The Death of a Regulator:
Strict Supervision, Bank Lending and Business Activity

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Abstract

An important question in banking is whether stricter supervision, especially in response to financial crises, improves the allocation of financial resources and boosts economic recovery. It could also choke off lending and amplify recent economic woes. However, estimating the effects of strict supervision is challenging. We exploit the extinction of the thrift regulator (OTS) – an unprecedented change in prudential supervision, affecting ten percent of all U.S. depository institutions. Using this event, we analyze the economic links between strict prudential supervision, bank lending and business activity. We first show that the OTS replacement indeed resulted in stricter supervision and enforcement of financial rules in former OTS banks. We then analyze the effects of stricter supervision and show that former OTS banks increase small business loans originations by roughly 15 percent. We also find increases in business dynamism (entry and exit) in counties most exposed to OTS banks, suggesting that the increase in business lending leads to a reallocation across new and old establishments. When we explore the mechanism for the lending results, we find that stricter supervision also affects well-capitalized banks, indicating it is not only bank capital that is holding back new lending by banks with non-performing loans.

Keywords: Bank regulation, Enforcement, Loan Losses, Aggregate outcomes, Prudential oversight, Business lending, Entry and exit

JEL classification: E44, E51, G21, G28, G31, G38, K22, K23, L51, M41, M48

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1. Introduction

A recurring storyline in banking crises is the fierce public backlash against bank supervisors for allegedly failing to take prompt and decisive action to unearth and correct problems of weak banks. These allegations often play an important role in justifying policy interventions such as the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 or the Dodd-Frank Act of 2010. But it is not clear whether stricter supervision following a financial crisis improves bank lending and the allocation of financial resources. It could also further depress bank lending and amplify the economic downturn. Despite the importance of this question, we have relatively little evidence on the economic effects of strict banking supervision, especially when it comes to the role of loan loss recognition in shaping bank lending and business activity.

Part of the problem is that isolating the effects of strict supervision is empirically challenging. First, it is difficult to determine and measure the precise timing and magnitude of changes in the attitudes of bank supervisors toward their regulated entities. Second, the jurisdictions of banking regulators seldom change or overlap with those of other regulators, and one cannot distinguish the effects of stricter supervision from those of concurrent macroeconomic events that also affect the performance of banks and business activity. Finally, regulated entities in the United States usually have an option to choose their regulator, therefore raising concerns about selection bias following a change in regulatory policy.

A notable exception is Agarwal, Lucca, Seru, and Trebbi (2014). They exploit the mandatory rotation of the federal and state regulators in the on-site supervision of state chartered banks and find that the institutional design and incentives of bank regulators affect the supervisory assessment of the same banks and the corrective actions implemented. However, in this setting, it is difficult to observe how changes in regulatory strictness shape bank lending and economic

outcomes in the long run as the supervision by the stricter federal regulators is, by construction, short-lived and lasts only until the following spell of a state regulator.

In this paper, we analyze the economic links between strict prudential supervision, bank lending and business activity. We exploit that Title III of Dodd Frank abolished the Office of Thrift Supervision (OTS) and transferred its powers to other regulators, i.e., the OCC, FDIC and FRS. This regulatory change was prompted in part by the perception that lax prudential supervision played a significant role in the failures of WaMu, IndyMac, and also Countrywide. The extinction of the OTS represented an unprecedented change in prudential supervision in the US banking system that directly affected approximately ten percent of all depository institutions, representing 8.5% of all U.S. deposits. Moreover, this change was exogenously imposed on thrifts, rather than resulting from self-selection into new regulators and hence can be used to study the economic effects of strict(er) prudential supervision.

We begin our analysis by examining whether the replacement of the OTS indeed resulted in stricter supervision and, in particular, stricter enforcement of accounting and financial rules governing loan loss recognition for former OTS institutions. We find that the loan loss provisions, charge-offs, and nonperforming loan ratios of former OTS banks show a sharp on-impact increase following the OTS replacement. For instance, the ratio of nonperforming loans increases by 0.4 percentage points for former OTS banks upon transition, which represents approximately 30% of the average nonperforming loans of all depository institutions over the sample period. We interpret this evidence as consistent with the idea that the new supervisors increase regulatory scrutiny, essentially enforcing stricter loan loss provisioning and more extensive recognition of problem loans in former OTS banks.

Next, we analyze the economic effects of stricter prudential supervision on thrifts. Forcing thrifts to increase their provisions and to classify loans as non-performing could force them to initiate a de-leveraging process to conserve capital which, in turn, could lower lending and create a credit crunch in the local economies that are more exposed to former OTS institutions. But aside from the capital channel, stricter supervision could force thrifts to improve their risk management systems. It could also force reluctant bank managers to formally recognize their bad loans and clean up their balance sheets, and it could prompt them to stop evergreening bad loans because bankers have local ties or face local pressures. These actions in turn could lead to more lending and a reallocation of lending toward new entrants and better performing businesses. In sum, it is not clear whether stricter supervision hurts or boots economic outcomes.

Our findings, on average, support the latter hypothesis. We show that former OTS banks increase the total amount of small business loans originations by approximately 15 percent relative to the period prior to the OTS elimination. This result is robust to the inclusion of county-by-year fixed effects and bank-by-county fixed effects and hence the documented effect is not driven by former OTS banks being located in counties better economic outcomes. Instead, our results suggest an increase in the supply of small business loans by former OTS banks following the OTS replacement.

However, it is still possible that former OTS banks increase their small business lending because they were systematically located in areas *within a county* that experienced faster recoveries. We address this concern by (i) conditioning on the exposure of each bank to a weighted house price index at the zip-code level in which it has a branch operation and (ii) by implementing an alternative specification that takes advantage of finer geographic data on aggregate small business lending at the census-tract level. These additional empirical tests

confirm that, on average, former OTS banks increase their small business lending in response to stricter supervision and loan loss recognition following the OTS extinction.[1]

One potential reason for why the capital channel, which should lead to less lending, does not dominate in our setting is that former OTS banks were, on average, sufficiently well-capitalized to absorb the additional loss recognition required by the new regulators without having to de-lever. Thus, the OTS setting provides an opportunity to examine and document effects of strict supervision that may be unobservable (or intertwined with the capital channel) when banks are weak or failing. Strict supervision could force bank managers to clean their balance sheets, improve their risk management practices or free them from pressures in the local community, which in turn could lead to new and expanded lending. Consistent with this idea, we find that positive effects of stricter supervision are concentrated in former OTS banks with above-median capitalization ratios prior to OTS extinction. But importantly, we also find stronger lending effects for banks that increase their loan loss provisions and recognition *once* subject to stricter supervision (but not before). The latter result suggests that even well-capitalized banks are reluctant to recognize existing loan losses and that forcing them to recognize them with strict supervision is important in encouraging new lending.

After documenting that, on average, former OTS banks expand small business lending following the regulatory transition, we investigate changes in business activity (entry and exit rates) in counties with greater exposure to former OTS banks. We find a considerable increase in business dynamism in counties most exposed to OTS banks: the semi-elasticities of the entry and exit rates of establishments in response to a standard deviation increase in the share of former

[1] We also check that our lending result is not driven by a potential pull-back by other banks, notably the Top 4 banks, given the evidence in Chen, Hanson and Stein (2017). We find that, if anything, excluding or controlling for Top 4 bank lending makes our results stronger.

OTS deposits in the county are 0.60% and 0.55%, respectively. These findings suggest that the increase in small business lending does not simply translate into greater flow of credit resources to all existing establishments. Instead, they suggest that financial institutions are reallocating their lending from old to new establishments, such that counties become more dynamic. Consistent with this idea, we find that the effect of greater county exposure to former OTS banks on entry rates is greater in industries that require greater access to external sources of finance, which suggests a credit channel and supports our interpretation of the results.

This paper makes several contributions to the literature. First, we contribute to the long-standing debate about regulatory forbearance and the costs and benefits of strict prudential supervision. The prior literature has mostly focused on the incentives of bank regulators in enforcing financial regulations for and closing of troubled financial institutions. Kroszner and Strahan (1996) study regulatory supervision when regulators have incentives to forbear because the deposit insurance fund is insolvent. Brown and Dinç (2005 and 2011) use cross- country datasets to study the role of political pressures and too-many-too fail concerns on regulatory forbearance. Agarwal et al. (2014) provide evidence on the incentives and institutional design that shape supervisory efforts to enforce existing financial regulations and Costello, Granja, and Weber (2017) find that stricter regulators enforce transparent financial reporting. Closer to our paper, Caballero, Hoshi, and Kashyap (2008) investigate the role of zombie lending on the allocation of resources and economic growth. But as they note in their paper, they cannot attribute their results to the attitudes of bank regulators. Our paper uses a well-defined change in the strictness of prudential supervision to trace the economic consequences of this regulatory shock on the recognition of bad loans, the supply of lending and aggregate economic outcomes.[2]

[2] In linking loan loss provisioning and the recognition of bad loans to bank lending, our paper is also related to the

The message of our paper is that not recognizing bad loans can hold back new lending even for well-capitalized banks, suggesting that the economic effects of strict supervision go beyond the capital channel.

Second, our paper provides an analysis of the economic consequences of a key element of the Dodd Frank Act, i.e., the provisions in Title III. Generally speaking, examining the effects of Dodd Frank has been challenging because they are often are difficult to isolate from other contemporaneous effects of the law as well as the macroeconomic environment. We overcome these challenges by exploiting micro-level datasets in the banking industry as well as pre-determined variation in the exposure of different geographic regions to specific financial institutions affected by the OTS elimination.

Third, our paper contributes to the broader debate about financial regulation and enforcement (e.g., La Porta, Lopez-de-Silanes and Shleifer, 2006; Daske, Hail, Leuz, and Verdi, 2008; Jackson and Roe, 2009; Christensen, Hail, and Leuz, 2013 and 2016). Related to banking, Barth, Caprio, and Levine (2004) and Granja (2017) find positive financial stability and development effects of disclosure regulation, which facilitates private monitoring, but mixed effects for supervisory policies and inspections. Our study contributes to this literature by isolating enforcement effects by studying a setting in which a regulator is replaced by another regulator that more strictly enforces existing financial regulations.

2. Institutional Setting

The Office of Thrift Supervision (OTS) was created in the aftermath of the Savings & Loans (S&L) crisis to replace the Federal Home Loan Bank Board (FHLBB) as the primary regulator of

accounting studies on the timeliness of loan loss provisioning and its consequences. See, e.g., Beatty and Liao (2011) and Bushman and Williams (2012).

the thrift industry. Upon its creation, the OTS was initially perceived as a strict regulatory entity for its crackdown on the insolvent thrifts that had been left unscathed by the previous regulators during the S&L crisis (Wayne, 1992).

Over the following decades, sweeping industry changes undermined the competitive advantage of the thrift charter. Initially, federal thrifts were the only financial institutions entitled to open new branches across state borders and benefited from OTS preemption of state law pursuant to the Home Owners Loan Act (HOLA) Sections 4(a) and 5(a). But the passage of the Riegle-Neal Act of 1994 and the state law preemption powers acquired by the Office of the Comptroller of the Currency (OCC) eroded this regulatory advantage. Moreover, the Treasury Department's 2008 blueprint for a modernized financial regulatory structure also recognized that the thrift charter no longer occupied a special role in ensuring the supply of residential mortgage loans to US consumers. The business models of the commercial banks and thrift charters had converged substantially and commercial banks surpassed the thrifts' share of the overall U.S. residential mortgage market. As a result, the Treasury Department considered that the thrift charter lost its *raison d'être* and recommended phasing it out.

The number of savings associations regulated by the OTS declined from 1,628 in 1994 to 815 in 2007. Between 1998 and 2010, 120 thrifts converted to commercial banks whereas only 43 commercial banks converted to a thrift charter (MacDonald and Schwartz, 2011). These trends resulted in a decline in the share of depository institutions regulated by the OTS from 12.5% in 1994 to less than 9.5% in the wake of the 2008 financial crisis. At the same time as its share of the regulatory market declined, the OTS became increasingly associated with initiatives that promoted the reduction of regulations and "red tape". This pro-industry stance culminated in the OTS strategic plan for the fiscal years 2007—2012, which stated that "OTS listens to, learns

from, and collaborates with the institutions it regulates and the public it serves on how best to address their needs."

The failures of two large OTS regulated entities, Washington Mutual and the IndyMac Federal Savings Bank during the 2008—2009 financial crisis occurred against this backdrop of greater regulatory competition and perceived regulatory leniency by the OTS. These failed banks jointly represented approximately 3.2% of all US branch deposits and are two of the largest bank failures ever. In addition, Countrywide Financial, which had changed its charter in 2006 in search for a favorable regulatory treatment by the OTS, was forced to merge to avoid failure (Appelbaum and Nakashima, 2008a). Following the public and media backlash against the OTS for their alleged failure to properly supervise these institutions (Appelbaum and Nakashima, 2008b), President Obama asked Congress to merge the OTS and OCC.

Title III of the Dodd-Frank Act of 2011 stipulates the closure of the OTS and the transfer of OTS powers and duties to the Federal Reserve, OCC, and FDIC. The transfer of functions occurred on July 21st, 2011, one year from the passage of the Dodd-Frank Act. Under the Act, the OCC acquired supervisory and rulemaking authority over federal savings associations and the FDIC acquired supervisory and rulemaking authority over state-chartered savings associations. In total, 649 thrifts transitioned to the OCC, whereas 59 thrifts transitioned to the FDIC following the transfer of functions.[3,4]

Industry documents and the SEC filings of many thrift holding companies suggest that the OCC supervision and examination of former OTS regulated entities was perceived as more demanding than that of the OTS. In the area of accounting and loan loss recognition, the OTS did

[3] Authors' calculation based on Summary of Deposits data collected on June 30th of each year.
[4] No thrifts banks were automatically transferred to the Federal Reserve, but following the transition some former OTS banks switched their charter from the OCC to the FED.

not require banks to implement partial or complete charge-offs for troubled loans. Charge-offs were required at foreclosure only. Moreover, thrifts were allowed to establish specific valuation allowances for estimated losses on troubled real estate loans when loans were deemed uncollectible. By contrast, the OCC required earlier charge-off when a loan was deemed uncollectible and forced stricter risk management and loan risk ratings that made it harder for thrifts to extend, renew, and evergreen loans. The 2012 10-K of Bank Financial, Inc., a SEC-registered thrift holding company, supports these claims stating: "The OCC maintains a number of operating policies and practices that are different from the OTS, including in the areas of loan classification and the timing of charge-offs…we revised our classification of asset policies and practices to complete our transition to the OCCs loan risk rating practices. The OCCs practices will make it more difficult to renew performing classified loans…at December 31, 2011 approximately $3.5 million of our non-accrual loan balances reflected our decision to liquidate or not renew performing classified loans".[5]

Similarly, other research reports and surveys of community banks support the notion that former OTS banks experienced significant changes in the areas of risk management and loan loss recognition upon transition. A poll conducted by Sageworks found that the biggest areas of change after the transition were the strengthening of the risk rating system, implementation of stress testing, and the increase of the Allowance for Loan and Lease Losses (ALLL). Peirce, Robinson, and Strattman (2014) conducted a survey of small community banks and report that 8.7% of the surveyed banks considered that the elimination of the OTS negatively affected bank

[5] There are many examples of thrift holding companies discussing the transition from OTS to OCC in their 10-Ks expressing more demanding accounting requirements. For instance, the 2012 10-K of WSFS Financial Inc. states: "Lastly, in late 2011, ... we undertook a project to reduce the number of Pass grades in our loan rating system with a goal of recalibrating our loan rating classifications to current OCC and FRS standards ... This resulted in the elimination of our last Pass grade or our "pass/watch" grade. The result of this grade elimination resulted in $67 million being reclassified to Criticized or Classified, with none going to nonaccrual status. The impact of this project contributed to an incremental $2.1 million to the provision and allowance for loan losses in 2011." Despite the many examples, we also establish empirically that the new supervisors are stricter.

earnings, whereas only 3.5% of banks report that the elimination of the OTS positively affected earnings.

In spite of the more demanding supervision of the OCC, most former OTS banks chose not to switch charter. By our computation, only 40 out of the 649 former OTS institutions that transitioned to the OCC switched to the Federal Reserve or the FDIC by June 30th, 2012. The small flow of OCC-regulated former OTS institutions to other regulators suggests that the other regulators are perceived as similarly strict and that regulatory shopping is unlikely to be a substantive force affecting our empirical analyses.

3. Data and Key Variables

We obtain data on the financial characteristics of all commercial banks and savings banks operating in the United States from the Quarterly Reports of Condition and Income and from the Thrift Financial Reports that banks file with the FDIC and the OTS, respectively. Financial information on savings banks prior to 2012 is obtained from the Thrift Financial Report data available for download from SNL Financial. To build consistent time-series of financial characteristics and financial ratios for savings banks, we rely on the TFR-to-Call mapping prepared by the OTS staff using the Research Information System (RIS) Data Warehouse Dictionary maintained by the FDIC.[6]

Small Business Lending data for each commercial and savings bank come from the Community and Reinvestment Act (CRA) small business loans database provided by the Federal Financial Institutions Examination Council (FFIEC) pursuant to Regulations 12 parts 25, 228, 345, and 195 of the aforementioned Act. This dataset contains information on the total number

6 The document is available online on the following address: http://www.ots.treas.gov/_files/4830092.pdf

and volume of small business loans originated by each reporting financial institutions in each US county during a calendar year. Since 2005, all commercial and savings banks whose total assets exceed $1 billion dollars must report this data to the FFIEC. The CRA small business lending dataset also includes aggregate information on the total number and volume of small business loans originated by all reporting institutions at the census-tract level during each calendar year.

We use bank location data for each commercial and savings bank from the Summary of Deposits (SOD) database provided by the FDIC. We map branch locations to their Census Tract using the Census Geocoder available in the United Census Bureau website. We drop some observations because their latitude and longitude data are missing and their address is improperly recorded. We use the census tract of each branch location to compute measures of the exposure of each census tract to former OTS bank.

To provide evidence on the economic effects of the OTS extinction, we use county-level data on the entry and exit rates of establishments in a given year from the Census Bureau's Statistics on US Businesses (SUSB) dataset. The SUSV is carried our on March 12th of each year. Following Chen, Hanson, and Stein (2017), we call the entry and exit rate from March 12th of year X to March 12th of year X+1, the entry and exit rate of year X. We use the county-by-industry level entry and exit rate information to analyze the main effects by industry after stratifying industries by their financial dependence on external sources. Information on the industry's dependence on external sources of financing is obtained from the Survey of Business Owners and is defined as the percentage of use of external financial capital defined as bank and government loans, loans from family/friends, credit cards, venture capital investment or grants.

4. Descriptive Statistics

The abolishment of the OTS directly affected 708 federal and state chartered savings associations whose primary regulator as of June 30th, 2011 was the Office of Thrift Supervision. Panel A of Table 1 presents descriptive statistics for key variables used in our analysis, separately for commercial banks and former OTS banks that transitioned to the OCC and FDIC following the OTS extinction. The average size of commercial banks is substantially greater than the size of former OTS banks. However, the median and size quartiles of the former OTS banks are greater than those of the commercial banks. These differences exist because the larger systemically important financial institutions organize as commercial banks, creating a substantial right skew in the size distribution of commercial banks.

The lending portfolio of former OTS banks tilts toward residential mortgage lending, which comprises approximately 40% of their asset portfolio. This portfolio allocation suggests that former OTS banks are still influenced by their historical role for the supply of residential mortgage loans to US consumers. Commercial banks have a more diversified loan portfolio with commercial and industrial (C&I) loans and commercial and real estate (CRE) loans accounting for 9.5% and 23.3% of their total assets, whereas these loan categories account only for 3.3% and 17.2% of the total assets of former OTS banks. These patterns are important differences and we address them explicitly in our analyses.

In spite of the differences in the composition of the loan portfolios across commercial banks and former OTS banks, the average loan quality of the lending portfolios does not differ substantially across the two groups. The average nonperforming loan ratios of commercial and former OTS banks over the sample period are 1.2% and 1.3%, respectively and their ratios of provisions to total assets are also very similar. The capital ratio levels of former OTS banks are,

nevertheless, substantially higher than those of commercial banks. The relatively high capitalization rate of former OTS banks is also an important feature of our setting and allows us to examine the effects of strict supervision through channels other than (low) capitalization.

In Panel B of Table 1, we report additional key statistics related to the small business lending activity of CRA reporting banks. Again, we see that commercial banks originate on average more small business loans than former OTS banks, which is consistent with the above discussion. However, the differences in the size distribution between commercial and former OTS banks are not as pronounced in the CRA reporting sample when measured in terms of their total deposits and number of branches. We also compare the average house price appreciation in counties where commercial banks and former OTS banks originate loans and find that the average house price appreciation is, on average, higher in counties where commercial banks are located. These statistics suggest that controlling for differences in loan demand across counties is important for our analysis.

5. OTS Extinction and Enforcement of Loan Loss Recognition

In this section, we document the regulatory consequences of the OTS extinction for former OTS banks. Towards this end, we analyze the transition of former OTS banks to the OCC and the FDIC with respect to the reporting and recognition of loan losses by former OTS banks relative to untreated commercial banks. In Section 2, we report anecdotal evidence suggesting that the enforcement policies of the new regulators of former OTS banks were significantly stricter than those of the OTS. These claims are supported by SEC filings of former OTS banks and industry reports suggesting that the new regulators prompted an increase in the loan loss provisions and a revision of the internal risk management and loan risk ratings of former OTS banks. Here, we empirically examine these claims and confirm that the observed changes in the

reporting and recognition of loan losses are indeed the result of stricter supervision and enforcement by the new regulators, rather than from composition or other spurious effects.

We begin our empirical analysis by asking whether the time series of the average loan loss provision and of the nonperforming loans ratio in Figure 1 suggest that former OTS banks were subject to stricter accounting and loan loss recognition policies after their transition to the OCC and FDIC. In Figure 1, we plot the average loan loss provision and average nonperforming loan ratios of banks that were formerly regulated by the OTS and those of all other commercial banks. Throughout most of the pre-crisis years, the average provisioning effort of commercial banks exceeded that of the former OTS banks, with the exception of the provisioning effort of OTS banks during the third quarter of 2008. Around the extinction of the OTS, however, there is a striking increase in the provisioning effort of former OTS banks relative to that of other commercial banks. This wedge persists until the fourth quarter of 2012 and then disappears as the provisioning ratios of former OTS banks converge to those of other commercial banks. A similar pattern is obtained when we analyze the time series evolution of the nonperforming loan ratio for both groups. The level of the nonperforming loan ratio of former OTS banks is systematically lower for former OTS banks throughout the crisis year but quickly surpasses that of commercial banks following the OTS extinction and remains above that of commercial banks until the end of the sample period. These figures suggest that accounting and loan loss recognition policies of former OTS banks became stricter around the regulatory change.

To formally examine whether the OTS extinction is associated with stricter accounting and loan loss recognition policies, we estimate the following linear regression model:

$$Y_{it} = \beta OTS \times Post_{it} + \theta X_{it} + \gamma_i + \delta_t + \varepsilon_{it} \qquad (1)$$

where Y is the loan loss provisioning, nonperforming loan, charge-off, or Allowance for Loan and Lease Losses (ALLL) ratio of bank i in quarter t. *OTS* is a dummy variable that takes the value of one if the bank was regulated by the OTS prior to the OTS extinction and *Post* is a dummy variable taking the value of one following the OTS extinction in the third quarter of 2011, inclusive. As the average size and loan portfolio composition of former OTS banks and commercial banks are very different, we also include a vector X containing financial characteristics such as size, portfolio composition and capitalization of the bank. One concern is that the assets of former OTS banks have worse unobserved quality (e.g. lower collateral values) than those of other banks. We deal with this possibility by including bank fixed-effects, $\boldsymbol{\gamma_i}$, which control for time-invariant unobserved characteristics of each bank. Finally, we add quarter fixed-effects, $\boldsymbol{\delta_t}$, to control for changes in aggregate economic conditions, which could be correlated with the extinction of the OTS. We cluster standard errors at the level of the bank's county headquarters.

Table 2 reports the results of this analysis and confirms the interpretation of Figure 1. The main coefficient, $\boldsymbol{\beta}$, is statistically significant and suggests that the loan loss provision ratio and nonperforming loan ratio of former OTS banks increase by approximately .027 and .365 percentage points after the OTS extinction. In both cases, these magnitudes are economically meaningful and correspond to an approximate 30% increase relative to the unconditional average of these variables over the entire sample period. We also conduct this analysis using the charge-off ratio, which measure the bank's propensity to write-off bad loans, and the ALLL ratio, which measures the total amount of the bad-debt allowance. Columns (5) to (8) report results for these alternative dependent variables and again suggest that former OTS banks faced stricter enforcement of accounting policies following the OTS extinction. We further note that

conditioning on measures of size, portfolio composition, and capitalization does not attenuate the main coefficients relative to the specifications that do not include any additional controls for financial characteristics. These results support the notion that the main results are not driven by differences in business models between former OTS and commercial banks but rather by differences in regulatory stance.

If the transition of former OTS banks to the OCC and FDIC are indeed the result of stricter supervision and, in particular, stricter enforcement of accounting and loan loss recognition rules, then we expect the transitioning effects to be more pronounced during the first supervisory examination cycle following the OTS extinction. Towards this end, we investigate whether the OTS extinction generates a sharp "on-impact" effect on the accounting and loan loss recognition policies of former OTS banks. To formally examine and trace the temporal evolution of the OTS extinction effects over time we estimate the following linear regression model:

$$Y_{it} = \sum_{t} \beta_t (OTS_{it} \times \delta_t) + \theta X_{it} + \gamma_i + \delta_t + \varepsilon_{it} \qquad (2)$$

which expands the model of equation (1) with interaction of the OTS dummy with a set of quarter dummies that take the value of one in each quarter of the sample period.

Figure 2 plots the series of coefficients, β_t, and corresponding standard errors. The plots suggest that, during the financial crisis period, the OTS was more permissive than other regulators in enforcing accounting and loan loss recognition rules. In particular, the provisioning and nonperforming loan ratios of former OTS banks stayed significantly below those of commercial banks with the same characteristics. These ratios experienced a sharp turnaround in the period that immediately followed the OTS extinction. During this period, both the provision and nonperforming loan ratios increase significantly more for former OTS banks. Finally, the

figures also suggest that the adjustment in the accounting and loan loss recognition policies of former OTS banks is completed around the start of 2013 as the provisioning effort of former OTS banks converges to those of other commercial banks and the difference in the level of nonperforming loan ratio plateaus around that period.

We perform a battery of robustness tests to confirm that the regulatory transition rather than other spurious relations drive the documented effects. In unreported tests we find that the effect of the OTS extinction persists if we restrict attention to the subsamples of below-median and above-median capitalization banks suggesting that the effect is not confined to the subsample of poorly capitalized financial institutions. Next, when we saturate the model with interactions between the *Post* dummy and the financial characteristics vector, *X*, the results and inferences are similar. Some attenuation of the main coefficients in their magnitude is expected if the regulatory transition also affects these financial characteristics (e.g., lending composition). As such, it is not clear that these interactions should be included, which is why we perform this test as sensitivity analysis only. Finally, we find that the effects of OTS extinction are larger in financial institutions with greater latent unrecognized losses as measured by their exposure to areas of large house price declines during the financial crisis.

Overall, we interpret the confluence of evidence as confirming the anecdotal evidence reported in section 2 and as suggesting that the transition of former OTS banks to OCC and FDIC implied stricter supervision and enforcement of loan loss reporting and recognition.

6. OTS Extinction and Small Business Lending

Having established that the extinction of the OTS essentially forced former OTS banks to recognize existing and future loan losses and to clean up their balance sheets, we analyze how

the transition in supervision affected banks' lending activities. As discussed, the direction of the effect is a priori not obvious.

A simple plot of the time-series of small business loan originations by former OTS banks and other commercial banks presented in Figure 3 suggests that total small business lending of former OTS banks increases following the OTS extinction. While total small business lending of commercial banks grew as well, albeit modestly, the total small business lending of former OTS banks outpaces that of their commercial bank counterparts after the OTS extinction. This simple plot already suggests that a positive effect on lending of former OTS banks to small businesses.

An obvious concern with the simple analysis of Figure 3 is that lending of former OTS banks increases more rapidly because of differences in business models or because the former OTS banks are located in areas that experienced higher growth in demand for small business credit relative to areas where other commercial banks are located.

We address this concern by exploiting information on the amount of small business loans that CRA reporting banks originate by county during a calendar year. Thus, we are able to compare the small business lending activities of former OTS banks in a county relative to the small business lending activities of other commercial banks that operate in the same county during the same calendar year. The empirical strategy relies on the idea that banks operating in the same counties are subject to similar shocks to small business credit demand. Hence, by comparing the evolution of lending of former OTS banks and other commercial banks in the same county we are better able to isolate the effect of the OTS extinction on the supply of credit of former OTS banks. We formalize this insight by estimating the following specification:

$$LnAmount_{bct} = \beta OTS \times Post_{bt} + \theta X_{bct} + \gamma_{ct} + \delta_{bc} + \varepsilon_{bct} \qquad (3)$$

where *LnAmount* is the natural logarithm of the total amount of small business loans originated by bank *b* in county *c* in calendar year *t. OTS* is a dummy variable that takes the value of one if the bank was regulated by the OTS prior to the OTS extinction and *Post* is a dummy variable taking the value of one following the OTS extinction in the calendar year 2011, inclusive. X_{bct} is a vector of characteristics of the bank that includes quadratic controls for the branch presence and total deposits collected by a bank in a county. The county-by-year fixed effects, γ_{ct}, control for unobserved common shocks that affect a county during a calendar year. In addition, we introduce bank-by-county fixed-effects, δ_{bc}, which control for unobserved time-invariant characteristics of the presence of each bank in each county as well as differences in business model. Standard errors are clustered at the county level. The inclusion of county-by-year and bank-by-county fixed effects ensures that former OTS banks are compared with commercial banks originating loans in the same county and year and, therefore, that the results are not driven by greater demand for small business loans in counties where former OTS banks are located.

We report the results of this analysis in Table 3. In column (1) we estimate a specification that includes year, bank, and county fixed effects, in column (2) we include county-by-year and bank fixed effects, and in column (3) we present our preferred specification that includes county-by-year and bank-by-county fixed effects. The coefficient on the main variable of interest, $OTS \times Post$, is statistically significant in all three specifications. The estimates are also economically meaningful. In our preferred model in column (3), the OTS extinction is associated with an 8.8% increase in the total volume of small business loans originated by former OTS banks. Interestingly, the magnitude of the main coefficient declines between columns (1) to (3) suggesting that not properly accounting for differences in unobserved demand shocks across former OTS banks and commercial banks could inflate the coefficients.

A remaining concern is that former OTS banks and commercial banks operate in systematically different areas *within* a county, which would not be addressed by the fixed effects in the model. We therefore compute a bank- and county-specific house price index using the zip codes in which banks have a branch presence within a county. We weight the price index of each zip code by the bank's level of deposits in that zip code, and then we re-estimate the model including this additional control. The rationale for including this variable is that a bank-by-county house-price index potentially captures systematic differences in the location strategies of former OTS and commercial banks and, therefore, absorbs some of the potential unobserved heterogeneity in within-county loan demand, which is not accounted by the fixed effects. The results, reported in columns (4) through (6), are quantitatively similar to those of columns (1) through (3), suggesting that our results are not driven by such differences in local credit demand.

To even further tighten our analysis with respect to the concern that differences in location patterns within a county are correlated with unobserved shifts in the demand for small business credit, we exploit the availability of a CRA dataset that contains information on the aggregate small business loans originated at the census-tract level by all CRA reporting banks. We draw on insights from Nguyen (2017) and compare changes in aggregate small business lending in census-tracts with a significant share of deposits held by former OTS banks with changes in the aggregate small business lending of other census-tracts located in the same county that have a smaller share of deposits held by former OTS banks.

Formally, we estimate the following OLS specification:

$$LnAmount_{ict} = \beta ShareOTS \times Post_{it} + \theta X_{it} + \gamma_i + \delta_{ct} + \varepsilon_{ict} \qquad (4)$$

where *i* indexes for census-tract, *c* indexes for county, and t indexes for year. *LnAmount* represents the aggregate small business lending by all CRA-reporting institutions in each census-

tract during the calendar year. *ShareOTS*, is the share of deposits held by branches of former OTS banks in each census-tract as of June 30th, 2010 and *Post* is a dummy variable taking the value of one following the OTS extinction during the calendar year 2011, inclusive. X_{it} is a vector of time-varying characteristics of the census-tract that includes quadratic controls for the number of branches and total amount of deposits held in branches located in the census-tract. The census-tract fixed effects, γ_i, control for unobserved heterogeneity at the census-tract level and the county-by-year fixed effects ensure that we compare census tracts within the same county that have different exposure to former OTS institutions.

We present the results in Table 4. The coefficients associated with the main variable of interest, $ShareOTS \times Post$, confirm that the OTS extinction is associated with an increase in small business lending by former OTS banks. The estimated effects are economically large: following the OTS extinction the aggregate small business lending increases approximately five percent more in census tracts whose deposits are 100% held in branches of former OTS banks relative to census tracts where former OTS banks do not have any branch.

Next, we modify the models of equations (3) and (4) to interact the *OTS* and *ShareOTS* variables with a series of year dummies that take the value of one in each of the sample years and zero otherwise. This analysis is akin to that presented in Figure 2 and its purpose is to examine whether the relation between the OTS extinction and small business lending is relatively sharp around the regulatory transition rather than an ongoing trend towards greater small business lending by former OTS banks. In Figure 4, we plot the series of coefficients and corresponding standard errors from estimating the modified version of equations (3) and (4). Both plots suggest that i) there are no significant pre-trends, which we interpret as suggesting that commercial banks operating in a county are an adequate control group for the former OTS banks operating in

the same county, and that ii) the main effect is statistically significant and economically meaningful immediately following the OTS extinction and regulatory transition. This pattern supports the interpretation that the increase in small business lending is a direct cause of the regulatory change in supervision and enforcement.

To be sure, we examine whether the relation between the OTS extinction and small business lending survives a battery of robustness tests. Specifically, we confirm that the results are robust to controlling for the portfolio holdings and size of the banks, weighing the observations by the size of the bank, adjusting for mergers and acquisitions, and controlling for the participation of the bank in the TARP program. Given the evidence in Chen, Hanson and Stein (2017), we also analyze whether our results are driven by the lending behavior of the Top 4 banks (Citigroup, Wells Fargo, JP Morgan Chase, and Bank of America) in the control group. We find that excluding the Top 4 banks does not alter and, if anything, strengthens our findings.

Overall, we conclude that the change in supervision from the OTS to the OCC and FDIC led to an increase in small business lending by former OTS banks. In the next section, we make an attempt to explore the mechanism(s) and channels through which stricter supervision resulting in more extensive loan loss reporting and recognition could lead to more bank lending.

7. Cross-Sectional Heterogeneity in the Effects of OTS Extinction

7.1. The Roles of Capitalization and Loan Loss Recognition

The results in the previous section are seemingly inconsistent with a large literature showing that financial institutions significantly cut lending in response to loan losses negatively affecting their balance sheets and capital (e.g. Peek and Rosengren, 2000; Chodorow-Reich, 2014; Ivashina, Bord, and Taliaferro, 2017; Paixão, 2017). Based on this literature, one would predict that more extensive loan loss provisioning and recognition should lead to less lending, rather

than more, due to its effect on bank capital. It is possible that the relatively well-capitalized former OTS banks expand their lending at the same time as the poorly-capitalized former OTS banks are forced to recognize their losses and scale back new lending. But such a substitution effect from poorly-capitalized to well-capitalized banks could not explain why average or aggregate lending by former OTS banks increases. Indeed, a key question is why relatively well-capitalized banks that could easily absorb the additional loan loss reporting and recognition imposed by the new regulator did not expand their lending until they were forced to recognize existing or expected losses in their loan portfolios. Thus, our setting provides the opportunity to examine if there are reasons beyond capital constraints why unrecognized loan losses are holding back new lending. Such evidence in turn could be a first step towards explaining why strict supervision that forces banks to recognize losses and to clean up their balance sheets results in new and more lending. To this end, we examine first whether the relation between stricter supervision and more small business lending varies with the capitalization of banks prior to the OTS extinction.

In columns (1) and (2) of Table 5, we stratify the sample based on the average regulatory capital ratio reported by each financial institution in the last quarter of 2010. The results are striking: former OTS banks with above-average regulatory capital increase their small business lending while banks with below-average regulatory capital ratios prior to the OTS extinction significantly reduce their total small business lending following the OTS extinction. These results should be interpreted with caution as the regulatory capital of banks could capture other unobservable characteristics related to banks' willingness to lend. Nevertheless, the differential effects depending on bank capitalization point to an important distinction. The results for below-average capitalization are largely consistent with prior literature that emphasizes the role of bank

capital. Based on this literature, poorly-capitalized banks are expected to scale back lending when they are forced to recognize losses and their capital is depleted. However, a novel finding is that well-capitalized banks expand their lending upon overhaul of their loan loss recognition. The latter is not consistent with a bank capital channel and suggests that there are other channels through which stricter supervision and loan loss recognition can unlock new lending when bank are reasonably well-capitalized.

To explore the existence of these other channels, we examine next whether the increase in small business lending following the OTS extinction is associated with the overhaul in the loan loss recognition and provisioning policies that followed the transition to the new regulator. The idea is to establish that former OTS banks that recognized their problem loans, established sufficient provisions, and cleaned their balance sheet following the regulatory change resumed and expanded their lending, presumably to healthier clients and new entrepreneurs.

To test this conjecture, we partition the sample based on the above- and below-average growth in the provisions of financial institutions between the four quarters that preceded and the four quarters that followed the OTS extinction (columns (3) and (4)) and also based on above- and below-average changes in the growth of nonperforming loans between 2010 and 2012 (columns (5) and (6)). The results support the idea that the positive effects of the OTS extinction on small business lending are concentrated in former OTS banks that cleaned up their balance sheet by ramping up their provisions and increasing their recognition of problem loans.

7.2. Role of Local Credit Conditions

An intriguing question posed by the findings that we presented thus far is what precluded commercial banks from financing the lending opportunities that allowed the former OTS banks to expand their lending following the OTS extinction. After all, one would expect that the more

strictly regulated commercial banks would be willing to lend to positive net present value (NPV) investment opportunities. A potential explanation is that the effects of the OTS extinction are concentrated in areas where commercial banks were capital constrained and, therefore, less willing to extend credit, which in turn allowed the former OTS banks to expand their lending after they cleaned up their balance sheets.

One way to test this explanation is to sort all U.S. counties based on the extent to which the former OTS banks' local competitors are capital constrained. We measure the constraints of local competitors using two alternative methods. First, we compute a pre-recession weighted average of the regulatory capital of local competitors in a county. We measure regulatory capital as the Tier 1 Capital ratio in the fourth quarter of 2007, and we weight the regulatory capital of each local competitor by its level of deposits in the county to account for competitor size. Second, we implement an approach similar to that of Greenstone, Mas, and Nguyen (2015) and compute a measure of the predicted credit supply shock in each county during the Great Recession based on pre-existing market shares and estimated aggregate bank supply shifts.[7]

We present the results in Table 6. In columns (1) and (2), we sort and split observations based on the weighted average of the capital ratios of local competitors. Consistent with the idea that the relation between OTS extinction and small business lending is strongest in areas where local competitors are capital constrained, we find that the main coefficient, β, is significant only in the subsample of former OTS banks with poorly capitalized local competitors. In columns (3) and (4), we investigate this idea by sorting and splitting all U.S. counties based on the predicted supply shift based on the Greenstone et al. (2015) approach. Again, the magnitude of the OTS extinction effect is greater and statistically significant only in areas with high negative supply

[7] More details of the implementation of the procedure can be found in Greenstone, Mas, and Nguyen (2015).

shocks. Overall, the results support the conjecture that the lending effects following the OTS extinction are stronger where competitors are more constrained.

8. Effects of OTS Extinction on Aggregate Economic Outcomes

We have documented that the regulatory transition of former OTS banks is associated with an increase in small business lending. A remaining question is whether this increase in small business lending was directed to incumbent firms or whether the stricter supervision of former OTS banks contributed to a better allocation of capital at the local level, e.g., by prompting banks to cut nonperforming loans to incumbents and redirecting lending to new entrepreneurs in the same county.

While we cannot directly observe the identities of loan recipients, we can investigate how greater exposure to former OTS banks following the OTS extinction is associated with changes in the aggregate rates of entry and exit of businesses at the county level. An increase in the entry and exit rates in counties with greater exposure to former OTS banks would be consistent with the idea that the former OTS banks are terminating delinquent loans and financing startup businesses.

We compute the exposure of a county to former OTS banks as the share of deposits in a county that is held in branches of former OTS banks as of June 30th, 2010.[8] We plot the spatial distribution of the county exposure to former OTS banks in Figure 5. We draw two insights from the plot. First, it suggests that spatial correlation or regional clustering is not a great concern in this setting. The counties with high exposure to former OTS banks are scattered throughout the United States. Second, the plot shows that more than half of the U.S. counties have no exposure

[8] We compute the county exposure to former OTS banks using the deposit levels of 2010, rather than those of an earlier year to avoid including WaMu and Indymac in these computations.

to former OTS banks. As these counties comprise a majority of the sample and could be structurally different from counties with OTS exposure, we exclude them from the analysis.

We calculate the entry (exit) rate as the ratio of new entrants (exits) in the county to the number of existing businesses in the county. We formally examine the relation between these two variables using the following OLS specification:

$$Y_{ct} = \beta ShareOTS \times Post_{ct} + \theta X_{ct} + \gamma_t + \delta_c + \varepsilon_{ct} \qquad (5)$$

where *Y* represents the entry and exit rate of new establishments in county *c* during year *t*, *ShareOTS* is the share of deposits held in branches of former OTS banks as of June 30th, 2010, *Post* is a dummy variable taking the value of one following the OTS extinction during the calendar year 2011, inclusive. *X* is a vector of characteristics comprising the number of bank branches and level of deposits held in the county, the number of establishments in the county, and the size composition of the establishments operating in the county measured by the number of establishments in the county that employ 1–4, 5–9, 10–19, 20–49, 50–99, 100–249, and 250–499 people. The year fixed effects, γ_t, control for overall trends in the evolution of entry and exit rates and the county fixed effects, δ_c, control for time-invariant unobservable characteristics of each county. As before, we cluster the standard errors at the county level.

We report the results of this analysis in Table 7. We present results for an OLS specification and also for weighted least squares (WLS) specifications, in which we weigh each observation by the level of employment in the county. We find considerable increases in business dynamism in counties most exposed to OTS banks. The main coefficients of interest, β, are statistically significant and suggest that the OTS extinction is positively related to entry and exit rates of establishments. The economic magnitudes are also meaningful: the semi-elasticities of the entry and exit rates of establishments in response to a standard deviation increase in the share of

former OTS deposits in the county are 0.60% and 0.55%, respectively. These findings suggest that the increase in small business lending does not simply translate into greater flow of credit to all existing establishments, but rather is consistent with a pattern in which financial institutions do not renew loans of some troubled incumbents and supply credit to new establishments.

Similar to the analyses depicted in Figures 2 and 4, we estimate how the effects of greater exposure to former OTS banks on entry and exit rates change over time. We expand the specification of the model in equation 5 by interacting *OTSshare* with a series of indicator variables that take the value of one in each year of the sample and plot the corresponding coefficients and respective standard errors in Figure 6. Consistent with the notion that stricter supervision and the ensuing loss recognition increased lending and business dynamism, we find that greater exposure to former OTS banks is significantly and positively associated with entry and exit rates following the OTS extinction, but not prior to the regulatory transition.

We conclude this part of our analysis with an additional robustness test, which should increase the confidence in our interpretation, essentially illustrating that the increase in business dynamism is related to new lending. If the regulatory transition increases business dynamism, the effects should be particularly pronounced in industries that are more dependent on external sources of financing. We exploit data from the Survey of Business Owners on the dependence from external sources of finance at the 2-digit SIC industry level and we then sort industries by below- and above-median external dependence. The strategy, which is akin to that of Rajan and Zingales (1998), is to examine whether the exposure to former OTS banks is associated with a larger effect on entry and exit rates in industries that are more dependent on external financing.

We re-estimate the model of equation 5 in the below- and above-median external financing subsamples using data on entry and exit rates at the industry-county level. We report these results

in Table 8. We find that the effect of greater county exposure to former OTS banks on entry rates is greater in industries that require greater access to external sources of finance, which suggests a financing channel and supports our interpretation of the business dynamism results. However, for the exit rates, the coefficient magnitudes for the OTS extinction effect are not much different across both subsamples, which we view as a caveat to our interpretation.

9. Conclusion

One of the main tradeoffs for bank regulators is striking a balance between, on one hand, protecting the financial system by forcing banks to recognize distressed loans, to clean-up their balance sheets when necessary, and to ensure adequate provisioning for future loan losses and, on the other hand, causing a credit crunch for the real economy by being too strict with financial institutions, especially in times of crisis and when banks face substantial loan losses.

In this paper, we examine this tradeoff by examining the elimination of the OTS by the Dodd-Frank Act, which occurred shortly after the Great Recession. This transition of former OTS supervised banks to new regulators, the OCC and the FDIC, which had a much stricter approach when it comes to loan loss recognition and provisioning, allows us to analyze the economic links between strict prudential supervision, bank lending and business activity.

We confirm that the regulatory transition resulted in stricter and more extensive loan loss recognition and provisioning. Next, we find little evidence that stricter supervision led to a credit crunch. Instead, we document that former OTS banks on average increase their lending to small businesses following the regulatory transition. Moreover, we find suggestive evidence that entry and exit rates for businesses increase in areas with significant presence of former OTS banks, consistent with former OTS banks not renewing loans to existing borrowers and instead lending to new establishments. To the best of our knowledge, ours is the first paper that examines how

stricter bank supervision with respect to loan losses translates into credit supply and aggregate outcomes. Our results suggest that even well-capitalized banks are reluctant to recognize existing loan losses and that forcing them to recognize them with strict supervision is important in encouraging new lending.

One important caveat to our analysis is that all the effects that we empirically document are relatively short-run. The extinction of the OTS resulted in an unprecedented increase in the concentration of banking supervision. Whether, in the long haul, this decline in the number of supervisors and the ensuing increase in regulator concentration will benefit the financial system and society in general is still an open question that requires further study.

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Figure 1: Time Series of Loan Loss Recognition

Figure 1 plots the average loan loss provision ratio (loan loss provision divided by total assets) and average nonperforming loan ratio (nonperforming loans divided by total assets) of former OTS banks and all other commercial banks during the period 2005Q1 to 2013Q4. Data are from the FFIEC Call Reports and from the Thrift Financial Reports.

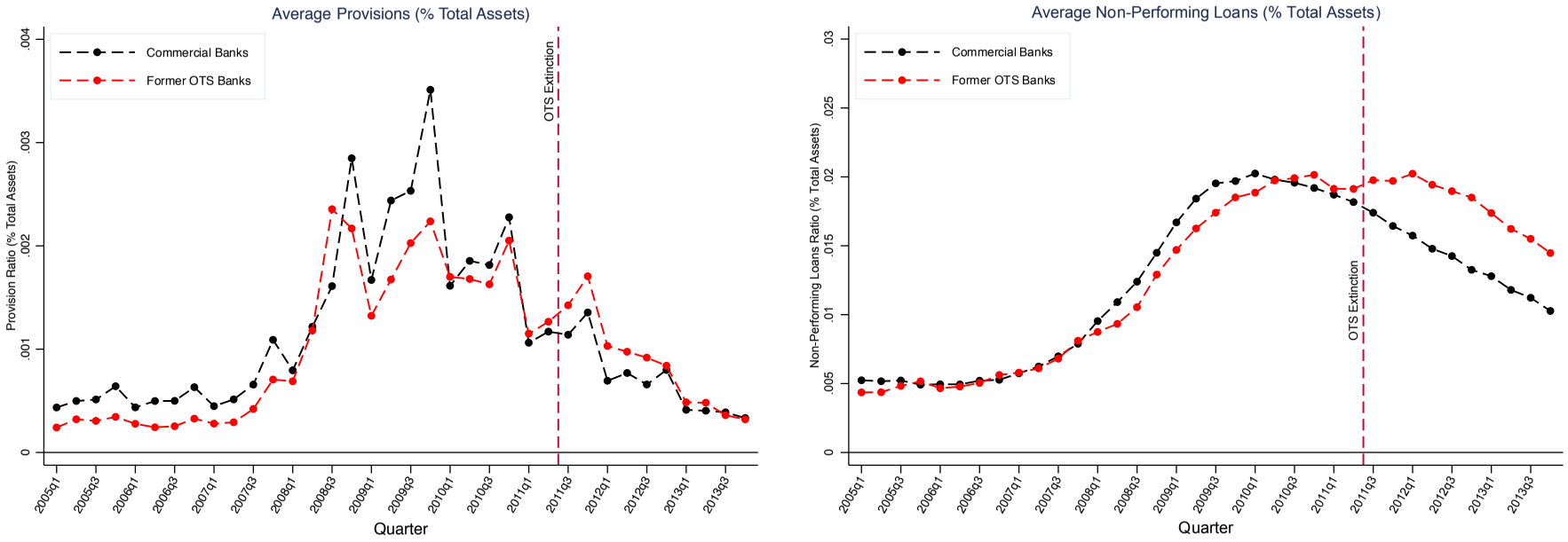


Figure 2: OTS Extinction and Loan Loss Recognition over time

Figure 2 plots the estimated impact of OTS supervision on the loan loss provision ratio and nonperforming loan ratio in each quarter of the sample period using OLS regressions. The shallow circles represent the series of coefficients β_t from interacting a set of dummy variables representing each quarter in the sample with a dummy variable taking the value of one if the depository institution's primary regulator in the first and second quarter of 2011 was the Office of Thrift Supervision in the following model specification: $Y_{it} = \gamma_t + \theta_i + \sum_t \beta_t OTSExtinction_{it} \times \gamma_t + \delta X_{it} + \epsilon_{it}$ and the vertical bands represent 90% confidence intervals for the point estimates in each quarter. The figure on the left represents the series of coefficients in a model where the loan loss provision ratio is the dependent variable. The figure on the right represents the series of coefficients in a model that uses nonperforming loan ratio as the dependent variable.

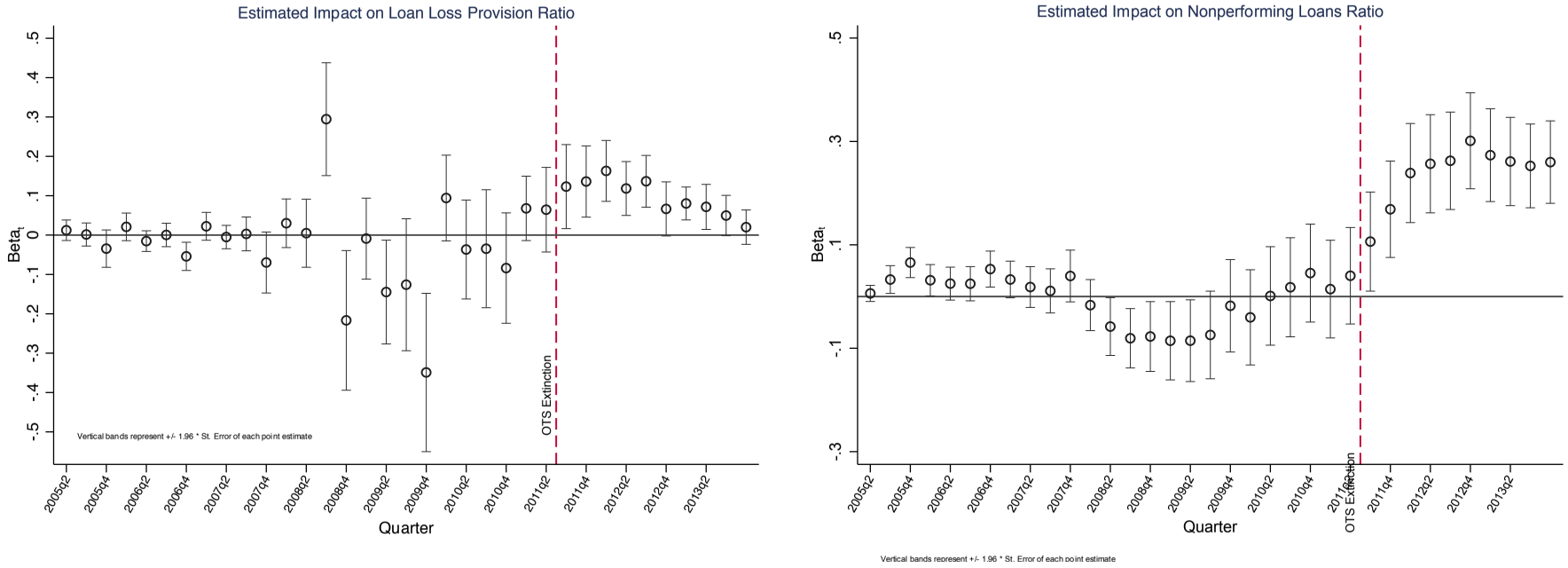


Figure 3: Annual Origination of Small Business Loans by Former OTS Banks and Other Commercial Banks

Figure 3 plots an index of the total volume of small business loans originated by former OTS banks and other commercial banks. Former OTS Banks are banks that reported the OTS as their primary regulator during 2010. Other Commercial Banks are all other banks that report to the CRA dataset. To avoid composition effects we employ a balanced sample of commercial banks and former OTS banks that were part of the CRA-reporting sample for the entire sample period.

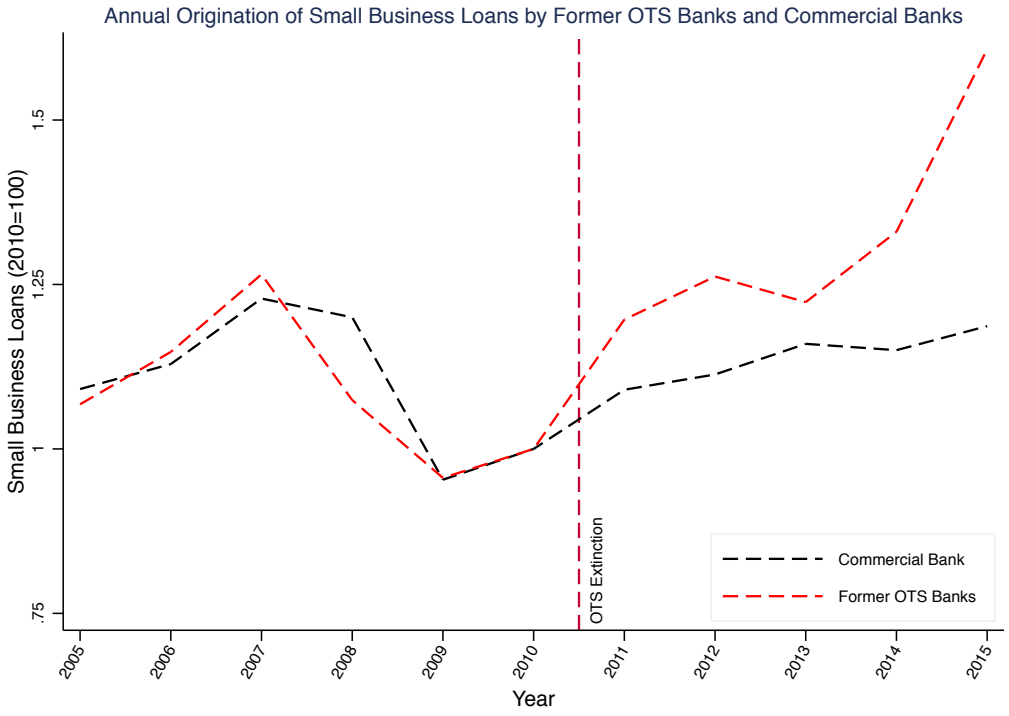


Figure 4: Small Business Lending and OTS Extinction: Impact over time

Figure 4 plots the average impact of OTS supervision on small business lending in each year of the sample period. In the left figure, the shallow circles represent the series of coefficients β_t from expanding the model specification in column (3) of Table 3 to include a set of interaction variables between year dummies and a dummy variable taking the value of one if the depository institution's primary regulator in 2010 was the Office of Thrift Supervision and the vertical bands represent 90% confidence intervals for the point estimates in each quarter. In the right figure, the shallow circles represent the series of coefficients β_t from expanding the model specification in column (2) of Table 4 to include a set of interaction variables between year dummies and the share of deposits held in former OTS institution in each census tract as of June 30th, 2010. Data on small business lending is from the Community Reinvestment Act Small Business Lending Dataset

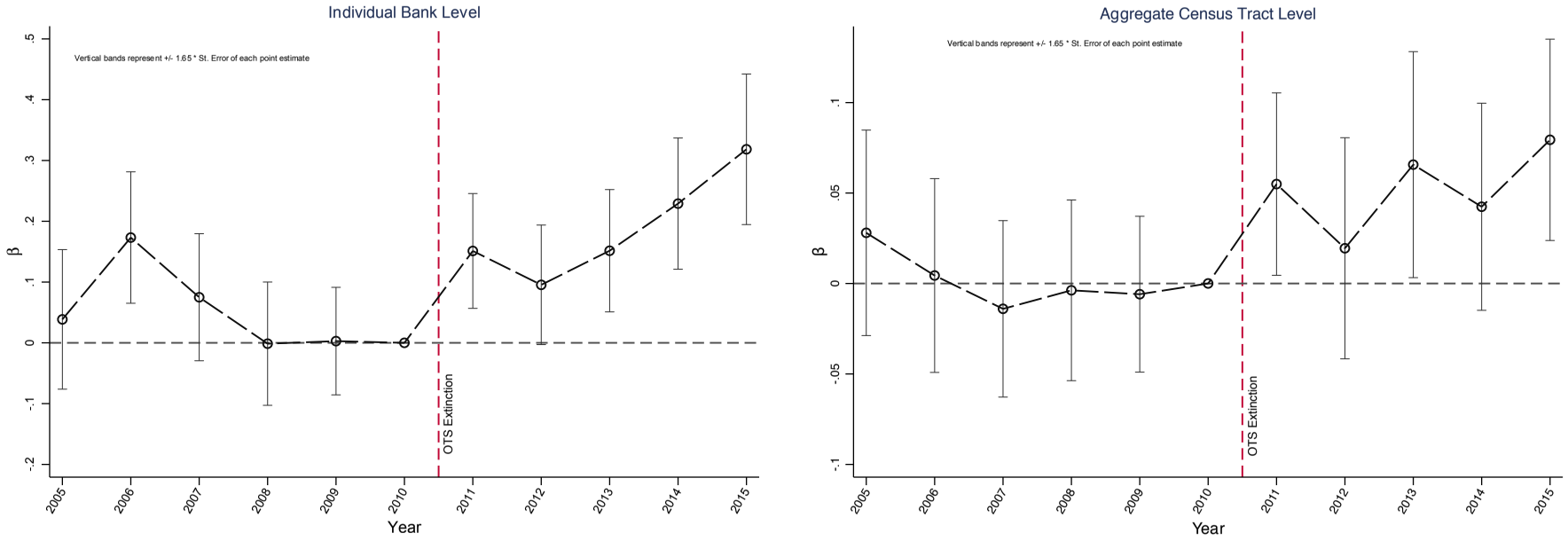


Figure 5: Geographic Distribution of OTS Deposit Share

Figure 5 represents the fraction of total bank deposits in a county accounted for by depository institutions whose primary regulator was the OTS in 2010. Data on branch deposits of OTS banks is from the Federal Deposit Insurance Corporation's Summary of Deposits Database.

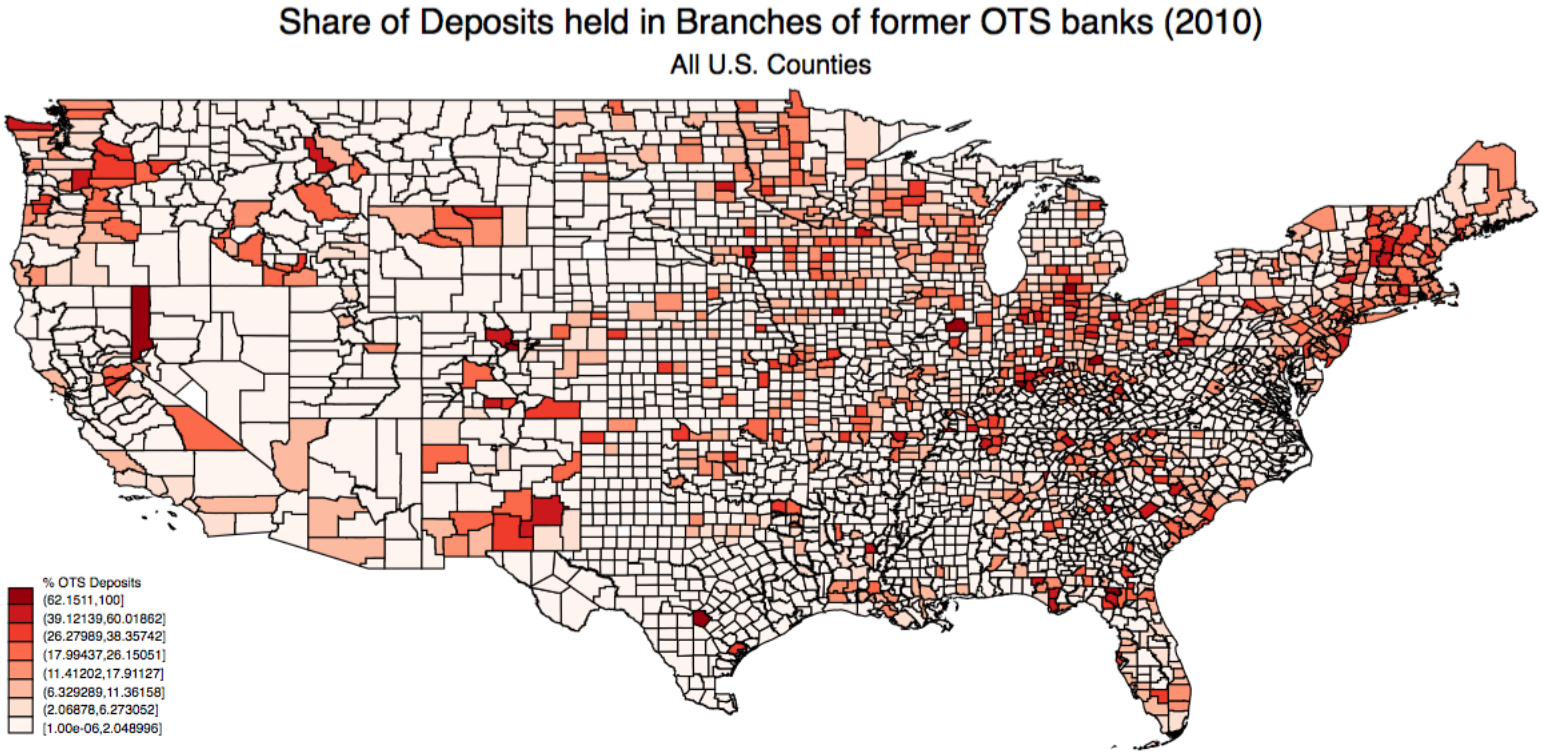


Figure 6: OTS Extinction and Entry and Exit Rates: Impact over time

Figure 6 plots the average impact of exposure to OTS commercial banks on entry and exit of establishments at the county level in each year of the sample period. In the left figure, the shallow circles represent the series of coefficients β_t from expanding the model specification in column (2) of Table 7 to include a set of interaction variables between year dummies and the share of deposits held in former OTS institution in each county as of June 30th, 2010. and the vertical bands represent 90% confidence intervals for the point estimates in each quarter. In the right figure, the shallow circles represent the series of coefficients β_t from expanding the model specification in column (4) of Table 7 to include a set of interaction variables between year dummies and the share of deposits held in former OTS institution in each county as of June 30th, 2010. Data on entry and exit of businesses at the county level is from the Census Bureau's Statistics of US Businesses and data on the share of deposits in former OTS institutions is from the FDIC's Summary of Deposits.

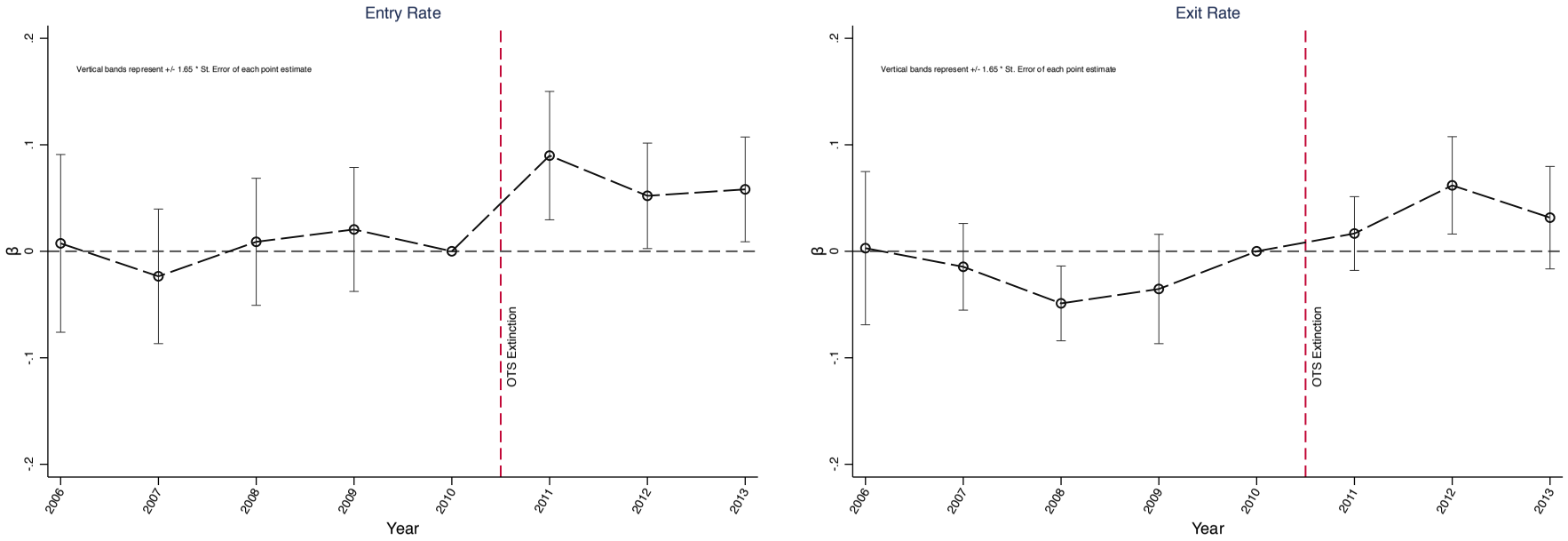


Table 1: Descriptive Statistics by OTS classification

Table 1 presents descriptive statistics of the main sample used in the analysis. Panel A presents financial characteristics and ratios of the entire sample of commercial and savings banks using call report and thrift financial report data. Panel B reports summary statistics of small business loan originations and deposit market characteristics in the sample of Community Reinvestment Act (CRA) Small Business Lending reporting banks *Total Assets* are total assets of the depository institution (RCFD2170). *Share Residential* is the ratio of residential real estate loans (RCON1797+RCON5367+RCON5368) and total assets (RCFD2170). *Share C&I* is the ratio of commercial and industrial loans (RCFD1766) and total assets (RCFD2170). *Share CRE* is the ratio of commercial and real estate loans (RCON1415+RCON1460+RCON1480+RCFD2746) and total assets (RCFD2170). *Loan Loss Provision Ratio* is defined as the ratio between Loan Loss Provisions (RIAD4230) and total assets (RCFD2170). *Charge-Off Ratio* is the ratio of total charge-offs (RIAD435) and total assets (RCFD2170). *Nonperforming Loan Ratio* is defined as the sum of total loans that are 90 days past due and still accruing (RCFD1407) and total nonaccrual loans (RCFD1407) divided by total assets (RCFD2170). *ALLL Ratio* is the ratio of the Allowance for loan and Lease Losses (RIAD3123) and total assets (RCFD2170). *Total SBL Originations* is the total amount of small business loans (in thousands) originated by a bank over a calendar year. *Number Branches* is the total number of branches operated by a bank as of June 30th of each year. *Total Deposits* is the total deposits held in domestic branches of a bank as of June 30th of each year. *HPI* is the average of the HPI of each zip code where the bank has a branch weighted by the share of county deposits that the bank holds in that zip code. The zipcode HPI is calculated using the all-transactions indexes at the zip code level provided by the Federal Housing Finance Agency.

Panel A: Financial Characteristics and Ratios

	Count	Mean	Std. Dev.	p25	p50	p75
Commercial Banks						
Total Assets	276,222	1,980,338.9	31,310,266.5	66,037	142,466	337,932
Share CRE	265,682	0.233	0.170	0.091	0.207	0.346
Share C&I	273,895	0.095	0.0885	0.041	0.075	0.122
Share Residential	265,682	0.17	0.129	0.082	0.151	0.234
Tier1 Capital Ratio	265,681	22.27	120.3	11.27	13.91	18.48
Loan Loss Provision Ratio	267,250	0.0011	0.00369	0	0.00034	0.00096
Charge-Off Ratio	265,680	0.0011	0.00350	0	0.00020	0.00084
Nonperforming Loan Ratio	273,827	0.012	0.0197	0.0013	0.0056	0.0145
ALLL Ratio	264,776	0.010	0.0069	0.0064	0.0087	0.0116
Former OTS Banks						
Total Assets	24,689	1,175,943.5	5,858,742.6	79,662	167,900	427,344
Share CRE	24,689	0.172	0.152	0.050	0.137	0.258
Share C&I	24,689	0.033	0.051	0	0.012	0.048
Share Residential	24,689	0.418	0.209	0.271	0.426	0.568
Tier1 Capital Ratio	24,689	29.63	66.96	13.61	18.38	28.13
Loan Loss Provision Ratio	24,689	0.0010	0.00313	0	0.00021	0.00081
Charge-Off Ratio	24,688	0.0009	0.0026	0	0.00009	0.00067
Nonperforming Loan Ratio	24,689	0.013	0.0210	0.0017	0.0064	0.0164
ALLL Ratio	22,486	0.007	0.0067	0.0031	0.0058	0.0091

Panel B: Small Business Loan and Deposit Market Characteristics of CRA Reporting Banks

	Count	Mean	Std. Dev.	p25	p50	p75
Commercial Banks						
Total SBL Originations	8,505	214,504.6	963,641.0	21,938	55,692	125,576
Number Branches	8,505	350.6	1,626.7	36	74	173
Total Deposits	8,505	7,741,388.2	51,713,920.3	515,872	1,023,661	2,192,585
HPI	8,298	1.114	0.137	1.039	1.107	1.189
Former OTS Banks						
Total SBL Originations	668	56,886.9	115,515.0	5,302.5	24,070.5	59,403
Number Branches	668	275.3	639.0	55	111	213
Total Deposits	668	3,666,661.6	7,167,811.3	928,023	1,343,974.5	2,987,659
HPI	646	1.094	0.143	1.002	1.090	1.182

Table 2: OTS Extinction and Loan Loss Recognition

Table 2 reports the coefficients of OLS regressions investigating the effect of the OTS extinction on loan loss recognition. The dependent variables are the *Loan Loss Provision Ratio*, *Nonperforming Loan Ratio*, *Charge-Off Ratio*, and *ALLL Ratio*. *Loan Loss Provision Ratio* is defined as the ratio between Loan Loss Provisions (RIAD4230) and total assets (RCFD2170). *Nonperforming Loan Ratio* is defined as the sum of total loans that are 90 days past due and still accruing (RCFD1407) and total nonaccrual loans (RCFD1407) divided by total assets (RCFD2170). *Charge-Off Ratio* is the ratio of total charge-offs (RIAD435) and total assets (RCFD2170). *ALLL Ratio* is the ratio of the Allowance for loan and Lease Losses (RIAD3123) and total assets (RCFD2170). *OTS* is an indicator variable that takes the value of one if the depository institution's primary regulator in the first and second quarter of 2011 was the Office of Thrift Supervision. *Post* is an indicator variable that takes the value of one for all quarters after 2011Q3 (inclusive). *Ln(Assets)* is the natural logarithm of total assets (RCFD2170). *Share Residential* is the ratio of residential real estate loans (RCON1797+RCON5367+RCON5368) and total assets (RCFD2170). *Share C&I* is the ratio of commercial and industrial loans (RCFD1766) and total assets (RCFD2170). *Share CRE* is the ratio of commercial and real estate loans (RCON1415+RCON1460+RCON1480+RCFD2746) and total assets (RCFD2170). *Tier1 Capital Ratio* is the Tier 1 capital ratio of the financial institution (RCFD7206). Standard errors are presented in parentheses, and are clustered at the level of the bank's county headquarters. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Loan Loss Provision Ratio		Nonperforming Loan Ratio		Charge-Off Ratio		ALLL Ratio	
OTS × Post	0.027***	0.027***	0.365***	0.407***	0.029***	0.033***	0.154***	0.167***
	(0.006)	(0.005)	(0.084)	(0.081)	(0.004)	(0.005)	(0.026)	(0.027)
Ln(Assets)		-0.004		-0.060		0.006		-0.099***
		(0.005)		(0.065)		(0.005)		(0.019)
Residential Share		0.046		1.789***		0.087**		0.971***
		(0.029)		(0.396)		(0.032)		(0.116)
C&I Share		0.118**		-1.194*		-0.110**		0.373**
		(0.041)		(0.478)		(0.039)		(0.109)
CRE Share		0.076*		-0.300		-0.118**		0.618***
		(0.031)		(0.516)		(0.039)		(0.116)
Tier1 Capital Ratio		-0.000		-0.000*		-0.000*		-0.000*
		(0.000)		(0.000)		(0.000)		(0.000)
Observations	291829	290260	298403	290260	290259	290258	287151	285600
Adjusted R^2	0.294	0.293	0.513	0.516	0.304	0.305	0.632	0.636
Quarter Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: OTS Extinction and Small Business Lending (Bank Level)

Table 3 reports the coefficients of OLS regressions investigating the effect of the OTS extinction on the supply of small business lending by former OTS banks. The dependent variable *Ln(Total Loans)* is the total amount of small business loans (loans whose principal amount is below $1 million) originated by a depository institution in a county over a calendar year. *OTS* is an indicator variable that takes the value of one if the depository institution primary regulator in the first and second quarter of 2011 was the Office of Thrift Supervision. *Post* is an indicator variable that takes the value of one for all years after 2011 (inclusive). *Ln(HPI)* is the natural logarithm of a house price index (HPI) calculated for each bank and each county where that bank has a branch network presence. The HPI is calculated using the all-transactions indexes at the zip code level provided by the Federal Housing Finance Agency. We calculate the HPI for each bank in each county by weighting the HPI of each zip code where the bank has a branch by the share of county deposits that the bank holds in that zip code. Baseline controls include nonparametric controls for the number of branches and total amount of deposits of each bank in each county. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Total Loans)					
OTS × Post	0.206***	0.155***	0.088**	0.204***	0.157***	0.094**
	(0.041)	(0.041)	(0.039)	(0.041)	(0.042)	(0.039)
Ln(HPI)				0.266***	-0.059	0.206
				(0.041)	(0.153)	(0.159)
Observations	139277	133144	130989	129310	125140	123123
Adjusted R^2	0.755	0.740	0.864	0.754	0.741	0.865
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	No	No	Yes	No	No
County Fixed Effects	Yes	No	No	Yes	No	No
Bank Fixed Effects	Yes	Yes	No	Yes	Yes	Yes
County-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Bank-County Fixed Effects	No	No	Yes	No	No	Yes

Table 4: OTS Extinction and Aggregate Small Business Lending by Census Tract

Table 4 reports the coefficients of OLS regressions investigating the effect of the OTS extinction on small business lending at the census tract level. The dependent variable *Ln(Aggregate Total Loans by Tract)* is the aggregate total amount of small business loans (loans whose principal amount is below $1 million) originated by all depository institutions in a census tract over a calendar year. *Share OTS* is the share of deposits held in former OTS institution in each census tract as of June 30th, 2010. *Post* is an indicator variable that takes the value of one for all years after 2011 (inclusive). *Ln(HPI)* is the natural logarithm of a house price index (HPI) at the census tract level The HPI is calculated using the all-transactions indexes at the census tract level provided by the Federal Housing Finance Agency. Baseline controls include nonparametric controls for the total number of branches and total amount of deposits held in each census-tract. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Ln(Aggregate Total Loans by Tract)			
Share OTS × Post	0.054***	0.051***	0.046*	0.038*
	(0.021)	(0.019)	(0.024)	(0.022)
Ln(HPI)			0.424***	0.250***
			(0.025)	(0.031)
Observations	241,922	236,254	193,608	188,845
Adjusted R-squared	0.843	0.858	0.839	0.853
Baseline Controls	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	No	Yes	No
County-Year Fixed Effects	No	Yes	No	Yes
Census Tract Fixed Effects	Yes	Yes	Yes	Yes

Table 5: OTS Extinction and Small Business Lending: Role of Capitalization and Loan Loss Recognition

Table 5 reports the coefficients of OLS regressions. Columns (1) and (2) repeat the analysis of column (3) of Table 3 after stratifying the sample based on above- and below-average levels of Tier1 Capital Ratio prior to the OTS extinction. Columns (3) and (4) repeat the analysis of column (3) of Table 3 after stratifying the sample based on above- and below-average changes between the loan loss provisions recorded in the four quarters that followed and the four quarters that preceded the OTS extinction. Columns (5) and (6) repeat the analysis of column (3) of Table 3 after stratifying the sample based on above- and below-average changes in the growth of nonperforming loans between 2010 and 2012. The dependent variable *Ln(Total Loans)* is the total amount of small business loans (loans whose principal amount is below $1 million) originated by a depository institution in a county over a calendar year. *OTS* is an indicator variable that takes the value of one if the depository institution primary regulator in the first and second quarter of 2011 was the Office of Thrift Supervision. *Post* is an indicator variable that takes the value of one for all years after 2011 (inclusive). Baseline controls include nonparametric controls for the number of branches and total amount of deposits of each bank in each county. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Total Loans)					
	Hi Tier1	Low Tier1	Hi Δ Prov.	Low Δ Prov.	Hi Δ NPL	Low Δ NPL
OTS × Post	0.185***	-0.511***	0.181***	0.060	0.233***	-0.034
	(0.044)	(0.096)	(0.070)	(0.061)	(0.051)	(0.082)
Observations	43790	62032	29398	73587	68573	31455
Adjusted R^2	0.854	0.870	0.849	0.866	0.869	0.845
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
County-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: OTS Extinction and Small Business Lending: Local Credit Supply

Table 6 reports the coefficients of OLS regressions. Columns (1) and (2) repeat the analysis of column (3) of Table 6 after stratifying the sample based on above- and below-median levels of the weighted average Tier1 Capital Ratio of local competitors, where the weights assigned to each local competitor are based on the share of deposits of that competitor in the county. Columns (3) and (4) repeat the analysis of column (3) of Table 3 after stratifying the sample based on above- and below-median level of the predicted lending shock in the county, which is measured using the same methodology as in Greenstone, Mas, and Nguyen (2015). The dependent variable *Ln(Total Loans)* is the total amount of small business loans (loans whose principal amount is below $1 million) originated by a depository institution in a county over a calendar year. *OTS* is an indicator variable that takes the value of one if the depository institution primary regulator in the first and second quarter of 2011 was the Office of Thrift Supervision. *Post* is an indicator variable that takes the value of one for all years after 2011 (inclusive). Baseline controls include nonparametric controls for the number of branches and total amount of deposits of each bank in each county. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Ln(Total Loans)			
	Hi Competitor Cap.	Low Competitor Cap.	Low Lending Shock	High Lending Shock
OTS × Post	0.043	0.097*	0.047	0.119**
	(0.060)	(0.056)	(0.055)	(0.054)
Observations	65320	55614	65575	65414
Adjusted R^2	0.859	0.866	0.862	0.866
Baseline Controls	Yes	Yes	Yes	Yes
County-Year Fixed Effects	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	Yes	Yes

Table 7: OTS Extinction and Entry and Exit of Establishments

Table 7 reports the coefficients of OLS and WLS regressions. The specifications columns (2) and (4) present coefficients from specification where each county observation is weighted by the total employment in that county. The dependent variable in columns (1) and (2), *Ln(Entry Rate)*, is the natural logarithm of the entry rate of new establishments in a given county and year. Entry rate is the ratio between the number of new establishments and the number of existing establishments at the beginning of the year. The dependent variable in columns (3) and (4), *Ln(Exit Rate)*, is the natural logarithm of the exit rate of establishment in a given county and year. Exit rate is defined as the ratio between the number of establishment that exit the market and the total number of establishments at the beginning of the year. *Share OTS* is the share of deposits held in former OTS institution in each census tract as of June 30th, 2010. *Post* is an indicator variable that takes the value of one for all year after 2011 (inclusive). Baseline controls include nonparametric controls for the total number of branches and total amount of deposits held in each county and controls for the logarithm of the number of establishments in the county that employ 1–4, 5–9, 10–19, 20–49, 50–99, 100–249, 250–499 people, and total number of establishments in the county. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Ln(Entry Rate)		Ln(Exit Rate)	
Share OTS × Post	0.055*	0.064**	0.090***	0.056**
	(0.031)	(0.025)	(0.026)	(0.022)
Observations	9,593	9,593	9,593	9,593
Adjusted R-squared	0.792	0.936	0.738	0.919
Baseline Controls	Yes	Yes	Yes	Yes
Employment Weighted	No	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes

Table 8: OTS Extinction, Entry and Exit and Dependence from External Sources of Finance

Table 8 reports the coefficients of WLS regressions in which each observation is weighted by the total employment in that county. The dependent variable in columns (1) and (3), *Ln(Entry Rate)*, is the natural logarithm of the entry rate of new establishments in a given county and year. Entry rate is the ratio between the number of new establishments and the number of existing establishments at the beginning of the year. The dependent variable in columns (2) and (4), *Ln(Exit Rate)*, is the natural logarithm of the exit rate of establishment in a given county and year. Exit rate is defined as the ratio between the number of establishment that exit the market and the total number of establishments at the beginning of the year. The models of specifications (1) and (2) use entry and exit rates in the subset of 2-digit NAICS industries with high dependence of external sources of finance and the models of specifications (3) and (4) use entry and exit rates in the subset of 2-digit NAICS industries with low dependence of external sources of finance. Industries are classified as high/low dependence on external sources of finance based on their above/below-median use of external financial capital according to the Census Bureau's 2010 Survey of Business Owners. We define external capital to include bank and government loans, loans from family and friends, credit cards, venture capital investment or grants and only consider employer firms in the Survey of Business Owners dataset. *Share OTS* is the share of deposits held in former OTS institution in each census tract as of June 30th, 2010. *Post* is an indicator variable that takes the value of one for all year after 2011 (inclusive). Baseline controls include nonparametric controls for the total number of branches and total amount of deposits held in each county and controls for the logarithm of the number of establishments in the county that employ 1–4, 5–9, 10–19, 20–49, 50–99, 100–249, 250–499 people, and total number of establishments in the county. Standard errors are presented in parentheses, and are clustered at the county level. ***, **, and *, represent statistical significance at 1%, 5%, and 10% levels, respectively.

	Ln(Entry Rate)	Ln(Exit Rate)	Ln(Entry Rate)	Ln(Exit Rate)
	High Ext. Fin. Dependence		Low Ext. Fin. Dependence	
Share OTS × Post	0.096**	0.060**	0.033	0.056**
	(0.040)	(0.025)	(0.023)	(0.024)
Observations	8,381	8,385	8,388	8,392
Adjusted R-squared	0.786	0.744	0.856	0.842
Baseline Controls	Yes	Yes	Yes	Yes
Employment Weighted	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes