How Does Competition Affect Bank Capital Structure? Evidence from a Natural Experiment*

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Abstract:

We exploit U.S. bank geographic deregulation over 1986-2014 using a dynamic partial adjustment methodology to test how changes in competition affect bank capital structure. We find that intensified competition induced by deregulation significantly increases bank target capital ratios and facilitates faster adjustment towards those targets. Investigation of the channels underlying the results suggests a very significant capital regime change associated with the Riegle-Neal Act, which first allowed interstate branching. Results are robust to alternative competition and capital measures, different specifications and subsamples, and falsification tests. Our findings imply previously undiscovered social benefits from deregulation in terms of improved financial stability.

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"Capital is a topic of never-ending importance to bankers and their counterparties, not to mention the regulators and central bankers whose job it is to oversee the stability of the financial system"

- Alan Greenspan, The Role of Capital in Optimal Banking Supervision and Regulation, Federal Reserve Bank of New York – Economic Policy Review, 1998.

1. Introduction

To keep the financial system safe, regulators enforce minimum bank capital standards. The capital absorbs potential future losses and provides better incentives to avoid excessive risk-taking. Bank managers generally rail against these regulations and argue that capital standards reduce their profits and market values. In this paper, we find other methods that policymakers may be able to use to accomplish their goals of higher bank capital. In particular, policies that increase bank competition may result in bank managers ***voluntarily*** choosing higher capital ratios. We find that an increase in competition through geographic deregulation results in higher target capital ratios and faster speeds of adjustment towards these targets. These findings suggest that policies that increase competition may have beneficial effects in terms of improving financial stability in addition to the previously investigated outcomes.

Understanding bank capital decisions is imperative because bank capital is a key determinant of bank risk and performance and a bulwark against systemic collapse during financial crises (e.g., Kashyap, Rajan, and Stein, 2008; Basel III, 2010; Admati, DeMarzo, Hellwig, and Pfleiderer, 2011; Calomiris and Herring, 2011; Hart and Zingales, 2011; Berger and Bouwman, 2013; Acharya, Mehran, and Thakor, forthcoming). This paper focuses on a previously unexplored determinant of bank capital – competition induced by bank geographic deregulation.

We conduct the first evaluation of the impact of U.S. bank geographic regulatory reforms over 1986 to 2014 – reforms that changed competitive conditions – on banks' capital decisions. We examine both the changes in bank target capital ratios and the adjustment speeds toward those targets. In doing so, we add to the research literatures on U.S. bank geographic deregulation, bank competition, and bank capital structure. We also contribute more broadly to the literature on firm capital structure by focusing on an important industry that is generally excluded from empirical finance investigations of capital structure. Focusing on one industry with different competitive conditions across markets and over time allows us to eliminate confounding differences across industries which cannot be adequately controlled for in a multi-industry setting.

By way of background, the bank capital literature finds that, despite being more leveraged than nonfinancials and subject to capital regulatory minimums, banks actively manage their capital structures (e.g., Marcus, 1983; Orgler and Taggart, 1983; Flannery, 1994; Myers and Rajan, 1998; Diamond and

Rajan, 2000; Berger, DeYoung, Flannery, Lee, and Öztekin, 2008; Flannery and Rangan, 2008; Allen, Carletti, and Marquez, 2011). Several papers also suggest that capital regulation may be of only second-order importance to capital structure decisions, as banks generally set their target capital ratios well above the regulatory requirements (e.g., Ayuso, Pérez, and Saurina, 2004; Lindquist, 2004; Barth, Caprio, and Levine, 2005; Brewer, Kaufman, and Wall, 2008; Gropp and Heider, 2011), and regulations do not affect their capital adjustment speeds unless the regulatory minimums are violated (e.g., Berger, DeYoung, Flannery, Lee, and Öztekin, 2008).

This literature also finds that bank capital structures are determined by financial factors such as bank charter value, risk, acquisition plans, deposits and loans structure, off-balance-sheet activities, and size (e.g., Berger, DeYoung, Flannery, Lee, and Öztekin, 2008) or pressures from bank stakeholders such as shareholders, debtholders, and depositors (e.g., Flannery and Sorescu, 1996; Morgan and Stiroh, 2001; Martinez Peria and Schmuckler, 2001; Calomiris and Wilson, 2004; Ashcraft, 2008; Flannery and Rangan, 2008; Lepetit, Saghi-Zedek, and Tarazi, 2015). A major difficulty in this literature is that bank capital is likely endogenous with competition, so causal relations are difficult to discern.

We address these endogeneity concerns by exploiting the staggered geographic deregulation of the U.S. banking industry to proxy for changes in bank competition. Historically, U.S. banks were geographically very restricted with no interstate operations and often with substantial intrastate barriers to competition. From 1978-1994, many interstate and intrastate restrictions were lifted, but interstate branching remained prohibited. The 1994 Riegle-Neal Interstate Banking and Branching Efficiency Act legalized interstate branching for the first time, but left some of the restrictions up to individual states. We construct tests using the deregulation events as plausibly exogenous shocks to competition that affect states at different points in time, given that literature supports the view that geographical deregulation significantly increased competition in banking (e.g., Flannery, 1984; Calem, 1994; Jayaratne and Strahan, 1998; Black and Strahan, 2002; Stiroh and Strahan, 2003; Rice and Strahan, 2010; Yildirim and Mohanty, 2010; Kroszner and Strahan, 2013). We acknowledge the possibility that deregulation may not be entirely exogenous and we address this concern using state-level controls, instruments, and falsification tests, and find qualitatively similar results. Results are also robust to alternative competition and capital proxies, different model specifications, and hold in various subsamples.

It is unknown *ex ante* how increased competition induced by deregulation affects banks' target capital ratios. We propose four channels under which banks exposed to more intense competition from deregulation would result in ***higher target capital ratios***. These channels focus on arguments about lower cost of capital, higher charter value, expanded growth opportunities, and increased shareholder-creditor

agency problems after deregulation. We also propose four other channels under which banks exposed to more intense competition would target ***lower target capital ratios***. These focus on arguments about higher cost of capital, lower charter value, increased too-big-to-fail incentives, and increased shareholder-manager agency problems after deregulation. From these channels, we formulate and test between two opposing hypotheses, H1a (**Higher Target Capital Ratio**) and H1b (**Lower Target Capital Ratio**), for the effects of competition on bank target capital ratios.

Similarly, it is unknown *ex ante* how competition affects bank capital adjustment speed. We propose two channels which predict ***faster adjustment speeds*** for banks exposed to intensified competition from deregulation. These channels are based on arguments about higher adjustment benefits from reduced financial distress costs and lower adjustment costs, from lower costs of capital issuance. We also propose two channels predicting ***slower adjustment speeds*** for banks exposed to deregulation-induced competition. These focus on arguments about lower adjustment benefits from reduced need to manage financial distress, and higher adjustment costs from higher agency costs. From these channels, we formulate and test two opposing hypotheses, H2a (**Faster Adjustment Speed**) over H2b (**Slower Adjustment Speed**), about the effects of competition on bank capital adjustment speeds.

Finally, it is unknown *ex ante* the methods banks use to adjust their capital ratios when exposed to deregulation-induced changes in competition. We propose three methods. These focus on ***active capital management*** or changing the numerator of the capital ratios; ***asset management***, or changing the denominator of the capital ratios; and ***passive capital management***, or relying on earnings retention to change capital ratios. The methods differ in costs, speed, and implications for interest income, liquidity, and/or opportunity costs of foregone growth. From these channels, we formulate and test among three hypotheses for all banks, H3a (**Active Capital Management**), H3b (**Asset Management**), and H3c (**Passive Capital Management**), and also separately for banks above and below their target capital ratios.

Our empirical application models bank target capital ratios as functions of competition – as proxied by geographic deregulation – using a partial adjustment methodology. This model treats right-hand-side bank characteristics as endogenous and employs all valid lags of these variables as instruments in the regressions, and accounts for a variety of bank capital determinants, as well as bank and year fixed effects. The bank fixed effects control for unobservable time-invariant differences across banks and the year fixed effects control for many macroeconomic and regulatory events, including changes in capital standards, that affect all banks at the same points in time.

We find robust evidence that increases in banking competition induced by deregulation cause bank

target capital ratios to increase. Specifically, we find that after the Riegle-Neal Act of 1994, banks in states with the fewest restrictions on interstate branching choose capital ratios 3.2% higher than banks in states with the most restrictions. The effect is economically large given the sample mean of the capital ratio is 8.9%. These results are consistent with the empirical dominance of Hypothesis H1a (**Higher Target Capital Ratio**) over Hypothesis H1b (**Lower Target Capital Ratio**). Furthermore, our channels analysis finds some support for all of the channels for H1a (**Higher Target Capital Ratio**), but it is difficult to differentiate precisely among the individual channels.

We also investigate how competition proxied by geographic deregulation affects the speed of adjustment toward target capital ratios using OLS with bootstrapped standard errors. We find that after the Riegle-Neal Act of 1994, the speed of adjustment is significantly (8.42%) faster for banks in the most deregulated states relative to banks in the least deregulated states. These results hold in subsamples that allow for asymmetry in the adjustment speed for below- and above-target banks, alternative time periods, and falsification tests. Our adjustment speed results are consistent with the empirical dominance of Hypothesis H2a (**Faster Adjustment Speed**) over Hypothesis H2b (**Slower Adjustment Speed**).

We finally test our last set of hypotheses regarding the methods banks use to adjust their capital ratios to changes in competition by comparing changes in equity and asset growth pre- and post-Riegle Neal – the most significant deregulation event. We find that banks adjust their capital ratios more using active capital market operations, such as equity issuances, repurchases, and dividend changes, to change the numerator of the capital ratios than passively through changes in retained earnings, consistent with the empirical dominance of Hypothesis H3a (**Active Capital Management**) over H3c (**Passive Capital Management**). Bank assets, the denominator of the capital ratios, goes up considerably more after the Riegle-Neal Act, reflecting banks' desires to exploit growth opportunities rather than manage assets, although other earning assets (such as securities) decrease, which could reflect some asset management to avoid the capital ratio going down, consistent with Hypothesis H3b (**Asset Management**).

Furthermore, we observe different strategies for banks with above- and below-target capital ratios. Banks with above-target capital achieve lower capital ratios primarily through managing their assets without any major contractions in the equity base after deregulation, consistent with Hypothesis H3b (**Asset Management)**. However, banks with below-target capital achieve higher capital ratios primarily by raising external capital after deregulation, consistent with Hypothesis H3a (**Active Capital Management**). Finally, our results also suggest that the **Passive Capital Management** is generally more important before 1994, whereas **Active Capital Management** and **Asset Management** are most important for the post-Riegle-Neal period, suggesting a very significant regime change associated with the Riegle-Neal Act.

The rest of the paper proceeds as follows. Section 2 describes how this paper relates to existing literature. Section 3 develops our hypotheses. Section 4 describes the data, model specification, and variables construction. Sections 5 and 6 present the bank target capital and adjustment speed analyses, respectively. Section 7 analyzes methods banks use to adjust their capital ratios. Section 8 concludes. Internet Appendix A presents additional robustness checks.

2. Literature Review

Our paper contributes to four strands of literature: bank geographical deregulation, bank competition and stability, bank capital management, and broader firm capital management.

2.1 Bank Geographical Deregulation

Before discussing the literature on bank geographic deregulation, we give a brief history. Prior to 1978, U.S. banks were very restricted in where they could operate. Almost no interstate banking was allowed due to the McFadden Act of 1927, and many states also restricted their banks from branching statewide. Bank holding companies (BHCs) were also geographically restricted both across and within states. From 1978 to 1994, individual states started allowing BHCs to own commercial banks across state lines, but interstate branch banking remained prohibited. The 1994 Riegle-Neal Act allowed BHCs to cross state lines and consolidate their commercial banks in different states into branches of a single bank, although individual states could opt in or out when they chose (all states eventually opted in).[2] A number of interstate restrictions, like *de novo* branching by out-of-state banks (opening up branches without purchasing an in-state bank), were left up to the states (Rice and Strahan, 2010). The 2010 Dodd-Frank Act, Section 613, partially reversed state restrictions on *de novo* branching by out-of-state banks.

A large literature examines the effects of bank geographic deregulation. Jayaratne and Strahan (1996) first document a significant causal link between bank deregulation and state income growth and output. Other papers find that deregulation makes business cycles smaller and more alike (Morgan, Rime, and Strahan, 2004), affects economic growth accelerations (Huang, 2008) and alters the distribution of income (e.g., Demyanyk, 2008; Levine, Levkov, and Rubinstein, 2008; Beck, Levine, and Levkov, 2010). Some research focuses on the effects on firms, and finds mostly favorable effects: it spurs entrepreneurship (Black and Strahan 2002), promotes creative destruction (Kerr and Nanda, 2009), expands credit supply to small firms by reducing the cost of credit (Rice and Strahan, 2010), leads to externally-financed growth (Berger, Chen, El Ghoul, and Guedhami, 2017), reduces investment in the short-run but increases it in the

[2] See Berger, Kashyap, and Scalise (1995) for detailed description of these geographic deregulations up through 1994.

long-run (Zarutskie, 2006), improves firm total factor productivity (Krishnan, Nandy, and Puri, 2014), and has mixed effects on innovation (e.g., Amore, Schneider, and Žaldokas, 2013; Chava, Oettl, Subramanian, and Subramanian, 2013; Cornaggia, Mao, Tian, and Wolfe, 2015). Other deregulation research focuses on households, and finds increased lending to households (Dick and Lehnert, 2010), increased home ownership due to improved access to mortgage credit (Tewari, 2014), increased stock market participation (Kozak and Sosyura, 2015), and reduced share of unbanked households among low income populations (Célérier and Matray, 2016).

We examine the effects of deregulation over the period 1986-2014 and include both early interstate and intrastate geographic deregulation prior to the Riegle-Neal Act and the late geographic deregulation of interstate bank branching laws as in Rice and Strahan (2010) with recent updates from state statutes and Dodd-Frank Act. We advance this line of review by focusing on the effects on bank capital decisions, about which there is no evidence.

2.2 Bank Competition and Stability

Regarding the effects of bank competition on financial stability, there are two opposing strands of literature: the "*competition-fragility*" view (e.g., Marcus, 1984; Keeley, 1990; Demsetz, Saidenberg, and Strahan, 1996; Carletti and Hartmann, 2003) asserting that more banking competition reduces stability, and the "*competition-stability*" view (e.g., Boyd and De Nicolo, 2005; Schaeck and Cihak, 2014) asserting the opposite. Berger, Klapper, and Turk-Ariss (2009) find evidence supporting both. Still others predict a potential nonmonotonic U-shape relationship between bank market power and risk (e.g., Martinez-Miera and Repullo, 2010). Our results have implications for this research and policy debate by showing that more competition increases bank capital, consistent with the *competition-stability* view. Notably, the reason here is quite different from most of the literature, given effects here operate through higher capital, rather than reduced loan risk.

2.3 Bank Capital Management

The bank capital structure literature finds that in addition to regulation, banks' capital structures are influenced by financial factors (e.g., Berger, DeYoung, Flannery, Lee, and Öztekin, 2008) and governance pressures from several bank stakeholders such as shareholders, debt holders, and depositors (e.g., Flannery and Sorescu, 1996; Morgan and Stiroh, 2001; Martinez Peria and Schmuckler, 2001; Calomiris and Wilson, 2004; Ashcraft, 2008; Flannery and Rangan, 2008; Lepetit, Saghi-Zedek, and Tarazi, 2015). We focus on the effects of competition from bank geographic deregulation, which is not previously examined.

2.4 Firm Capital Management

The broader literature on firm capital management is dominated by three major capital structure theories (see reviews by Harris and Raviv, 1991; Frank and Goyal, 2003): the (static and dynamic) tradeoff theory (e.g., Kraus and Litzenberger, 1973; Jensen, 1986; Jensen and Meckling, 1976; Myers 1977), the pecking order theory (e.g., Myers, 1984; Myers and Majluf, 1984), and the market timing theory (e.g. Baker and Wurgler, 2002). All three receive some empirical support (e.g., Frank and Goyal, 2003; Flannery and Rangan, 2006; Lemmon, Roberts, and Zender, 2008; Frank and Goyal, 2009; Huang and Ritter, 2009; Öztekin and Flannery, 2012; DeAngelo and Roll, 2015). One relevant paper examines the effects of industrial deregulation on nonfinancial firm capital structure targets (Ovtchinnikov, 2010). However, it does not study the effects of bank deregulation, nor does it examine speeds of adjustment like we do. In addition, our study focuses on a single industry, banking, which enables us to circumvent confounding differences across industries which cannot be effectively accounted for in a multi-industry setting.

3. Hypothesis Development

It is unclear *ex ante* whether increased competition from deregulation increases or decreases bank target capital ratios and adjustment speeds. It is also unknown whether the capital ratio adjustments are primarily accomplished passively through changes in earnings retention or actively through capital market operations (equity issuances, repurchases, or dividend changes).

Starting with the target capital ratios, there are at least four channels that predict **higher** target capital ratios for banks exposed to more intense competition from deregulation:

> **Lower Cost of Capital Channel:** Deregulation-induced competition may lower the cost of capital from both internal and external sources, raising target capital ratios. The post-deregulation competition may increase bank earnings (e.g. Chong, 1991), making it easier for banks passively retain more of these as higher capital ratios (e.g., Myers and Majluf, 1984; Berger, 1995; Per Hortlund, 2005). The higher bank earnings may reflect 1) greater X-efficiencies from more efficient organizational structures that do not require separate management in different locations, more X-efficient firms applying their policies and procedures to less X-efficient banks they acquire (e.g., Alchian and Demsetz, 1972), and/or greater scale efficiencies from operating at more efficient larger scales (e.g., Berger and Mester, 1997). The increase in scale and greater profitability may also make it easier and less expensive to raise external equity, as investors prefer larger, more transparent firms, and those with higher earnings that may generate greater returns on their investments.

Higher Charter Value Channel: Banks may have higher charter values from greater deregulation-induced competition for two reasons. First, they may have higher expected future profitability from increased efficiency. Second, they may be safer (i.e, lower volatility of earnings) due to increased scale and diversification. Banks may target higher capital ratios to protect their higher charter values.

Expanded Growth Opportunities Channel: Increased competition after deregulation opens more opportunities to expand by acquiring other banks or starting branches in more locations, which requires more capital. Thus, banks may target higher capital ratios to allow them to engage in future expansion opportunities when they arise.

Shareholder-Creditor Agency Problem Mitigation Channel: Increased competition after deregulation may increase shareholder-creditor agency problems due to the expanded growth opportunities, resulting in added difficulties and costs in raising debt. To mitigate these problems, banks may respond by increasing target capital ratios.

There are also at least four channels that predict **lower** target capital ratios for banks exposed to more intense competition from deregulation:

Higher Cost of Capital Channel: Deregulation-induced competition may alternatively raise the cost of capital ratios from internal and external sources, lowering target capital ratios. The increased competition may reduce bank earnings under the structure-conduct-performance (SCP) hypothesis as the increased competition forces firms to provide more favorable prices to consumers (Bain, 1959), making the internal cost of capital higher. The extra competition may also make the banks riskier as acquisitions of banks in other markets generates more uncertain returns. The lower profitability and higher risk may also make it more difficult and expensive to raise external equity, as investors require a discount for investing in less profitable and riskier firms.

Lower Charter Value Channel: Banks may have lower charter values from reduced expected future profitability and higher risk, so may target lower capital ratios.

Too-Big-To-Fail Channel: The increased size of banks from deregulation may afford them extra implicit government protection from failure as they become too big to fail. This creates moral hazard incentives to take on additional risk, including by targeting lower capital ratios.

Shareholder-Manager Agency Problem Mitigation Channel: Deregulation-induced competition may also increase shareholder-manager agency problems because of the expanded growth opportunities. Managers may have more opportunities to make value-reducing empire-building acquisitions to raise their compensation and/or prestige. To mitigate these problems, banks may respond by decreasing target capital ratios to keep more pressure on managers to focus on value maximization.

These channels imply two opposing hypotheses for the effects of increased competition on target capital ratios of banks in deregulated states:

H1a: Increased competition results in higher target capital ratio for banks in deregulated states.

H1b: Increased competition results in lower target capital ratio for banks in deregulated states.

The increased competition induced by deregulation may also affect adjustment speeds toward target capital ratios. We propose two channels that predict **faster** adjustment speeds:

Higher Adjustment Benefits Channel: Banks may adjust faster to target capital ratios when the costs of financial distress or bankruptcy are higher. The potentially higher charter values discussed above imply higher opportunity costs from financial distress and bankruptcy, giving incentives to increase adjustment speed. (De Jonghe and Öztekin, 2015).

Lower Adjustment Costs Channel: Banks also have incentives to adjust faster when adjustment costs are lower. The potentially lower costs of capital from both internal and external sources due to higher profitability and increased safety discussed above may also result in faster adjustment speeds.

We also propose two channels that predict **slower** capital adjustment speeds:

Lower Adjustment Benefits Channel: Banks may adjust more slowly to target capital ratios because costs of financial distress or bankruptcy may be lower. The potentially lower charter values and increased too-big-to-fail incentives discussed above imply lower opportunity costs from financial distress and bankruptcy, slowing adjustment speeds.

Higher Adjustment Costs Channel: Banks may also adjust more slowly when adjustment costs are higher. The potentially higher costs of capital due to lower profitability and greater risks from more competition may also result in slower adjustment speeds.

These channels above imply the following opposing hypotheses for the effects of increased competition on capital structure adjustment speed of banks in deregulated states:

H2a: Increased competition results in <u>faster adjustment speed</u> for banks in deregulated states.

H2b: Increased competition results in <u>slower adjustment speed</u> for banks in deregulated states.

Our empirical analysis tests which of these hypotheses (H1a vs. H1b and H2a vs. H2b) dominate.

Finally, capital ratio adjustments caused by deregulation-induced changes in competition may be primarily achieved through one of the following channels:

> **<u>Active Capital Management Channel</u>**: Capital ratio changes are achieved actively through capital market operations (equity issuances, repurchases, or dividend changes).
>
> **<u>Asset Management Channel</u>**: Capital ratio changes are achieved by actively managing their total assets.
>
> **<u>Passive Capital Management Channel</u>**: Capital ratio changes are achieved passively through earnings retention.

Active capital management (focused on changing the numerator of the capital ratios) can generally be used to change capital ratios substantially in short periods of time but may be expensive in terms of risk premiums and administrative costs. Asset management (focused on changing the denominator of the capital ratios) is the fastest of the three and may be used to change capital ratios but generally by less than active capital management and may involve significant changes in interest income, bank liquidity, and/or opportunity costs of foregoing growth. By contrast, passive capital management (focused on changing the numerator of the capital ratios) is generally slower to change the capital ratios, but is less expensive than the active methods.

We hypothesize that the desired changes in capital ratios are more likely to go through the **Active Capital Management Channel** to the extent that target capital ratios are much higher due to deregulation-induced competition, i.e., that Hypotheses 1a empirically dominates. The desired changes in capital ratios are more likely to go through the **Asset Management Channel** to the extent that the capital adjustment speeds are much higher due to deregulation-induced competition, i.e., that Hypotheses 2a empirically dominates, provided that the opportunity costs of foregone growth are not prohibitive. Finally, we hypothesize that the capital changes motived by deregulation-driven increases in competition are more likely to go through the **Passive Capital Management Channel** to the extent that the target capital ratios

and adjustment speeds are lower, i.e., that Hypotheses 1b and 2b both empirically dominate. Thus, we offer the following three hypotheses:

H3a: Increased competition results in more active capital management for banks in deregulated states.

H3b: Increased competition results in more asset management for banks in deregulated states.

H3c: Increased competition results in more passive capital management for banks in deregulated states.

Our empirical analysis tests which of these hypotheses (H3a, H3b, and H3c) empirically dominate.

4. Data and Methodology

4.1 Data and Sample

We use annual financial data for all U.S. bank holding companies (BHCs) over 1986 to 2014 from the Federal Reserve's Y-9C Reports.[3] We also collect information on market equity and S&P Credit Ratings from Compustat, merger and acquisition (M&A) data from the Federal Reserve Bank of Chicago, and deposit data from the FDIC Summary of Deposits. Our dataset is an unbalanced panel containing 9,072 bank-year observations over 28 years, for about 350 BHCs per year on average.

4.2 Capital Measures

Our main capital measure $k_{i,t}$ is *Equity Ratio*, equity capital divided by total unweighted, on-book assets. In robustness tests, we use three alternative capital measures: *Leverage Ratio* (Tier 1 capital divided by total unweighted, on-book assets); *Tier 1 Capital Ratio* (Tier 1 capital divided by risk-weighted assets); and *Total Capital Ratio* (Tier 1 plus Tier 2 capital divided by risk-weighted assets). We also construct a pre-determined measure of "do-nothing capital" (*DNK*) for each of the four capital ratios. *DNK* represents what the capital ratio would be if the BHC "did nothing": kept dividend payments constant and let the remaining cash flow accrue to capital. It is constructed as capital plus net income minus lagged dividends, all divided by current "assets," where "assets" is either total unweighted assets (for *Do-Nothing Capital* and *Do-Nothing Leverage*) or risk-weighted assets (for *Do-Nothing Tier1 Capital* and *Do-Nothing Total Capital*).

[3] Before 2006, all BHCs with at least $150 million in total assets filed these quarterly reports. Beginning with the March 2006 reports, the cutoff for mandatory filing was raised to $500 million. Throughout the paper, we refer to BHCs as banks for convenience.

4.3 Model Specification

We model the target capital ratio $\boldsymbol{k}^{*}_{i,t}$ as a function of the banks' competitive stance in the credit environment (***COMP***) and banks' operating features (***X***):

$$\boldsymbol{k}^{*}_{i,t} = \frac{\boldsymbol{K}^{*}_{i,t}}{\boldsymbol{A}_{i,t}} = \theta \boldsymbol{COMP}_{i,t-1} + \beta \boldsymbol{X}_{i,t-1} + \psi \boldsymbol{BANK}_{i} + \tau \boldsymbol{YEAR}_{t} \quad (1)$$

where:

$\boldsymbol{K}^{*}_{i,t}$ is the target (desired) book value of equity capital,

$\boldsymbol{A}_{i,t}$ is the book value of simple (unweighted) assets,

$\boldsymbol{COMP}_{i,t-1}$ is the set of geographic deregulation indices that affect target capital by removing barriers to bank expansion within and across state lines and spurring competition: *Intra*, *Inter*, *R&S Index*, *KNP Index*, and their components, described in more detail in Section 4.4.

$\boldsymbol{X}_{i,t-1}$ is the set of bank characteristics that affect target capital, including bank profitability, bank risk, cost efficiency, market-to-book ratio, number of acquisitions, bank size, retail deposits, business loans, and off-balance sheet activities, described in more detail in Section 4.5.

$\boldsymbol{BANK}_{i}$ and $\boldsymbol{YEAR}_{t}$ are bank and time fixed effects to capture bank and time-specific sources of unobserved heterogeneity i.e, regulatory events, including changes in capital standards (e.g., Gropp and Heider, 2011; De Jonghe and Öztekin, 2015).

To estimate the adjustment speed toward the target capital ratio, we model bank capital using a partial adjustment framework that indicates that the bank closes a constant (λ) proportion of the gap between its current capital ratio and its target capital ratio ($\boldsymbol{k}^{*}_{i,t}$) in each period. We separate a firm's capital change into a passive component and an active adjustment. Capital ratio at time *t* would be $\boldsymbol{DNK}_{i,t}$ if the bank engages in no net capital market activities, but simply keeps dividend payments constant and lets the remaining cash flow accrue to capital. The bank's actively managed capital ratio change would then be $\Delta \boldsymbol{k}_{i,t} = \boldsymbol{k}_{i,t} - \boldsymbol{DNK}_{i,t-1}$ and this could be undertaken through a combination of capital market activities such as equity issues and repurchases, changes in dividend payments, or adjustments to assets. A bank's actively managed capital ratio change, $(\Delta \boldsymbol{k}_{i,t} = \boldsymbol{k}_{i,t} - \boldsymbol{DNK}_{i,t-1})$ is a weighted average (with weight $\lambda \in [0,1]$) of its target capital ratio, $\boldsymbol{k}^{*}_{i,t}$, and its do-nothing (passive) capital ratio, $\boldsymbol{DNK}_{i,t-1}$, as well as a random shock, $\tilde{\delta}_{i,t}$:

$$\boldsymbol{k}_{i,t} - \boldsymbol{DNK}_{i,t-1} = \lambda(\boldsymbol{k}^{*}_{i,t} - \boldsymbol{DNK}_{i,t-1}) + \tilde{\delta}_{i,t} \quad (2)$$

where:

$\boldsymbol{k}_{i,t}$ = book value of equity capital $\boldsymbol{K}_{i,t}$ divided by (unweighted) assets $\boldsymbol{A}_{i,t}$,

$\boldsymbol{DNK}_{i,t-1}$, = "do-nothing capital ratio" at time $t \equiv \left(\dfrac{\boldsymbol{K}_{i,t-1} + \boldsymbol{NI}_{i,t} - \boldsymbol{DIV}_{i,t-1}}{\boldsymbol{A}_{i,t}} \right)$.

$\boldsymbol{NI}_{t}$ = net income of the i^{th} bank in the current period,

$\boldsymbol{DIV}_{i,t-1}$ = dollar dividend payments by the i^{th} bank in period *t-1*,

λ is a scalar adjustment speed, and

$\tilde{\delta}_{i,t}$ is a random error.

The speed of adjustment, λ, ranges from 0 to 1. As banks move from perfect passive managers (λ=0) to perfect active managers (λ=1), they adjust their capital ratios immediately to the target. The smaller the λ, the more binding the financial frictions are, and the longer it takes a bank to return to its target after a shock to its capital.

We substitute (1) into (2) and rearrange it to isolate the capital ratio:

$$\boldsymbol{k}_{i,t} = (\lambda\beta)\,\boldsymbol{X}_{i,t-1} + (\lambda\theta)\boldsymbol{COMP}_{i,t-1} + (1-\lambda)\,\boldsymbol{DNK}_{i,t-1} + \mu\boldsymbol{BANK}_{i} + \gamma\boldsymbol{YEAR}_{t} + \hat{\delta}_{i,t} \quad (3)$$

Following Flannery and Hankins (2013), we estimate equation (3) using Blundell and Bond's (1998) generalized method of moments (GMM) estimator to avoid biases from OLS or standard fixed effects models. The inclusion of bank ($\boldsymbol{BANK}_{i}$) and year ($\boldsymbol{YEAR}_{t}$) fixed effects capture the effects of unobserved bank heterogeneity and time-varying factors such as macroeconomic, financial market conditions, and regulatory events, including changes in capital standards, that affect all banks at the same points in time. The long-run impact of ***COMP*** on the capital ratio is given by its estimated coefficient, divided by λ (one minus the coefficient on the do-nothing capital ratio). This estimation provides an initial set of explicit estimates of βs, θs, and λ, which allows us to calculate an initial estimated target capital ratio: $\hat{\boldsymbol{k}}^{*}_{i,t} = \theta\boldsymbol{COMP}_{i,t-1} + \beta\boldsymbol{X}_{i,t-1} + \psi\boldsymbol{BANK}_{i} + \tau\boldsymbol{YEAR}_{t} = \left(\dfrac{1}{\lambda}\right)\left(\hat{\boldsymbol{k}}_{i,t} - (1-\lambda)\boldsymbol{DNK}_{i,t-1}\right) + \hat{\delta}_{i,t}$ and deviation from the target capital ratio: $\left(\boldsymbol{DEV}_{i,t-1} = \hat{\boldsymbol{k}}^{*}_{i,t} - \boldsymbol{DNK}_{i,t-1}\right)$ for each bank-year. The baseline adjustment speed is obtained by subtracting the coefficient estimate on the do-nothing-capital $\left(\boldsymbol{DNK}_{i,t-1}\right)$ from 1.

According to (3), each bank has its own time-varying target capital and starting place (***DNK***), but all banks adjust at the same rate (λ) in all time-periods. However, the speed with which a bank adjusts its capital ratio should depend on its specific situation. We thus allow the adjustment speed to vary with time and bank characteristics, with special emphasis on the bank's competitive stance in the credit market:

$$\lambda_{i,t} = \Lambda \boldsymbol{Z}_{i,t-1} = \vartheta \boldsymbol{COMP}_{i,t-1} + \gamma \boldsymbol{Y}_{i,t-1} \tag{4}$$

We investigate a partial adjustment model in which bank characteristics and competition affect both the target capital ratio and the speed of adjustment. We substitute (4) into (3) and rearrange it:

$$\Delta \boldsymbol{k}_{i,t} = \left(\Lambda \boldsymbol{Z}_{i,t-1}\right)\left(\theta \boldsymbol{COMP}_{i,t-1} + \beta \boldsymbol{X}_{i,t-1} - \boldsymbol{DNK}_{i,t-1}\right) + \psi \boldsymbol{YEAR}_t + \tilde{\delta}_{i,t} \tag{5}$$

where:

Λ is a vector of coefficients for the adjustment speed function, and

$\boldsymbol{Z_{i,t-1}}$ is the set of bank characteristics (***Y***) that affect adjustment speed, including the initial capital adequacy (measured relative to the its target capital), bond rating, inflation, GDP growth; year fixed effects; and a set of deregulation indices that remove barriers to bank competition within and across state lines (***COMP***) as before: *Intra*, *Inter*, *R&S Index*, *KNP Index*, and their components.

We estimate equation (5) in two steps. In the first step, we estimate equation (3) using system GMM and extract an estimate of target capital ratio using equation (1) and the predicted values from equation (3). The use of system GMM accounts for the bias in the adjustment speeds caused by the dynamic panel structure of the data and allows us to address potential endogeneity of the right-hand side variables by using their lags as instruments. This specification assumes that the adjustment speed λ is constant for all sample banks. In the second step, we relax the constant-speed-of-adjustment constraint. Using the results from the first step, we calculate each bank's deviation from its estimated target capital ratio, which we label $\boldsymbol{DEV}_{i,t-1} = \boldsymbol{k}^{*}_{i,t} - \boldsymbol{DNK}_{i,t-1}$, and substitute this estimated deviation in equation (5) to obtain:

$$\Delta \boldsymbol{k}_{i,t} = \left(\Lambda \boldsymbol{Z}_{i,t-1}\right)\left(\boldsymbol{DEV}_{i,t-1}\right) + \psi \boldsymbol{YEAR}_t + \tilde{\delta}_{i,t} \tag{6}$$

This second step involves a pooled OLS regression of the dependent variable (actively managed capital ratio change, $\Delta \boldsymbol{k}_{i,t} = \boldsymbol{k}_{i,t} - \boldsymbol{DNK}_{i,t-1}$,) on a set of variables defined as the product of $\boldsymbol{DEV}_{i,t-1}$ and the above-mentioned covariates affecting the adjustment speed, with bootstrapped standard errors to account for the generated regressor (Pagan, 1984 and Faulkender, Flannery, Hankins, and Smith, 2012).

The vector of estimated coefficients allows us to test various hypotheses on the determinants of the adjustment speed, and in particular, the effect of bank competition on the speed of adjustment.

4.4 Main Independent Variables (Competition)

To proxy for competition in the markets where banks operate, we follow Rice and Strahan (2010) and Krishnan, Nandy, and Puri (2014) and construct several indices of bank geographic deregulation. Our primary measure of interstate bank branching restrictions is the *R&S Index.* This is the weighted Rice-Strahan index of interstate banking deregulation at the bank-level, where the weights are based on the proportions of bank deposits in each state where the bank operates. We extend the R&S Index which originally stopped in 2005 to 2014 by going manually through the individual state statutes and updates from the 2010 Dodd Frank Act. As described in Rice and Strahan (2010), the Riegle-Neal Act allowed states from the time of enactment in 1994 until 1997 to employ a variety of means to erect out-of-state entry barriers to bar out-of-state banks to set up branches within their borders. Specifically, states could set regulations on interstate branching with regard to four provisions: (i) the minimum age of the target institution (*Minimum Age*); (ii) de novo interstate branching (*DeNovo Branching*); (iii) the acquisition of individual branches (*Acquisition*); and (iv) a statewide deposit cap that can be the same as or larger than the IBEEA default of 30% (*Deposit Cap*). The state-level *R&S Index* is the sum of the restrictions and ranges from zero (deregulated, most open toward interstate entry and competition) to four (highly regulated, most restrictive toward interstate entry and competition) based on the deregulation changes in a state. The index takes a value of four for all years before the state implements interstate bank branching deregulation.

An alternative measure of interstate bank branching restrictions is the *KNP Index*. This is the weighted Krishnan, Nandy and Puri (2014) index of interstate banking deregulation at the bank-level, based on Rice and Strahan (2010), plus an additional restriction for reciprocity between states. As Johnson and Rice (2008) and Krishnan, Nandy and Puri (2014) note, the previous four provisions in the *R&S Index* were offered by certain states with reciprocity, that is, they allowed a particular action by an out-of-state bank as long as the laws of the home state of that out-of-state bank were reciprocal, permitting the same level of interstate banking. This additional condition also increases the out-of-state banks that can expand within other states. The state-level *KNP index* is the sum of the restrictions and ranges from zero (deregulated, most open toward interstate entry and competition) to five (highly regulated, most restrictive toward interstate entry and competition) based on the regulation changes in a state. In additional analyses, we also decompose the *R&S Index* and *KNP Index* into their subcomponents to understand the mechanisms underlying our baseline findings.

Finally, the Riegle-Neal Act was preceded by early state-level deregulations of intra-state and inter-state banking expansions (e.g., Jayaratne and Strahan, 1996; Black and Strahan, 2002; Cetorelli and Strahan, 2006), but may be different in their effects from the interstate branching deregulation described above. Thus, early intrastate banking deregulation allowed banks to branch statewide by either acquiring existing branches or establishing new ones, while early interstate banking deregulation allowed bank holding companies to buy and operate banks chartered in other states. Both intrastate and interstate deregulation may reduce local barriers to entry to other in-state and out-of-state banking organizations and increase competition. However, intrastate deregulation may also have the effect of decreasing competition from other in-state banks if it results in M&As of banks with significant local market overlap or banks with greater market shares able to exercise their market power (e.g., Shepherd, 1982; Berger, 1995; Berger, Chen, El Ghoul, and Guedhami, 2017).

To account for these early deregulatory events which occurred early in our sample period, we add two additional deregulation indices. *Intra* and *Inter* are the weighted intrastate and interstate deregulation indices at the bank level, where the weights are based on the proportions of bank deposits in each state. The state-level *Intra* index is a binary variable equal to 1 in the years after the focal state implemented intrastate banking deregulation, as described in Jayaratne and Strahan (1996). The state-level *Inter* index is a binary variable for the years after the focal state implemented interstate banking deregulation, as described in Black and Strahan (2002).

4.5 Control Variables

We include a number of control variables as in Berger, DeYoung, Flannery, Lee, and Öztekin (2008) to test the effects of deregulation-induced competition on the change in bank capital ratios and their speed of adjustment (i.e., the elements of vector *X*).

First, we employ two proxies of BHC performance: *ROA* and *Cost Efficiency*, These variables reflect two potentially offsetting effects (e.g., Berger and di Patti, 2006). On the one hand, more profitable BHCs may choose lower equity ratios because higher profitability reduces expected costs of bankruptcy and financial distress. Alternatively, more profitable BHCs may choose higher capital ratios to protect the franchise value associated with high profitability. Second, we control for BHC risk (*StdvROA*). Riskier BHCs may hold larger stocks of buffer capital and/or have higher capital ratios to absorb potential losses.

Third, we use several proxies to capture differences in charter value and counterparty risk concerns: *Retail Deposits, Business Loans,* and *Off-Balance-Sheet.* A greater reliance on retail deposits should reduce pressure from counterparties to hold capital. At the same time, a greater endowment of (core) depositors

may increase the BHC's charter value, and induce it to hold more equity as protection. Corporate borrowers may prefer to deal with banks that put more capital at risk, increasing banks' incentives to monitor (e.g., Allen, Carletti, and Marquez, 2006). Additionally, business borrowers may prefer well-capitalized lenders because borrower-lender relationships are costly to replace if the lender fails. BHCs with large number of derivative contracts may hold more capital against such exposure to counterparty risk, but they may also carry less capital if these positions are used to hedge the risk of their other operations.

Fourth, we control for BHCs' growth opportunities in several ways. We control for bank *Market-to-Book* ratio, a typical proxy of perceived growth opportunities, reflecting managerial ability to use assets effectively and grow the firm. Banks with higher growth opportunities may target higher capital ratios to allow them to engage in future expansion opportunities when they arise. We also control for bank acquisition strategies based on their actual pattern of acquisitions in the near future, *Merger*. Banks with external growth strategies may need to hold extra capital for unpredictable acquisition opportunities. We also control for bank size, *Ln(Assets)*. Larger banking organizations are likely to hold relatively less capital due to greater diversification, scale economies in risk management, greater ability to raise equity on short notice, and/or a "too-big-to-fail" expectation for the largest institutions.

To estimate the effects of competition on bank capital adjustment speed, we use additional determinants. Distressed BHCs may raise capital more rapidly in response to extraordinary external pressures (Berger, DeYoung, Flannery, Lee, and Öztekin, 2008). We measure bond market pressure using S&P's bond ratings and create three binary variables: *BBB*, *Junk*, *Missing Rating*. Bond ratings of over BBB are the left-out category in the regressions. To account for the firm's initial position relative to the target, we include the variable *Undercapitalized*. We also control for annual inflation (*Inflation*) and annual GDP growth (*GDP Growth*), as macroeconomic conditions have been shown to affect the capital adjustment speed for corporate firms (e.g. Drobetz and Wanzenried, 2006; Cook and Tang, 2010).

4.6 Summary Statistics

Table 1 contains definitions and summary statistics of the variables used in this study. In terms of capital (Panels A and D), BHCs have a mean *Equity Ratio* of 0.089, *Leverage Ratio* of 0.0885, *Tier 1 Capital Ratio* of 0.1255, and *Total Capital Ratio* of 0.1420, indicating that the average BHC is well capitalized. In addition, they have a mean *Do-Nothing Capital* of 0.086, *Do-Nothing Leverage* of 0.0845, *Do-Nothing Tier 1 Capital* of 0.1226, and *Do-Nothing Total Capital* of 0.1379, in all cases do-nothing capital being below its corresponding capital ratio. This suggests that sample BHCs may have actively tried to raise their capital ratios beyond the ratios implied by passive retention of earned income.

Turning to our competition variables proxied by the geographic deregulation variables (Panel B), the average BHC in our sample has an intrastate deregulation index (*Intra*) of 0.9889, an interstate deregulation index (*Inter*) of 0.9939, an index of interstate branching deregulation (*R&S Index*) of 2.0863, an index of interstate branching deregulation (*KNP Index*) of 2.6892, a *Minimum Age* restriction of 0.6498, a *DeNovo Branching* restriction of 0.5444, an *Acquisition* restriction of 0.5236, a *Deposit Cap* restriction of 0.3686, and a *Reciprocity* restriction of 0.6029.

In terms of other BHC characteristics (Panel C), the average BHC has a level of *ROA* of 0.0088, a *StdvROA* of 0.0042, a *Cost Efficiency* of 0.6630, a *Market-to-Book* of 1.4814, number of acquisitions in the subsequent year (*Merger*) of 0.0484, *Ln(Assets)* of 14.4977, *Retail Deposits* ratio of 0.6115, *Business Loans* ratio of 0.2624, *Off-Balance-Sheet* ratio of 0.0343, *Income Diversity* of 0.2092, *Asset Diversity* of 0.6603, and bank concentration (*HHI*) of 0.1236. Only about 0.05% of the BHCs have a bond rating of BBB- or below (*Junk*), while 6.34% have a bond rating of BBB, and 82.43% have missing credit rating, while the remaining are banks with ratings above BBB (the omitted category).

Macroeconomic conditions (Panel D) in our sample show an average *Inflation* of 2.2019 and an average *GDP Growth* of 2.5823 at the national-level. At the state-level, the average population (*State Population*) is 15.8762, the average *Coincident Index* is 0.0219, the average *Freedom Index* is 6.7971, and the average *Effective Tax* rate is 0.0658. Finally, 37.33% of the observations in our sample are in *Crisis Years*, with 20.24% in a *Banking Crisis*, and 17.09% in a *Market Crisis*, while the remaining observations (62.67%) are in a normal time period (*Normal Times*).

5. Empirical Results for the Effects of Competition on Bank Target Capital

Identifying the causal effects of competition on bank target capital is challenging due to both potential omitted variables and reverse causality concerns. For instance, unobservable state characteristics related to both local competition and bank capital decisions could remain in the regression error terms. A reverse causality concern may also arise if banks in different states vary significantly in their capital targets, such differences affected the deregulation. Our identification strategy is to exploit the staggered deregulation of bank geographic deregulation laws in the U.S., which generate plausibly exogenous variation in states' competition environment. An advantage of this strategy is that there are multiple shocks that affect different states at different times. To further mitigate endogeneity concerns, we model bank capital ratios using a dynamic partial adjustment methodology with bank-specific and time-varying target ratios and heterogeneous adjustment to the target. The dynamic models treat right-hand side bank-level controls as endogenous and employ all valid lags of these variables as instruments in the regressions, while controlling

for a variety of bank capital determinants, as well as bank and year fixed effects.

5.1 Main Regression Results

Table 2 shows the main results for equation (3) and tests of Hypotheses H1a (**Higher Target Capital Ratio)** and H1b (**Lower Target Capital Ratio)**. The long-run effects of the deregulation indices on target capital can be inferred from the raw coefficient estimate on the deregulation index scaled by one minus the coefficient on *Do-Nothing Capital*. Columns 1 and 2 present results using *Intra* and respectively *Inter*, which takes the value one in a state that was deregulated. The coefficients on these terms are positive and statistically significant at the 1% level, suggesting that increased competition induced by early deregulation is associated with higher target capital ratios.[4] Columns 3 and 4 present results using *R&S Index* and *KNP Index*. The deregulation terms for these indices (shown in the shaded area) are negative and statistically significant at the 1% level, suggesting that higher competition –proxied by less strict bank branching restrictions – is also associated with higher bank target capital ratios.

These results are consistent with the statistical empirical dominance of Hypothesis H1a (**Higher Target Capital Ratio)** over Hypothesis H1b (**Lower Target Capital Ratio)**. They are also economically significant. Using *R&S Index*, banks in states that are most open to interstate branching choose a capital ratio that is 3.2% (0.0029/(1-0.6419)*4) higher (compared to the sample mean of 8.9%) than banks in states with the most restrictions.

Columns 5-9 decompose the *R&S Index* and *KNP Index* into their individual components of: *Minimum Age*, *DeNovo Branching*, *Acquisition*, *Deposit Cap*, and *Reciprocity*. All deregulation restriction coefficients are negative and statistically significant at the 1% level, suggesting that increased competition, induced by the removal of all of the individual bank branching restrictions, is associated with higher bank target capital ratios. When comparing the magnitudes, we see that the most important driver of our results is the deregulation of the minimum age requirement (usually 3 or 5 years) to buy a bank or branch in another state, leading to an increase in the target capital ratio by 4.5 percentage points. The deregulation of the other restrictions results in an increase in the target capital by 2.5-3.3 percentage points. [5]

5.2 Potential Channels

In Table 3, we interact the deregulation measures with the bank-level determinants of the capital ratio to

[4] In theory, not all deregulation is necessarily pro-competitive. As acknowledged earlier, intrastate deregulation could also decrease competition if it results in M&As of banks with sizeable local market overlap or banks with greater market shares.

[5] The findings for the bank-level controls are generally consistent with the existing literature (e.g., Berger, DeYoung, Flannery, Lee, and Öztekin, 2008), but we do not discuss them in detail for brevity.

shed light on potential channels behind the observed positive relationship between banks' target capital ratio and competition. For brevity, we focus on the late deregulation results, using the *R&S Index* and *KNP Index* in columns 3 and 4, respectively, but findings are generally consistent using *Intra* and *Inter* in columns 1 and 2, respectively. We focus on the interactions between the deregulation index (*DRI*) and bank characteristics to give us some clues about which of the channels of Hypothesis H1a (**Higher Target Capital Ratio)** help us explain the results.[6]

The interaction with *ROA* is negative and statistically significant, suggesting that banks exposed to more deregulation (i.e., a lower value for the *RS Index*) have much higher equity ratios consistent with the **Lower Cost of Capital Channel**, that is, banks that are more profitable can both access easier capital and get lower internal and external funding. This also provides some support for the **Higher Charter Value Channel**, since to the extent that current profitability predicts higher future profitability, these banks have higher charter values that banks protect with higher equity. These findings are reinforced by the effects of *Cost Efficiency* and the *StdvROA*, suggesting that deregulated banks that become more cost efficient and safer also hold more capital. We also consider interactions of *DRI* with other proxies for bank charter value: *Retail Deposits*, *Business Loans*, and *Off-Balance-Sheet*. Out of these quantities of services, only the interaction coefficient on *Business Loans* is negative and statistically significant, consistent again with the **Higher Charter Value Channel**.

The interaction terms of *DRI* with *Market-to-Book* and *Merger* are both negative and statistically significant and provide some support for both the **Expanded Growth Opportunities Channel** and the **Shareholder-Creditor Agency Problem Mitigation Channel** (driven by expanded growth opportunities). Overall, the channels analysis is consistent with all of the channels for H1a (**Higher Target Capital Ratio**), but it is difficult to differentiate precisely among the individual channels. Results are similar using the *KNP Index*.

5.3 Early and Late Deregulation

5.3.1 Including Early and Late Deregulation in the Same Regression

In Table 4 Panel A we present results using different combinations of early and late (pre- and post-Riegle-Neal) deregulation measures. When included together with the late deregulation measures, the effects of the early deregulations are either insignificant or marginally significant, while the late deregulation

[6] While we include the uninteracted *DRI* term, this does not help with the investigation of the channels because it gives the effect when all of the variables that are interacted have value 0, which are not realistic values in many cases. For example, we do not want to evaluate the effect with 0 retail deposits.

measures remain negative and both statistically (at the 1% level) and economically significant.

5.3.2 Pre-1995 and Post-1995 Subperiods

A likely reason why the effects of the early deregulations are much weaker or nonexistent when the late deregulation measures are included is that the early deregulation effects only last up to 1994 when Riegle-Neal was enacted, and were no longer effective after interstate branching went into effect. To investigate this further, we run regressions separately for the 1986-1994 and 1995-2014 sample periods in Table 4 Panels B1 (*Intra*, *Inter*, *R&S Index*, and *KNP Index*) and B2 (the individual late deregulation subcomponents). The results suggest that the *Intra* and *Inter* effects only hold for the 1986-1994 period, while results for the *R&S Index*, *KNP Index*, and their subcomponents hold only for the 1995-2014 period.

5.4 Effects over Time

Next, we would like to probe any differences over time in the relation between competition and bank target capital ratios. In particular, we would like to understand if any changes occur during and after the recent financial crisis when there is heightened market and regulatory pressure to keep capital ratios high. We thus examine the dynamics of the relation between bank branching deregulation and the target capital ratio by including a series of dummies to trace out the year-by-year effects of competition as proxied by the late deregulation measures. Specifically, we interact the *R&S Index* with a pre-1995 dummy and with dummies for each of the time periods thereafter. Figure 1 shows a plot of the interaction coefficients with their 95% confidence intervals for the target capital ratio. We find that the impact of competition on the target capital ratio is positive and statistically significant almost every year before the crisis. However, from 2008 until the end of the sample period, the effects are reversed. Similar patterns are observed for the *KNP Index* (see Internet Appendix, Figure A1). This reversal may be due to banks in deregulated states already having higher capital ratios, and being less influenced by regulatory and market pressures in the post-crisis period.

5.5. Competition and Target Capital of Banks - Robustness Checks

We provide a number of robustness tests for the effects of competition on bank target capital ratios. We focus here on the *R&S Index*, but show similar results in the Appendix A for the *KNP Index*.

5.5.1 Alternative Measures of Capital and Competition and Different Empirical Specifications

In Table 5, Panel A, we provide robustness checks using alternative measures of capital, competition, and different empirical specifications. Column 1, uses the *R&S Index* for the bank's headquarters state rather than being apportioned according to the location of its deposits in various states for multistate banks. In columns 2-4, we examine three alternative measures for bank capital: *Leverage Ratio*, *Tier 1 Capital Ratio*, and *Total Capital Ratio*, respectively, along with their corresponding *Do-Nothing Capital* measures. Our

results continue to hold and are statistically significant at the 1% level in all cases.

State-level shocks or other characteristics that may coincide with deregulation could drive our results. To address this potential causality issue, we treat deregulation as endogenous. In column 5, we add state fixed effects as instruments for deregulation. In column 6, we instrument deregulation with its own lags and several state-level conditions that may favor state deregulation: *State Population*, *Coincident Index, Freedom Index,* and *Effective Tax Rate*. In column 7, we instrument deregulation with its own lags, the state level characteristics from regression (6), and state fixed effects. To address the potential concern that bank capital decisions in a state may be related, in column 8, we aggregate bank-level financial data at the state-level and then estimate our regressions at the state level, while controlling for state fixed effects and using weighted system GMM. Specifically, to accommodate varying importance of the states in the sample, we use weights that are proportional to the number of banks in each state. Our results continue to hold in all of these analyses.

An additional concern is that bank entry and exit are affected by deregulation and also affect bank capital structure decisions. Columns 9 and 10 present regressions using surviving banks only and acquiring banks only, respectively, and our results continue to hold.

5.5.2 Sample Composition and Alternative Explanations

Table 5 Panel B presents tests of whether our findings are driven by potential biases in the sample or alternative explanations, again relying on the *R&S Index* (similar results hold for the *KNP Index*). In column 1, we restrict our analysis to banks that do not relocate their state headquarters during the sample period to rule out a concern of bank relocation based on deregulation. Column 2 drops South Dakota and Delaware, states with very liberal banking rules. Column 3 employs lagged *Equity Ratio* in place of *Do-Nothing Capital* as a control. Column 4 adds two additional controls for the banking environment, the *Fed Funds Rate* and *TED Spread*. In column 5, we introduce *Before (2, 1)*, a dummy equal to one in the two years prior to interstate branching deregulation in the state to capture the difference in the target capital between the two years prior to deregulation in the state of a bank and the period prior to these two years (Krishnan, Nandy, and Puri, 2014). This allows us to test whether our results reflect secular trends in bank capital structure[7]. For all of these checks, the effect of the *R&S Index* remains economically and statistically significant. More importantly, we find that the coefficient estimate on the *Before (2, 1)* dummy is not economically and statistically significant, alleviating concerns that our results are driven by reverse

[7] This also helps validate our identification strategy by testing the key assumption of parallel trends in difference-in-differences regressions (e.g., Roberts and Whited, 2012). In order for our results to be valid, we should find that the coefficient on the *Before (2,1)* variable is statistically not significantly different than 0.

causality or trends in the capital ratios.

5.5.3 Falsification Tests

To address concerns that omitted shocks that occurred at about the same time as the deregulation drive our results, we conduct several placebo tests and check whether our results disappear when we artificially assume that deregulation occurs one, two, three, four, or five years prior to or after it actually occurred (e.g., Roberts and Whited, 2012). Table 5 Panel C, columns 1-10 shows results for the *Pseudo R&S Index*. All the coefficients are statistically insignificant, suggesting that this concern did not drive our main results. Column 11 randomly assigns states to the *R&S Index* values 0-4 maintaining the original empirical distribution, and column 12 randomly assigns the states into each of the deregulation years with their corresponding index values. Similar findings hold for the *KNP Index* (Internet Appendix). We again find the insignificant coefficients for the pseudo indices, alleviating concerns about alternative unobservable shocks occurring at the same time as the deregulatory events, from our main results.

5.5.4 Cross-Sectional Evidence

In Table 5 Panel D, we re-estimate the model using the *R&S Index* subsamples of below and above median values of bank and market characteristics – bank size, *Market-to-Book* (*MTB*), *Income Diversity*, *Asset Diversity*, Herfindahl-Hirschman Index (*HHI*), state economic activity (*Coincident Index*). Across all subsamples, the coefficients on the *R&S Index* are negative and statistically significant, consistent with our main results that more competition increases target capital ratios, but there are some differences in magnitudes. Notably, large banks raise their capital more in response to competition than small banks, and banks in states with better economic conditions respond more as well.

6. Empirical Results for the Effects of Competition on Bank Capital Adjustment Speed

In this section, we test Hypotheses H2a (**Faster Adjustment Speed**) and H2b (**Slower Adjustment Speed**) about how banks' capital adjustment speeds are affected by increased competition from geographic deregulation.

6.1 Competition and Bank Capital Adjustment Speed – Main Regression Results

We analyze capital adjustment speeds using a pooled OLS regression of the form in equation (6), with bootstrapped standard errors to account for the generated regressor (Pagan, 1984). We also control for a variety of bank capital speed determinants, as well as year fixed effects. Table 6 Panel A shows the main regression estimation results.

Columns 1 and 2 present results using only *Intra* and *Inter* early deregulation, respectively. The

coefficient of *Intra* is positive and statistically significant at the 1% level, while the coefficient of *Inter* is not statistically significant. These results suggest that only early intrastate bank deregulation is associated with higher bank capital adjustment speeds. Columns 3 and 4 use our main measure *R&S Index*, and the alternative *KNP Index*, respectively. The coefficients of *R&S Index* and *KNP Index* (shown in the shaded area), are negative and statistically significant at the 1% level. After the Riegle-Neal deregulation, the speed of adjustment to the target for banks in the most open interstate branching regime (*R&S Index*=0) is 8.44% faster (-2.11x4) compared to banks in the most restricted regime (*R&S Index*=4). Consequently, an average bank in the most restricted interstate branching regime takes about 2.7 years to close half the gap between its actual and target capital, which goes down to 1.9 years for an average bank that switches to the most open interstate branching regime.[8] These results are consistent with the empirical dominance of Hypothesis H2a (**Faster Adjustment Speed**) over Hypothesis H2b (**Slower Adjustment Speed**), which predicts a higher bank capital adjustment speed from increased competition.

In columns 5-9, we decompose the *R&S Index* and *KNP Index* into their individual components: *Minimum Age*, *DeNovo Branching*, *Acquisition*, *Deposit Cap*, and *Reciprocity*. All deregulation restriction terms except *Reciprocity*, are negative and statistically significant at the 1% level, suggesting that increased competition from several interstate branching deregulations are associated with higher adjustment speeds. When comparing the magnitude of the coefficients, we see that the most important drivers of our results are deregulations of deposit cap, acquisitions, and *de novo* branching restrictions.

Columns 10 and 11 present results for the *R&S Index* and the *KNP Index*, controlling for early deregulation indices *Intra* and *Inter*. In column 12, we show the results using the components of the late deregulation indices (*Minimum Age*, *DeNovo Branching*, *Acquisition*, *Deposit Cap*, and *Reciprocity*) and early deregulation indices *Intra* and *Inter*. As observed earlier for the target capital ratios, when using early *Intra* and *Inter* deregulation along with the Riegle-Neal *R&S Index* or *KNP Index* or deregulation individual restrictions in the regression, the effects of the early *Inter* deregulation fade away, while the effects of early *Intra* are either marginally significant or no longer statistically significant. This is because early deregulation has been in effect only until 1994. However, *R&S Index* and *KNP Index* remain statistically significant at the 1% level, consistent with the empirical dominance of Hypothesis H2a (**Faster Adjustment Speed**) over Hypothesis H2b (**Slower Adjustment Speed**). The control variables are mostly insignificant.

[8] The 2.7 years is calculated as (LN(0.5)/LN(1 – 0.31-8), where 0.31 is the constant term in column 3 of Table 6, and 8% is the difference in the adjustment speed between the most open and most restricted regimes).

6.2 Effects over Time

In Figure 2, we plot the dynamics of the relation between bank branching deregulation and speed of adjustment to the target. The positive impact of the *R&S Index* on the adjustment speed was modest during the early years, 1994-1998, but strengthened in 1999-2003, as well as toward the end of the sample period, 2012-2014. Surprisingly, in 2011, the *R&S Index* has resulted in a significant decline in the banks' adjustment speed. Similar patterns are observed for the *KNP Index* (Internet Appendix, Figure A2). Finally, constraining the pre-1994 coefficients to zero does not alter the dynamic effects patterns (Internet Appendix, Figures A3 and A4).

6.3 Asymmetry Based on Capitalization (Below and Above Target)

Bank capital management may depend on whether the bank is below or above the target capital. Accordingly, in Table 6 Panel B, we allow for asymmetric response to the competition, based on the bank's position relative to its target. The banks with below-target capital adjust at a slightly slower pace. The positive impact of competition on the adjustment speed is less pronounced among the banks with below-target capital (1.86% vs 2.25% using the *R&S Index* and 1.70% vs. 3.17% using the *KNP Index*). However, our main conclusions continue to hold in both subsamples, with economic magnitude similar to our earlier results.

6.4 Robustness Tests

To dismiss the potential alternative explanation that our results on capital adjustment speeds may be driven by unobservable omitted variables or shocks that overlap with the state-level Riegle-Neal deregulatory events, we conduct two placebo tests (Internet Appendix, Table A3, Panel A).[9] In the first test, randomly assigns states to the *R&S Index* values 0-4 maintaining the original empirical distribution. In the second placebo test, randomly assigns the states into each of the deregulation years with their corresponding index values. We find that the coefficient estimates of the placebo deregulation indices are statistically insignificant and not different from zero in all cases. Similar to target capital tests, placebo test results confirm that reverse causality does not drive the capital adjustment speed results.

When applicable, we conduct the robustness tests undertaken for the target capital in Section 5.5 for the adjustment speeds. All of the results hold (Internet Appendix, Table A3, Panel B). Specifically, excluding South Dakota and Delaware from the sample; excluding crisis and post-crisis years; controlling

[9] Placebo tests undertaken for the target capital structure which artificially assume that Riegle-Neal state deregulation occurs one to five years prior to or after the actual deregulation year are not appropriate for the adjustment speed, since partial adjustment to target implies that deregulation effects are spread out across years, depending on the size of the costs and the benefits of adjustment.

for fed funds rate and TED spread for monetary policy effects; and ruling out timing and capital ratio trend explanations, leave our conclusions unchanged.

7. Empirical Results for the Effects of Competition on Bank Capital Adjustment Methods

In this section, we test Hypotheses H3a, H3b, and H3c, regarding the extent to which banks employ a more active capital management, asset management, or passive capital adjustment methods to adjust their capital ratios in response to deregulation-induced increase in competition. For this purpose, we focus on growth rates in bank equity, assets, and liabilities. Because we analyze a large number of variables, we conduct a simple set of univariate tests of differences before and after the Riegle Neal Act, which largely deregulated interstate branching.

7.1 Growth in Characteristics Before and After Riegle-Neal Act

Table 7 compares the growth in bank balance sheet components – equity (Panel A), assets (Panel B), and liabilities (Panel C) – pre-Riegle-Neal Act (column 1) and post-Riegle-Neal Act (column 2). The differences between the two periods and their significance are also presented (column 3).

Panel A focuses on changes in the numerator of the capital ratio, equity, and distinguishes between internal and external sources of this capital. Internal capital denotes changes in retained earnings, and external capital is the outcome of bank net issuances of shares, repurchases, and dividends. The results show that external capital increases significantly more after the Riegle-Neal Act (7.8408%-6.1444% =1.6964%), whereas internal capital increases by much lesser amounts and the difference in periods is not statistically significant. These findings are strongly consistent with the empirical dominance of Hypothesis H3a (**Active Capital Management**) over H3c (**Passive Capital Management**).

Panel B focuses on changes in the denominator of the capital ratio, *Total Assets*, and shows changes several components of these assets. We find that bank assets go up considerably more after the Riegle-Neal Act (7.5492%-6.0156%=1.5335%), and much of this is due to growth in loans and non-earnings assets, while other earning assets such as securities show a sharp decrease. The loan growth seems more likely to reflect banks' desires to exploit growth opportunities rather than managing their assets to change the denominators of their capital ratios. The decrease in growth of other earnings assets such as securities, however, could reflect asset management to avoid the capital ratio going down. This suggests that Hypothesis H3b (**Asset Management**) could also be relevant for our results.

Panel C shows that all the liability categories increase after the Riegle-Neal Act. Particularly, both core deposits (demand and savings) and other funding (interbank funding and large time deposits) growth

rates are substantially higher, suggesting that both play an important role in bank financing. These likely reflect increases in the sizes of the banks after the Riegle Neal-Act.

7.2 Growth in Characteristics for Banks with Above- and Below-Target Capital Before and After Riegle-Neal Act

Table 8 replicates Table 7, but splits the sample into banks with above- and below-target capital in the pre- and post-Riegle-Neal periods, i.e., banks with *Do-Nothing Capital* above- and below-target level at time *t-1*. That is, we show the annual growth of characteristics (over the subsequent year, from *t-1* to *t*) for banks attempting to adjust their capital ratios downward and upward respectively. Panels A, B, and C show data for growth in equity, assets, and liabilities, respectively, and columns 1-3 and 4-6 show the data for banks with above- and below-target capital, respectively.

First, we focus on the adjustments made by banks with above-target capital (columns 1-3), which should reduce their capital ratio to reach their target. Panel A shows that the growth rate of the capital ratio for above-target banks is significantly more negative in the post-Riegle-Neal period (-2.5333% -(-1.7566%)=-0.7767%), suggesting that banks make efforts to converge to their target. The growth in bank equity follows a similar pattern. However, perhaps surprisingly, both external and internal capital increase rather than decrease (although the difference between periods is only significant for external capital), suggesting that these banks do not seem to achieve leveraging by a reduction in their capital base. Thus, neither Hypothesis H3a (**Active Capital Management**) or H3c (**Passive Capital Management**) are applicable for these banks.

Next, Panel B shows that asset growth for banks with above-target capital increases significantly more after the Riegle-Neal Act (8.1297%-6.4293%=1.7005%), and the asset expansion is primarily attained by loans and other non-earning assets (hoarding cash). This suggests that these banks achieve leveraging via managing their assets and not a reduction in the capital base, so Hypothesis H3b (**Asset Management**) is likely the most relevant for them. Panel C further shows that the expansion in bank size for these banks after the Riegle-Neal Act is financed both by core deposits (demand and savings) and other funding.

Next, we investigate the adjustments made by banks with below-target capital that need to increase their capital ratio to move towards their target. Panel A shows that the growth rate of the capital ratio for banks with below-target capital is increased in the post-Riegle-Neal period (7.2714% -5.3245%=1.9470%), suggesting that banks actively adjust their capital to converge to their target. The growth in bank equity shows an even higher increase (7.6446%-5.5364%=2.1083%) and is statistically significant. Further, when distinguishing between external and internal equity, we find that external capital of these banks increases

significantly more after the Riegle-Neal Act (11.3143%-10.1938%=1.1205%), whereas internal capital decreases, consistent with the empirical dominance of Hypothesis H3a (**Active Capital Management**) over H3c (**Passive Capital Management**).

Next, Panel B shows that asset growth for banks with below-target capital increases significantly after the Riegle-Neal Act (6.9537%-5.6186%=1.3351%), and similarly to the banks with above-target capital, this is primarily attained via loans and non-earning assets (hoarding cash). Thus, most of the increase in the capital ratio by the banks with below-target capital is realized by recapitalizing rather than downsizing the bank, so Hypothesis H3b (**Asset Management**) is likely not relevant for them. Finally, Panel C shows that the patterns of liabilities for banks with below-target capital mimic the observed trends for banks with above-target capital, and confirm better ability of the banks with below-target capital to obtain financing after the Riegle-Neal Act to sustain their asset growth.

To summarize, banks with above- and below-target capital use very different capital strategies after the Riegle-Neal Act. On the one hand, banks with above-target capital achieve leveraging primarily through managing their assets (**Asset Management**), without any major contraction in the equity base after Riegle-Neal Act. On the other hand, banks with below-target capital delever primarily via raising more external capital after Riegle-Neal Act (**Active Capital Management)**. Finally, these results also suggest that the **Passive Capital Management** is generally more important in the pre-Riegle-Neal period and less important in the post-Riegle-Neal period, whereas the **Active Capital Management** and **Asset Management** methods are most important for the post-Riegle-Neal period.

8. Conclusions

This paper contributes to our understanding of how increased competition induced by banking geographic deregulation influences banks' capital decisions. We examine, for the first time, the impact of changes in competition resulting from several deregulation events (early intrastate and interstate banking deregulation and late Riegle-Neal Act interstate bank branching deregulation) on both bank target capital ratios and the adjustment speeds towards those targets. Our empirical strategy is to exploit the staggered deregulation of state-level banking laws to identify exogenous variations in bank competition.

We use a partial adjustment methodology in which bank target capital ratios are modelled as functions of competition, and use OLS with bootstrapped standard errors to evaluate the speed at which banks converge to their target capital ratios. We find robust evidence that intensified bank competition induced by deregulation causes significant increases in bank target capital ratios consistent with the empirical dominance of Hypothesis H1a (**Higher Target Capital Ratio**) over Hypothesis H1b (**Lower**

Target Capital Ratio). Furthermore, a channel analysis for the documented effects suggests that all of the channels for H1a (**Higher Target Capital Ratio**) find some empirical support, but it is difficult to differentiate precisely among the individual ones. In addition, we also find that increased competition leads to faster adjustments towards the banks' target capital ratios, consistent with the empirical dominance of Hypothesis H2a (**Faster Adjustment Speed**) over Hypothesis H2b (**Slower Adjustment Speed**). We conduct a variety of robustness tests and find that our results hold when using alternative competition and capital proxies, different empirical specifications, subsamples, and falsification tests.

We also examine the methods that banks use to adjust their capital ratios to changes in competition by comparing changes in equity and asset growth pre- and post-Riegle Neal – the most significant deregulation event. Particularly, we study whether banks use a more active capital management, asset management, or passive capital adjustment methods after deregulation to adjust their capital ratios. We find that banks adjust their capital ratio more using active capital market operations which increase the numerator of the capital ratios, rather than passively through changes in retained earnings, consistent with the empirical dominance of Hypothesis H3a (**Active Capital Management**) over H3c (**Passive Capital Management**). Additionally, bank assets increase substantially more after the Riegle-Neal Act, denoting banks' desires to exploit growth opportunities rather than manage assets, nevertheless other earnings assets (such as securities) decrease, which may reflect some asset management to avoid the capital ratio to decline, consistent with Hypothesis H3b (**Asset Management**).

Finally, we analyze capital strategies employed by banks with above- and below-target capital after deregulation and observe very different results. Banks with above-target capital lever up mainly via managing their assets without any major contractions in the equity base after deregulation, consistent with Hypothesis H3b (**Asset Management)**. Banks with below-target capital delever mainly by raising external capital after deregulation, consistent with Hypothesis H3a (**Active Capital Management**). Our results also suggest that the **Passive Capital Management** is generally more important before Riegle-Neal Act, whereas the **Active Capital Management** and **Asset Management** methods are most important after the Riegle-Neal Act. This latter finding emphasizes a notable regime change related to the Riegle-Neal Act.

Overall, our findings shed light on the consequences of deregulation and competition and the determinants of bank capital structure. We add to the literatures on U.S. bank geographic deregulation, bank competition, bank capital structure. We also add more broadly to the literature on firm capital structure by focusing on an important industry that is generally excluded from the finance investigations of capital structure. Focusing on one important industry – banking – with different competitive conditions across markets and over time allows us to eliminate confounding differences across industries which cannot be

adequately controlled for in a multi-industry setting. Finally, we also extend the literature on regulation and financial stability, by focusing on geographic regulation rather than prudential regulation. We find that deregulation leads to higher target capital ratios and swifter adjustment to these targets, likely increasing financial stability. These findings have policy implications by showing that more competition enhances stability, consistent with the *competition-stability* view. Remarkably, the argument here is quite different from most literature supporting the *competition-stability* view, as effects documented here operate through higher capital ratios, rather than lower loan risk.

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Figure 1. Dynamic Effects of Competition (proxied by *R&S Index*) on the Target Capital
This figure plots the coefficients for the dynamic effects of the *R&S Index* on the target capital. The year dummies in Equation (3) are replaced by the interaction terms of the *R&S Index* and year dummies and the coefficients on the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience.

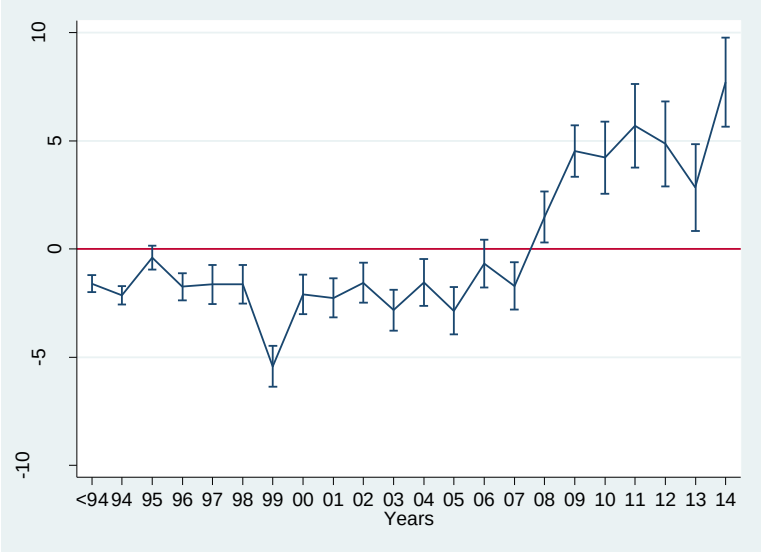

Figure 2. Dynamic Effects of Competition (proxied by *R&S Index*) on the Capital Adjustment Speed
This figure plots the coefficients for the dynamic effects of the *R&S Index* on the capital adjustment speed. The year dummies in Equation (6) are replaced by the interaction terms of the *R&S Index* and year dummies and the coefficients on the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience.

Table 1. Variable Definitions and Summary Statistics

This table provides definitions and summary statistics for all variables used in our analysis for the period 1986-2014. All variables using dollar amounts are expressed in real 2014 dollars using the implicit GDP price deflator. We report means, medians, standard deviations, min, and max on all the regression variables used to examine the relationship between competition and bank capital structure.

Variables	Definition	Mean	Median	Stdv	Min	Max
Panel A. Capital Variables						
Equity Ratio	Ratio of equity capital to total (unweighted) assets.	0.0885	0.0862	0.0219	0.0491	0.1390
Do-Nothing Capital	(Lagged equity capital + Net income - Lagged dividends)/Total assets.	0.0855	0.0833	0.0229	0.0459	0.1383
Panel B. Deregulation Variables						
Intra	The weighted intrastate deregulation index at the bank level, where the weights are based on the proportions of bank deposits in each state. The state-level *Intra* index is a binary variable equal to 1 in the years after the focal state implemented intrastate deregulation (Jayaratne and Strahan, 1996).	0.9889	1.0000	0.0998	0.0000	1.0000
Inter	The weighted interstate deregulation index at the bank level, where the weights are based on the proportions of bank deposits in each state. The state-level *Inter* index is a binary variable equal to 1 in the years after the focal state implemented interstate deregulation (Black and Strahan, 2002).	0.9939	1.0000	0.0768	0.0000	1.0000
R&S Index	Bank competition proxied by the weighted Rice-Strahan index of interstate bank branching deregulation at the bank level, where the weights are based on the proportions of bank deposits in each state. The state-level *R&S index* is based on Rice and Strahan (2010) and subsequent updates from individual state statutes, and ranges from zero (deregulated) to four (highly regulated) based on the regulation changes in a state.	2.0863	2.0000	1.5875	0.0000	4.0000
KNP index	Bank competition proxied by the weighted Krishnan, Nandy and Puri (2014) index of interstate bank branching deregulation at the bank level, , where the weights are based on the proportions of bank deposits in each state. The state-level *KNP index* is based on Rice and Strahan (2010), plus the additional restriction for reciprocity between states, and subsequent updates from individual state statutes, and ranges from zero (deregulated) to five (highly regulated) based on the regulation changes in a state.	2.6892	2.3147	1.6347	0.0000	5.0000
Minimum Age	The weighted *Minimum Age* restriction at the bank-level, where the weights are based on the proportions of bank deposits in each state. The state-level restriction is an indicator equal to one before the year that the minimum age restriction for acquisition was removed or state implements deregulation of this restriction.	0.6498	1.0000	0.4560	0.0000	1.0000
DeNovo Branching	The weighted *DeNovo Branching* restriction at the bank-level, where the weights are based on the proportions of bank deposits in each state. The state-level restriction is an indicator equal to one before the year that de novo interstate branching restriction was removed or state implements deregulation of this restriction.	0.5444	0.9261	0.4812	0.0000	1.0000
Acquisition	The weighted *Acquisition* restriction at the bank-level, where the weights are based on the proportions of bank deposits in each state. The state-level restriction is an indicator equal to one before the year that interstate branching by acquisition restriction was removed or state implements deregulation of this restriction.	0.5236	0.7571	0.4777	0.0000	1.0000
Deposit Cap	The weighted *Deposit Cap* restriction at the bank-level, where the weights are based on the proportions of bank deposits in each state. The state-level restriction is an indicator equal to one before the year that statewide deposit cap on branch acquisitions restriction was removed or state implements deregulation of this restriction.	0.3686	0.0000	0.4653	0.0000	1.0000
Reciprocity	The weighted *Reciprocity* restriction at the bank-level, where the weights are based on the proportions of bank deposits in each state. The state-level restriction is an indicator equal to one before the year that reciprocity restriction was removed or state implements deregulation of this restriction	0.6029	0.9996	0.4590	0.0000	1.0000

Variables	Definition	Mean	Median	St Dev	Min	Max
Panel C. Control Variables						
ROA	Return on assets (net income/total assets).	0.0088	0.0095	0.0050	-0.0025	0.0179
StdvROA	Standard deviation of ROA over the past 12 quarters.	0.0042	0.0022	0.0048	0.0007	0.0178
Cost Efficiency	Noninterest expense/ (Net interest income + Noninterest income).	0.6630	0.6547	0.1051	0.4768	0.8891
Retail Deposits	Non-business transaction deposits + small certificates of deposits)/Total liabilities.	0.6115	0.6196	0.1154	0.3972	0.8033
Business Loans	(C&I loans + commercial real estate loans + construction and land development loans)/ Total loans.	0.2624	0.2432	0.1242	0.0793	0.5212
Off-Balance-Sheet	Total gross Notional amount of all derivative contracts/Total assets.	0.0343	0.0000	0.0593	0.0000	0.1773
Market-to-Book	Market value of equity divided by the book value of equity.	1.4814	1.3832	0.6775	0.4326	2.9420
Merger	Number of acquisitions in the following year.	0.0484	0.0000	0.2625	0.0000	8.0000
Ln(Assets)	Natural logarithm of total assets.	14.4977	14.2782	1.2693	12.2808	16.6102
Income Diversity	1-| (Net interest income-Total Noninterest income)/Total Operating Income|. (Laeven and Levine, 2007).	0.2092	0.2330	0.1961	-0.1939	0.5022
Asset Diversity	1-|(Net loans-Other earning assets)/Total Earning Assets|. (Goetz, Laeven, and Levine, 2016).	0.6603	0.6622	0.1755	0.3343	0.9636
HHI	A measure of bank concentration, measured by the Herfindahl-Hirschman Deposits Index (HHI) determined using the bank deposit data from the FDIC Summary of Deposits. Higher values show greater market concentration.	0.1236	0.1121	0.0647	0.0133	0.7712
Junk	Dummy variable equal to one if bond rating is lower than BBB-.	0.0005	0.0000	0.0231	0.0000	1.0000
BBB	Dummy variable equal to one if bond rating is BBB.	0.0634	0.0000	0.2438	0.0000	1.0000
Missing Rating	Dummy variable equal to one if bond rating is missing.	0.8243	1.0000	0.3806	0.0000	1.0000
Inflation	Annual inflation, GDP deflator.	2.2019	2.0857	0.7538	0.7594	3.8880
GDP Growth	Annual GDP growth.	2.5823	2.7190	1.6448	-2.7755	4.6852
Panel D. Variables Used in Robustness Tests						
Leverage Ratio	Ratio of Tier 1 capital to total (unweighted) assets.	0.0888	0.0868	0.0193	0.0555	0.1376
Do-Nothing Leverage	(Lagged leverage ratio + Net income - Lagged dividends)/Total assets.	0.0845	0.0823	0.0204	0.0509	0.1352
Tier 1 Capital Ratio	Ratio of Tier 1 capital to risk-weighted assets.	0.1255	0.1193	0.0343	0.0756	0.2333
Do-Nothing Tier 1 Capital	(Lagged Tier 1 capital ratio + Net income - Lagged dividends)/Total risk-weighted assets.	0.1226	0.1164	0.0364	0.0704	0.2322
Total Capital Ratio	Ratio of (Tier 1 + Tier 2) capital to risk-weighted assets.	0.1420	0.1349	0.0328	0.0950	0.2501
Do-Nothing Total Capital	(Lagged Total capital ratio + Net income - Lagged dividends)/Total risk-weighted assets.	0.1379	0.1312	0.0363	0.0858	0.2496
State Population	The natural logarithm of the State Population.	15.8762	15.9179	0.8714	13.1597	17.474
Coincident Index	The change in the state-level Philadelphia Federal Reserve Bank's Coincident Index. This index combines four economic indicators – nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements deflated by the consumer price index – into a single statistic.	0.0219	0.0283	0.0301	-0.1212	0.1181
Freedom Index	The Fraser Institute state-level index of economic freedom.	6.7971	6.8000	0.7494	3.9000	8.7000
Effective Tax Rate	The state-level effective income tax rate a bank has to pay as in Berger and Bouwman (2013).	0.0658	0.0700	0.0335	0.0000	0.1230
Crisis Years	Dummy variable equal to one for years 1987, 1990-1992, 1998, 2000-2002, 2007-2009.	0.3733	0.0000	0.4837	0.0000	1.0000
Banking Crisis	Dummy variable equal to one for years 1990-1992, 2007-2009.	0.2024	0.0000	0.4018	0.0000	1.0000
Market Crisis	Dummy variable equal to one for years 1987, 1998, 2000-2002.	0.1709	0.0000	0.3764	0.0000	1.0000
Normal Times	Dummy variable equal to one for years 1995, 1996, 2004, 2005.	0.1671	0.0000	0.3731	0.0000	1.0000

Data Sources: Bank Holding Company Y-9C reports, FDIC Summary of Deposits, Bureau of Economic Analysis, Jayaratne and Strahan (1996), Black and Strahan (2002), Rice and Strahan (2010), Krishnan, Nandy, and Puri (2014), Individual State Statutes, U.S. Census Bureau, Federal Reserve Bank of Philadelphia, and Fraser Institute.

Table 2. Competition and Target Capital: Main Results

This table reports the regression estimates for analyzing the effects of competition on bank target capital. We estimate a partial adjustment model (Equation (3)) where the dependent variable is bank *Equity Ratio*, calculated as the ratio of bank equity capital to total (unweighted) assets. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent									
Intra	0.0158***								
	(0.000)								
Inter		0.0270***							
		(0.000)							
R&S Index			**-0.0029*****						
			(0.000)						
KNP Index				**-0.0024*****					
				(0.000)					
Minimum Age					-0.0166***				
					(0.000)				
DeNovo Branching						-0.0103***			
						(0.000)			
Acquisition							-0.0116***		
							(0.000)		
Deposit Cap								-0.0081***	
								(0.000)	
Reciprocity									-0.0081***
									(0.000)
Do-Nothing Capital	0.7549***	0.7615***	0.6419***	0.6506***	0.6309***	0.6414***	0.6466***	0.6752***	0.7207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	-0.2389***	-0.2538***	0.0594**	0.0519*	0.0215	0.0437	0.0350	0.0120	-0.1020***
	(0.000)	(0.000)	(0.031)	(0.063)	(0.486)	(0.125)	(0.203)	(0.671)	(0.001)
StdvROA	-0.0688**	-0.0535*	-0.1298***	-0.1296***	-0.1076***	-0.1336***	-0.1129***	-0.1448***	-0.1033***
	(0.010)	(0.065)	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.002)
Cost Efficiency	-0.0167***	-0.0180***	-0.0098***	-0.0087***	-0.0125***	-0.0111***	-0.0114***	-0.0090***	-0.0104***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Retail Deposits	0.0029	0.0045**	0.0298***	0.0274***	0.0314***	0.0269***	0.0296***	0.0260***	0.0127***
	(0.116)	(0.011)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Business Loans	-0.0030*	-0.0035**	0.0074***	0.0066***	0.0062***	0.0130***	0.0062***	0.0020	0.0015
	(0.071)	(0.029)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.260)	(0.394)
Off-Balance-Sheet	0.0175***	0.0230***	0.0058	0.0070*	0.0041	0.0088**	0.0060	0.0088**	0.0183***
	(0.000)	(0.000)	(0.165)	(0.093)	(0.376)	(0.029)	(0.166)	(0.032)	(0.000)
Market-to-Book	-0.0016***	-0.0016***	-0.0034***	-0.0037***	-0.0029***	-0.0021***	-0.0036***	-0.0040***	-0.0035***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Merger	0.0097***	0.0097***	0.0083***	0.0084***	0.0078***	0.0085***	0.0084***	0.0089***	0.0093***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Assets)	-0.0019***	-0.0026***	-0.0003	-0.0003	-0.0004	-0.0013***	-0.0005	-0.0001	-0.0015***
	(0.000)	(0.000)	(0.324)	(0.378)	(0.212)	(0.000)	(0.113)	(0.794)	(0.000)
Constant	0.0497***	0.0475***	0.0349***	0.0350***	0.0432***	0.0481***	0.0394***	0.0298***	0.0567***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072

Table 3. Competition and Target Capital: Potential Channels

This table reports the regression estimates for analyzing the effects of competition on bank target capital with additional interactions for potential channels. We estimate a partial adjustment model (Equation (3)) where the dependent variable is bank *Equity Ratio*, calculated as the ratio of bank equity capital to total (unweighted) assets. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Column	(1)	(2)	(3)	(4)
Dependent Variable	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Deregulation Index (DRI)	*Intra*	*Inter*	*R&S Index*	*KNP index*
DRI x ROA	-0.0191	-2.8052***	**-0.1786*****	-0.1993***
	(0.769)	(0.000)	**(0.001)**	(0.000)
DRI x StdvROA	-0.8082***	-2.7385***	**0.0816***	0.0413
	(0.000)	(0.000)	**(0.059)**	(0.321)
DRI x Cost Efficiency	-0.0441***	-0.1582***	**-0.0051****	-0.0053**
	(0.000)	(0.000)	**(0.044)**	(0.025)
DRI x Retail Deposits	0.0607***	0.0997***	-0.0012	-0.0009
	(0.000)	(0.000)	(0.638)	(0.693)
DRI x Business Loans	0.0165***	0.0064**	**-0.0114*****	-0.0117***
	(0.000)	(0.029)	**(0.000)**	(0.000)
DRI x Off-Balance-Sheet	-0.0033	0.1339***	0.0036	0.0049
	(0.655)	(0.000)	(0.469)	(0.282)
DRI x Market-to-Book	-0.0064***	-0.0125***	**-0.0031*****	-0.0031***
	(0.000)	(0.000)	**(0.000)**	(0.000)
DRI x Merger	0.0010	0.0098***	**-0.0032*****	-0.0028***
	(0.438)	(0.000)	**(0.000)**	(0.000)
DRI x Ln(Assets)	0.0038***	0.0072***	-0.0003	-0.0002
	(0.000)	(0.000)	(0.265)	(0.452)
DRI	-0.0395***	-0.0005	0.0178***	0.0148***
	(0.000)	(0.981)	(0.003)	(0.006)
Do-Nothing Capital	0.7492***	0.7595***	0.6567***	0.6625***
	(0.000)	(0.000)	(0.000)	(0.000)
ROA	-0.2237***	2.4951***	0.6372***	0.8208***
	(0.000)	(0.000)	(0.000)	(0.000)
StdvROA	0.8116***	2.6944***	-0.3243***	-0.2865***
	(0.000)	(0.000)	(0.000)	(0.005)
Cost Efficiency	0.0255***	0.1381***	0.0024	0.0066
	(0.000)	(0.000)	(0.645)	(0.271)
Retail Deposits	-0.0576***	-0.0958***	0.0075	0.0076
	(0.000)	(0.000)	(0.160)	(0.196)
Business Loans	-0.0167***	-0.0074**	0.0451***	0.0540***
	(0.000)	(0.014)	(0.000)	(0.000)
Off-Balance-Sheet	0.0232***	-0.1057***	0.0127	0.0056
	(0.001)	(0.000)	(0.271)	(0.676)
Market-to-Book	0.0047***	0.0109***	0.0063***	0.0078***
	(0.000)	(0.000)	(0.000)	(0.000)
Merger	0.0085***	0.0000	0.0140***	0.0147***
	(0.000)	(.)	(0.000)	(0.000)
Ln(Assets)	-0.0064***	-0.0103***	-0.0028***	-0.0030***
	(0.000)	(0.000)	(0.001)	(0.001)
Constant	0.1150***	0.0842***	0.0343**	0.0362**
	(0.000)	(0.000)	(0.015)	(0.019)
Bank Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	9,072	9,072	9,072	9,072

Table 4. Competition and Target Capital: Early and Late Deregulation

This table reports the regression estimates for analyzing the effects of competition on bank target capital for several different time periods. Panel A reports results for the pre-1995 and post-1995 sub-periods. Panel A1 presents results for the *Intra*, *Inter*, *R&S Index*, and *KNP Index* for the pre-1995 and post-1995 sub-periods. Panel A2 presents results for components of the *R&S Index* and *KNP Index* for the pre-1995 and post-1995 sub-periods. Panel B reports the regression estimates for analyzing the effects of competition on bank target capital structure with additional interactions with financial crises. Crisis years are: 1987, 1990, 1991, 1992, 1998, 2000, 2001, 2002, 2007, 2008, 2009. Banking crisis years are: 1990, 1991, 1992, 2007, 2008, 2009. Market crisis year are: 1987, 1998, 2000, 2001, 2002. No crisis years are all other years. For all panels, we estimate a partial adjustment model (Equation (3)) where the dependent variable is bank *Equity Ratio*, calculated as the ratio of bank equity capital to total (unweighted) assets. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A. Including Early and Late Deregulation in the Same Regression

Column	(1)	(2)	(3)
Dependent Variable	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent Variables			
Intra	0.0130**	0.0118*	-0.0195
	(0.027)	(0.055)	(0.405)
Inter	-0.0025	0.0127	0.0198
	(0.851)	(0.367)	(0.683)
R&S Index	**-0.0027*****		
	(0.000)		
KNP Index		**-0.0021*****	
		(0.000)	
Minimum Age			-0.0111**
			(0.033)
DeNovo Branching			-0.0047
			(0.240)
Acquisition			0.0022
			(0.679)
Deposit Cap			0.0073
			(0.232)
Reciprocity			-0.0080**
			(0.037)
Do-Nothing Capital	YES	YES	YES
Other Bank Controls	YES	YES	YES
Bank Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES
Observations	9,072	9,072	9,072

Panel B. Results for Pre-1995 and Post-1995 Sub-Periods

Panel B1. Indices for Pre-1995 and Post-1995 Sub-periods: Intra, Inter, R&S Index, KNP index

Column	(1)		(2)		(3)		(4)	
Dependent Variable	*Equity Ratio*		*Equity Ratio*		*Equity Ratio*		*Equity Ratio*	
Independent Variables								
Deregulation Index (DRI)	*Intra*		*Inter*		*R&S Index*		*KNP index*	
Time Period	1986-1994	1995-2014	1986-1994	1995-2014	1986-1994	1995-2014	1986-1994	1995-2014
DRI	**0.0156*****	**0.0036**	**0.0252*****	**0.0084**	**0.0010**	**-0.0028*****	**0.0004**	**-0.0021*****
	(0.001)	**(0.540)**	**(0.000)**	**(0.632)**	**(0.641)**	**(0.000)**	**(0.818)**	**(0.000)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,985	7,087	1,985	7,087	1,985	7,087	1,985	7,087

Panel B2. Indices for Pre-1995 and Post-1995 Sub-periods: Individual Indices Components

Column	(1)		(2)		(3)		(4)		(5)	
Dependent Variable	*Equity Ratio*		*Equity Ratio*		*Equity Ratio*		*Equity Ratio*		*Equity Ratio*	
Independent Variables										
Deregulation Index (DRI)	*Minimum Age*		*DeNovo Branching*		*Acquisition*		*Deposit Cap*		*Reciprocity*	
Time Period	1986-1994	1995-2014	1986-1994	1995-2014	1986-1994	1995-2014	1986-1994	1995-2014	1986-1994	1995-2014
DRI	**0.0088**	**-0.0149*****	**0.0088**	**-0.0098*****	**-0.0046**	**-0.0102*****	**0.0087**	**-0.0061*****	**0.0087**	**-0.0044*****
	(0.360)	**(0.000)**	**(0.360)**	**(0.000)**	**(0.542)**	**(0.000)**	**(0.367)**	**(0.000)**	**(0.367)**	**(0.000)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,985	7,087	1,985	7,087	1,985	7,087	1,985	7,087	1,985	7,087

Table 5. Competition and Target Capital: Robustness Tests

This table reports robustness tests for the effects of competition on bank target capital. Competition is proxied by the *R&S Index* (the results are very similar with the *KNP Index* and are reported in Appendix A).

Panel A reports tests related to alternative deregulation and capital measures, model specifications, and subsample results. Column 1 uses the unweighted *R&S Index*. Column 2-4 present regression estimates using alternative capital measures: *Leverage Ratio* and *Do-Nothing Leverage* in column 2, *Tier 1 Capital Ratio* and *Do-Nothing Tier 1 Capital* in column 3, *Total Capital Ratio* and *Do-Nothing Total Capital* in column 4. Columns 5-7 treat deregulation as endogenous. Column 5 presents regression estimates using *Equity Ratio,* controlling for *Do-Nothing Capital* (as in our main specification) with the addition of state fixed effects as instruments for deregulation. Column 6 instruments deregulation with its own lags and state level controls. Column 7 instruments deregulation with its own lags, state level controls, and state fixed effects. Column 8 shows weighted regression estimates using bank-level data aggregated at state-level, state fixed effects, with weights that are proportional to the number of banks in each state. Column 9 presents regression estimates using the surviving banks only. Column 10 presents regression estimates using the acquiring banks only.

Panel B reports additional robustness tests related to the sample composition and alternative explanations. Column 1 restricts the sample to banks that do not relocate their headquarters anytime during the sample period. Column 2 excludes banks headquartered in South Dakota and Delaware since these states had changes in their laws that encouraged the entry of credit card banks shortly before removing branching restrictions. Column 3 presents results using *Equity Ratio,* the equity to total assets as a dependent variable and the lagged equity to total assets as the control variable. Column 4 employs the fed funds rate and the TED spread as additional controls in our main specification to take into account the effects of the banking environment. Column 5 employs an additional control for the deregulation index in the main specification to control for parallel trends. *Before (2,1)* is a dummy variable that equals one if the year is within two years prior to the interstate bank branching deregulation in the state of the bank (Krishnan, Nandy, and Puri, 2014). This variable captures the difference in the capital target for banks between the two years prior to deregulation in a state of a bank and the years prior to two years before the deregulation.

Panel C reports the regression estimates for analyzing the effects of competition on bank target capital structure using several placebo tests. The following placebo tests are included: Columns 1-5 present regression estimates when the deregulation is falsified to 1,2,3,4, or 5 years before the actual state deregulation year; Columns 6-10 present regression estimates when deregulation is falsified to 1,2,3,4, or 5 years after the actual state deregulation year; Column 11 presents regression estimates when we randomly assign states into the R&S Index values 0-4, maintaining the original distribution; Column 12 presents regression estimates when we randomly assign states into deregulation dates with their corresponding index values.

Panel D reports the regression estimates for analyzing the effects of competition on bank target capital structure using cross-sectional evidence. The following tests are included: Columns 1-2 present results for small and large banks. Columns 3-4 present results for banks for low and high *Market-to-Book* (MTB). Columns 5-6 present results for banks for low and high *Income Diversity*. Columns 7-8 present results for banks for low and high *Asset Diversity.* Columns 9-10 present results for banks for low and high *HHI.* Columns 11-12 present results for banks operating in local markets with low and high *Coincident Index.*

For all panels, we estimate a partial adjustment model (Equation (3)) where the dependent variable is bank *Equity Ratio,* calculated as the ratio of bank equity capital to total (unweighted) assets, unless it is specified otherwise in the column description above. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A. Robustness Tests: Alternative Measures of Deregulation and Capital, State-Level Fixed Effects and Instruments, Survivorship Bias

Robustness Test:	Alternative Deregulation Measure: Bank HDQ R&S Index	Alternative Capital Measures: Leverage Ratio, Tier 1 Capital Ratio, Total Capital Ratio			State Fixed Effects	Using Instruments: State Controls	Using Instruments: State Controls and State Fixed Effects	State-Level Aggregation and Instruments: State Controls	Surviving Banks Only	Acquiring Banks Only
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable	*Equity Ratio*	*Leverage*	*Tier 1 Capital*	*Total Capital*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent Variables										
R&S Index	**-0.0030*** (0.000)**	**-0.0023*** (0.000)**	**-0.0007*** (0.001)**	**-0.0014*** (0.000)**	**-0.0029*** (0.000)**	**-0.0005*** (0.009)**	**-0.0007*** (0.001)**	**-0.0012*** (0.000)**	**-0.0032*** (0.000)**	**-0.0024*** (0.000)**
State Population						-0.0006***	0.0337***	-0.0000		
						(0.003)	(0.002)	(0.923)		
Coincident Index						0.0093*	0.0023	-0.0077***		
						(0.060)	(0.652)	(0.003)		
Freedom Index						-0.0004	0.0003	0.0001		
						(0.202)	(0.599)	(0.612)		
Effective Tax Rate						-0.0077**	-0.0120**	-0.0134		
						(0.086)	(0.032)	(0.588)		
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
State Fixed Effects	NO	NO	NO	NO	YES	NO	YES	YES	NO	NO
Observations	9,363	7,903	7,861	7,847	9,072	8,991	8,991	1,065	2,169	3,759

Panel B. Robustness Tests: Sample Composition and Alternative Explanations

Robustness Test:	Exclude Banks with HDQ Relocations	Exclude South Dakota and Delaware	Replace *Do-Nothing Capital* with Lagged Equity Ratio	Add Banking Environment Controls	Add Control for Parallel Trends *Before (2, 1)*
Column	(1)	(2)	(3)	(4)	(5)
Dependent Variable	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent Variables					
R&S Index	**-0.0029*** (0.000)**	**-0.0029*** (0.000)**	**-0.0031*** (0.000)**	**-0.0019*** (0.000)**	**-0.0014** (0.020)**
Fed Fund Rate				-0.0011***	
				(0.000)	
TED Spread				0.0047***	
				(0.000)	
Before (2,1)					-0.0009
					(0.766)
Do-Nothing Capital	YES	YES	NO	YES	YES
Lagged Equity Ratio	NO	NO	YES	NO	NO
Other Bank Controls	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	NO	YES
Year Fixed Effects	YES	YES	YES	YES	YES
State Fixed Effects	NO	NO	NO	YES	NO
Observations	8,757	9,071	9,118	6,052	9,072

Panel C. Placebo Tests

Robustness Test:	Placebo Tests: R&S Deregulation Falsified to:											
Placebo Test	1 Yr. Before Actual Deregulation	2 Yrs. Before Actual Deregulation	3 Yrs. Before Actual Deregulation	4 Yrs. Before Actual Deregulation	5 Yrs. Before Actual Deregulation	1 Yr. After Actual Deregulation	2 Yrs. After Actual Deregulation	3 Yrs. After Actual Deregulation	4 Yrs. Before Actual Deregulation	5 Yrs. Before Actual	Random State Assignment Into R&S	Random State Assignment Into Dereg. Dates
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent Variables												
Pseudo R&S Index	**-0.0002**	**-0.0003**	**-0.0005**	**-0.0004**	**-0.0005**	**0.0001**	**-0.0003**	**-0.0005**	**-0.0003**	**-0.0070**	**-0.0058**	**-0.0008**
	(0.568)	**(0.391)**	**(0.195)**	**(0.220)**	**(0.197)**	**(0.857)**	**(0.490)**	**(0.285)**	**(0.421)**	**(0.108)**	**(0.219)**	**(0.609)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072

Panel D. Cross-Sectional Evidence

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*	*Equity Capital*
Independent Variables												
Criteria	Size		Market-to-Book (MTB)		Income Diversity		Asset Diversity		HHI		State Coincident Index	
Subsample	Small	Large	Low MTB	High MTB	Low Income Diversity	High Income Diversity	Low Asset Diversity	High Asset Diversity	Low HHI	High HHI	Low Coincident	High Coincident
R&S Index	**-0.0007*****	**-0.0027*****	**-0.0032*****	**-0.0039*****	**-0.0021*****	**-0.0036*****	**-0.0032*****	**-0.0024*****	**-0.0024*****	**-0.0033*****	**-0.0024*****	**-0.0056*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,505	7,567	4,527	4,545	4,255	4,817	5,037	4,035	3,492	5,559	4,370	4,621

Table 6. Competition and Capital Adjustment Speed Results

This table reports the regression estimates for analyzing the effects of competition on capital adjustment speed. In the first stage, we estimate equation (3) using system GMM and extract an estimate of target capital ratio using equation (1) and the predicted values from equation (3). In the second stage, we substitute the estimated deviation from the target capital ratio into the partial adjustment equation (5) to produce estimates of the determinants of bank adjustment speeds. This second step involves a pooled ordinary least squares (OLS) regression of the dependent variable (actively managed capital ratio change as measured by the difference between *Equity Ratio* and *Do-Nothing Capital*) on a set of variables defined as the product of estimated deviation and the covariates affecting the adjustment speed, as in Equation (6). Panel A reports the main capital adjustment speed regression estimates. Panel B reports the regression estimates for analyzing the effects of competition on capital adjustment speed using asymmetry based on bank capitalization: below target in columns 1 and 3 and above target in columns 2 and 4, using *R&S Index* and *KNP index*, respectively. The capitalization dummy is excluded from the estimation. For both panels, the dependent variable is the actively managed capital ratio change (difference between *Equity Ratio* and *Do-Nothing Capital*). The key explanatory variables are the interactions of the estimated deviation with the *R&S Index* and *KNP index*. Bank characteristics are: *Junk* is a dummy variable equal to one if bond rating is lower than BBB-; *BBB* is a dummy variable equal to one if bond rating is than BBB. *Missing Rating* is a dummy variable equal to one if bond rating is missing; *Inflation* is the annual inflation; *GDP Growth* is the annual GDP growth. All models include Year Fixed Effects. The details of definitions and measurements of all variables are reported in Table 1. Standard errors are bootstrapped to account for the generated regressor (Pagan, 1984; Faulkender, Flannery, Hankins, and Smith, 2012). Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A. Capital Adjustment Speed: Main Regression Estimates

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	Δk	Δk	Δk	Δk	Δk	Δk	Δk	Δk	Δk	Δk	Δk	Δk
Independent Variables												
Constant	0.1462*	0.2355**	0.3125***	0.3204***	0.2898***	0.2971***	0.3105***	0.2833***	0.2753***	0.2368**	0.2806**	0.2971**
	(0.080)	(0.039)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.040)	(0.025)	(0.021)
Intra	0.1442***									0.1006*	0.0883*	0.0853
	(0.028)									(0.089)	(0.074)	(0.167)
Inter		0.0550								-0.0152	-0.0294	-0.0506
		(0.607)								(0.886)	(0.817)	(0.684)
R&S Index			**-0.0211*****							**-0.0235*****		
			(0.000)							**(0.000)**		
KNP Index				**-0.0241*****							**-0.0287*****	
				(0.000)							**(0.000)**	
Minimum Age					-0.0246*							-0.0245
					(0.089)							(0.442)
DeNovo Branching						-0.0496***						-0.0263
						(0.005)						(0.349)
Acquisition							-0.0545***					-0.0270
							(0.001)					(0.441)
Deposit Cap								-0.0815***				-0.0417*
								(0.000)				(0.080)
Reciprocity									0.0048			-0.0361
									(0.822)			(0.135)
Undercapitalized	-0.0199	-0.0203	-0.0203	-0.0208	-0.0223	-0.0181	-0.0224	-0.0192	-0.0179	-0.0208	-0.0209	-0.0210
	(0.226)	(0.191)	(0.198)	(0.131)	(0.117)	(0.282)	(0.102)	(0.251)	(0.291)	(0.195)	(0.174)	(0.138)
Junk	0.1673	0.2068	0.0813	0.0268	-0.0989	0.1087	0.2103	0.2205	0.1960	0.1029	0.0775	-0.0273
	(0.560)	(0.462)	(0.793)	(0.916)	(0.621)	(0.661)	(0.414)	(0.525)	(0.483)	(0.751)	(0.808)	(0.915)
BBB	0.0452	0.0447	0.0354	0.0214	0.0312	0.0391	0.0340	0.0438	0.0408	0.0329	0.0269	0.0293
	(0.273)	(0.254)	(0.443)	(0.637)	(0.395)	(0.354)	(0.377)	(0.193)	(0.232)	(0.370)	(0.547)	(0.466)
Missing Rating	0.0117	0.0120	0.0067	0.0030	0.0130	0.0108	0.0106	0.0119	0.0110	-0.0005	-0.0040	0.0001
	(0.648)	(0.661)	(0.805)	(0.913)	(0.595)	(0.712)	(0.658)	(0.671)	(0.707)	(0.987)	(0.902)	(0.998)

Inflation	0.0197	0.0193	0.0278**	0.0291**	0.0178	0.0228*	0.0215	0.0292***	0.0210*	0.0295**	0.0349**	0.0387**
	(0.123)	(0.140)	(0.021)	(0.037)	(0.126)	(0.060)	(0.152)	(0.010)	(0.084)	(0.034)	(0.014)	(0.018)
GDP Growth	0.0045	0.0037	0.0067	0.0038	0.0013	0.0056	0.0046	0.0046	0.0030	0.0077	0.0078**	0.0086
	(0.382)	(0.574)	(0.221)	(0.392)	(0.780)	(0.258)	(0.343)	(0.313)	(0.589)	(0.142)	(0.047)	(0.119)
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9.072	9.072	9.072	9.072	9.072	9.072	9.072	9.072	9.072	9.072	9.072	9.072
R-squared	0.475	0.475	0.473	0.466	0.450	0.474	0.476	0.476	0.473	0.479	0.480	0.480

Panel B. Capital Adjustment Speed: Asymmetry Based on Capitalization

Column	(1)	(2)	(3)	(4)
Dependent Variable	Δk	Δk	Δk	Δk
Independent Variables				
Subsample	Below Target Capital	Above Target Capital	Below Target capital	Above Target Capital
Constant	0.2790***	0.2896***	0.2858***	0.2992***
	(0.000)	(0.000)	(0.000)	(0.000)
R&S Index	**-0.0186*** **	**-0.0225*** **		
	(0.000)	**(0.000)**		
KNP Index			**-0.0170*** **	**-0.0317*** **
			(0.000)	**(0.000)**
Bank Controls	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	5,817	3,255	5,791	3,281
R-squared	0.521	0.331	0.513	0.324

Table 7. Growth in Bank Characteristics Before and After Riegle-Neal Act

This table presents the average growth rates of various bank-level variables before and after bank Riegle-Neal Act: (1) variables directly related to capital ratio and (changes in) equity in panel A, (2) the asset composition variables in panel B, (3) funding structure variables in panel C. Columns 1 and 2 report averages during the pre-deregulation and post-deregulation years, respectively. Column 3 reports the mean difference between post- and pre-deregulation years and the associated *p*-values of the pairwise *t*-tests of equality of means (with unequal variances) of the pre-deregulation years compared with the post-deregulation years, respectively. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

Column	(1)	(2)	(3)
	All Banks **Pre**-Riegle-Neal Act (N Obs.)	**All Banks** **Post**-Riegle-Neal Act (N Obs.)	**Difference** (2)-(1) (*p*-value)
Panel A. Equity			
%ΔExternal Equity	6.1444	7.8408	1.6964***
	(2,682)	(,7057)	(0.0003)
%ΔExternal Equity to Total Equity	-0.9063	0.283876	1.1901***
	(2,682)	7057	(0.0022)
%ΔInternal Equity	9.2700	9.6118	0.3418
	(2,677)	(7,043)	(0.5779)
%ΔInternal Equity to Total Equity	1.1186	1.2161	0.0975
	(2,677)	(7,043)	(0.8666)
%ΔEquity	3.7090	3.9737	0.2647
	(2,850)	(7,312)	(0.2447)
%ΔEquity to Total Assets	3.6173	3.8325	0.2152
	(2,850)	(7,312)	(0.3054)
Panel B. Assets			
%ΔTotal Assets	6.0156	7.5492	1.5335***
	(2,682)	(7,057)	(0.0000)
%ΔLoans	6.2308	7.8928	1.6620***
	(2,682)	(7,057)	(0.0000)
%ΔLoans to Total Assets	0.2525	0.2884	0.0360
	(2,682)	(7,057)	(0.8081)
%ΔOther Earning Assets	33.0995	9.8353	-23.2642***
	(652)	(7,048)	(0.0000)
%ΔOther Earning Assets to Total Assets	22.2989	1.8211	-20.4778***
	(652)	(7,048)	(0.0000)
%ΔNon-Earning Assets	-0.7956	4.9451	5.7407***
	(2,682)	(7,057)	(0.0000)
%ΔNon-Earning Assets to Total Assets	-6.4983	-2.7985	3.6997***
	(2,682)	(7,057)	(0.0000)
%ΔFixed Assets	5.4144	5.6197	0.2052
	(2,682)	(7,056)	(0.5215)
%ΔFixed Assets to Total Assets	-3.3242	-4.0120	-0.6878***
	(2,682)	(7,056)	(0.0072)
Panel C. Liabilities			
%ΔLiabilities	-2.8109	-1.9437	0.8672***
	(2,682)	(7,057)	(0.0000)
%ΔDemand and Savings Deposits	5.7705	7.4817	1.7113***
	(2,682)	(7,048)	(0.0000)
%ΔDemand and Savings Deposits to Total Liabilities	8.5376	9.3860	0.8485***
	(2,682)	(7,048)	(0.0005)
%ΔOther Funding	6.7748	9.0203	2.2455***
	(2,682)	(7,057)	(0.0000)
%ΔOther Funding to Total Liabilities	9.5099	10.9319	1.4221***
	(2,682)	(7,057)	(0.0072)

Table 8. Growth in Bank Characteristics for Banks with Above- and Below-Target Capital Before and After Riegle-Neal Act

This table presents the average growth rates of various bank-level variables: (1) variables directly related to the capital ratio and changes in equity in panel A, (2) asset composition variables in panel B, and (3) funding structure variables in panel C. Columns 1–2 and 4–5 report average yearly growth rates of (unscaled) bank-level variables for negative (above-target) and positive (below-target) deviation (banks are allocated to above- and below-target groups based on the sign of the deviation of the *Do-Nothing Capital* from its optimal level at time *t-1* and growth is measured over next year, from *t-1* to *t*), respectively. We also report number of observations per group (in parentheses), as not all variables are available for each bank. Columns 3 and 6 contain *p*-values of the pairwise *t*-tests of equality of means (with unequal variances) of pre-deregulation compared with post-deregulation years for banks above- and below- target, respectively. *, **, *** indicate significance at the 90%, 95%, and 99% confidence levels, respectively.

Group	**Banks with Above-Target Capital Ratio**			**Banks with Below-Target Capital Ratio**		
Column	(1)	(2)	(3)	(4)	(5)	(6)
	Above-Target **Pre**-Riegle-Neal Act (N Obs.)	**Above-Target** **Post**-Riegle-Neal Act (N Obs.)	**Difference** (2)-(1) (*p*-value)	**Below-Target** **Pre**-Riegle-Neal Act (N Obs.)	**Below-Target** **Post**-Riegle-Neal Act (N Obs.)	**Difference** (5)-(4) (*p*-value)
Panel A. Equity						
%ΔExternal Equity	0.8522	3.2933	2.4411**	10.1938	11.3143	1.1205*
	(1,094)	(2,969)	(0.0002)	(1,322)	(3,953)	(0.0960)
%ΔExternal Equity to Total Equity	-1.4063	-0.3719	1.0345*	-0.7924	0.9090	1.7014
	1,094	2,969	0.0953	1,322	3,953	0.0013
%ΔInternal Equity	8.0289	8.5198	0.4909	10.4920	10.2386	-0.2534
	(1,094)	(2,961)	(0.6098)	(1,319)	(3,947)	(0.7596)
%ΔInternal Equity to Total Equity	4.6825	6.0412	1.3587	0.3089	-1.7931	-2.1020***
	(705)	(2,612)	(0.1313)	(1,683)	(4,273)	(0.0070)
%ΔEquity	-1.9559	-2.8009	-0.8450***	5.5364	7.6446	2.1083***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔEquity to Total Assets	-1.7566	-2.5333	-0.7767***	5.3245	7.2714	1.9470***
	(1,094)	(2,969)	(0.0001)	(1,322)	(3,953)	(0.0000)
Panel B. Assets						
%ΔTotal Assets	6.4293	8.1297	1.7005***	5.6186	6.9537	1.3351***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔLoans	6.0976	8.4969	2.3993***	5.6833	7.2553	1.5719***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔLoans to Total Assets	-0.0955	0.3596	0.4551*	-0.0826	0.2024	0.2849
	(1,094)	(2,969)	(0.0549)	(1,322)	(3,953)	(0.1589)
%ΔOther Earning Assets	37.2481	10.1927	-27.0554***	31.1449	9.4720	-21.6728***
	(184)	(2,965)	(0.0000)	(458)	(3,948)	(0.0000)
%ΔOther Earning Assets to Total Assets	23.6135	1.6933	-21.9202***	21.7195	1.9867	-19.7329***
	(184)	(2,965)	(0.0000)	(458)	(3,948)	(0.0000)
%ΔNon-Earning Assets	-1.3794	5.1225	6.5020***	-0.0259	4.7343	4.7602***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔNon-Earning Assets to Total Assets	-7.5435	-3.2807	4.2628***	-5.2824	-2.3602	2.9222***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔFixed Assets	5.4370	5.9644	0.5274	4.8954	5.1826	0.2872
	(1,094)	(2,969)	(0.2913)	(1,322)	(3,953)	(0.5157)
%ΔFixed Assets to Total Assets	-3.6850	-4.1043	-0.4193	-3.4827	-3.9346	-0.4519
	(1,094)	(2,969)	(0.3088)	(1,322)	(3,953)	(0.1916)
Panel C. Liabilities						
%ΔLiabilities	-2.5895	-1.4527	1.1368***	-3.0365	-2.3331	0.7035***
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0000)
%ΔDemand and Savings Deposits	6.3608	7.6621	1.3013***	5.5863	7.2379	1.6516***
	(1,094)	(2,966)	(0.0010)	(1,322)	(3,948)	(0.0000)
%ΔDemand and Savings Deposits to	8.9304	9.0543	0.1239	8.5577	9.5455	0.9878***
	(1,094)	(2,966)	(0.7486)	(1,322)	(3,948)	(0.0029)
%ΔOther Funding	8.4723	12.7141	4.2418	4.1861	5.8846	1.6986**
	(1,094)	(2,969)	(0.0000)	(1,322)	(3,953)	(0.0192)
%ΔOther Funding to Liabilities	11.0163	14.0849	3.0686***	7.1207	8.2166	1.0959
	(1,094)	(2,969)	(0.0003)	(1,322)	(3,953)	(0.1258)

Internet Appendix for "How Does Competition Affect Bank Capital Structure? Evidence from a Natural Experiment" – Supplemental Tests

Figure A1. Dynamic Effects of Competition (proxied by *KNP Index*) on the Target Capital
This figure plots the coefficients for the dynamic effects of the *KNP Index* on the target capital structure. The year dummies in Equation (3) are replaced by the interaction terms of the *KNP Index* and year dummies and the coefficients on the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience.

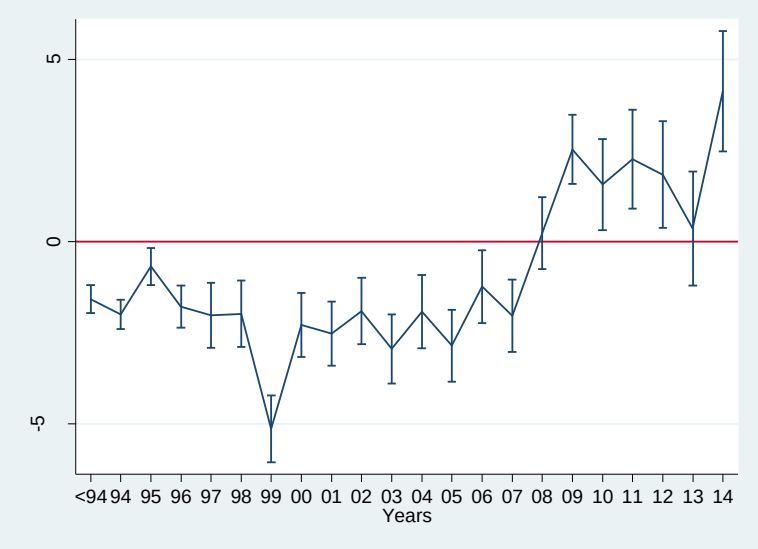

Figure A2. Dynamic Effects of Competition (proxied by *KNP Index*) on the Capital Adjustment Speed
This figure plots the coefficients for the dynamic effects of the *KNP Index* on the capital adjustment speed. The year dummies in Equation (6) are replaced by the interaction terms of the *KNP Index* and year dummies and the coefficients on the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience.

Figure A3. Dynamic Effects of Competition (proxied by *R&S Index*) on the Capital Adjustment Speed (Constrained Regression) This figure plots the coefficients for the dynamic effects of the *R&S Index* on the capital adjustment speed. The year dummies in Equation (6) are replaced by the interaction terms of the *R&S Index* and year dummies and the coefficients in the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience. Pre-94 coefficients are constrained to zero.

Figure A4. Dynamic Effects of Competition (proxied by *KNP Index*) on the Capital Adjustment Speed (Constrained Regression) This figure plots the coefficients for the dynamic effects of the *KNP Index* on the capital adjustment speed. The year dummies in Equation (6) are replaced by the interaction terms of the *KNP Index* and year dummies and the coefficients on the interaction terms are plotted along with their 95% confidence intervals (represented by the solid straight lines). Coefficient estimates are multiplied by 10 and displayed in percent format for convenience. Pre-94 coefficients are constrained to zero.

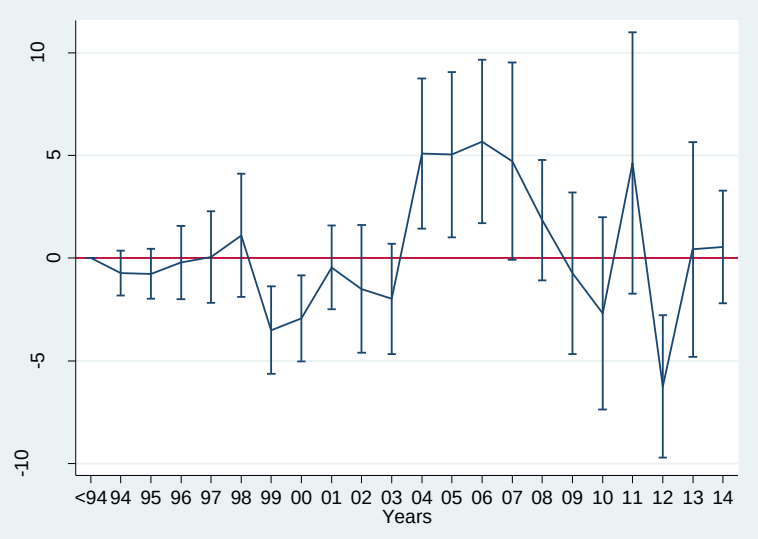

Table A1. Competition and Target Capital: Robustness Tests using the *KNP Index*

This table reports robustness tests for the relation between bank deregulation and bank target capital when we proxy competition by the *KNP Index*. Panel A reports estimations when using alternative measures of deregulation and capital, state-level fixed effects and instruments, and considering survivorship considerations. Column 1 uses the unweighted *KNP Index*. Column 2-4 present regression estimates using alternative capital measures: *Leverage Ratio* and *Do-Nothing Leverage* in column 2, *Tier 1 Capital Ratio* and *Do-Nothing Tier 1 Capital* in column 3, *Total Capital Ratio* and *Do-Nothing Total Capital* in column 4. Columns 5-7 treat deregulation as endogenous. Column 5 presents regression estimates using *Equity Ratio*, controlling for *Do-Nothing Capital* (as in our main specification) with the addition of state fixed effects as instruments for deregulation. Column 6 instruments deregulation with its own lags and state level controls. Column 7 instruments deregulation with its own lags, state level controls, and state fixed effects. Column 8 shows weighted regression estimates using bank-level data aggregated at state-level, state fixed effects, with weights that are proportional to the number of banks in each state. Column 9 presents regression estimates using the surviving banks only. Column 10 presents regression estimates using the acquiring banks only. Panel B presents the placebo tests for the *KNP Index*. Columns 1-5 present regression estimates when the deregulation is falsified to 1,2,3,4, or 5 years before the actual state deregulation year; Columns 6-10 present regression estimates when deregulation is falsified to 1,2,3,4, or 5 years after the actual state deregulation year; Column 11 presents regression estimates when we randomly assign states into the *KNP Index* values 0-4, maintaining the original distribution; Column 1-2 presents regression estimates when we randomly assign states into dates with their corresponding deregulation index values. Panel C provides cross-sectional evidence using the *KNP Index*. Columns 1-2 present results for small and large banks. Columns 3-4 present results for banks for low and high *Market-to-Book* (MTB). Columns 5-6 present results for banks for low and high *Income Diversity*. Columns 7-8 present results for banks for low and high *Asset Diversity.* Columns 9-10 present results for banks for low and high *HHI.* Columns 11-12 present results for banks operating in local markets with low and high *Coincident Index.* In all panels, we estimate a partial adjustment model (Equation (3)) where the dependent variable is bank *Equity Ratio*, calculated as the ratio of bank equity capital to total (unweighted) assets, unless it is specified otherwise in the column description above. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A. Robustness Tests: Alternative Measures of Deregulation and Capital, State-Level Fixed Effects and Instruments, Survivorship Bias

Robustness Test:	Alternative Deregulation Measure: Bank HDQ KNP Index	Alternative Capital Measures: Leverage Ratio, Tier 1 Capital Ratio, Total Capital Ratio			Using Instruments: State Fixed Effects	Using Instruments: State Controls	Using Instruments: State Controls and State Fixed Effects	State-Level Aggregation and Instruments: State Controls	Surviving Banks Only	Acquiring Banks Only
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable	*Equity Ratio*	*Leverage Ratio*	*Tier 1 Capital*	*Total Capital*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*	*Equity Ratio*
Independent Variables										
KNP Index	**-0.0024*****	**-0.0018*****	**-0.0005*****	**-0.0014*****	**-0.0024*****	**-0.0006*****	**-0.0007*****	**-0.0011*****	**-0.0027*****	**-0.0019*****
	(0.000)	**(0.000)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.003)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**
State Population						-0.0006***	0.0336***	0.0001		
						(0.003)	(0.002)	(0.743)		
Coincident Index						0.0090*	0.0022	-0.0070***		
						(0.069)	(0.667)	(0.008)		
Freedom Index						-0.0002	0.0004	0.0003		
						(0.413)	(0.471)	(0.272)		
Effective Tax Rate						-0.0081*	-0.0120**	-0.0095		
						(0.064)	(0.031)	(0.683)		
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
State Fixed Effects	NO	NO	NO	NO	YES	NO	YES	YES	NO	NO
Observations	9,363	7,903	7,861	7,847	9,072	8,991	8,991	1,065	2,169	3,759

Panel B. Placebo Tests

Robustness Test	Placebo Tests: KNP Deregulation Falsified to:											
Placebo Test	1 Yr. Before Actual Deregulation	2 Yrs. Before Actual Deregulation	3 Yrs. Before Actual Deregulation	4 Yrs. Before Actual Deregulation	5 Yrs. Before Actual Deregulation	1 Yr. After Actual Deregulation	2 Yrs. After Actual Deregulation	3 Yrs. After Actual Deregulation	4 Yrs. Before Actual Deregulation	5 Yrs. Before Actual	Random State Assignment Into R&S	Random State Assignment Into Dereg. Dates
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pseudo KNP Index	**-0.0014**	**-0.0003**	**-0.0008**	**-0.0010**	**-0.0007**	**-0.0013**	**0.0010**	**0.0007**	**0.0010**	**-0.0004**	**-0.0001**	**0.0000**
	(0.275)	**(0.835)**	**(0.590)**	**(0.502)**	**(0.722)**	**(0.249)**	**(0.395)**	**(0.543)**	**(0.426)**	**(0.745)**	**(0.800)**	**(0.996)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072	9,072

Panel C. Cross-Sectional Evidence

Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Subsample	Small	Large	Low MTB	High MTB	Low Income Diversity	High Income Diversity	Low Asset Diversity	High Asset Diversity	Low HHI	High HHI	Low Coincidence	High Coincidence
KNP Index	**-0.0005*****	**-0.0021*****	**-0.0027*****	**-0.0030*****	**-0.0017*****	**-0.0028*****	**-0.0027*****	**-0.0021*****	**-0.0018*****	**-0.0028*****	**-0.0020*****	**-0.0051*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Do-Nothing Capital	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Other Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,505	7,567	4,527	4,545	4,255	4,817	5,037	4,035	3,492	5,559	4,370	4,621

Table A2. Competition and Adjustment Speeds: Robustness Tests

This table reports the regression estimates for analyzing the effects of competition on bank capital adjustment speed using several robustness tests. Panel A reports results from the placebo tests. Columns 1 and 3 present regression estimates when we randomly assign states into deregulation dates, maintaining the original distribution, for the R&S index and KNP index respectively; Columns 2 and 4 present regression estimates when we randomly assign states into deregulation dates with their corresponding deregulation index values, for the R&S index and KNP index respectively. Panel B reports additional robustness tests for the *R&P Index* only (the unreported results are very similar with the *KNP Index*). Column 1 excludes banks headquartered in South Dakota and Delaware. Column 2 drops bank-year observations post-2006. Column 3 employs the fed funds rate and the TED spread as additional controls in our main specification to take into account the effects of the banking environment. Column 4 employs an additional control for the deregulation index in the main specification to control for parallel trends. Before (2,1) is a dummy variable that equals one if the year is within two years prior to the interstate bank branching deregulation in the state of the bank (Krishnan, Nandy, and Puri, 2014). This variable captures the difference in the capital target for banks between the two years prior to deregulation in a state of a bank and the years prior to two years before the deregulation. For both panels, in the first stage, we estimate equation (3) using system GMM and extract an estimate of target capital ratio using equation (1) and the predicted values from equation (3). In the second stage, we substitute the estimated deviation from the target capital ratio into the partial adjustment equation (5) to produce estimates of the determinants of bank adjustment speeds. This second step involves a pooled ordinary least squares (OLS) regression of the dependent variable on a set of variables defined as the product of estimated deviation and the covariates affecting the adjustment speed, as in Equation (6). The dependent variable is the actively managed capital ratio change (difference between *Equity Ratio* and *Do-Nothing Capital*). The key explanatory variables are the interactions of the estimated deviation with the deregulation index. Bank characteristics include *Undercapitalized*, a binary variable equal to 1 if the bank capital ratio lies below its target level, and 0 otherwise; *Junk*, a dummy variable equal to one if bond rating is lower than BBB-; *BBB*, a dummy variable equal to one if bond rating is than BBB; *Missing Rating*, a dummy variable equal to one if bond rating is missing; *Inflation*, the annual inflation; *GDP Growth*, the annual GDP growth. All models include Year Fixed Effects. The details of definitions and measurements of all variables are reported in Table 1. The *p*-values are reported beneath the coefficient estimates. Standard errors are bootstrapped to account for the generated regressor (Pagan, 1984; Faulkender, Flannery, Hankins, and Smith, 2012). Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A. Placebo Tests

Column	(1)	(2)	(3)	(4)
Dependent Variable	Δk	Δk	Δk	Δk
Independent Variables				
Constant	0.2146***	0.1912***	0.2085***	0.2154***
	(0.000)	(0.000)	(0.000)	(0.000)
Pseudo R&S Index	**-0.0002**	**-0.0069**		
	(0.962)	**(0.187)**		
Pseudo KNP Index			**0.0019**	**-0.0004**
			(0.597)	**(0.940)**
Bank Controls	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Observations	9,072	9,072	9,072	9,072
R-squared	0.275	0.254	0.275	0.275

Panel B. Additional Robustness Tests

Column	(1)	(2)	(3)	(4)
	Exclude South Dakota and Delaware	Exclude Post-2006 Bank-Year Observations	Add Banking Environment Controls	Add Control For Parallel Trends
Dependent Variable	Δk	Δk	Δk	Δk
Independent Variables				
Constant	0.3063***	0.3291***	0.3699***	0.3124***
	(0.000)	(0.000)	(0.000)	(0.000)
R&S Index	**-0.0209*****	**-0.0260*****	**-0.0132****	**-0.0223*****
	(0.001)	**(0.000)**	**(0.029)**	**(0.000)**
Fed Fund Rate			-0.0085*	
			(0.066)	
TED Spread			0.0765***	
			(0.001)	
Before (2,1)				0.0221
				(0.257)
Bank Controls	YES	YES	YES	YES
Year Fixed Effects	YES	YES	NO	YES
Observations	9,030	6,563	6,052	9,072
R-squared	0.476	0.535	0.480	0.474