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THE DEATH OF A REGULATOR:  
STRICT SUPERVISION, BANK LENDING AND BUSINESS ACTIVITY

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### **ABSTRACT**

An important question in banking is how strict supervision affects bank lending and in turn local business activity. Forcing banks to recognize losses could choke off lending and amplify local economic woes, especially after financial crises. But stricter supervision could also lead to changes in how banks assess loans and manage their loan portfolios. Estimating such effects is challenging. We exploit the extinction of the thrift regulator (OTS) – a large change in prudential supervision, affecting ten percent of all U.S. depository institutions. Using this event, we analyze economic links between strict supervision, bank lending and business activity. We first show that the OTS replacement indeed resulted in stricter supervision of former OTS banks. We then analyze the lending effects of this regulatory change and show that former OTS banks increase small business lending by approximately 10 percent. This increase stems primarily from well-capitalized banks and those more affected by the new regime. These findings suggest that stricter supervision operates not only through capital but can also overcome frictions in bank management, leading to more lending and a reallocation of loans. Consistent with the latter, we find increases in business entry and exit in counties with greater exposure to OTS banks.

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## **1. Introduction**

A recurring storyline in banking crises is the public backlash against bank supervisors for their failure 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 that overhaul the regulatory oversight of the banking system, including tighter rules and stricter monitoring of financial institutions (e.g., Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) of 1989; Dodd-Frank Act of 2010). Despite the importance of such interventions, we have limited evidence on the economic trade-offs associated with reforms that aim to limit regulatory forbearance and promote stricter bank supervision.

In this paper, we use a recent reform of the U.S. banking system that saw a large number of banks transitioning from a more lenient to a stricter supervisor. This transition implied sweeping changes in key areas of bank management, including loan loss recognition, loan risk ratings, stress testing, and risk management. Such changes plausibly enhance how banks assess and manage their loan portfolios. Thus, lending could increase, in particular, if stricter supervision and monitoring reduce existing agency frictions and/or adverse selection problems, which prevented bank managers from lending and adopting better practices under the old regime. Alternatively, a stricter regulatory stance by the new supervisor could put pressure on the balance sheets of transitioning banks, especially when the recovery is still fragile, and in turn force banks to cut lending. Our aim is to examine the economic consequences of stricter supervision, particularly, with respect to access to credit and business activity.

Effective July 2011, Title III of Dodd Frank abolished the Office of Thrift Supervision (OTS) and transferred its powers to other regulators, i.e., the Office of the Comptroller of the Currency (OCC) and the Federal Deposit Insurance Corporation (FDIC). This regulatory change

was prompted in part by a well-founded perception that lax prudential supervision played a significant role in the demises of Washington Mutual, IndyMac, and also Countrywide. The extinction of the OTS was a major change in prudential supervision in the US banking system, affecting roughly 10% of all depository institutions with 8.5% of all U.S. deposits. It affected banks across a wide spectrum of capital and liquidity levels, operating in different geographies.

The OTS setting overcomes many challenges faced when examining the role of bank supervision for credit access and business activity. First, the associated changes in bank supervision are economically meaningful and their timing is well defined. Second, in this setting, it is possible to distinguish the effects of stricter supervision from local economic shocks that also affect the performance of banks and local business activity because former OTS banks operate in geographies in which there are banks that have other supervisors. Third, the transition is externally imposed on all thrifts, irrespective of their financial condition, and it does not involve thrifts selecting a new regulator. Moreover, charter switches before and after the OTS extinction are rare and hence not a major concern.<sup>1</sup>

We begin our analysis by validating that the replacement of the OTS in 2011 implied stricter supervision, leading to major changes in how thrifts manage their loan portfolios. While there is plenty of anecdotal and survey evidence (discussed in Section 2) that thrifts changed how they assess and manage their loans, such changes in internal practices are difficult to measure. We therefore focus on readily observable changes in banks' loan classifications, loss provisioning and loss recognition as indications for stricter supervision more generally. We find that loan loss provisions, charge-offs, and nonperforming loan ratios of former OTS banks exhibit a sharp on-

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<sup>1</sup> We calculate based on FDIC's Summary of Deposits data that only 23 out of 836 thrifts switched from the OTS to other banking regulators in the four years that preceded the OTS extinction and only 41 out of 708 former OTS banks that were subject to the regulatory transition switched charters between the OCC, FDIC, and Federal Reserve System in the four years that followed the regulatory transition.

impact increase following the OTS replacement, relative to control banks without changes in supervision. 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 notion that the new supervisors increase regulatory scrutiny for former OTS banks, which in turn changes how they manage their loan portfolios.

Next, we analyze the economic effects of stricter bank supervision. Forcing thrifts to increase loan loss provisions and recognize problem loans could induce them to de-lever to conserve capital, which likely hurts lending and could create a credit crunch for local businesses. But the regulatory transition also forced thrifts to revisit their lending practices, rating systems and risk management. Improvements in how banks assess and manage loans could increase lending. Furthermore, stricter supervisory monitoring could mitigate existing agency frictions, be it a reluctance to recognize bad loans because of career concerns, cozy local relations that generate private benefits or exert pressures to evergreen bad loans, or simply a preference for a ‘quiet life.’ Thus, stricter supervisor could not only lead to more lending, but also to a reallocation of loans toward new and better performing businesses. Such frictions would also explain why bank managers were unlikely to overhaul their loan management and lending practices on their own.<sup>2</sup> In the end, it is an empirical question which channel dominates and hence whether stricter supervision hurts or boosts lending and local business activity.

Our findings support the latter. We show that former OTS banks increase the total amount of small business loans originations by roughly 10% relative to the period prior to the OTS

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<sup>2</sup> It is also conceivable that adverse selection prevents banks from adopting better risk management practices, even when such practices are beneficial. For instance, a thrift initiating stress testing in 2009 or 2010 could have set off concerns about its financial health, which is less likely when a supervisor forces all thrifts to adopt such practices.

elimination. We obtain this result after the inclusion of county-by-year fixed effects and bank-by-county fixed effects. Thus, the lending effect is not driven by former OTS banks being located in counties with better economic conditions (loan demand) but rather by an increase in the origination of small business loans by former OTS banks relative to small business lending by other banks operating in the same county in the same year (loan supply).

We rule out a number of alternative explanations for the above results. We examine whether former OTS banks increase their small business lending because they are systematically located in areas *within a county* that experienced faster recoveries from the financial crisis. We conduct analyses at the (finer) census-tract level and still find essentially the same results. We also address concerns that (i) the results reflect business model differences between the former OTS banks and the controls banks and (ii) that former OTS banks were more exposed to the boom-bust cycle in house prices and, hence, that the results reflect mean reversion in the performance of former OTS banks. We further examine the possibility that OTS banks shift from residential lending to small business lending, but do not find evidence that such changes could explain our findings. Finally, we check that our result is not driven by a pull-back by other banks, notably the Top-4 banks, given the evidence in Chen, Hanson and Stein (2017).

One potential reason for not seeing a decline in lending as supervision tightens, and hence support for the capital channel, is that former OTS banks were, on average, sufficiently well-capitalized so that they could absorb the additional losses the new supervisors forced to them to recognize without having to recapitalize. Thus, unlike other settings where such interventions coincide with financial distress, the OTS setting provides an opportunity to examine new and different economic effects of strict supervision because it offers significant variation in both the

capitalization of former OTS banks prior to the OTS extinction as well as in the scope and intensity of the regulatory intervention.

Consistent with this reasoning, we find that the positive effect of stricter supervision is concentrated in former OTS banks with above-average capitalization ratios prior to OTS extinction. Thrifts with below-average capital ratios exhibit a decline in their small business lending, consistent with the capital channel. Importantly, we also document stronger lending effects for banks that are more strongly treated by the new regime, using two proxies. We find more lending (i) for former OTS banks with larger changes in loan provisioning and loss recognition after the regulatory transition and (ii) for thrifts whose headquarters are located more closely to their new supervisor's field office (Wilson and Veuger, 2017; Gopalan, Kalda, and Manela, 2016).<sup>3</sup> These results point to frictions in bank management. That is, even well capitalized banks were reluctant to recognize loan losses and overhaul their lending practices, rating systems and risk management before the regulatory transition. Thus, our findings suggest that strict supervision can overcome existing frictions and lead to changes in how banks assess and manage their loans, which in turn improves banks' supply and allocation of credit.

While our evidence is consistent with this interpretation, there is an alternative explanation that the results up to this point do not rule out. It is conceivable that the new supervisors require former OTS banks to reduce their exposure to residential lending and diversify their lending portfolios. Such requirements would affect the former OTS banks' supply of business loans right around the regulatory transition and hence could explain our results. To distinguish these alternatives, we use the pre-crisis (and transition) lending shares and show that our results persist

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<sup>3</sup> We also explore the role of local credit conditions and show that the lending results are stronger in areas where the local competitors were more capital constrained or experiencing negative supply shocks and hence less willing or able to satisfy small business loan demand.

when we condition on the pre-crisis shares and, more importantly, that the results are not amplified for the subset of former OTS banks with high pre-crisis concentrations of residential lending in their loan portfolios. We also use the annual rejection rates for mortgage loans applications to control for banks' changes in the residential lending strategies and portfolio substitution. Again, our results are robust to such controls and do not support the alternative explanation. Thus, it is more likely that stricter supervision leads to shake-up in internal bank management practices of former OTS banks, which in turn drives our lending results.

After documenting that, on average, former OTS banks expand small business lending following the regulatory shake-up, we investigate changes in business activity (entry and exit rates) in counties with greater exposure to former OTS banks. These analyses shed light on the reallocation of credit. We find a significant increase in business dynamism in counties with larger exposures to former OTS banks: the semi-elasticities of the entry and exit rates of establishments with respect to a one-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 more lending to existing businesses. Instead, it suggests that former OTS banks reallocate their lending from old to new establishments. Consistent with this idea, we find larger increases in the entry and exit rates after the regulatory transition in counties with larger changes in small business lending and also greater increases in entry rates in industries that require better access to external sources of finance. Both findings suggest a credit channel and support our interpretation of the results.

Our paper is most closely related to the findings in 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 over a longer horizon as the supervision by the stricter federal regulators is, by construction, short-lived and lasts only until the following spell of a state regulator. We contribute to this line of research by examining the effects of strict supervision on lending and business activity around a regulatory change.

We also 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. For instance, Kroszner and Strahan (1996) study supervision when regulators have incentives to forbear because the deposit insurance fund is insolvent. Brown and Dinç (2005 and 2011) use cross-country data to study the role of political pressures and too-many-to fail concerns on regulatory forbearance. Costello, Granja, and Weber (2016) find that stricter regulators enforce transparent financial reporting. Barth, Caprio, and Levine (2004) and Granja (2016) document positive financial stability and development effects of bank disclosure regulation, but mixed findings for supervisory policies and inspections. 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, the lack of restructuring is not necessarily attributable to bank supervision. Bian, Haselman, Kick, and Vig (2017) find that the bailout of small banks in Germany is more likely to produce positive outcomes when the regulators conducting the bank's reorganization are not captured by local forces. Our paper examines the economic consequences of a well-defined change in the strictness of bank

supervision. The message of our paper is that stricter supervision can increase bank lending even for well-capitalized banks, suggesting that its economic effects go beyond the capital channel.

Our paper also contributes to the emerging literature examining the economic effects of the Dodd-Frank Act. Generally speaking, examining the effects of Dodd Frank has been challenging because its provisions are often difficult to isolate from other contemporaneous effects of the law as well as the concurrent macroeconomic changes. We contribute to a recent stream of literature (e.g., Dimitrov, Palia, and Tang, 2015; Buchak, Matvos, Piskorski, and Seru, 2017) that exploits granular datasets as well as pre-determined variation in the exposure of different geographic regions to specific financial institutions to overcome these challenges. In doing so, we provide novel evidence on the economic consequences of a key element of the Dodd-Frank Act, i.e., the provisions in Title III that eliminated the OTS.<sup>4</sup>

## **2. Institutional Setting**

Savings and Savings & Loans banks, also called thrifts, specialize in supplying residential mortgages to U.S. consumers. These banks are required by their charter to invest 65 percent of their asset portfolio in qualified thrift investments, which include residential real-estate loans, home-equity loans, mortgage-backed securities, credit card, and small business loans. In return for these restrictive portfolio allocation practices, these banks enjoyed favorable regulatory treatment that included privileged access to financing through the Federal Home Loan Banks, preemption of state law, and unlimited interstate branching.

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<sup>4</sup> In studying how supervision affects loan loss provisioning, our paper is also related to studies on the timeliness of loan loss provisioning and its economic effects (e.g., Beatty and Liao, 2011; Bushman and Williams, 2012; Bhat, Ryan, and Vyas, 2017). Further, the paper relates to the broader literature on enforcement of financial regulation (e.g., La Porta, Lopez-de-Silanes and Shleifer, 2006; Jackson and Roe, 2009; Christensen, Hail, and Leuz, 2016).

The Savings & Loans (S&L) crisis in the 1980s and early 1990s hit the thrift industry hard and was blamed, in part, on lenient supervision (e.g., Kane, 1989). The OTS was created in the aftermath of the S&L crisis to replace the Federal Home Loan Bank Board (FHLBB) as the primary regulator of the thrift industry. Initially, the OTS was perceived as strict, cracking down on the insolvent thrifts that had been left unscathed by the FHLBB (Wayne, 1992).

Over the following decades, however, sweeping industry and regulatory changes undermined the competitive advantages of the thrift charter. Federal thrifts were the first financial institutions entitled to open new branches across state borders and benefited from the preemption of state law pursuant to the Depression-era Home Owners' Loan Act (HOLA). But the passage of the Riegle-Neal Act of 1994 eroded this regulatory advantage, giving the Office of the Comptroller of the Currency (OCC) the power to adopt preemption rules for national banks. In 1995, several unsuccessful bills proposed to abolish the OTS and to consolidate the regulation for thrifts and commercial banks, arguing that the thrift charter had become obsolete (MacDonald and Schwartz, 2011). The Treasury Department's 2008 blueprint for a modernized financial regulatory structure also recognized that the thrift charter no longer had a special role in providing residential mortgage loans to US consumers. The business models of commercial banks and thrifts had converged substantially and the commercial banks' share of the overall U.S. residential mortgage market surpassed that of the thrifts. As a result, the blue print concluded that the thrift charter had lost its *raison d'être* and recommended phasing it out.

Consistent with these developments, the number of thrifts 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).<sup>5</sup> 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 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 21, 2011, one year after the passage of the Dodd-Frank Act. Under the Act, the OCC acquired supervisory and rulemaking authority over federally-chartered OTS banks and the FDIC acquired supervisory and rulemaking authority over state-chartered OTS banks. In total,

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<sup>5</sup> According to our calculations based on FDIC data, only 23 thrifts converted to a commercial bank charter in the four years preceding the OTS extinction. We therefore do not believe that our results are affected by avoidance behavior in the period before the OTS extinction.

649 federal thrifts were slated to automatically transition to the OCC, whereas 59 state-chartered thrifts transitioned to the FDIC following the transfer of functions.<sup>6</sup>

Industry documents and SEC filings of many thrift holding companies suggest that the OCC supervision was perceived as more demanding than OTS supervision, affecting key areas of bank and loan management. In the area of loss recognition, the OTS did not require 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 should be charged-off. By contrast, the OCC required earlier charge-off when a loan was deemed uncollectible. In addition, the regulatory transition also implied significant changes in how banks determined their Allowance for Loan and Lease Losses and hence their provisioning, which could have significant impact on bank profitability around the transition (e.g., Peirce, Robinson, and Stratman, 2014). Many formerly OTS banks purchased new software solutions or hired consultants to assist with the more complicated OCC requirements (Bayer, 2014). According to a SageWorks Poll in 2013, over 50 percent of responding bankers indicated that they had to strengthen their risk rating system as a result of feedback from OCC examiners or guidance and 38 percent indicated that the implementation of stress testing was the biggest change.<sup>7</sup> These changes made it, among other things, harder for thrifts to renew or evergreen loans. The 2012 10-K of Bank Financial, a SEC-registered thrift holding company, illustrates these changes by 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

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<sup>6</sup> Authors’ calculation based on Summary of Deposits data collected on June 30<sup>th</sup> of each year. No thrifts banks were automatically transferred to the Federal Reserve, but following the transition a small number of former OTS banks switched their charter from the OCC to the FED. See discussion below for more details.

<sup>7</sup> <https://www.sageworks.com/blog/post/2013/11/14/biggest-areas-of-change-transitioning-from-OTS-to-OCC.aspx>

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”.<sup>8</sup>

Illustrating that the supervisory changes go beyond loss recognition and provisioning, publicly available enforcement actions imposed by the OCC on former OTS banks following the regulatory transition suggest that the OCC also forced improvements in the areas of internal management, credit administration, and loan and risk management. Specifically, these enforcement actions require former OTS banks to implement procedures to ensure adequate collateral documentation, that extensions of credit are granted only after obtaining relevant credit information, and that procedures to obtain updated financial information from existing borrowers are adopted. In some instances, the enforcement actions go so far as requiring the Board of the former OTS bank to ensure competent top management.<sup>9</sup>

While the regulatory competitive advantage of former OTS banks had been substantially diminished prior to the OTS extinction (MacDonald and Schwartz, 2011), the Dodd-Frank Act contained statutes that potentially further eroded the regulatory competitive advantage of thrifts. The Act removed remaining barriers to interstate branching from which former OTS banks were previously exempt and replaced the OTS preemption of state laws by the preemption standards of the OCC. While it is possible that former OTS banks responded to this erosion of their

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<sup>8</sup> There are many examples of thrift holding companies discussing the transition from OTS to OCC in their 10-Ks expressing more demanding 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.”

<sup>9</sup> In the appendix to this paper, we illustrate some of these requirements with passages taken from formal written agreements completed during 2012 between the OCC and multiple former OTS banks.

competitive position by expanding their credit supply, we believe that such a response is unlikely. The removal of existing barriers to entry is more likely to facilitate entry by commercial banks in the local markets of former OTS banks, which could further assail the former OTS banks' competitive position and, in turn, negatively affect their supply of credit.

To address concerns about avoidance behavior, we check and find that most former OTS banks do not to switch charters. By our computation, 40 of the 649 former OTS institutions that automatically transitioned to the OCC switched to the Federal Reserve or the FDIC by June 30, 2012, and in the four years that followed the OTS extinction an additional 40 institutions decided to switch from the OCC to another primary regulator. The small flow of OCC-regulated former OTS institutions to other regulators suggests that the other supervisors are perceived as similarly strict and that regulatory shopping is unlikely to be a substantive force affecting our empirical analyses.<sup>10</sup>

### **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

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<sup>10</sup> In untabulated analysis, we support this assertion and find that state-chartered thrifts transitioning to the FDIC and federal thrifts transitioning to the OCC saw similar increases in their provisioning and charge-off ratios following the OTS extinction.

prepared by the OTS staff using the Research Information System (RIS) Data Warehouse Dictionary maintained by the FDIC.<sup>11</sup>

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 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 1,773 branch addresses that account for 1.15% of the total number of branches because their latitude and longitude data are missing or 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 banks.

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 SUSB is carried out on March 12<sup>th</sup> of each year. Following Chen, Hanson, and Stein (2017), we call the entry and exit rate from March 12<sup>th</sup> of

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<sup>11</sup> The document is available online on the following address: [http://www.ots.treas.gov/\\_files/4830092.pdf](http://www.ots.treas.gov/_files/4830092.pdf)



year X to March 12<sup>th</sup> of year X+1, the entry and exit rate of year X. In the context of our main analysis, we compute the entry and exit rates at the county level for all counties included in the SUSB. For subsequent analyses, we further compute county entry and exit rates for the subset of industries with high and low dependence on external sources of financing. We obtain information on the industry's dependence on external sources of financing from the 2011 Survey of Business Owners and we define this dependence as the percentage of respondent firms in the survey that use bank and government loans, loans from family/friends, credit cards, venture capital investment, or grants as a source of financing.

#### **4. Descriptive Statistics**

The abolishment of the OTS directly affected 708 federal and state-chartered thrifts whose primary regulator as of June 30, 2011 was the Office of Thrift Supervision. Panel A of Table 1 presents descriptive statistics for the key variables in our analysis, separately for commercial banks and former OTS banks. 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 is tilted 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 in the supply of residential mortgage loans to US consumers. Commercial banks have more diversified loan portfolios with commercial and industrial (C&I) loans and commercial real estate (CRE) loans accounting for 9.5% and 23.3% of their total assets, respectively. For former OTS banks, these loan categories

account only for 3.3% and 17.2% of the total assets. These patterns highlight important differences across two groups of banks, which we address explicitly in our empirical 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 ratios of former OTS banks are, nevertheless, substantially higher than the ratios of commercial banks. The relatively high capitalization rate of former OTS banks is 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 descriptive statistics for the sample 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 mean annual house-price appreciation in counties where commercial banks and former OTS banks originate loans and find that the house-price appreciation is, on average, higher for commercial banks. These statistics suggest that controlling for differences in loan demand across counties is important for our analysis.

## **5. OTS Extinction and Loan Loss Recognition and Provisioning**

In this section, we provide evidence that the OTS extinction indeed resulted in stricter supervision for former OTS banks. As some of the changes in internal practices resulting from the transition are difficult to measure directly (e.g., improvements in loan and risk management),

we analyze more readily observable changes in banks' loan classifications, loss provisioning and loss recognition. These changes are indications of stricter supervision more generally, but can be studied based on call and thrift report data. Consistent with this notion, we provide anecdotal evidence in Section 2 that illustrates that the regulatory transition resulted in wide-ranging changes in key areas of bank and loan management.

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 the 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. After the extinction of the OTS, however, there is a striking increase in provisioning 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 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 supervision, we estimate the following linear regression model:

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

where  $Y$  is the loan loss provisioning, nonperforming loans, charge-offs, 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 formerly regulated by the OTS 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,  $\gamma_i$ , which control for time-invariant, unobserved characteristics of each bank. We also add quarter fixed-effects,  $\delta_t$ , 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 banks' county headquarters.

Table 2 reports the results of this analysis and confirms the interpretation of Figure 1. The main coefficient,  $\beta$ , is statistically significant and suggests that the loan loss provision ratios and nonperforming loan ratios 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 measures a bank's propensity to write-off bad loans, and the ALLL ratio, which measures the total bad-debt allowance. Columns (5) to (8) report results for these alternative

dependent variables and again suggest that former OTS banks faced stricter supervision following the OTS extinction. We further note that conditioning on measures of size, portfolio composition, and capitalization does not attenuate the coefficients of interest relative to the specifications that do not include any additional controls for financial characteristics. This observation makes it unlikely that the results are driven by differences in business models between former OTS and commercial banks.

If the transition of former OTS banks to the OCC and FDIC are indeed the result of stricter supervision, then we expect the above 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 variables. To formally examine and trace the temporal evolution of the OTS extinction effects over time we estimate the following linear regression model:

$$Y_{it} = \sum_t \beta_t(OTS_{it} \times \delta_t) + \theta X_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad (2)$$

which expands the model of equation (1) with an 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,  $\beta_t$ , and corresponding standard errors. The plots suggest that, during the financial crisis period, the OTS was more permissive than the regulators of commercial banks. 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. The figures also suggest that the former OTS banks’ accounting and

reporting adjustments are completed around the start of 2013, given the provisioning of former OTS banks converges to the provisioning of other commercial banks and the difference in the level of nonperforming loan ratios across banks starts to plateau.

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 banks. Next, when we add interactions between the *Post* dummy and the financial characteristics vector,  $X$ , the results and inferences remain 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 in the model, which is why we perform this test as sensitivity analysis only. We also find that the results are statistically and economically similar in the subsample of federal thrift charters, which were automatically transferred to the OCC upon the OTS extinction, and in the subsample of state thrift charters, which were automatically transferred to the FDIC upon the transition. Finally, we find that the effects of OTS extinction are larger in banks 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 evidence as confirming the anecdotal evidence reported in section 2 and as suggesting that the transition of former OTS banks to the OCC and the FDIC implied stricter supervision.

## **6. OTS Extinction and Small Business Lending**

In this section, we analyze how the supervisory transition affected banks' small business lending. As discussed, the direction of the effect is a priori not obvious. Having established that the transition forced former OTS banks to recognize existing and future loan losses and to clean up their balance sheets, it is quite possible that lending declines. But as the transition implied broader changes in how banks assess and manage their loans, lending could also increase.

A simple plot of the time-series of small business loan originations by former OTS banks and other commercial banks presented in Figure 3 shows 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 a positive effect on small business lending after the regulatory transition. Of course, the simple analysis of Figure 3 does not address that lending of former OTS banks could increase 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 can control for these effects 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 of former OTS banks in a county relative to the small business lending 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 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 by former OTS banks. We estimate this

effect with the following specification:

$$\text{LnAmount}_{bct} = \beta \text{OTS} \times \text{Post}_{bt} + \theta X_{bct} + \gamma_{ct} + \delta_{bc} + \varepsilon_{bct} \quad (3)$$

where  $\text{LnAmount}$  is the natural logarithm of the total amount of small business loans originated by bank  $b$  in county  $c$  in calendar year  $t$ .  $\text{OTS}$  is a dummy variable that takes the value of one if the bank was regulated by the OTS prior to the OTS extinction and  $\text{Post}$  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,  $\gamma_{ct}$ , control for unobserved common shocks that affect a county during a calendar year. In addition, we introduce bank-by-county fixed-effects,  $\delta_{bc}$ , 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 and in Column (2) we present our preferred specification that includes county-by-year and bank-by-county fixed effects. The coefficient on the main variable of interest,  $\text{OTS} \times \text{Post}$ , is statistically significant in all specifications and the estimates are also economically meaningful. In our preferred model reported in Column (2), the OTS extinction is associated with an 8.8% increase in the volume of small business loans originated by former OTS banks. The magnitude of the main coefficient declines between



Columns (1) to (2) suggesting that not properly accounting for differences in unobserved demand shocks across former OTS banks and commercial banks could inflate the coefficients.

The average total assets and holdings of C&I loans differ substantially across former OTS banks and commercial banks. Thus, a potential concern with our empirical analysis is that the business models of most former OTS banks are different from those of other commercial banks making the latter an inappropriate control group in our empirical analysis. To assuage this concern, in Column (3), we use coarsened exact matching (CEM) (Iacus, King, and Porro, 2012) to ensure that we compare former OTS banks with other commercial banks of similar size and similar share of C&I holdings. The results suggest that the empirical results are robust to CEM matching and, if anything, the economic magnitude of the estimated effect increases in this specification.

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 address this concern in two ways. First, we 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 at the zip level 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.

Second, to further tighten the geographic fineness of our analysis to address concerns about unobserved shifts in the within-county 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 Nguyen (2014) 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. While census tracts are finer than counties, the drawback of this approach is that the lending data is no longer by bank and we have to use an exposure variable. Formally, we estimate the following OLS specification:

$$\text{LnAmount}_{ict} = \beta \text{ShareOTS} \times \text{Post}_{it} + \theta X_{it} + \gamma_i + \delta_{ct} + \varepsilon_{ict} \quad (4)$$

where  $i$  indexes for census-tract,  $c$  indexes for county, and  $t$  indexes for year.  $\text{LnAmount}$  represents the aggregate small business lending by all CRA-reporting institutions in each census-tract during the calendar year.  $\text{ShareOTS}$ , is the share of deposits held by branches of former OTS banks in each census-tract as of June 30, 2010 and  $\text{Post}$  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,  $\gamma_i$ , 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,  $\text{ShareOTS} \times \text{Post}$ , confirm that the OTS extinction is associated with an increase in

small business lending by former OTS banks. The estimated effects are also economically meaningful: 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. These effects are smaller than in Table 3, but could result from using an exposure variable.

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 it serves two purposes: 1) it examines 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, and 2) it addresses concerns that the effects capture mean reversion in the performance of 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 rather than mean-reversion in the performance of former OTS banks.

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 (i) controlling for the total assets of banks and the interaction of this variable with the *Post*

dummy, (ii) weighing the observations by the size of the bank, (iii) adjusting for mergers and acquisitions of banks to make sure the results are not driven by changes in sample composition, and (iv) 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 potentially 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 led to an increase in small business lending by former OTS banks. In the next section, we explore cross-sectional heterogeneity in the lending effects to shed light on the mechanism(s) through which stricter supervision leads 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, 2013; Bord, Ivashina, and Taliaferro, 2017). Based on this literature, one would predict that stricter supervision 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 as the poorly-capitalized former OTS banks are forced to recognize their losses and scale back their 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. In fact, most former OTS banks were relatively well capitalized and could easily absorb the loan loss

provisioning and recognition imposed by the new supervisors. Thus, our setting provides the opportunity to examine if there are effects beyond the capital channel and other reasons why relatively well-capitalized banks expand their lending after stricter supervision.

We start by examining 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 are important. The results for below-average capitalization are largely consistent with prior literature that emphasizes the role of bank capital for lending. Based on this literature, poorly-capitalized banks are expected to scale back lending when they are forced to recognize losses and have little capital.

However, our finding that well-capitalized banks expand their lending upon facing stricter supervision that forces them to overhaul their lending practices is novel. It points to frictions in bank management and suggests that there are other channels through which stricter supervision can affect lending. The idea is that strict supervision can overcome existing agency frictions and lead to changes in how banks assess and manage their loans, which in turn improves banks' supply and allocation of credit. To explore this idea, we examine whether the increase in small

business lending following the OTS extinction is more pronounced in former OTS banks that were treated more strongly by the new supervisors, using two different proxies.

First, we conjecture that former OTS banks that were forced by the new supervisors to recognize their problem loans, establish sufficient provisions, and clean up their balance sheets following the regulatory change were also more strongly treated on other dimensions on bank and loan management. Thus, we should see larger lending effects in those banks. 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 annual growth of nonperforming loans between 2010 and 2012 (Columns (5) and (6)). The results support the conjecture and show that the positive effects of the OTS extinction on small business lending are concentrated in former OTS banks that show larger changes in their provisions and recognition of problem loans.

Second, we examine whether the increase in small business lending is associated with stricter monitoring of former OTS banks by the new supervisors. Because banks in close proximity to a regulatory field office are subject to greater regulatory monitoring and experience better outcomes (Wilson and Veuger, 2017; Gopalan, Kalda, and Manela, 2016), we investigate if the proximity between the headquarters of the bank and the closest OCC field office is associated with more pronounced lending effects following the regulatory transition. The results in Columns (7) and (8) suggest that the positive lending effects of the OTS extinction are concentrated in the subset of former OTS banks that are relatively close to an OCC field office. These results are consistent with the notion that greater regulatory scrutiny after the OTS

extinction reduced pre-existing agency frictions, which in turn increased small business lending by former OTS banks.

## ***7.2. Role of Local Credit Conditions***

An intriguing question posed by the findings that we presented thus far is: Why did commercial banks in the same counties not pursue the new lending opportunities that the former OTS banks found following the OTS extinction? After all, one would expect that the more strictly regulated commercial banks would exploit lending opportunities that are positive net present value. A potential explanation is that the effects of the OTS extinction are concentrated in areas where the commercial banks, as local competitors, were more capital constrained and, therefore, less willing to extend credit, which in turn allowed the former OTS banks to expand their lending after the regulatory transition.

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 (negative) credit-supply shock in each county during the Great Recession based on pre-existing market shares and estimated aggregate bank supply shifts.<sup>12</sup>

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<sup>12</sup> More details of the implementation of the procedure can be found in Greenstone, Mas and Nguyen (2015).

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 stronger in areas where local competitors are more capital constrained, we find that the main coefficient,  $\beta$ , 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 shock 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 larger negative supply shocks. Overall, the results support the conjecture that the lending effects following the OTS extinction are stronger where competitors are more constrained.

#### **8. Alternative Hypothesis: Portfolio Diversification of former OTS banks**

While our results are consistent with the interpretation we have presented so far, an alternative explanation that is not yet ruled out by the data is that former OTS banks expand their supply of small business lending because their new regulators demand that they reduce exposures to the residential mortgage market. We attempt to rule out this explanation below.

To determine whether this portfolio diversification channel drives our results, we conduct two sets of tests. In the first set of tests, we include additional control variables representing the pre-crisis portfolio shares of Residential, Commercial and Real Estate (CRE), and Commercial & Industrial (C&I) loans interacted with the *Post* dummy. In the second set of tests, we use the Home Mortgage Disclosure Act (HMDA) data to compute a bank's annual rate of rejection of residential mortgage applications as a proxy for its residential lending policy (and changes therein). We then expand the set of control variables in the main analysis by including the annual rejection rate of mortgage applications and its interaction with the *Post* dummy. We use these



additional variables to ensure that the former OTS banks' expansion in the supply of small business lending is not merely the flip side of a contraction in residential mortgage lending that was forced upon former OTS banks by their new banking regulators.

We report these results in Table 7. The first set of results re-estimate the main results of Table 3 after controlling for the pre-crisis shares of the three lending types (CRE, Residential, and C&I loans) interacted with the *Post* dummy.<sup>13</sup> The results reported in Columns (1) and (2) are quantitatively very similar to Table 3 and, if anything, the economic magnitude of the main coefficient becomes slightly larger. In Column (3), we go one step further and interact our main variable of interest with the pre-crisis share of residential loans. Consistent with the notion that the expansion of the supply of small business loans by former OTS banks is not primarily driven by portfolio diversification, we do not find evidence that the expansion of small business lending is stronger for banks with relatively high pre-crisis of Residential loans.

In the second set of tests, we include the annual rate of rejection of new mortgage applications and its interaction with the *Post* dummy as additional controls, which should capture changes in the residential lending policies. The results, reported in Columns (4) and (5) suggest that including these additional measures does not significantly alter our small business lending results. Moreover, in Column (6), we examine whether the expansion of small business lending is stronger for former OTS banks with higher mortgage application rejection rates, i.e., tighter post-OTS mortgage lending policies. The results suggest that the expansion in small business lending is greater for former OTS banks with *lower* mortgage application rejection rates. This finding is not consistent with the idea that banks are merely substituting originations of mortgage loans by the origination of small business loans.

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<sup>13</sup> In robustness tests, we also include the time-varying share of CRE, Residential, and C&I loans and find results that are quantitatively and qualitatively similar.

Taken together, the above tests make it unlikely that the expanded small business lending is driven by the new regulators forcing former OTS banks to diversify their loan portfolios.

## **9. 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 due to stricter supervision of former OTS banks contributes 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 businesses 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 entry and exit rates 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 these banks are terminating delinquent loans and financing new 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 30, 2010.<sup>14</sup> 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 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.

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<sup>14</sup> 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.

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:

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

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 30<sup>th</sup>, 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,  $\gamma_t$ , control for overall trends in the evolution of entry and exit rates and the county fixed effects,  $\delta_c$ , 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 8. In Panel A, 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,  $\beta$ , 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 former OTS banks no longer evergreen 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 *Share OTS* 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 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.

In Table 8, Panel B we examine whether these effects vary based on the overall increase in lending growth. We stratify counties based on the percentage change in the aggregate amount of small business loans originated during 2010-2012. The results of Panel B suggest that the effects of the OTS extinction are more pronounced in areas that experienced more growth in lending. The results also suggest that the OTS extinction is associated with an increase in *both* entry and exit in counties experiencing high growth in small business lending, rather than an increase in the entry rate in counties experiencing high growth in credit supply and an increase in exit in counties experiencing *low* growth in credit supply. These results are consistent with the anecdotal evidence that the former OTS banks tightened their standards for loan renewals and hence reallocated their lending to new establishments.

We conclude our analysis with an additional test to gauge whether 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 9. 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.

## **10. Conclusion**

An important question in banking is how strict supervision affects bank lending and in turn local business activity. Bank supervisors face a tradeoff between, on one hand, protecting the financial system by forcing banks to correct weaknesses in how they assess and manage their loans, to recognize their troubled loans, 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 banks, especially shortly after a financial crisis.

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 have a much stricter regulatory approach that affects key areas of bank management, including loan loss recognition, loan risk ratings, stress testing, and risk management, allows us to analyze the economic links between strict prudential supervision, bank lending and business activity.

We confirm first that the regulatory transition resulted in stricter supervision, as evidenced by significant changes in their loan loss recognition and loan provisioning shortly after the OTS extinction. 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 by approximately 10 percent. The increase is concentrated in well-capitalized banks as well as in banks that are more strongly treated by the new regime, i.e., those with larger changes in their provisions and recognition of non-performing loans and those that are more closely related to their new regulator's field offices. Thus, even well capitalized banks were reluctant to recognize loan losses and overhaul their lending practices, rating systems and risk management until the treatment by the stricter supervisor. These findings suggest that stricter supervision operates not only through capital but also can overcome frictions in bank management, leading to more lending and a reallocation of loans.

Consistent with the latter, we find evidence that entry and exit rates for businesses increase in areas with a larger presence of former OTS banks, consistent with former OTS banks not renewing loans to existing borrowers and lending to new establishments. Thus, our paper provides evidence how a policy intervention that significantly curtails regulatory forbearance shapes credit supply and business activity following a financial crisis.

There are two important caveats to our analysis. First, we document economic effects for the years after the regulatory transition. But we do not know how the elimination of the OTS will

play out in the long run. It is, for instance, an open question whether the decline in the number of supervisors and corresponding increase in regulatory concentration benefits the financial system in the long haul. Second, the US banking system features many small banks and many of the former OTS banks were relatively small. Our analysis is, therefore, more likely to be relevant for smaller and perhaps less sophisticated banks. However, there are several banking systems around the world that feature a significant fraction of smaller banks (e.g., Germany and Italy).

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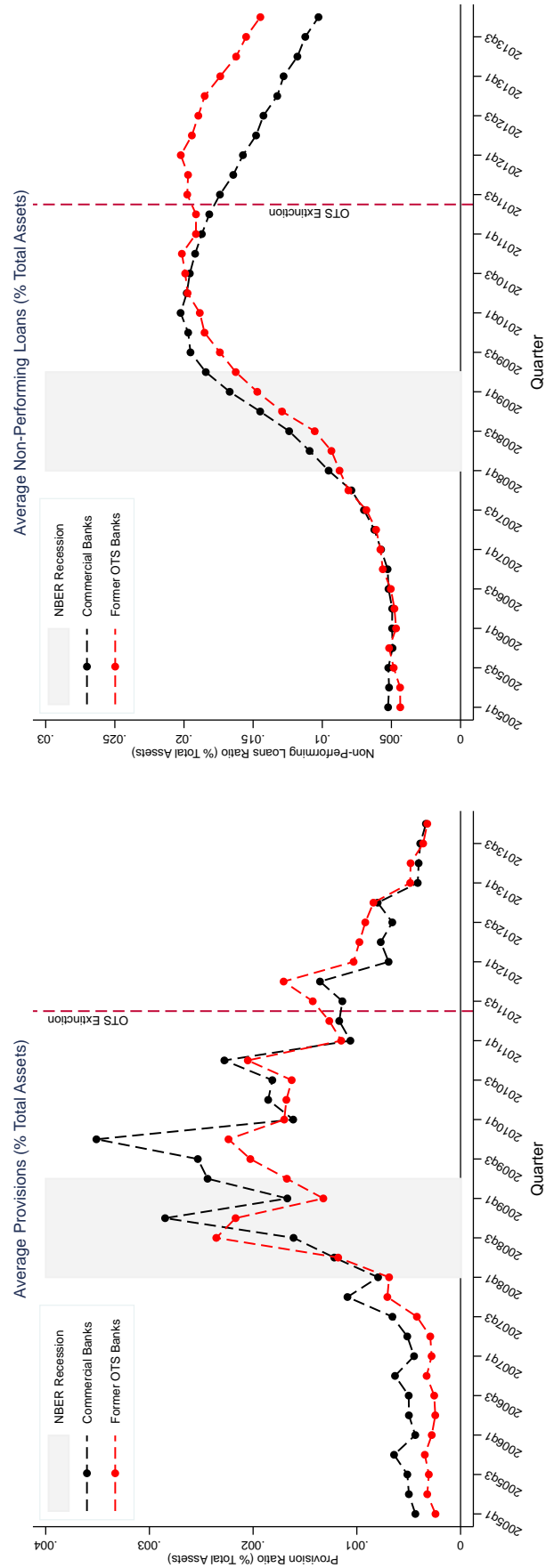


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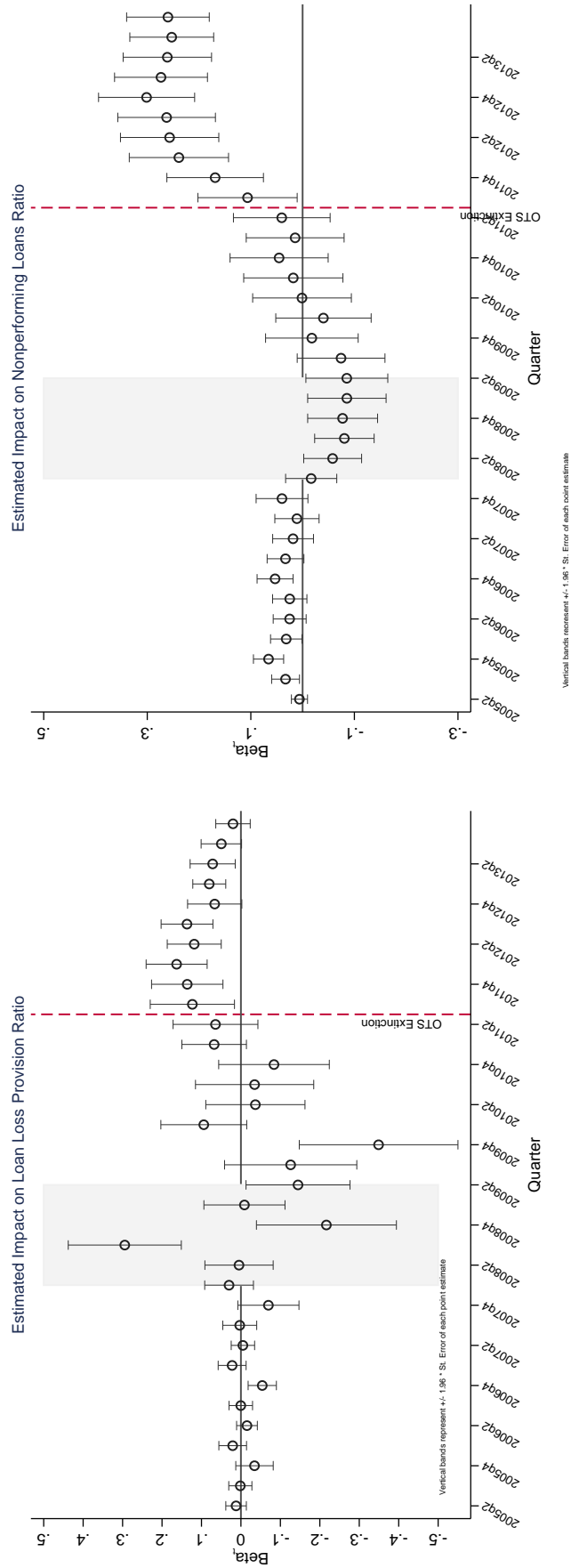
**Figure 1: Time Series of Loan Loss Recognition**

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.



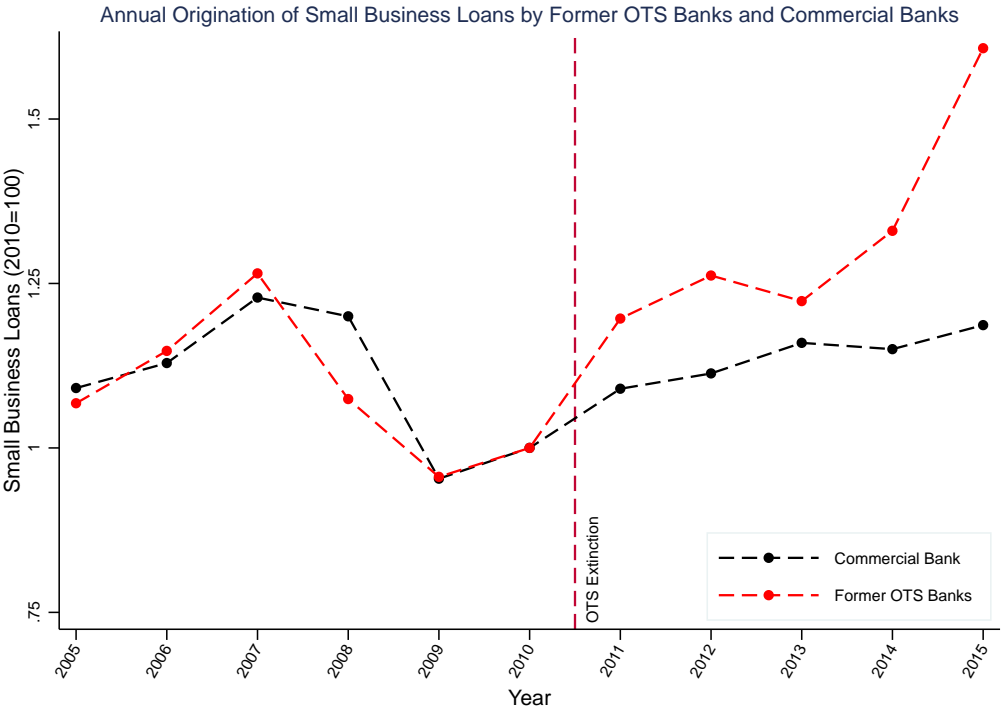
**Figure 2: OTS Extinction and Loan Loss Recognition over time**

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  $\beta_t$  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.



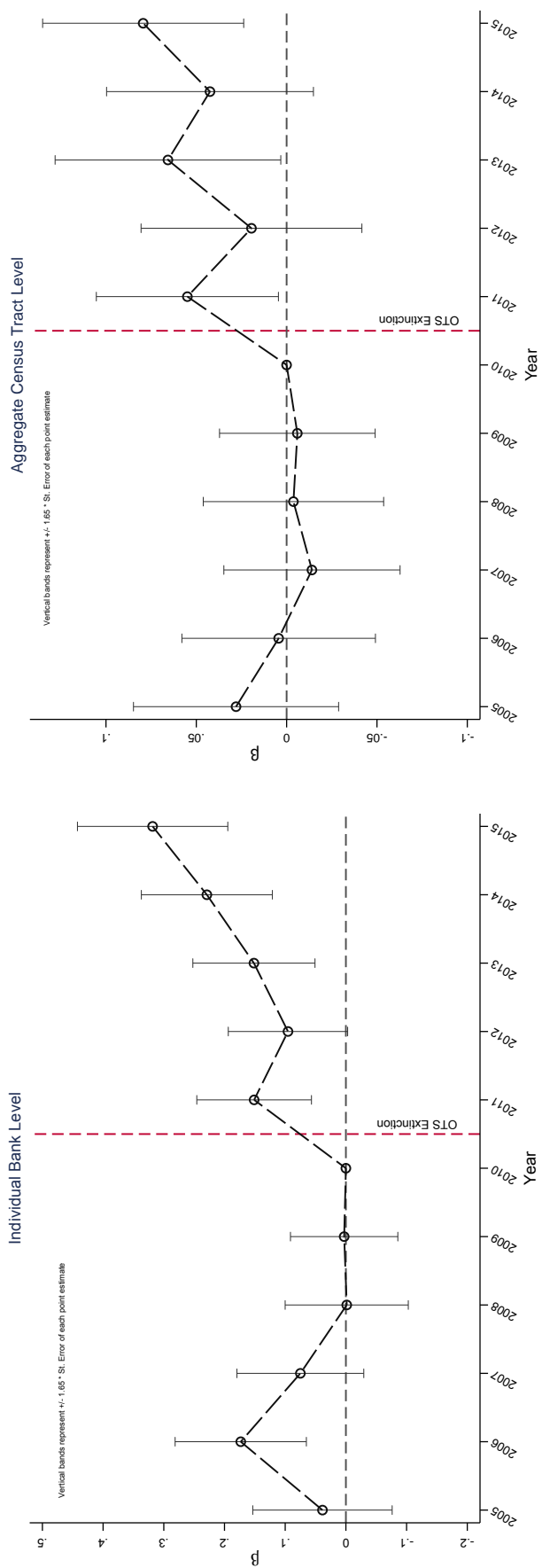
**Figure 3: Total Annual Origination of Small Business Loans by Former OTS Banks and Other Commercial Banks**

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  $\beta_t$  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  $\beta_t$  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

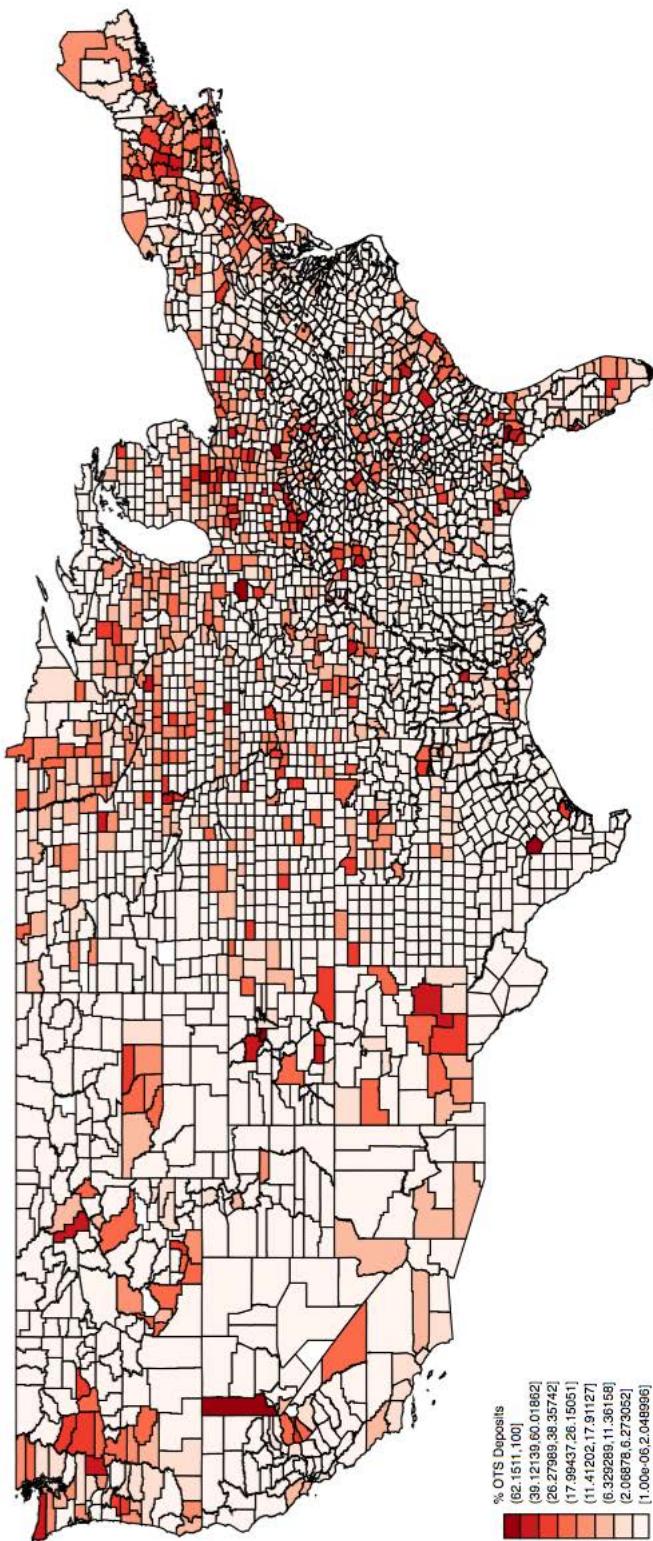


**Figure 5: Geographic Distribution of OTS Deposit Share**

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.

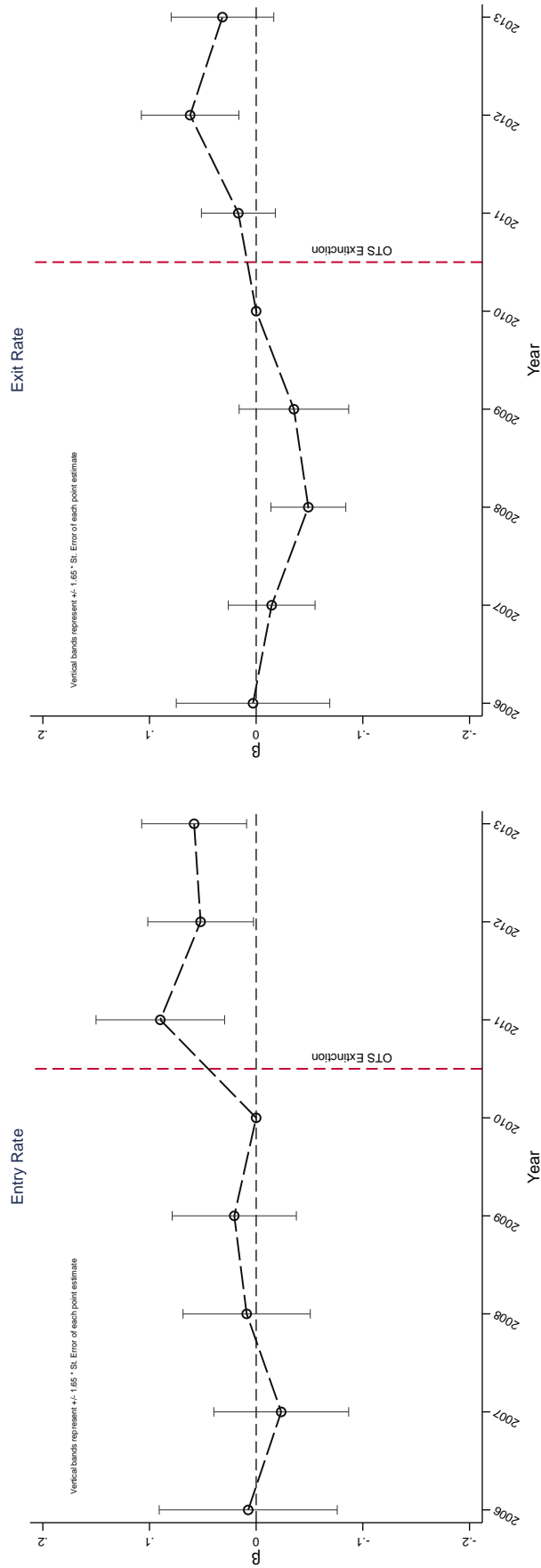
### Share of Deposits held in Branches of former OTS banks (2010)

All U.S. Counties



**Figure 6: OTS Extinction and Business Entry and Exit Rates: Impact over Time**

Figure 6 plots the average impact of exposure to OTS commercial banks on entry and exit of (business) establishments at the county level in each year of the sample period. In the left figure, the shallow circles represent the series of coefficients  $\beta_t$  from expanding the model specification in column (2) of Table 8 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  $\beta_t$  from expanding the model specification in column (4) of Table 8 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 for Sample Banks**

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 banks using call report and thrift financial report data. Panel B reports summary statistics for the sample of Community Reinvestment Act (CRA) Small Business Lending reporting banks. *Total Assets* are total assets of the depository institution (measured in \$000s) (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 (measured in \$000s) 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 (measured in \$000s). *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
<b>Commercial Banks</b>						
Total Assets	276,222	1,980,338	31,310,266	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
<b>Former OTS Banks</b>						
Total Assets	24,689	1,175,943	5,858,742	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
<b>Commercial Banks</b>						
Total SBL Originations	8,505	214,504	963,641	21,938	55,692	125,576
Number Branches	8,505	350.6	1,626.7	36	74	173
Total Assets	8,505	4,138,426,192	54,375,080,904	1,642,812	5,828,784	28,301,078
Total Deposits	8,505	7,741,388	51,713,920	515,872	1,023,661	2,192,585
HPI	8,298	1.114	0.137	1.039	1.107	1.189
<b>Former OTS Banks</b>						
Total SBL Originations	668	56,886	115,515	5,302	24,070	59,403
Number Branches	668	275.3	639.0	55	111	213
Total Assets	668	132,904,676	687,671,861	4,068,040	10,161,059	34,254,948
Total Deposits	668	3,666,661	7,167,811	928,023	1,343,974	2,987,659
HPI	646	1.094	0.143	1.002	1.090	1.182

**Table 2: OTS Extinction and Loan Loss Recognition: Impact of Stricter Supervision**

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).  $\ln(\text{Assets})$  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*** (0.006)	0.027*** (0.005)	0.365*** (0.084)	0.407*** (0.081)	0.029*** (0.004)	0.033*** (0.005)	0.154*** (0.026)	0.167*** (0.027)
Ln(Assets)		-0.004 (0.005)		-0.060 (0.065)		0.006 (0.005)		-0.099*** (0.019)
Residential Share		0.046 (0.029)		1.789*** (0.396)		0.087** (0.032)		0.971*** (0.116)
C&I Share		0.118** (0.041)		-1.194* (0.478)		-0.110** (0.039)		0.373** (0.109)
CRE Share		0.076* (0.031)		-0.300 (0.516)		-0.118** (0.039)		0.618*** (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  $\ln(\text{Total Loans})$  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. The index is designed to capture potential and absorb potential systematic differences in the location strategies of former OTS and commercial banks within a county location. Baseline controls include linear and quadratic terms 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 $\times$ Post	0.206*** (0.041)	0.088** (0.039)	0.152*** (0.041)	0.204*** (0.041)	0.094** (0.039)	0.158*** (0.042)
Ln(HPI)				0.266*** (0.041)	0.206 (0.159)	0.450** (0.203)
Observations	139277	130989	116550	129310	123123	109740
Adjusted $R^2$	0.755	0.864	0.881	0.754	0.865	0.883
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	No	No	Yes	No	No
County-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Bank-County Fixed Effects	No	Yes	Yes	No	Yes	Yes
Coarsened Exact Matching	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  $\text{Ln}(\text{Aggregate Total Loans by Tract})$  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.  $\text{Share OTS}$  is the share of deposits held in former OTS institution in each census tract as of June 30th, 2010.  $\text{Post}$  is an indicator variable that takes the value of one for all years after 2011 (inclusive).  $\text{Ln}(\text{HPI})$  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 linear and quadratic terms 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 $\times$ Post	0.054*** (0.021)	0.051*** (0.019)	0.046* (0.024)	0.038* (0.022)
Ln(HPI)			0.424*** (0.025)	0.250*** (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, Loan Loss Recognition and OCC Supervision**

Table 5 reports the coefficients of OLS regressions. Columns (1) and (2) repeat the analysis of column (2) of Table 3 after stratifying the sample based on above- and below-median levels of Tier1 Capital Ratio of the former OTS banks subsample prior to the OTS extinction. Columns (3) and (4) repeat the analysis of column (2) 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 (2) of Table 3 after stratifying the sample based on above- and below-average changes in the growth of nonperforming loans between 2010 and 2012. Columns (7) and (8) repeat the analysis of column (2) of Table 3 after stratifying the sample based on above- and below-median distance of the headquarters of the bank to the closest OCC field office. 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 linear and quadratic terms 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)	(7)	(8)
	Hi Tier1	Low Tier1	Hi $\Delta$ Prov.	Low $\Delta$ Prov.	Hi $\Delta$ NPL	Low $\Delta$ NPL	Low Dist OCC	Hi Dist OCC
	Ln(Total Loans)							
OTS $\times$ Post	0.265*** (0.061)	-0.227*** (0.070)	0.181*** (0.070)	0.060 (0.061)	0.233*** (0.051)	-0.034 (0.082)	0.251*** (0.068)	0.018 (0.050)
Observations	19197	88309	29398	73587	68573	31455	54655	65128
Adjusted $R^2$	0.838	0.868	0.849	0.866	0.869	0.845	0.878	0.850
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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

Table 6 reports the coefficients of OLS regressions. Columns (1) and (2) repeat the analysis of column (2) 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 (2) of Table 3 after stratifying the sample based on above- and below-median level of the predicted negative lending shock in the county, which is measured using the same methodology as in Greenstone, Mas, and Nguyen (2015). The dependent variable  $\text{Ln}(\text{Total Loans})$  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 linear and quadratic terms 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 Neg Lending Shock	Hi Neg Lending Shock
OTS $\times$ Post	0.043 (0.060)	0.097* (0.056)	0.047 (0.055)	0.119** (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: Robustness: Assessing the Impact of Changes in Banks' Lending Portfolios**

Table 7 reports the coefficients of OLS regressions. The dependent variable  $\ln(\text{Total Loans})$  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).  $Pre-Crisis\ Share\ CRE$  represents the share of CRE loans that the bank holds in its loan portfolio in the last quarter of 2007.  $Pre-Crisis\ Share\ Residential$  represents the share of Residential loans that the bank holds in its loan portfolio in the last quarter of 2007.  $Pre-Crisis\ Share\ C\&I$  represents the share of C&I loans that the bank holds in its loan portfolio in the last quarter of 2007.  $Mortgage\ Rejection\ Rate$  represents the ratio between the number of conventional, owner-occupied, one to four-family, home purchase mortgage applications rejected by the bank and the total number of such applications received by the bank. Baseline controls include linear and quadratic terms 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 $\times$ Post	0.234*** (0.044)	0.130*** (0.043)	0.251* (0.129)	0.197*** (0.041)	0.069* (0.038)	0.198*** (0.065)
Pre-Crisis Share CRE $\times$ Post	-0.521*** (0.064)	-0.596*** (0.063)	-0.593*** (0.063)			
Pre-Crisis Share Residential $\times$ Post	-0.345*** (0.109)	-0.771*** (0.118)	-0.730*** (0.121)			
Pre-Crisis Share C&I $\times$ Post	-0.247 (0.163)	-0.672*** (0.166)	-0.680*** (0.166)			
OTS $\times$ Post $\times$ Pre-Crisis Share Residential			-0.368 (0.369)			
Mort. Rejection Rate				-0.399*** (0.037)	-0.338*** (0.034)	-0.354*** (0.035)
Mort. Rejection Rate $\times$ Post				-0.005 (0.039)	-0.027 (0.040)	-0.007 (0.040)
OTS $\times$ Post $\times$ Mort. Rejection Rate						-0.604** (0.270)
Observations	128920	121372	121372	136798	128551	128551
Adjusted $R^2$	0.760	0.866	0.866	0.757	0.866	0.866
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	No	No	Yes	No	No
County-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Bank-County Fixed Effects	No	Yes	Yes	No	Yes	Yes

**Table 8: OTS Extinction and Entry and Exit of Local Business Establishments**

Panel A of Table 8 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),  $\ln(\text{Entry Rate})$ , 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),  $\ln(\text{Exit Rate})$ , 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 county deposits held in former OTS institution 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 linear and quadratic terms 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. Panel B repeats the analysis after stratifying the sample based on above- and below-median levels of the percentage change in the aggregate amount of small business loans originated in a county between 2010 and 2012. Standard errors are presented in parentheses, and are clustered at the county level. \*\*\*, \*\*, and \*, represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Panel A: Baseline Specification**

	(1)	(2)	(3)	(4)
	Ln(Entry Rate)		Ln(Exit Rate)	
Share OTS $\times$ 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

**Panel B: Heterogeneity based on Aggregate Lending Changes**

	High $\Delta$ SBL		Low $\Delta$ SBL		High $\Delta$ SBL		Low $\Delta$ SBL	
	Ln(Entry Rate)				Ln(Exit Rate)			
Share OTS $\times$ Post	0.103**	0.073***	0.010	0.029	0.135***	0.074**	0.053	0.041
	(0.043)	(0.025)	(0.043)	(0.052)	(0.036)	(0.030)	(0.037)	(0.038)
Observations	4800	4800	4794	4793	4800	4800	4794	4793
Adjusted $R^2$	0.796	0.937	0.788	0.935	0.751	0.923	0.724	0.916
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employment Weighted	No	Yes	No	Yes	No	Yes	No	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



**Table 9: OTS Extinction, Entry and Exit and Dependence from External Sources of Finance**

Table 9 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 (2),  $\ln(\text{Entry Rate})$ , 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),  $\ln(\text{Exit Rate})$ , 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 (3) 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 (2) 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 county deposits held in former OTS institution 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 linear and quadratic terms 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 \*, repr esent statistical significance at 1%, 5%, and 10% levels, respectively.

	Hi Ext. Fin.	Low Ext. Fin.	Hi Ext. Fin.	Low Ext. Fin.
	Ln(Entry Rate)		Ln(Exit Rate)	
Share OTS $\times$ Post	0.096** (0.040)	0.033 (0.023)	0.060** (0.025)	0.056** (0.024)
Observations	8381	8388	8385	8392
Adjusted $R^2$	0.786	0.856	0.744	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

## Figure IA1: Example passages from OCC Enforcement Action on Former OTS Banks

In this appendix, we show passages from OCC Enforcement Actions and formal written agreements between the OCC and former OTS banks. Panel A shows the third section of the formal written agreement between the OCC and Delanco Federal Savings Bank of November 21st, 2012 requiring Delanco's Board to ensure competent management by means of hiring new managers or providing additional training to existing managers that continue in their position. Panel B shows shows the sixth section of the formal written agreement between the OCC and Amory Federal Savings & Loans Association of July 19th, 2012 requiring Amory's management to implement new loan portfolio management practices. Panel C shows shows the sixth section of the formal written agreement between the OCC and Community Bank, Staunton, Virginia of August 9th, 2012 requiring Community Bank's management to implement new credit risk management practices.

### Panel A: Formal Written Agreement between OCC and Delanco, FSB.

#### ARTICLE III

##### BOARD TO ENSURE COMPETENT MANAGEMENT

(1) The Board shall ensure that the Bank has competent management in place on a full-time basis in its Chief Executive Officer, Chief Financial Officer, and Vice President of Commercial Lending positions to carry out the Board's policies, ensure compliance with this Agreement, applicable laws, rules and regulations, and manage the day-to-day operations of the Bank in a safe and sound manner.

(4) If the Board determines that an officer will continue in his/her position but that the officer's depth of skills needs improvement, the Board will within sixty (60) days develop and implement a written program, with specific time frames, to improve the officer's supervision and management of the Bank. At a minimum, the written program shall include:

- (a) an education program designed to ensure that the officer has skills and abilities necessary to supervise effectively;

### Panel B: Formal Written Agreement between OCC and Amory Federal Savings & Loans Association.

#### ARTICLE VI

##### LOAN PORTFOLIO MANAGEMENT

(1) The Board shall, within sixty (60) days, develop, implement, and thereafter ensure Bank adherence to a written program to improve the Bank's loan portfolio management. The program shall include, but not be limited to:

- (a) procedures to ensure satisfactory and perfected collateral documentation;
- (b) procedures to ensure that extensions of credit are granted, by renewal or otherwise, to any borrower only after obtaining and analyzing current and satisfactory credit information;

**Panel C: Formal Written Agreement between OCC and Community Bank, Staunton, Virginia.**

Article VI

CREDIT RISK MANAGEMENT

(1) Within sixty (60) days, the Board shall develop, implement, and thereafter ensure Bank adherence to a written program to improve the Bank's credit risk management consistent with the guidance set forth in the OCC Handbook "Rating Credit Risk". The program shall include, but not be limited to:

- (a) procedures to ensure accurate and timely risk grades, including loss recognition and identification of nonaccrual loans;
- (b) procedures for early problem loan identification;
- (c) procedures for establishing loan officer and credit administration accountability for failure to assign accurate and timely risk grades on loans, including recognition of nonaccrual status under their respective supervision;
- (d) implementation of an effective credit risk training program for all lending staff, internal loan review staff, financial analysts, and members of the Directors Loan Committee;
- (e) stress testing of higher risk loan concentration categories (non-owner occupied, commercial real estate (CRE), land, and construction loans),