	Min.	Max.	Observations
Bank-level data					
OTD	0.28	0.45	0	1	433,809
Loan growth	2.82	5.86	−9.02	26.86	433,809
Bank size	11.39	1.17	9.10	15.33	433,809
ROA (%)	0.66	0.5	−0.92	2.06	433,809
Capital ratio (%)	10.6	3.59	6.02	29.47	433,809
Z-score (Ln)	3.38	0.38	2.58	4.34	433,809
High deposit share	0.56	0.5	0	1	433,809
High wholesale share	0.42	0.49	0	1	433,809
High loans-to-deposits	0.29	0.46	0	1	433,809
High capital	0.53	0.5	0	1	433,809
Larger bank	0.3	0.46	0	1	433,809
Bank-HHI 1994-2006	0.21	0.11	0.03	0.57	433,809
Bank-HHI 2010-2019	0.22	0.11	0.03	0.57	209,919
Mortgage Amount (Ln)	8.15	1.86	3.81	12.49	8,842
Mortgage Growth (%)	27.04	85.61	−73.48	297.78	8,842
Mortgage applications (Ln)	3.98	1.82	0	13.07	10,657
NII (%)	2.5	1.15	0.53	5.61	433,809
Securitization rate of nonbanks	0.57	0.44	0	1	21,420
Loan-level data					
Accept	0.62	0.49	0	1	7,507,486
Securitization	0.71	0.45	0	1	4,631,398
Female	0.23	0.42	0	1	4,631,398
LTI Ratio	2	2.36	0	1316.09	4,631,398
Mortgage Amount (Ln)	4.68	0.79	0	11.49	4,631,398
Annual data					
Fed rate	3.91	1.69	1	6	433,809
Branch-level data					
Average Deposit Rate (%)	2.06	1.39	0.1	5.85	269,580
CD12M Rate (%)	3.44	1.49	0.1	5.85	260,566
MM25K Rate (%)	2.09	1.25	0.1	5.85	270,088
Deposit Growth (%)	11.06	22.31	−15.91	79.57	393,592
Branch HHI (1994 to 2006)	0.21	0.11	0.05	1	641,545
Branch HHI (2010 to 2019)	0.22	0.12	0.06	0.77	209,919
State-level data					
DC	0.52	0.5	0	1	433,809
BE index	1.14	1.36	0	4	433,809
De novo branching	0.23	0.42	0	1	433,809
Branching Acquisition	0.18	0.38	0	1	433,809
Age Limit	0.18	0.38	0	1	433,809
Time since intrastate deregulation	13.77	7.04	0	34	428,800
HPI	5.4	0.31	4.77	6.58	433,809
Jumbo shares (%)	0.05	0.05	0	0.45	433,809
LTI ratio	1.89	0.27	1.45	3.2	433,809
Denial (debt-to-income)	0.02	0.01	0.01	0.07	433,809
Denial (employment history)	0	0	0	0.03	433,809
Denial (collateral)	0.01	0	0	0.03	433,809
Denial (insufficient cash)	0	0	0	0.02	433,809
Denial (missing information)	0	0	0	0.01	433,809
Acceptance Rate	0.63	0.09	0.41	0.84	433,809
Third Party Purchases	0.48	0.08	0.17	0.77	433,809
GSE Purchases	0.31	0.08	0.09	0.52	433,809
Private Purchases	29.27	26.72	0	100	433,809
Refinance	0.45	0.15	0.09	0.8	433,809
Homestead exemtptions (Ln)	10.46	0.47	8.15	12.58	433,809
Renegotiation rates (%)	0.03	0.05	0	0.49	433,809
State corporate tax (%)	5.34	3.06	0	11.66	433,809
County-level data					
Unemployment Rate (%)	4.94	1.07	2	9.70	433,809

(*Continued*)

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TABLE 2
(CONTINUED)

Variable	Mean	Std. dev.	Min.	Max.	Observations
Poverty Rate (%)	12.29	3.19	4.5	25.7	433,809
Net Job Creation (%)	2.29	1.8	−1.98	6.81	433,809
Population Growth (%)	0.9	5.93	−94.39	1183.03	433,809
Senior Population (%)	14.38	4.08	2.5	37.85	433,809
Reallocation Rate (%)	26.61	3.02	20.63	34.55	433,809
Mortgage default (%)	1.43	0.51	0.2	3.61	433,809
County HHI (1994 to 2006)	0.20	0.09	0.05	1	33,127
County HHI (2010 to 2019)	0.23	0.08	0.1	0.57	209,919

NOTE: This table presents descriptive statistics for the variables used in the empirical analysis. In the Bank-, Branch-, and Loan-level data, we report descriptive statistics for only single-state banks given that our main analyses are based on single-state banks. Variable definitions and data sources are shown in Table 1. "Ln" denotes that a variable is measured in natural logarithms.

discretion to restrict mergers on the grounds of excess consolidation of deposit market shares. The IBBEA specifies a deposit cap limit of 30% of statewide deposits. This prevents multistate banks from acquiring a financial institution with at least 30% of statewide deposits, thereby constraining deposit competition. However, the law grants states authority to set the statewide deposit market cap. Setting a lower cap hinders entry by out-of-state banks, thereby limiting the contestability of markets and preserving within-state deposit competition (Johnson and Rice 2008). Online Appendix Table A.1 provides information on the timing of the removal of deposit market caps.

3.1 Identification Strategy

Our identification strategy exploits exogenous changes in deposit market caps across states and time. We use a difference-in-difference estimator that compares the evolution of mortgage securitization between banks in states that remove the deposit market cap versus similar institutions in other states that do not deregulate. We estimate

$$y_{bst} = \beta DC_{st} + \gamma X_{bst-1} + \delta_b + \delta_t + \varepsilon_{bst}, \tag{1}$$

where y_{bst} is a dependent variable (e.g., OTD status) for bank b in state s in quarter t; DC_{st} is a dummy variable equal to 1 if a state removes the 30% statewide deposit cap in favor of a higher limit, 0 otherwise; X_{bst} is a vector of control variables including the first lags of Bank Size, Capital ratio, ROA, Z-score, and the state house price index HPI; δ_b and δ_t are bank and quarter-year fixed effects, respectively; ε_{bst} is the error term. We cluster the standard errors at the state level. The bank and quarter-year fixed effects purge all bank-specific, time-invariant factors and time-varying shocks common to all banks (e.g., federal law changes, monetary policy, and macroeconomic fundamentals).

We use the same approach in the deposit cost tests with the exception that the dependent variable (interest rates paid on various deposit products) is measured at

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TABLE 3

EX-ANTE COMPARABILITY OF TREATMENT AND CONTROL GROUPS

	Treatment		Control		
Variable	Mean	σ	Mean	σ	ND
OTD	0.272	0.445	0.251	0.434	0.03
Deposit rate (%)	4.474	0.544	4.393	0.481	0.11
Deposit growth (%)	1.326	6.212	0.853	5.614	0.06
Loan growth (%)	2.554	5.576	2.733	6.088	−0.02
Bank size	11.318	1.240	10.986	1.173	0.19
ROA	0.646	0.500	0.706	0.482	−0.09
Capital ratio (%)	9.873	3.259	9.571	2.961	0.07
Z-score	3.315	0.375	3.251	0.377	0.12

NOTE: This table shows the mean pretreatment value of each variable within the treatment and control group. σ denotes the standard deviation of the mean. ND indicates the normalized difference between the treatment and control groups' mean values. Imbens and Wooldridge (2009) show that an absolute normalized difference smaller than 0.25 indicates that there is no significant difference between mean values.

the bank-branch-state-year level. In these tests, we use branch fixed effects and year fixed effects to rule out that our results are driven by other branch-specific time-invariant characteristics or any time-varying common economic factors that affect all branches simultaneously.

Difference-in-difference estimates are more meaningful when the treatment and control groups are observationally equivalent ex-ante because similar units are differentially exposed to a shock. To examine the groups' comparability, we use the normalized difference methodology proposed by Imbens and Wooldridge (2009). Normalized level differences of less than 0.25 in a variable during the pretreatment period indicate that the groups are similar along a given dimension. All the absolute normalized difference values in Table 3 show the groups resemble each another.

Critical to our identification strategy is the identifying assumption of parallel trends. To examine whether OTD status evolves in tandem within the treatment and control groups prior to the removal of deposit caps, we estimate

$$y_{bst} = \beta_{-8}DC_{st-8} + \beta_{-7}DC_{st-7} + \cdots + \beta_{-1}DC_{st-1} + \beta_0 DC_{st} + \cdots + \beta_n DC_{st+n} + \varepsilon_{bst}, \quad (2)$$

where y_{bst} is a dummy variable equal to 1 if bank b in state s securitizes mortgages during quarter t; DC_{st-k} is the kth quarter lag of the deregulation variable, DC_{st}; DC_{st+n} is the nth quarter lead of the deregulation variable, and DC_{st}; ε_{bst} is the error term. Insignificant estimates of β_{-i} (where $i \in (-8, -7, \ldots, -1)$) indicate parallel trends as there are no significant differences in y_{bst} between the treatment and control groups during quarter i before deregulation occurs.

Figure 2 plots the quarterly coefficient estimates and their corresponding 95% confidence intervals. During all pretreatment quarters the estimates are insignificant, which empirically supports the parallel trends assumption.

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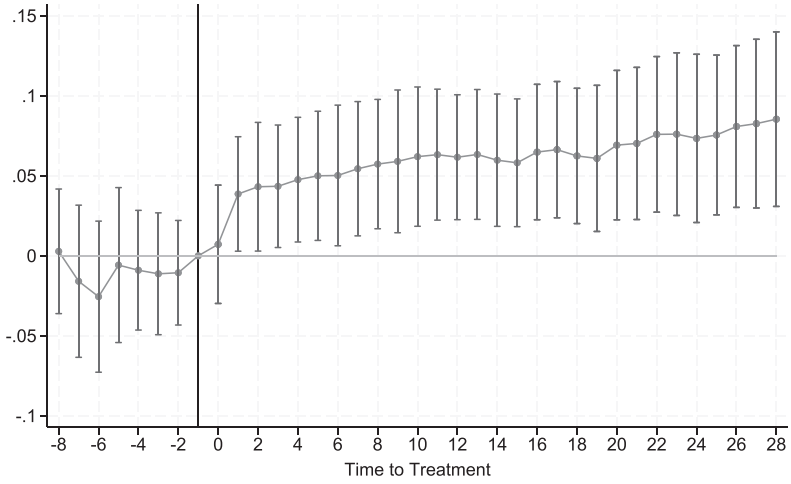

Fig 2. Parallel Trends Test.

NOTES: This figure shows the dynamic treatment effects of removing the deposit cap on banks' OTD status. The dots plots two way fixed effects event-study coefficient estimates for relative-time periods from 8 quarters before to 28 quarters after the date when a state removes the deposit cap limit. The vertical lines indicate 95% confidence intervals.

The removal of deposit caps is plausibly exogeneous with respect to mortgage securitization for several reasons. First, previous research highlights that the deregulation process was chaotic, suggesting the gradual removal of barriers to entry appeared at random (Goetz, Laeven, and Levine 2013, Goetz 2018). Second, the data show no trends in mortgage securitization before the removal of deposit caps as one would anticipate if conditions within the securitization market motivate enactment. Column (1) in Online Appendix Table A.2 presents the pretreatment dynamic coefficient estimates depicted in Figure 2. Relative to banks in untreated states, treated banks do not show significantly higher OTD incidences.

A related question is whether securitization or developments within the deposit market motivate the removal of statewide deposit caps. If so, simultaneity bias will be present in equation (1). We estimate a Cox proportional hazard model

$$h(t) = h_0(t) \times exp(\beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n), \tag{3}$$

where t represents time until the removal of the deposit cap limit, $h_0(t)$ is the baseline hazard, and $X_1, X_2, \cdots X_n$ denote state-level covariates. We define failure as the quarter in which a state removes the statewide deposit cap.

Columns (1)–(3) of Table 4 suggest that the average incidence of securitization, deposit rates, and deposit growth rates are insignificant determinants of the removal of deposit market caps. In other words, these factors do not influence the timing of the legislative shock to deposit market competition. This is consistent with exogeneity of the removal of deposit market caps documented elsewhere in the literature.

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TABLE 4

BANKING MARKET CHARACTERISTICS AND TIME TO DEPOSIT MARKET CAP REMOVAL

Dependent variable	(1)	(2) Time to deregulation	(3)
OTD	−2.210		
	(2.817)		
Average deposit rate		−0.261	
		(0.160)	
Deposit growth			−0.006
			(1.083)
Bank size	2.045***	0.004	−0.022
	(0.606)	(0.129)	(0.075)
Capital ratio	−0.345	−0.323**	−0.163***
	(0.473)	(0.139)	(0.052)
ROA	−3.224***	1.339*	0.607***
	(0.547)	(0.712)	(0.231)
Z-score	0.285	1.750	−0.085
	(3.513)	(1.759)	(0.463)
Unemployment rate	−0.264	0.224	0.462***
	(0.245)	(0.348)	(0.077)
Poverty rate	−0.026	0.004	0.011
	(0.080)	(0.027)	(0.016)
Net job creation rate	0.050	−0.131	0.097***
	(0.187)	(0.283)	(0.033)
Observations	299	127	148
p-value of chi^2	0.00	0.00	0.00

NOTE: This table reports estimates equation (3). Variable definitions are shown in Table 1. Standard errors are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.2 Does the Removal of Deposit Market Caps Increase Deposit Competition?

A necessary condition for the econometric analysis is that the removal of deposit caps triggers an increase in deposit competition. To establish whether this is the case, we estimate equation (1) using various deposit market HHIs. To do so, we follow Drechsler, Savov, and Schnabl (2017) and Li, Loutskina, and Strahan (2019) and construct three measures of deposit competition.

The first measure is a branch-HHI variable. Using branch-level data from the FDIC's Summary of Deposits database, we calculate the branch-HHI by summing the squared deposit market shares of all banks that operate branches in county *c* during year *t*. We then assign to each bank branch in our data the HHI of the county in which it is located. A lower branch-HHI value indicates less concentration (i.e., more deposit market competition). Since many banks have multiple branches distributed across county lines, the branch-HHI does not fully capture the aggregate deposit competition level that each bank faces. To tackle this issue, we follow Drechsler, Savov, and Schnabl (2017) and calculate a bank-HHI, defined as the weighted average of branch-HHIs across all of bank *b*'s branches during year *t*. Weights are defined using the share of deposits a bank raises in a given market. With this setup, two banks operating in one county could have different bank-HHIs because their branching footprints do not fully overlap (Li, Loutskina, and Strahan 2019). Finally, we calculate the county-HHI as the average of the bank-HHIs across all banks

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TABLE 5

DEPOSIT COMPETITION AND MORTGAGE SECURITIZATION

	(1)	(2)	(3)	(4)	(5)	(6)
Level of aggregation		Bank			Loan	
Dependent variable		OTD			Securitization	
Sample	All	Single	Multi	All	GSE	Non-GSE
DC	0.071***	0.072***	−0.056	0.130***	0.131***	0.135***
	(0.021)	(0.021)	(0.059)	(0.023)	(0.023)	(0.032)
$Size_{t-1}$	0.121***	0.120***	−0.002	0.005	0.006	−0.005
	(0.008)	(0.008)	(0.045)	(0.007)	(0.007)	(0.014)
Capital $ratio_{t-1}$	−0.005***	−0.005***	−0.006	−0.001	−0.001	0.003
	(0.002)	(0.002)	(0.007)	(0.003)	(0.003)	(0.004)
ROA_{t-1}	0.009**	0.010***	−0.020	−0.026**	−0.025**	−0.031
	(0.004)	(0.004)	(0.022)	(0.011)	(0.011)	(0.021)
$Z\text{-}Score_{t-1}$	0.015*	0.016*	−0.020	−0.042	−0.049	0.015
	(0.008)	(0.008)	(0.022)	(0.031)	(0.033)	(0.036)
HPI_{t-1}	−0.115**	−0.119**	0.094	0.027	0.019	0.146**
	(0.050)	(0.051)	(0.079)	(0.030)	(0.030)	(0.066)
Female				0.004***	−0.002	0.009***
				(0.001)	(0.002)	(0.001)
LTI				0.003***	0.012***	−0.000**
				(0.001)	(0.002)	(0.000)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes	No	No	No
Year FE	No	No	No	Yes	Yes	Yes
Observations	438,212	433,809	4,403	4,631,398	4,238,454	392,944
Adjusted R^2	0.679	0.674	0.812	0.397	0.402	0.433

NOTE: This table reports estimates of equation (1). The sample in columns (1) and (3) contain single- and multistate banks. In columns (2), (4), (5), and (6), the sample contains only single-state banks. For single-state banks, we code DC as equal to 1 if the state they operate in has relaxed the 30% deposit cap, 0 otherwise. For multistate banks, we code DC as equal to 1 if the state they have headquarter in has relaxed the 30% deposit cap, 0 otherwise. "GSE" denotes loans that are eligible for sale to the Government Sponsored Enterprises. "Non-GSE" denotes loans that are ineligible for sale to the Government Sponsored Enterprises. Variable definitions are shown in Table 1. The standard errors are clustered by state and reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

operating in a given county. This measure captures the exposure of a given local market to funding conditions across all banks operating within it.

Column (1) in Online Appendix Table A.3 reports estimates using the branch HHI measure as the dependent variable. The results show that following the removal of deposit cap limits, the average branch-HHI declines by 0.012 units, equivalent to a 5.71% increase in deposit competition between branches. We find corroborating evidence in columns (2) and (3) of the table. Using the bank-level indicator, estimates show that deposit competition increases by 2.3% following the removal of deposit caps. The county-level estimates in column (3) show that, at this level, competition intensifies by 3.81%.

4. RESULTS

Table 5 presents estimates of equation (1) using the OTD indicator as the dependent variable. In column (1), the sample contains single- and multistate banks. Removing

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the 30% statewide deposit market cap significantly increases the probability that a bank operates an OTD model by 7.1 percentage points. The magnitude of this effect is equivalent to a 25.3% increase considering 28% of banks in the sample operate an OTD model.[7]

Among the control variables, column (1) shows that increasing size, profitability, and soundness is associated with a significantly higher probability that a bank securitizes mortgages. The probability of OTD status is significantly lower among well-capitalized banks and those operating in states with faster rates of house price appreciation.

The shock to deposit competition is likely to be greater for a single-state relative to a multistate bank that can source deposits from out-of-state markets where competition is less severe (Gilje, Loutskina, and Strahan 2016, Danisewicz et al. 2017). Consistent with this view, column (2) of Table 5 shows that the deposit competition coefficient estimate is positive and significantly related to OTD status for single-state banks. In contrast, when we constrain the sample to multistate banks in column (3), deposit competition has no significant effect on OTD status.

To corroborate the bank-level findings, the rest of Table 5 presents estimates of equation (1) using the loan-level HMDA data. In column (4), we estimate that the shock to deposit competition provokes a 13 pp increase in the probability that a single-state bank securitizes a mortgage loan. The coefficient estimate is significant at the 1% level. Given that on average, 71% of mortgage loans get securitized in our sample, the magnitude of the effect is economically significant, and equivalent to a 18% increase. The results in columns (5) and (6) show that this is a general result for the mortgage market. Irrespective of whether we limit the sample to loans eligible for sale to the GSEs (column (5)) or non-GSE eligible loans (column (6)), increasing deposit competition leads to a significantly higher likelihood that a loan is securitized.[8] The deposit competition coefficient estimate implies an increase in the probability of securitization of between 13.1 pp and 13.5 pp.

Together, the findings show that increasing deposit competition influences securitization along both the extensive and intensive margin. As deposit competition

7. Consistent with the view that deposit competition provokes securitization by eroding incumbents' profitability, Online Appendix Table A.4 shows that single-state banks' net interest income margin narrows by 0.052 percentage points following the removal of the deposit cap limit. Figure 2 shows the removal of deposit caps leads to an increase in the probability a single-state bank securitizes mortgages, even in the short run. This is consistent with multimarkets banks entering quickly following deregulation. The FDIC Summary of Deposits database shows multistate banks capture 11.4% deposit market share within a year of the removal of the deposit cap. Five years after deregulation, their market share increased to 45.2%. These patterns suggest single-state banks rapidly experienced erosion of their deposit base which triggered entry into the OTD market for mortgages.

8. The GSEs are key participants in the secondary market for mortgage loans due their mandate to provide liquidity to support lending and home ownership. To achieve this aim, they specify a set of underwriting criteria that a loan must meet to be eligible for GSE purchase. Loans eligible for sale to the GSEs therefore tend to have lower debt-to-income ratios, smaller loan amounts, higher credit scores, and due to less risk, lower interest rates, relative to non-GSE-eligible loans (McGowan and Nguyen 2022).

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TABLE 6

DEPOSIT COMPETITION AND DEPOSIT INTEREST RATES

Dependent variable	(1) Average deposit rates	(2) Certificates of deposit	(3) Money market 25k	(4) Deposits
DC	0.110***	0.131***	0.079**	−0.105***
	(0.019)	(0.012)	(0.031)	(0.029)
$Size_{t-1}$	0.011	0.015*	−0.017	0.427***
	(0.008)	(0.008)	(0.013)	(0.025)
Capital $ratio_{t-1}$	−0.000	0.000	−0.005*	−0.019***
	(0.002)	(0.002)	(0.003)	(0.005)
ROA_{t-1}	0.014**	0.019***	−0.023**	0.039*
	(0.007)	(0.007)	(0.010)	(0.020)
$Z\text{-score}_{t-1}$	−0.010	−0.011	−0.015	0.022
	(0.012)	(0.011)	(0.022)	(0.026)
HPI_{t-1}	0.136**	−0.010	0.458***	0.175*
	(0.065)	(0.093)	(0.115)	(0.095)
Branch $deposits_{t-1}$	0.014	−0.028**	−0.029	
	(0.018)	(0.012)	(0.033)	
Observations	269,580	260,566	270,088	492,572
Branch FE	Yes	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes	No
Year FE	No	No	No	Yes
Adjusted R^2	0.945	0.952	0.830	0.386

NOTE: This table reports estimates of equation (1) for single-state banks. Variable definitions are shown in Table 1. The standard errors are clustered by state and reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

intensifies, more banks sell mortgage loans. At the same time, banks also securitize a greater share of the mortgages they originate.

4.1 Deposit Costs

To understand the mechanism underlying the deposit competition-securitization nexus among single-state banks, we analyze the evolution of deposit costs using the branch-level data set. We first test how deposit competition influences the average cost of deposit funds across all deposit products.

Column (1) of Table 6 shows that deposit competition provokes an 11 basis point increase in the average deposit rate. The coefficient estimate is significant at the 1% level. Given that the average interest rate a bank pays for its deposits is 2.06%, the magnitude of the effect is economically meaningful and equivalent to a 5.34% increase.

Our next test examines how deposit competition affects the rate paid on 12 month CDs and MM 25k funds, two of the most important sources of deposit funding. Column (2) in Table 6 shows that the interest rate paid on CDs significantly increases by 13.1 basis points. Greater deposit competition triggers a significant 7.9 basis point increase in the rates paid on MM 25k funds.

The estimates suggest that as deposit competition intensifies, incumbent banks are forced to set higher equilibrium deposit interest rates to prevent a drain of liquidity. To understand whether single-state banks experience a relative contraction in deposit

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funding, we estimate equation (1) using the level of deposits as the dependent variable. Column (4) of Table 6 shows that the average single-state bank branch experiences a significant 10% reduction in its deposit holdings.[9]

4.2 Bank Funding Structure

So far, the findings suggest that banks turn to securitization to finance loans in the face of tougher deposit competition that erodes their deposit holdings and increase deposit costs. However, the extent of the changes in securitization behavior may vary according to a bank's ex-ante dependence on deposits to fund lending. To examine this conjecture, we estimate

$$y_{bst} = \beta DC_{st} + \gamma X_{bst-1} + \varphi DC_{st} \times Z_{bs} + \delta_b + \delta_t + \varepsilon_{bst}, \quad (4)$$

where all variables are defined as in equation (1) except Z_b that is a pretreatment average characteristic for bank b. The characteristics we consider are: reliance on deposits (measured using the high deposit share dummy variable), wholesale funding reliance (measured using the high wholesale funding share dummy variable), the loans-to-deposits ratio (measured using the high loans-to-deposits dummy variable), capitalization (measured using the high capital dummy variable), and bank size (measured using the larger bank dummy variable).

Across all specifications in Table 7, we find that deposit competition provokes a significant increase in mortgage securitization. However, bank characteristics amplify and dampen this response. For example, column (1) of Table 7 shows that following the removal of deposit caps, banks with a deposit-to-asset ratio above the median are 2 pp more likely to operate an OTD model relative to banks below the median. The finding is consistent with this group being exposed to relatively more intense competition, and a larger increase in deposit funding costs, due to their greater reliance on deposits to fund mortgage credit origination.

Banks that use more wholesale funding to finance their activities are potentially insulated from deposit competition after the removal of deposit caps because this funding source is not directly affected by the removal of deposit caps. Column (2) of Table 7 provides evidence that this is these case. A financial institution with an above median wholesale funding share is 10 pp less likely to securitize mortgages after deregulation.

In column (3), we ask how the loans-to-deposit ratio influences securitization choices. Intuitively, higher values on this metric show that banks are more reliant on deposits to fund lending. Consistent with this intuition, banks with loans-to-deposit

9. Online Appendix Table A.5 reports estimates showing the effect of deposit competition on multistate banks. We find that the removal of deposit caps has no significant effect on the probability that a multistate bank securitizes mortgages (column (1)), loan growth (column (2)), deposit growth rates (column (3)), or deposit interest rates (column (4)). The findings are consistent with multistate banks avoiding deposit competition by sourcing deposits from less competitive markets, and recent evidence that shows 85% of multistate banks set uniform deposit interest rates across their branches (Granja and Paixao 2021).

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TABLE 7

HETEROGENOUS TREATMENT EFFECTS

Dependent variable: OTD	(1)	(2)	(3)	(4)	(5)
DC	0.061***	0.089***	0.071***	0.077***	0.071***
	(0.020)	(0.024)	(0.021)	(0.022)	(0.021)
DC × High deposit shares	0.020**				
	(0.008)				
DC × High wholesales share		−0.100***			
		(0.015)			
DC × High loans-to-deposits ratio			0.133**		
			(0.056)		
DC × High capital				−0.011**	
				(0.005)	
DC × Larger bank					0.011
					(0.032)
$Size_{t-1}$	0.121***	0.122***	0.120***	0.119***	0.120***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Capital $ratio_{t-1}$	−0.005***	−0.004***	−0.005***	−0.005***	−0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
ROA_{t-1}	0.010***	0.010***	0.010***	0.010***	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$Z\text{-}score_{t-1}$	0.015*	0.015*	0.016*	0.016*	0.016*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
HPI_{t-1}	−0.120**	−0.118**	−0.119**	−0.118**	−0.119**
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
Observations	433,809	433,809	433,809	433,809	433,809
Bank FE	Yes	Yes	Yes	Yes	Yes
Quarter*Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.674	0.675	0.674	0.674	0.674

NOTE: This table reports estimates of equation (4) for single-state banks and estimates the heterogeneous effect across bank characteristics. Variable definitions are shown in Table 1. The standard errors are clustered by state and reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

ratios above the median are approximately 13 pp more likely to securitize following the removal of deposit caps.

The remainder of Table 7 studies how capitalization and size correlate with mortgage securitization after deregulation. We find that better capitalized banks are less likely to offload mortgage loans in column (4), whereas, among single-state banks, relatively larger institutions are no more likely to securitize mortgages compared to smaller banks in column (5).

4.3 External Validity Tests

Our empirical analyses focus on 1994Q1 to 2006Q4 because this period contains plausibly exogenous variation in deposit competition that allows us to pin down consistent estimates. However, if the deposit competition-mortgage securitization nexus holds generally, we should obtain similar findings during other periods. Call Reports do not contain OTD status data before 1994. We thus design an external validity test using information between 2010Q1 and 2019Q4. This period does not feature regulatory-driven variation in states' deposit competition. To this end, we follow

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TABLE 8

EXTERNAL VALIDITY TESTS

Dependent variable: OTD	(1)	(2)	(3)
Bank-HHI	−0.091*		
	(0.053)		
Branch-HHI		−0.119**	
		(0.048)	
County-HHI			−0.112*
			(0.067)
Control variables	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes
Observations	209,919	209,919	209,919
Adjusted R^2	0.860	0.860	0.860

NOTE: This table reports estimates of equation (1) for single-state banks. The sample contains observations from 2010Q1 to 2019Q4. We retrieve data from the FDIC Summary of Deposits database and follow Drechsler, Savov, and Schnabl (2017) and Li, Loutskina, and Strahan (2019) to construct three measures for deposit market competition: Branch-HHI, Bank-HHI, and County-HHI. The vector of unreported control variables contains Size_{t-1}, $\text{Capital ratio}_{t-1}$, ROA_{t-1}, Z-score_{t-1}, and HPI_{t-1}. Variable definitions are shown in Table 1. The standard errors are clustered at the bank level and reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Drechsler, Savov, and Schnabl (2017) and Li, Loutskina, and Strahan (2019) and use the branch-, bank-, and county-HHIs as measures for deposit market competition. We merge these HHI variables into the bank-level data and estimate

$$y_{bct} = \beta HHI_{jt} + \delta_b + \delta_t + \varepsilon_{bct}, \tag{5}$$

where y_{bct} is the OTD status of bank b in county c in year t; HHI_{jt}, $(j \in i, b, c)$, is one of the three HHI indexes where higher HHI values indicate lower deposit market competition. δ_b and δ_t denote bank and year fixed effects, respectively; ε_{bct} is the error term. Standard errors are clustered at the bank level.

Estimates of equation (5) are shown in Table 8. We find that more intense deposit competition significantly increases the probability that a bank operates an OTD model. Column (1) shows that banks with bank-HHI one standard deviation above the mean (i.e., a less competitive market for deposits) are 2 pp less likely to operate an OTD model relative to one with a bank-HHI one standard deviation below the mean.[10] Column (2) provides similar evidence, and bank operating in a county with a branch-HHI one standard deviation above the mean is 2.6 pp less likely to operate an OTD model relative to one with a branch-HHI one standard deviation below the mean. Finally, column (3) shows that comparing a bank that is one standard deviation above to a bank one standard deviation below the mean county-HHI results in a 1.8 pp lower probability that it operates an OTD model.

Together, these findings imply that tougher deposit market competition leads to a greater likelihood that banks use securitization to finance loans. Our baseline findings

10. The standard deviation of the bank-HHI is 0.11. The effect size is calculated as $2 \times 0.11 \times (-0.091)*100 = 2$ pp.

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thus hold more generally, and are not an artifact of the sample time period, or the way we measure deposit market competition.

5. ROBUSTNESS TESTS

In this section, we conduct tests to affirm that the findings are not driven by the choice of estimator, or confounding factors.

5.1 Methodological Sensitivity Checks

The identification strategy leverages the staggered removal of statewide deposit cap limits across U.S. states using a two-way fixed effects difference-in-difference estimator. This approach rests on the identifying assumption that, conditional on the control variables and fixed effects, changes to deposit competition are exogenous. Recent econometric advances highlight that the strict exogeneity assumption may fail under the two-way fixed effect design in cases where treatment is staggered across time because the composite error term can correlate with the treatment variable and group fixed effects (Goodman-Bacon 2021, Sun and Abraham 2021, Callaway and Sant'Anna 2021, Baker, Larcker, and Wang 2022).

To address this issue, we use a stacked difference-in-difference estimator to obtain dynamic coefficient estimates in the eight quarters on either side of the normalized change in deposit competition when the statewide deposit market cap limit is removed. Column 1 in Online Appendix Table A.2 reports the results. During the eight pretreatment quarters, the coefficient estimates are insignificant. However, after the deposit competition shock, the dynamic coefficient estimates are positive and significant, and are also of the same order of magnitude as the baseline results.

In addition, we check the robustness of the findings to estimating equation (1) using a logit estimator. The marginal effect in column (2) of Online Appendix Table A.2 remains similar. We also test the sensitivity of the results to bootstrapping the standard errors using 50 replications rather than state-level clustering. Column (3) shows that our key findings remain unaffected. Overall, methodological issues do not appear to drive the inferences.

5.2 Placebo Tests

We use placebo tests to examine whether observable or unobservable confounds bias our results. Deposit competition applies exclusively to financial intermediaries that fund loans using deposits. Securitization within nondeposit taking financial institutions should be unaffected by the removal of statewide deposit caps. If an observable or unobservable omitted variable rather than deposit competition drives our results, we would expect securitization among nonbanks to respond to deregulation the same way as is the case for banks.

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TABLE 9

FALSIFICATION TESTS

Sample	(1) Nonbanks	(2) Nonbanks	(3) Banks
Dependent variable	Securitization rate	Securitization rate	OTD
DC	−0.005	−0.005	
	(0.009)	(0.009)	
LTI		0.001	
		(0.001)	
Gender		0.037**	
		(0.018)	
Urban		−0.032*	
		(0.017)	
Placebo			0.001
			(0.008)
$Size_{t-1}$			0.119***
			(0.016)
Capital $Ratio_{t-1}$			−0.014***
			(0.001)
ROA_{t-1}			0.016***
			(0.005)
Z-$score_{t-1}$			0.053***
			(0.011)
HPI_{t-1}			−0.429**
			(0.173)
Firm FE	Yes	Yes	No
Year FE	Yes	Yes	No
Bank FE	No	No	Yes
Quarter × Year FE	No	No	Yes
Observations	21,420	21,420	142,151
Adjusted R^2	0.82	0.82	0.64

NOTE: This table reports estimates of equation (6) for nonbanks in columns (1) and (2), and single-state banks in column (3). The sample includes annual firm-level data on nonbanks using data from HMDA. Variable definitions are shown in Table 1. The standard errors are clustered at the state level and reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Using HMDA data, for each nonbank, we calculate the annual securitization rate (the ratio of securitized loans to total loans originated by the institution) of mortgage loans, the average LTI ratio of borrowers, the female loan ratio (the ratio of loans to females to total loans originated by the institution), and the urban ratio (the ratio of loans for properties in metropolitan statistical areas to total loans originated by the institution). We then estimate

$$s_{ist} = \beta DC_{st} + \gamma X_{ist-1} + \delta_i + \delta_t + \varepsilon_{ist}, \tag{6}$$

where s_{ist} is the securitization rate for nonbank i in state s during year t; DC_{st} is the deposit competition indicator; X_{ist-1} is a vector of control variables; δ_i and δ_t are nonbank and year fixed effects, respectively; ε_{ist} is the error term.

We present estimates of equation (6) in Table 9. Column (1) shows that deposit competition has no effect on a nonbank's securitization rate. The deposit competition coefficient estimate is economically close to zero and statistically insignificant.

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Column (2) of Table 9 demonstrates that this finding remains unaffected by the inclusion of control variables.

Our second approach is to restrict the sample to banks in states that do not remove deposit caps but are contiguous with the treatment group (states that remove restrictions). We randomly allocate 50% of banks within each state to placebo treatment status and estimate

$$OTD_{bst} = \beta Placebo_{st} + \gamma X_{bst-1} + \delta_b + \delta_t + \varepsilon_{bst}, \tag{7}$$

where all variables are defined as in equation (1) except $Placebo_{st}$ equals 1 if a contiguous state has removed the 30% deposit cap during quarter t, 0 otherwise. The placebo coefficient estimate in column (3) of Table 9 is insignificant. Hence, our results are not driven by secular trends in the banking industry. We only detect changes in mortgage securitization among banks that are exposed to actual changes in deposit competition.

In sum, the removal of statewide deposit market caps influences neither nonbanks' nor untreated banks' securitization decisions. If an omitted variable drives the baseline findings, the placebo deposit competition coefficient should be statistically significant and comparable in economic magnitude to Table 5. The placebo checks also suggest the effects we observe are not due to developments in the lending market which both banks and nonbanks are subject to. Rather, it is only when deposit-taking banks are subject to tougher deposit competition that the probability of securitization changes. This suggests that our findings have a causal interpretation.

5.3 The Legal Environment

The IBBEA granted states the authority to remove other impediments to interstate branching. During the sample period, states repeal entry barriers by changing regulation surrounding the minimum age of a target institution, allowing de novo interstate branching, and removing restrictions on the acquisition of individual bank branches.[11] These measures may also influence the level of deposit market competition single-state banks face from multistate entrants. We therefore use the Rice and Strahan (2010) branching expansion (BE) index that aggregates the four interstate branching regulation indices to measure the overall level of deposit competition in a state. Column (1) of Table 10 shows that the probability a bank securitizes mortgages is significantly increasing in the BE index. In essence, when states remove more entry barriers, single-state banks experience tougher deposit competition that triggers mortgage securitization.

11. The minimum age of the target institution defines how long a bank must have been in existence prior to its interstate acquisition or merger. This requirement cannot be set to be more than 5 years. Under de novo interstate branching, the opening of new out-of-state branches only applies when states "opt-in" to this provision. States may permit the acquisition of individual branches, rather than all branches belonging to a bank. An interstate merger transaction may involve the acquisition of a branch or branches without the acquisition of the whole bank in the state.

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TABLE 10

BANKING REGULATORY ROBUSTNESS TESTS

Sample Dependent variable: OTD	(1) All	(2) All	(3) Exclude GBLA	(4) Exclude Basel II	(5) All	(6) All
BE index	0.017***					
	(0.005)					
DC		0.075***	0.071***	0.071***	0.071***	0.072***
		(0.015)	(0.016)	(0.020)	(0.021)	(0.021)
De novo branching		0.064**				
		(0.027)				
Age limit		−0.002				
		(0.023)				
Branching acquisition		−0.033*				
		(0.020)				
Time since intrastate deregulation						−0.008*
						(0.004)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Regulator × Quarter × Year FE	No	No	No	No	Yes	No
Observations	433,809	433,809	213,178	373,901	433,809	428,800
Adjusted R^2	0.678	0.679	0.756	0.691	0.678	0.679

NOTE: This table reports estimates of equation (1) for single-state banks. The vector of unreported control variables contains Size_{t-1}, Capital ratio_{t-1}, ROA_{t-1}, Z-score_{t-1}, and HPI_{t-1}. Variable definitions are shown in Table 1. The standard errors are clustered by state and the reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

A concern could be that removal of the 30% deposit cap coincides with changes to other interstate branching restrictions. However, Goetz, Laeven, and Levine (2013) and Goetz (2018) report deregulation of the four interstate branching restrictions was haphazard and plausibly exogenous. We therefore append equation (1) with controls for whether the state permits de novo branching, sets an age limit for target institutions of less than 5 years, and if it permits interstate branch acquisition. Column (2) in Table 10 reports the estimates. The effect of removing the deposit cap is robust to this change: the deposit competition coefficient estimate remains significant but is also comparable in economic magnitude to the baseline results. Hence, the key finding is not driven by changes to other aspects of interstate branching regulation.

The results in column (2) show that de novo branching provokes a significant increase in the likelihood that a bank securitizes mortgage loans. This is consistent with this form of deregulation provoking tougher deposit competition as multistate banks enter by increasing the number of branches operating in the state. In contrast, removing barriers to branch acquisition significantly lowers the odds that a bank operates an OTD model because this form of deregulation leads to consolidation in deposit markets. Removing age limits has an insignificant effect on securitization.

The GLBA is frequently identified as the catalyst for the increase in securitization activity during the lead up to the financial crisis. We therefore remove observations from 1999Q4 onward when the Act was in force. Column (3) in Table 10 shows that the deposit competition coefficient remains positive and statistically significant. This test also rules out that our findings are due to subsequent legislation such as the

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repeal of the Glass-Steagall Act in 1999, the Commodity Futures Modernization Act of 2000, the American Dream Downpayment Act of 2003, and the monetary policy tightening between 2003 and 2006.

The Basel II Accord, published in June 2004, proposed changes to international banking standards, including higher capital ratios (Raz, McGowan, and Zhao 2022). We therefore exclude observations from 2004Q2 onward and report estimates of equation (1) in column (4) of Table 10. We continue to find that the deposit competition coefficient is positive and significantly related to OTD status.

Banks are potentially subject to different levels of regulatory monitoring depending on their charter and regulator (Danisewicz et al. 2018,,2020). We therefore create charter-year and regulator-year fixed effects to capture time-varying differential shocks to regulation and monitoring. The inferences are unaffected by this change in column (5) of Table 10.

Between the early 1970s and 1994, U.S. states removed restrictions on intrastate bank branching. While this deregulation episode was completed prior to the start of our sample, a concern may be that the effects of intrastate deregulation persist through time. We therefore append equation (1) with a variable that measures the number of quarters since a state liberalized intrastate deregulation. We continue to find statistically significant effects arising from the removal of deposit market caps on OTD status in column (6) of Table 10.

5.4 Mortgage Market Factors

Next, we augment equation (1) with mortgage market control variables to capture a diverse set of potential confounds. For example, the secondary market for prime mortgages is thicker than for jumbo loans owing to the GSEs' purchase guarantees. Agarwal, Chang, and Yavas (2014) report that during the securitization boom, banks were more likely to securitize less risky mortgage loans. Prior research links securitization to insufficient screening (Keys et al. 2010). We capture these forces using the bank-level ratio of jumbo to total mortgage loan applications (secondary market thickness), LTI ratio (borrower riskiness), and loan denial rates (screening intensity). Table 11 shows that these changes do not affect our inferences.

Alternatively, OTD status may respond to elements of the lending environment. Deposit-constrained banks may turn to securitization to fund loans where they accept a greater number of mortgage applications. Column (1) of Table 12 shows that the findings are robust to controlling for the mortgage application acceptance rate.

Chernenko, Hanson, and Sunderam (2016) argue that the growth in securitization before the financial crisis reflects an increase in investor demand for Mortgage Backed Securities (MBS) and Collateralized Debt Obligations (CDOs). Thus, the higher incidence of OTD status across banks may reflect investor demand, rather than supply-side deposit competition effects. Relatedly, the GSEs account for approximately 70% of secondary market mortgage loan purchases. When the GSEs alter their underwriting criteria to include a wider range of loans, banks have stronger incentives to use securitization to unload credit risk. We approximate overall demand for MBS

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TABLE 11

Borrower Credit Quality Tests

Dependent variable: OTD	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DC	0.072***	0.071***	0.072***	0.071***	0.072***	0.074***	0.069***
	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	(0.020)	(0.021)
Jumbo share	−0.165						
	(0.141)						
LTI ratio		0.049					
		(0.037)					
Denial rate (DTI ratio)			0.939				
			(0.753)				
Denial rate (employment history)				3.455**			
				(1.664)			
Denial rate (collateral)					1.070		
					(1.315)		
Denial rate (insufficient cash)						3.473	
						(2.130)	
Denial rate (missing information)							6.537
							(4.234)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	433,809	433,809	433,809	433,809	433,809	433,809	433,809
Adjusted R^2	0.674	0.674	0.674	0.674	0.674	0.674	0.674

Note: This table reports estimates of equation (1) for single-state banks. Variable definitions are shown in Table 1. The vector of unreported control variables contains Size_{t-1}, $\text{Capital ratio}_{t-1}$, ROA_{t-1}, Z-score_{t-1}, and HPI_{t-1}. Variable definitions are shown in Table 1. The standard errors are clustered by state and are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

(including private and GSE purchases) using third-party purchases (the state-level ratio of loan sales to third parties to total originated loans). GSE demand is measured using the state-level ratio of loan sales to GSEs to total originated loans (GSE purchases). Similarly, we capture non-GSE demand using the state-level ratio of loan sales to private buyers to total originated loans (private purchases). Our estimates in columns (2)–(4) of Table 12 show that demand-side factors do not confound our inferences.

Banks may securitize mortgages to unload prepayment risk due to refinancing or the credit risk of mortgage default (McGowan and Nguyen 2022). Columns (5) and (6) of Table 12 present estimates of equation (1) that includes controls for these factors. Deposit competition continues to exert a significantly positive effect on OTD status.

Drechsler, Savov, and Schnabl (2020) show that between 2003 and 2006, the tightening of monetary policy incentivizes financial institutions, especially nonbanks, to increase lending in the private secondary market. They argue that the effects of monetary policy vary depending on deposit concentration across banks. To rule out this concern, we use the Drechsler, Savov, and Schnabl (2017) bank-HHI variable and interact it with the Fed funds rate. This term captures the differential effect of monetary policy across imperfectly competitive deposit markets.

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TABLE 12

LENDING ENVIRONMENT

Dependent variable: OTD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DC	0.075***	0.074***	0.073***	0.072***	0.073***	0.071***	0.071***	0.072***	0.072***
	(0.019)	(0.020)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Acceptance rate	−0.241**								
	(0.101)								
Third party purchases		−0.089							
		(0.078)							
GSE purchases			−0.080						
			(0.073)						
Private purchases				0.000					
				(0.000)					
Refinancing					−0.090				
					(0.083)				
Mortgage default						0.022*			
						(0.011)			
Bank-HHI × FED rate							2.464**		
							(1.076)		
Bank-HHI							−0.104*		
							(0.059)		
Number of applications								−0.001	
								(0.026)	
Mortgage amount									−0.003
									(0.027)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	433,809	433,809	433,809	433,809	433,809	433,809	433,809	433,809	433,809
Adjusted R^2	0.674	0.674	0.674	0.674	0.674	0.674	0.674	0.674	0.674

NOTE: This table reports estimates of equation (1) for single-state banks. The vector of unreported control variables contains Size_{t-1}, $\text{Capital ratio}_{t-1}$, ROA_{t-1}, Z-score_{t-1}, and HPI_{t-1}. Variable definitions are shown in Table 1. The standard errors are clustered by state and are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

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Column (7) in Table 12 presents estimates of equation (1) with the additional controls for bank-HHI and the bank-HHI-Fed rate interaction. In more concentrated deposit markets, banks have a lower probability of operating an OTD model, consistent with our argument that increasing deposit competition creates securitization incentives. Furthermore, in line with Drechsler, Savov, and Schnabl (2020), we observe that when the Federal Reserve tightens monetary policy, banks in more concentrated markets are more likely to sell loans in the secondary market. Importantly, while the predictions in Drechsler, Savov, and Schnabl (2020) hold in our setting, the deposit competition coefficient remains positive and significant, suggesting that the interplay between bank market structure and monetary policy does not confound the effect of deposit competition on OTD status.

The rest of Table 12 presents tests that show that loan demand does not confound the inferences. Irrespective of whether we measure demand using the number of mortgage applications (column (8)) or the amount of mortgage credit (column (9)), the findings are robust.

5.5 Lending, Risk Taking, Liquidity, and Regulatory Capital

Do banks reduce lending in the face of tougher deposit market competition? On the one hand, as single-state banks face a contraction in deposit holdings, they may reduce credit supply. Alternatively, the amount of credit they originate may remain unchanged because banks pivot toward securitization to fund loans. Column (1) in Online Appendix Table A.6 shows that the shock to deposit competition had no significant effect on the amount of credit treated banks originate. In column (2), we find similar results using loan growth as the dependent variable. Columns (3) and (4) present similar results using the annual mortgage loan amount and mortgage loan growth rate as the dependent variable. Finally, we use the loan-level HMDA to evaluate whether deposit competition affects the probability that a bank accepts a mortgage application. The deposit competition coefficient estimate in column (5) of Table A.6 is again insignificant. Deposit competition therefore had little effect on credit supply.

While securitization offers a cheaper funding source in the face of intensifying deposit competition, banks could alternatively originate riskier mortgages that have wider net interest margins and hold them on balance sheet. We test this conjecture using loan-level data by estimating

$$A_{ilst} = \beta_1 DC_{st} + \beta_2 W_{ilst} + \beta_3 DC_{st} \times W_{ilst} + \gamma X_{ilst-1} + \delta_i + \delta_t + \varepsilon_{ilst}, \qquad (8)$$

where A_{ilst} equals 1 if loan application by borrower i located in state s during year t is accepted by lender l, 0 otherwise; W_{ilst} is a loan-level measure of borrower i's riskiness; all other variables are defined as in equation (1).

Column (1) in Online Appendix Table A.7 presents estimates of equation (8) using the LTI ratio measure of riskiness. Loans with higher LTI ratios are significantly less likely to be accepted. However, the LTI-deposit competition coefficient estimate is insignificant. Column (2) shows complementary evidence using applicant income

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to measure risk. Applications from high-income borrowers are significantly more likely to be accepted but the income-deposit competition interaction coefficient is insignificant. Financial institutions therefore do not lower lending standards by originating riskier loans when deposit competition increases.

Next, we test if our findings are driven by state-level laws on bankruptcy, renegotiation conditions between lenders and borrowers, and state corporate tax. Columns (1)–(3) of Online Appendix Table A.8 show that our results remain unchanged with the inclusion of these state-level conditions. Column (4) of the same table shows results from a sample that excludes observations of banks that are involved in M&As during the sample. Much of the 2008 housing crisis was concentrated in California, Florida, and New York. We therefore exclude observations from these states in column (5) of Online Appendix Table A.8 to ensure that the results are not driven by housing market fundamentals in these areas. In each case, the findings are robust.

5.6 Deposit Supply and Loan Demand

We revisit the idea that reductions in deposit supply rather than deposit competition drive our inferences. To implement these tests, we use variables found to determine deposit supply elsewhere in the literature. For example, Acharya and Mora (2014) and Han, Park, and Pennacchi (2015) report that deposit supply is greater in regions where seniors make up a larger share of the population. Other factors that may affect deposit supply include the population growth rate, job creation, poverty, unemployment, and the rate of relocation (migration) from other parts of the U.S. Irrespective of the inclusion of these additional variables, we continue to find in Table A.9 that deposit competition significantly affects banks' propensity to engage in securitization.

Finally, Online Appendix Table A.10 shows the shock to deposit competition did not influence mortgage loan demand, either at the bank or market levels.

6. CONCLUSION

We present evidence that deposit competition spurs banks' securitization activity. As banks compete more intensively for deposits, deposit costs increase and banks' deposit holdings contract. This motivates banks to turn to capital markets to fund lending via securitization. Our estimates show deposit competition increases the probability a bank securitizes mortgages by 7.1 percentage points. Mortgage loan-level analyses provide complementary evidence showing securitization increases along the intensive margin as well. A novel insight of our work is the substitutability of deposit and securitization funding models in the face of deposit competition.

It is important to recognize that our findings help explain the timing and intensity of the remarkable securitization boom ahead of the financial crisis. Existing supply-side explanations show the tightening of monetary policy in 2003 helped provoke an increase in securitization by nonbank lenders (Drechsler, Savov, and Schnabl 2020). Yet, the pace of securitization activity accelerated in the mid-1990s among banks,

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including small local banks, suggesting other factors also helped ignite the boom. Consistent with this fact, we document that the removal of deposit market caps raised the intensity of deposit market competition and spurred securitization. Quantitatively, this channel matters, accounting for 25.3% of the increase in the number of banks operating OTD platforms during the precrisis period. In addition, regulatory-induced deposit competition does not influence securitization incentives among nonbanks that do not rely on deposit funding but are subject to the same lending market environment.

The link between deposit competition and securitization does not just hold during the pre-2007 years. Rather, it is present during the years following the financial crisis as well. This is consistent with the continuing importance of deposits, and competition for deposits, in funding loans. Other factors that govern the intensity of competition in deposit markets may produce similar outcomes.

LITERATURE CITED

Acharya, Viral V., and Nada Mora. (2014) "A Crisis of Banks as Liquidity Providers." *Journal of Finance*, 70, 1–43.

Agarwal, Sumit, Yan Chang, and Abdullah Yavas. (2014) "Adverse Selection in Mortgage Securitization." *Journal of Financial Economics*, 105, 640–60.

Allen, Franklin, and Douglas Gale. (2004) "Competition and Financial Stability." *Journal of Money, Credit and Banking*, 36, 453–80.

Arping, Stefan. (2017) "Deposit Competition and Loan Markets." *Journal of Banking & Finance*, 80, 108–18.

Baker, Andrew, David F. Larcker, and Charles C. Y. Wang. (2022) "How Much Should We Trust Staggered Difference-in-Differences Estimates?" *Journal of Financial Economics*, 144, 370–95.

Berger, Allen, Sadok El Ghoul, Omrane Guedhami, and Raluca Roman. (2022) "Geographical Deregulation and Banks' Cost of Equity Capital." *Journal of International Money and Finance*, 120, 102498.

Blundell-Wignall, Adrian, Paul Atkinson, and Se Hoon Lee. (2009) "The Current Financial Crisis: Causes and Policy Issues." *OECD Journal: Financial Market Trends*, 2008, 1–21.

Callaway, Brantly, and Pedro H.C. Sant'Anna. (2021) "Difference-in-Differences with Multiple Time Periods." *Journal of Econometrics*, 225, 200–230.

Chernenko, Sergey, Samuel G. Hanson, and Adi Sunderam. (2016) "Who Neglects Risk? Investor Experience and the Credit Boom." *Journal of Financial Economics*, 122, 248–69.

Corradin, Stefano, Gropp, Reint, Huizinga, Harry, and Laeven, Luc. (2016) "The Effect of Personal Bankruptcy Exemptions on Investment in Home Equity." *Journal of Financial Intermediation*, 25, 77–98.

Danisewicz, Piotr, Danny McGowan, Enrico Onali, and Klaus Schaeck. (2017) "The Real Effects of Banking Supervision: Evidence from Enforcement Actions." *Journal of Financial Intermediation*, 35, 86–101.

Danisewicz, Piotr, Danny McGowan, Enrico Onali, and Klaus Schaeck. (2018) "Debt Priority Structure, Market Discipline and Bank Conduct." *Review of Financial Studies*, 31, 4493–555.

15384616, 0, Downloaded from https://onlinelibrary.wiley.com/doi/10.1111/jmcb.13207 by Test, Wiley Online Library on [09/10/2024]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

Danisewicz, Piotr, Danny McGowan, Enrico Onali, and Klaus Schaeck. (2020) "Debtholder Monitoring Incentives and Bank Earnings Opacity." *Journal of Financial and Quantitative Analysis*, 56, 1408–45.

Demyanyk, Yuliya, and Otto Van Hemert. (2011) "Understanding the Subprime Mortgage Crisis." *Review of Financial Studies*, 24, 1848–80.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl. (2017) "The Deposits Channel of Monetary Policy." *Quarterly Journal of Economics*, 132, 1819–76.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl. (2020) "How Monetary Policy Shaped the Housing Boom." Technical Report, National Bureau of Economic Research.

Egan, Mark, Ali Hortaçsu, and Gregor Matvos. (2017) "Deposit Competition and Financial Fragility: Evidence from the U.S. Banking Sector." *American Economic Review*, 107, 169–216.

Favara, Giovanni, and Jean Imbs. (2015) "Credit Supply and the Price of Housing." *American Economic Review*, 105, 958–92.

Gennaioli, Nicola, Andrei Shleifer, and Robert Vishny. (2012) "Neglected Risks, Financial Innovation, and Financial Fragility." *Journal of Financial Economics*, 104, 452–68.

Gerardi, Kristopher, Andreas Lehnert, and Shane M. Sherlund. (2008) "Making Sense of the Subprime Crisis." *Brookings Papers on Economic Activity*, 2008, 69–145.

Ghent, Andra, and Rossen Valkanov. (2016) "Comparing Securitized and Balance Sheet Loans: Size Matters." *Management Science*, 62, 2784–803.

Gilje, Erik, Elena Loutskina, and Philip E. Strahan. (2016) "Exporting Liquidity: Branch Banking and Financial Integration." *Journal of Finance*, 71, 1159–84.

Goetz, Martin. (2018) "Competition and Bank Stability." *Journal of Financial Intermediation*, 35, 57–69.

Goetz, Martin, Luc Laeven, and Ross Levine. (2013) "Identifying the Valuation Effects and Agency Costs of Corporate Diversification: Evidence from the Geographic Diversification of U.S. Banks." *Review of Financial Studies*, 27, 1787–823.

Goodman-Bacon, Andrew. (2021) "Difference-in-Differences with Variation in Treatment Timing." *Journal of Econometrics*, 225, 254–77. Themed Issue: Treatment Effect 1.

Gorton, Gary, and Andrew Metrick. (2013) "Securitization." *Handbook of the Economics of Finance*, edited by George M. Constantinides, Milton Harris, and Rene M. Stulz, Vol. 2, pp. 1–70. Oxford: Holland.

Gorton, Gary, and George Pennacchi. (1995) "Banks and Loan Sales Marketing Nonmarketable Assets." *Journal of Monetary Economics*, 35, 389–411.

Granja, Joao J, and Nuno Paixao. (2021) "Market Concentration and Uniform Pricing: Evidence from Bank Mergers." Bank of Canada Staff Working Paper, No. 2021-9.

Griffin, John, and Dragon Yongjun Tang. (2012) "Did Subjectivity Play a Role in CDO Credit Ratings?" *Journal of Finance*, 67, 1293–328.

Han, Joongho, Kwangwoo Park, and George Pennacchi. (2015) "Corporate Taxes and Securitization." *Journal of Finance*, 70, 1287–321.

Hellmann, Thomas F., Kevin C. Murdock, and Joseph E. Stiglitz. (2000) "Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?" *American Economic Review*, 90, 147–65.

Imbens, Guido W., and Jeffrey M. Wooldridge. (2009) "Recent Developments in the Econometrics of Program Evaluation." *Journal of Economic Literature*, 47, 5–86.

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Jayaratne, Jith, and Phillip E. Strahan. (1996) "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics*, 111, 639–70.

Jayaratne, Jith, and Phillip E. Strahan. (1998) "Entry Restrictions, Industry Evolution, and Dynamic Efficiency: Evidence from Commercial Banking." *Journal of Law and Economics*, 41, 239–73.

Jiang, Liangliang, Ross Levine, and Chen Lin. (2016) "Competition and Bank Opacity." *Review of Financial Studies*, 29, 1911–42.

Johnson, Christian, and Tara Rice. (2008) "Assessing a Decade of Interstate Bank Branching." *Washington and Lee Law Review*, 65, 73–127.

Keil, Jan, and Karsten Müller. (2020) "Bank Branching Deregulation and the Syndicated Loan Market." *Journal of Financial and Quantitative Analysis*, 55, 1269–303.

Keys, Benjamin, Tanmoy Mukherjee, Amit Seru, and Vikrant Vig. (2010) "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans." *Quarterly Journal of Economics*, 125, 307–62.

Keys, Benjamin, Amit Seru, and Vikrant Vig. (2012) "Lender Screening and the Role of Securitization: Evidence from Prime and Subprime Mortgage Markets." *Review of Financial Studies*, 25, 2071–108.

Kroszner, Randall S., and Philip E. Strahan. (1999) "What Drives Deregulation? Economics and Politics of the Relaxation of Bank Branching Restrictions." *Quarterly Journal of Economics*, 114, 1437–67.

Li, Lei, Elena Loutskina, and Philip E. Strahan. (2019) "Deposit Market Power, Funding Stability and Long-Term Credit." Technical Report, National Bureau of Economic Research.

Loutskina, Elena. (2011) "The Role of Securitization in Bank Liquidity and Funding Management." *Journal of Financial Economics*, 100, 663–84.

Loutskina, Elena, and Phillip E. Strahan. (2009) "Securitization and the Declining Impact of Bank Financial Condition on Loan Supply: Evidence from Mortgage Originations." *Journal of Finance*, 64, 861–922.

McGowan, Danny, and Huyen Nguyen. (2023) "To Securitize or To Price Credit Risk?" *Journal of Financial and Quantitative Analysis*, 58(1), 289–323.

Mian, Atif, and Amir Sufi. (2009) "The Consequences of Mortgage Credit Expansion: Evidence from the 2007 Mortgage Default Crisis." *Quarterly Journal of Economics*, 124, 1449–96.

Parlour, Christine A., and Andrew Winton. (2013) "Laying Off Credit Risk: Loan Sales versus Credit Default Swaps." *Journal of Financial Economics*, 107, 25–45.

Pennacchi, George. (1988) "Loan Sales and the Cost of Bank Capital." *Journal of Finance*, 43, 375–96.

Raz, Arisyi F., Danny McGowan, and Tianshu Zhao. (2022) "The Dark Side of Liquidity Regulation: Bank Opacity and Liquidity Risk." *Journal of Financial Intermediation*, 52.

Rice, Tara, and Phillip E. Strahan. (2010) "Does Credit Competition Affect Small-Firm Finance?" *Journal of Finance*, 65, 861–89.

Stiroh, Kevin, and Phillip E. Strahan. (2003) "Competitive Dynamics of Deregulation: Evidence from U.S. Banking." *Journal of Money, Credit, and Banking*, 35, 801–28.

Sun, Liyang, and Sarah Abraham. (2021) "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." *Journal of Econometrics*, 225, 175–99.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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Table A.2: Methodological Sensitivity Checks
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