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Abstract

We construct a novel signal of bank expectations utilizing confidential data and a regulatory constraint imposed on bank internal capital markets during the 2008 crisis that made internal equity injections to commercial bank subsidiaries difficult to reverse. When the US government initiated a $176 billion recapitalization program during the crisis, this constraint made it *costly* ex-ante for multi-bank holding companies (MBHC) to use these funds for the purpose of recapitalizing subsidiaries against future anticipated losses; in contrast, lending the funds to subsidiaries was exempt from the constraint and thus carried an *option value* for future reallocations across sibling subsidiaries. Several findings emerge. First, we show that MBHCs treated internal equity injections as a scarce resource when emergency funds arrived, whereas single-bank holding companies did not because the constraint was not costly for them. Second, we find that excess internal equity injections by MBHCs form a signal of their expectations for post-crisis subsidiary outlook—i.e., future profitability, supervisory ratings, and credit originations. Third, the geographical aggregation of these individual bank signals predicts the long-run real effects of the 2008 crisis on small businesses across US states—i.e., post-crisis growth in small business revenues, employment, establishments, payroll, and wages. Our study provides a more direct test of "banks as efficient information producers" (e.g., Diamond (1984), Fama (1985)), and is the first to show that credible signals of this bank knowledge can be extracted from the internal capital markets, allowing regulators to forecast *in real time* a geographical rank-order for post-crisis real outcomes at small firms. This new policy tool can be seen as a potential side benefit of government-sponsored bank recapitalization programs, of which there have been 33 in the past 40 years worldwide.

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1. Introduction

The literature on macrofinance has found that some financial indicators can serve as predictive signals for future economic activity—e.g., King and Levine (1993), Adrian et al. (2019), Gilchrist and Zakrajšek (2012), Schularick and Taylor (2012). Our paper complements this literature by deriving a novel empirical signal with three unique features. First, while studies have traditionally focused on predicting recessions along the country-level *time-series* dimension, our signal forecasts the long-term, real transmission effects of a given crisis event, *once it has occurred*, along the *cross section* of local geography. Specifically, at the start of a crisis, it can forecast a rank order of geographies based on the real effects they will experience post-crisis. Second, our forecasting focuses specifically on real outcomes in the "small firm" economy—i.e., growth in small business revenues, employment, establishments, payroll, and wages —which is an important, opaque, and understudied segment of the economy. Third, this is accomplished by observing costly bank actions during the crisis, which yield a credible signal of the downside risks that banks foresee in the local economy. This signal can be constructed by regulators in real time during a given crisis to glean bank information for the purpose of designing more efficiently targeted local stimulus programs during recovery.

To develop this signal, we combine insights from financial intermediation theory and the internal capital markets literature. A seminal theory behind the existence of financial intermediaries states that banks hold a special role in the economy as information producers and delegated monitors for the credit markets because of cost advantages inherent to their information production function (Diamond, 1984). We propose a new testable implication of this theory: if this theory is valid, banks' private information about their investment opportunities should have predictive power for post-crisis outcomes. Of course, a key obstacle remains: the superior information set of banks is, by definition, unobserved. *Our key contribution is to show that banks revealed this private information through costly actions undertaken in the internal capital markets during the 2008 crisis.* Using novel data that decompose each bank into its respective subsidiary-level and parent holding company-level balance sheets, we provide evidence that *costly* recapitalizations of subsidiaries by parent holding companies during the 2008 crisis *credibly revealed* the banks' private information about the downside risks facing their post-crisis investment opportunities in the geographies where they operated. In other words, the magnitudes of these costly recapitalizations generate cross-sectional signals at the bank-state level. Each signal represents a given bank's assessment of a state's economic performance post-Lehman. We connect individual bank signals to states using the subsidiary's pre-crisis, small business credit exposures within each state. To filter out idiosyncratic information about specific borrowers, we average individual signals of all banks competing within a given state, and find that these state-level signals have surprising predictive power for the future growth of small business revenues, employment, establishments, payroll, and wages years after the crisis. This is the first paper to introduce a signal that predicts post-crisis outcomes for the "small firm" economy, which represents businesses that are typically financially constrained, opaque, and whose dynamics tend to diverge from those of large firms. The predictive power of our signal for small firms suggests that banks have garnered significant information regarding future local demand conditions, to which small firms are highly sensitive.[3]

Our research design requires two key ingredients that were present during the 2008 crisis. First, to observe subsidiary recapitalization decisions, parent holding companies need to receive new equity capital to allocate. For this reason, our empirical setup focuses on the largest US government-sponsored recapitalization program in history, known as the Capital Purchase Program (CPP). This program was part of the Troubled Asset Relief Program (TARP) announced by the US Treasury in response to the systemic collapse triggered by the 2008 bankruptcy of Lehman Brothers. The CPP provided parent holding companies with a $176 billion windfall of fresh emergency capital that simultaneously entered

[3] This is consistent with the findings that small firms find it optimal to be subject to monitoring (Fama (1985), Diamond (1991), Nakamura (1993)).

the internal capital markets of 246 bank holding companies soon after the Lehman bankruptcy, enabling our analysis of within-TARP variation. Second, internal equity injections must be *costly* if they are going to reveal private bank expectations. To this end, our identification strategy exploits a special regulatory constraint imposed on the internal capital market during the 2008 crisis that made internal equity injections to bank subsidiaries difficult to reverse by limiting their ability to pay dividends upstream to parent holding companies.[4] To show that the informativeness of internal equity injections comes from the costs of this constraint, we identify the *intensity* by which the regulatory constraint imposed costs on the internal capital market of each organization by exploiting preexisting differences in the organizational structure of bank holding companies—namely, multi-bank holding companies (MBHC) versus single-bank holding companies (SBHC). Specifically, the constraint made it *costly* ex-ante for MBHCs to use the emergency CPP funds to recapitalize a given subsidiary in anticipation of future losses, because that portion of TARP CPP funds may subsequently become "trapped" for the remainder of the crisis and would be unavailable to flexibly reallocate to a sibling subsidiary in case further shocks arose. Instead, *lending* these funds to the subsidiary in the form of a short-term cash deposit (debt) would not be subject to the constraint and thus carried the *option value* of flexible future reallocations. This option value is the opportunity cost of injecting equity. Using a revealed preference argument, an MBHC would thus only find it optimal to inject equity if it deemed that the subsidiary's downside risk of future losses outweighed the loss in reallocation option value. Thus, the observed choice of an MBHC to inject equity *credibly reveals* its outlook for post-crisis economic outcomes. In comparison, the option value associated with lending CPP funds is less valuable for SBHCs because, by definition, they have no other sibling bank subsidiaries to reallocate TARP funds towards. Therefore,

[4] Because bank subsidiaries (not parents) hold FDIC-insured deposits of the public, subsidiary-level regulators were concerned that legal entities outside the federal safety net (parent holding companies) should not opportunistically attempt to extract subsidiary equity otherwise meant to provide cushion for insured deposits. As a result, regulators limited the payment of dividends from the subsidiaries upstream to the parent during the 2008 crisis.

internal equity injection choices by SBHCs do not produce credible signals of their private information, as injections do not carry an opportunity cost for SBHCs. This difference in the cost of subsidiary recapitalizations across the two types of holding companies allows us to create two signals for analytical purposes: a "treatment" signal constructed from the internal equity injection decisions of MBHCs that we hypothesize should reveal bank expectations, and a "placebo" signal constructed from the internal equity injections of SBHCs that should not.[5]

Our empirical analysis begins by documenting how parents of MBHCs and SBHCs internally allocated CPP funds based on each subsidiary's confidential supervisory exam rating, known as the CAMELS score. Our first set of results show that on the first date that TARP CPP funds arrived, MBHCs provided nearly zero internal equity injections to subsidiaries with the best CAMELS score, more (16 basis points) to subsidiaries with a medium CAMELS score, and the most (64 basis points) to subsidiaries with the worst CAMELS scores.[6] In contrast, SBHCs provided the *same* amount (141 basis points) of internal equity injections to their sole bank subsidiary, regardless of the subsidiary's CAMELS score. That is, the SBHC injection amount is not sensitive to the subsidiary's distress level. This result is consistent with the notion that, because the opportunity cost of an internal equity injection is higher for MBHCs than it is for SBHCs, MBHCs treat internal equity injections of CPP funds as a *scarce* resource, whereas SBHCs do not. Unlike MBHCs, SBHCs inject a flat amount because they do not need to portion injections based on subsidiary "need" (e.g., subsidiary distress ratings), as SBHCs have no sibling subsidiaries to reallocate to. In addition to this finding that illustrates the scarcity of MBHC internal injections in the cross section, we also find evidence of the scarcity of MBHC internal injections in the time series. To limit the amount of "trapped" capital on any given date, MBHCs

[5] SBHCs may have their own private information. However, this information does not get revealed through the internal equity injection variable because injections have little opportunity cost for SBHCs.
[6] The size of an internal equity injection is measured as the number of basis points that the subsidiary's capital ratio increases as a result of the internal equity injection.

perform all their internal equity injections to the subsidiaries with the worst CAMELS score on the first date of TARP CPP arrival, while they smooth out injections through time to subsidiaries with the medium CAMELS score and they smooth out injections even more over time to subsidiaries with the best CAMELS score. In contrast, SBHCs perform all their injections in one shot on the first date of TARP arrival without any time-smoothing.

Next, we test whether the realized internal equity injection decisions have predictive power for financial distress at the recipient subsidiary several years into the future. Because internal equity injections provide the recipient subsidiary with additional capital cushion to protect against current and future distress, it is important to distinguish that there are two types of distress that the raw internal equity injections address. The first is distress associated with a preexisting (pre-crisis) condition. Supervisory exams, as represented via CAMELS scores, are designed to capture this backwards-looking distress component. The second is *future* (forward-looking) distress related to the deterioration of local investment opportunities that the parent anticipates will affect the subsidiary's condition in the future due to the crisis event (e.g., the Lehman bankruptcy). As our goal is to extract the bank's outlook about forward-looking outcomes due to the crisis event, we define our signal as the residual of the internal equity injection after controlling for the CAMELS score. Therefore, this variable, which we label "excess" internal equity injection, captures the amount of internal equity injections that the parent decided to provide in excess of what a subsidiary with a given CAMELS score received on average.[7] We find that "excess" internal equity injections reveal and predict which subsidiaries will experience future distress in the post-crisis period. Specifically, for every 100 basis points of excess internal equity

[7] For the purpose of extracting the parent's information about future outcomes, we use the internal equity decisions as of the first date of TARP. Even though these injections are smoothed through time for subsidiaries with better CAMELS scores, the injections on day 1 are the most informative because that is when the scarcity of internal equity injections is highest, as parents have to deal with the cost emanating from the regulatory constraint of trapped subsidiary capital as well as the fact that multiple subsidiaries compete to receive injections. Once time passes and some sibling subsidiaries have been satisfied via recapitalizations, it becomes less costly to inject and thus less informative for our purpose of creating a signal that reveals private information. Thus, the date of TARP arrival contains all the information content for our signal.

injections provided by an MBHC parent on the date of TARP arrival, the recipient subsidiary subsequently exhibits 43 basis points lower annual ROA and 329 basis points lower annual ROE post-crisis. These recipient subsidiaries also see future CAMELS scores worsen in the post-crisis period—i.e., for every 100 basis points of excess internal equity injections provided by an MBHC parent on the date of TARP arrival, the recipient subsidiary's CAMELS score worsens each quarter thereafter by 0.08 rating points. Consistent with our hypothesis, the corresponding tests for SBHCs all show no predictive power, as they do not contain reveal any information about their expectations.

The final set of results test the ability of the excess internal equity injections to predict local real outcomes. We construct an aggregated excess injection signal by calculating state-level averages of the individual excess injection signals across competing bank subsidiaries (only MBHCs) weighted by their respective preexisting small business exposures in the given state. We find that these state-level excess internal equity injections reveal and predict which states will experience the worst growth in post-crisis small business revenues, employment, establishments, payroll, and wages. Specifically, for each 100 basis points of aggregated excess internal equity injections, the recipient state subsequently exhibits 229 basis points lower annual growth in nonemployer firm revenues, 97 basis points lower annual employment growth, 108 basis points lower establishment growth, 172 basis points lower annual payroll growth, and 336 basis points lower wage growth at small businesses in the post-crisis period.

Coming back to the topic of how individual subsidiary credit decisions respond to this deterioration in future real conditions, we see that recipient subsidiaries exhibit strong reductions in future credit originations—i.e., for every 100 basis points of excess internal equity injections provided by an MBHC parent on the date of TARP arrival, the recipient subsidiary subsequently curtails new credit originations annually by 48 percentage points for the next four years in the post-crisis period. This finding is in line with the notion that banks utilize their private information regarding post-crisis investment conditions by shifting their small business loan portfolio away from these negative outlook states. Consistent with our hypothesis, the excess injections from SBHCs show no results, as they are not credible signals of the SBHCs' expectations.

These findings reveal an added side benefit of government-sponsored recapitalization programs, of which there have been 33 worldwide in the past 40 years.[8] Specifically, our signal is a useful policy tool for regulators to extract (in real time) the rank order of local geographies that banks expect to be most impacted by crisis transmission effects. This knowledge can aid in the efficient design of stimulus programs for small businesses affected by systemic shocks (e.g., the Paycheck Protection Program and the Main Street Lending Program).

The paper is organized as follows. Section 2 provides a review of the relevant literature as well as our paper's contribution. Section 3 delivers an overview of the institutional details surrounding the structure of bank internal capital markets as well as details on the TARP CPP program. Section 4 describes the data and summary statistics. Section 5 describes the empirical specifications. Section 6 discusses the results. Section 7 concludes.

2. Literature Review and Contribution

Our study contributes to three strands of research—namely, the literature on financial intermediation, internal capital markets, and macrofinance.

a. Financial Intermediation

[8] Historically, there have been 33 government-sponsored bank recapitalization programs in the past 40 years: Argentina (1995, 2011), Bolivia (1994), Brazil (1994), Bulgaria (1996), Chile (1981), Colombia (1982,1998), Croatia (1998), Czech Republic (1996), Ecuador (1998), Estonia (1992), Finland (1991), Ghana (1982), Indonesia (1997), Jamaica (1996), Japan (1997), Korea (1997), Lithuania (1995), Malaysia (1997), Mexico (1994), Norway (1991), Paraguay (1995), Philippines (1997), Sri Lanka (1989), Sweden (1991), Thailand (1997), Turkey (2000), Uruguay (2002), the United Kingdom (2007), the United States (2009), Venezuela (1994), and Vietnam (1997).

In the financial intermediation literature, it is commonly argued that banks play a special role in the financial system because they resolve important information asymmetries.[9] Theoretical models highlight the unique monitoring functions of banks (e.g., Diamond, 1984, 1991, Ramakrishnan and Thakor, 1984, Fama, 1985). These studies generally argue that banks have a comparative cost advantage that enables them to undertake superior debt-related monitoring in an imperfect capital market. If banks do know more about the prospects of the firms they lend to as compared to nonbank creditors, a standard test in the literature argues that bank loan agreements should then be "unique" or "special" relative to other forms of finance—e.g., they should convey useful information to the market. Many empirical studies show evidence that bank loan announcements yield a significantly positive return for borrowers (e.g., James 1987, Lummer and McConnell, 1989, Mikkelson and Partch, 1986, Best and Zhang, 1993, Billett, Flannery, and Garfinkel, 1995).[10] Recently, some studies have questioned this evidence. Maskara and Mullineaux (2011) suggest that the positive announcement effect of bank loans suffer from sample selection bias because the borrower's decision to announce a bank loan is generally discretionary, while Gande and Saunders (2012) document that the traditional monitoring incentives of banks were weakened due to the development of the secondary market for loans.

We contribute to the financial intermediation literature by providing a more direct way to test this theory that does not rely on the indirect implication of borrower stock price reactions but rather *directly shows the predictive power* of bank information (revealed via costly bank actions) for forecasting future distress associated with borrowers. Our results suggest that banks' costly injection

[9] The literature began with two problems associated with the production of information by a generic economic agent—specifically, the "reliability problem" and the "appropriability problem". The returns to producing the information could not all be captured by the information producer, possibly making the production of the information uneconomic (Grossman and Stiglitz (1980)). Leland and Pyle (1977) and Campbell and Kracaw (1980) show that the reliability and appropriability problems can be eliminated if the information producer invests a sufficient minimum amount of its own wealth.
[10] Recent papers have explored the relationship between information acquisition and physical distance between borrowers and lenders (Petersen and Rajan (2002), Agarwal and Hauswald (2010)). Qian et al. (2015) highlight how the quality (predictive power) of information production varies with incentives and communication costs.

decisions can be useful for predicting small business outcomes (such as small business revenues, employment, establishment, payroll, and wages) across geographical regions. The predictive power of our signal for small businesses provides the first empirical confirmation of Fama (1985), Nakamura (1993), and Diamond (1991), who argue that the specialness of banks would be most applicable to small firms, as these firms subject themselves to bank monitoring and bank loan finance.[11] In addition, Krishnaswami et al. (1999) find evidence consistent with the intuition that banks' low information production costs are more valuable when information asymmetry is severe. Our main results are consistent with this claim, as we find that banks' costly internal equity injections were extremely informative for predicting economic outcomes after the 2008 crisis, a time when information asymmetry between the market and banks was historically high.

Overall, our findings constitute a unique and more direct test of the special role that banks play in the economy, suggesting that their information production technology is likely very cost-efficient. Not only are banks information producers of borrower creditworthiness, but they also possess valuable expectations about future real prospects at the lower size distribution of the US nonfinancial business sector.

[11] Disclosing information to banks (rather than public markets) is less costly, since banks have access to the firm's transaction accounts and can gather much of the required nonpublic information at low cost (Nakamura, 1993). Because the cost of producing the information required for public debt financing is high, small firms tend to rely more on bank loans (Fama, 1985). Further, Nakamura (1993) argues that the informational advantage of bank debt is less pronounced for big firms because their numerous accounts are usually spread over a greater number of banks, and each bank only has access to partial information. Thus, for big firms the cost advantage in borrowing from a bank is considerably lower. Fama (1985), Nakamura (1993), and Diamond (1991) predict that small firms use more bank debt. The Diamond (1991) model has some interesting empirical implications. First, it implies that new borrowers—for example, start-ups or young firms—initially submit to bank monitoring to acquire a reputation and then switch to public debt. Finally, as smaller and younger firms generally have less established reputations in financial markets, the information production role of an intermediary is more important to them relative to larger, more established firms.

b. Internal Capital Markets

The theoretical literature argues that control rights (in the sense of Grossman and Hart, 1986, Hart and Moore, 1990, and Hart, 1995) are one key difference between the study of internal versus external capital markets, leading to higher monitoring incentives (Gertner, Scharfstein, and Stein, 1994). In this way, the internal capital market brings a higher quality of information to bear on decisions than the external market and can create value by actively reallocating scarce resources across projects (e.g., Alchian, 1969, Williamson, 1975, Stein, 1997). With regards to empirical work, there have been numerous studies exploring the operation of internal capital markets in nonfinancial firms, many of which show evidence of investment spillovers due to capital market frictions in the external markets (i.e., Shin and Stulz, 1998, Lamont, 1997, Maksimovic and Phillips, 2002, Giroud and Mueller, 2015, 2019). Relatedly, the empirical literature for *bank* internal capital markets has also identified causal spillovers of liquidity shocks through the internal market (e.g., Peek and Rosengren, 1997, 2000, Houston et al., 1997, Campello, 2002, Schnabl, 2012, Cetorelli and Goldberg, 2012a, 2012b, Gilje, Loutskina, and Strahan, 2016).

Whereas the prior literature (bank or nonfinancial) has focused on showing causal evidence for the *shock transmission* role of internal capital markets in propagating spillovers across sibling divisions, our paper flips the question and shows that frictions or costs inside the internal capital markets can be exploited to extract the private information of firm managers in order to create novel signals that predict a variety of future outcomes depending on the empirical context (what we term the *revealed information* role of internal capital markets). More specifically, because of large information asymmetries between managers and external investors, observing costly managerial actions inside the internal capital market creates credible signals of private managerial information about future investment conditions that contain local macroeconomic informational content. In our study, we find that due to the regulatory constraint during the 2008 crisis, the internal equity injection variable becomes a particularly informative signal for the bank's future insolvency expectations, leading to a myriad of bank private information signals at the bank-state level. As we do in our real outcomes analysis, these granular signals can be aggregated to create local macroeconomic signals with surprising predictive power.

c. Macrofinance

There is a large literature examining the ability of financial variables to predict macroeconomic outcomes and financial crises. Research has focused on stock and bond markets (Harvey, 1989), commercial paper spreads (Bernanke, 1990, Friedman and Kuttner, 1992), the slope of the yield curve (Estrella and Hardouvelis, 1991), systemic risk measures (Giglio, Kelly, and Pruitt, 2016, Allen, Bali, and Tang, 2012), high-yield bonds (Gertler and Lown, 1999), corporate bond credit spreads (Gilchrist and Zakrajsek, 2012, Krishnamurthy and Muir, 2020, Philippon, 2009), credit market sentiment (Lopez-Salido et al., 2017), composite financial conditions indices (Adrian, Boyarchenko, and Giannone, 2019), corporate loan spreads (Saunders et al., 2021), credit growth (Schularick and Taylor, 2012), financial development measures (King and Levine, 1993), and mutual fund flows (Ben-Rephael et al., 2021).

Our study complements this literature in several ways. First, while the literature has traditionally focused on forecasting the arrival of a recession or crisis at the country time-series dimension, our measure predicts the magnitude by which a given crisis event will transmit macroeconomic shocks to small firms along the *cross-sectional distribution* of US states. To the best of our knowledge, there are no prior studies that have established predictive signals for the geographical distribution of crisis transmission effects, especially not for small business real outcomes. The study of small firms, whose economics differ widely from those of large firms, is particularly important (e.g., Gupta, Sapriza, and Yankov, 2022, Petersen and Rajan, 1994, 2002, Deyoung et al., 2015, Chodorow-Reich et al., 2022, Gertler and Gilchrist, 1994, Adelino et al., 2015) yet understudied in the broader macroeconomic literature due to data limitations. Second, the common theme in the empirical research on macroeconomic time-series forecasting is the use of financial signals from *external* capital markets, deriving their predictive power from frictions present in a variety of economic models (e.g., financial accelerator mechanisms and credit channel theories). In contrast, our financial signal is sourced from the *internal* capital markets, deriving its predictive power from the theory that banks hold significant amounts of private information about borrowing firms due to their economic role as efficient information producers (e.g., Diamond, 1984, Fama, 1985).

3. Institutional Background

a. Internal Capital Market Structure of Bank Holding Companies

To illustrate the internal allocation of CPP funds through the organization, we provide an overview of the holding company structure as well as regulatory frictions impacting subsidiaries. Figure 1 denotes a simplified representation of a bank holding company structure comprised of three legally separate entities—namely, the parent holding company, commercial bank subsidiary 1, and commercial bank subsidiary 2.[12]

Insert Figure 1: Consolidated View of Bank Holding Companies

Insert Figure 2: Disaggregated "Internal Capital Markets" Balance Sheet View of Bank Holding Companies

Figures 1 and 2 illustrate how to visualize the relationship between a consolidated balance sheet and the disaggregated "internal capital markets" view of the parent and subsidiary balance sheets within that firm. Assume that a bank holding company has two subsidiaries. The left panel in Figure 1 represents a traditional consolidated balance sheet of a bank holding company (similar to what might be presented in a 10-K annual report). The right panel of this figure then breaks down each asset and liability by legal

[12] Commercial bank subsidiaries come in three varieties. National banks are federally chartered and overseen by the Office of the Comptroller of the Currency as well as the Federal Reserve. State member banks are chartered and regulated by the local state banking authority in addition to being members of the Federal Reserve System. Finally, state nonmember banks are state-chartered but have elected not to be members of the Federal Reserve System; thus, they are overseen by the FDIC.

entity ownership. Figure 2 further separates these assets into three individual balance sheets (holding company-only, bank subsidiary 1, and bank subsidiary 2). It is important to note that the key variable of our study, the holding company's internal equity injection, only becomes visible in the disaggregated balance sheet view of Figure 2.

Parent holding companies do not typically perform any external business on their own; instead, they raise a variety of nondeposit unsecured funding (commercial paper and long-term corporate bonds) from debt markets as well as issue shares to equity investors. These funds are then typically downstreamed to subsidiaries as either internal equity injections, cash deposits (debt claim), or long-term loans. Parent holding companies almost always own 100% of the equity in their operating commercial bank and nonbank subsidiaries. Market participants can own claims on the parent holding company via long-term corporate bonds, commercial paper, and equity stock, and the commercial bank subsidiary via deposits insured by the Federal Deposit Insurance Corporation (FDIC), uninsured deposits, and corporate bonds. External claims on the holding company ultimately derive value from the interest and dividend income paid upstream from subsidiaries to parents. Parents are dis-incentivized from allowing strategic failures of their commercial bank subsidiaries due to the FDIC's cross-guarantee authority introduced through the Financial Institutions Reform, Recovery, and Enforcement Act of 1989. Because bank subsidiaries (not parents) hold FDIC-insured deposits of the public, the cross-guarantee authority provides the FDIC unilateral authority to offset losses incurred from the failure of a depository institution by assessing claims against its healthy, sibling institutions.

The key internal capital market friction in our research design came from a regulatory constraint specially imposed during the 2008 crisis. Due to regulatory concerns about potential leakages of the federal insurance safety net after the Lehman collapse, subsidiary-level supervisors temporarily increased their scrutiny regarding upstream payments of internal dividends out of commercial bank subsidiaries. This helped to prevent the extraction of subsidiary equity, which provided a crucial cushion against the default of insured deposits. Whereas banks could attempt to obtain special permissions, the general enhancement of supervisory scrutiny increased the cost of flexibly reallocating equity once it had been internally injected during the 2008 crisis.[13]

Supervisors assess the financial health of each bank subsidiary through the use of regular, on-site supervisory exam ratings (known as CAMELS ratings). Performed once every 12 to 18 months, on-site exams culminate in a private and highly confidential rating, commonly known by acronym as a CAMELS rating. To produce this single rating, the examiner evaluates the bank subsidiary along six components: (C) capital adequacy, (A) asset quality, (M) management's ability to ensure the safety, soundness, and compliance of its bank operations, (E) earnings, (L) adequacy of bank liquidity, and (S) the bank's sensitivity to market risk. The composite CAMELS rating is not simply an average of the individual component ratings but instead reflects examiners’ informed judgment as to how the individual components ratings are combined to provide a summary measure of a bank’s overall condition. The composite CAMELS rating, and its component ratings, are expressed through a numerical scale of 1 through 5, with 1 being the best rating, and 5 being the worst rating. Financial distress is defined by a CAMELS rating of 3, 4, or 5, whereas a rating of 1 or 2 means the subsidiary is in good standing. It is important to know that the CAMELS rating is not meant to incorporate any expectations or projections of future distress but rather the subsidiary’s current distress condition. CAMELS ratings prove to be a strongly incentivizing factor for banks, as they are key inputs for a host of regulatory costs, such as regulatory fines, FDIC insurance premiums, cease-and-desist enforcement actions, and access to the Fed's discount window, in addition to regulatory licensing, branching, and merger approval decisions.

As monitoring and examination resources are limited, supervisors also perform off-site surveillance through a program known as the Supervision and Regulation Statistical Assessment of

[13] This enhanced scrutiny lasted for the duration of the 2008 crisis.

Bank Risk (SR-SABR), which identifies banks with potential vulnerabilities based on an algorithm that monitors quarterly Call Report information (and incorporates examination data and information about historical bank failures). In identifying such banks, it uses an econometric model that estimates the chance that a bank may be adversely rated or fail (or become critically undercapitalized) in the near future. Because these grades are updated each quarter, SR-SABR provides a useful way of monitoring bank health between examinations and assessing priorities for examination scheduling.

It is also important to know that the commercial bank subsidiary's ability to provide internal loans to nonbank parts of the organization (e.g., parent holding company and nonbank siblings) is tightly limited by Section 23A of the Federal Reserve Act. Enacted in 1933 in the aftermath of the Great Depression, regulators implemented Section 23A to prevent the leakage of the federal subsidy onto nondepository financial institutions. This law imposes quantitative limitations and collateral requirements on commercial bank extensions of credit to nonbank subsidiaries, constituting a kind of ring fence on funds being lent by commercial bank subsidiaries to nonbank subsidiaries or the parent holding company.

b. Capital Purchase Program (Troubled Asset Relief Program)

The onset of the 2008 Global Financial Crisis led to the creation of several government-sponsored emergency funding programs. In October 2008, TARP was created under the Emergency Economic Stabilization Act and provided the US Treasury with $700 billion to purchase troubled assets from banks. A sub-program of TARP was CPP, which used $218 billion of taxpayer funds to purchase newly issued senior preferred shares and warrants of US banks. This constituted the largest recapitalization program in the history of the US banking system.

The nine largest financial institutions were forced to participate in the capital injection—namely, JP Morgan Chase & Co, Citigroup Inc., Wells Fargo & Co., State Street Corp., Bank of New York Mellon, Bank of America Corp., Merrill Lynch, Morgan Stanley, and Goldman Sachs. The rest of the program involved the voluntary participation of banks through an application and Treasury approval process. Taliaferro (2009) outlines this procedure. Because our analysis compares the internal allocation choices of TARP recipients, all of our analysis looks at within-TARP variation. From October 2008 to June 2009, over 600 financial institutions participated (including bank holding companies, standalone banks, thrifts, and credit unions). As the paper's focus is exclusively on bank holding companies, our data sample contains the 246 bank holding companies that participated, which covers $176 billion of the CPP. It is important to note that a key eligibility criterion for a bank holding company to participate in the TARP CPP program was that it was not allowed to own any subsidiaries with a composite CAMELS rating of 4 or worse, as the TARP CPP program was not designed to be a bailout. Although the research question of our paper is not related to the efficiency of the government recapitalization program, there have been many studies on this line (e.g., Veronesi and Zingales, 2010, Hoshi and Kashyap, 2010, Bayazitova and Shivdasani, 2009, Duchin and Sosyura, 2014, and Philippon and Schnabl, 2013).

4. Data and Empirical Framework

a. Data Description and Summary Statistics

Information on the issuance of TARP CPP funds is collected from TARP Transaction Reports from the US Treasury’s website. These transactions are hand matched to each recipient banking organization’s identifier, known as RSSDs. In order to trace the flow of these emergency funds through each organization, we deconstruct each US bank holding company into parent holding company and bank subsidiary balance sheets. We obtain quarterly parent holding company-only balance sheet information from the FR Y-9LP dataset and merge this with the quarterly balance sheet data of commercial bank subsidiaries from the FFIEC 031/041 Call Report. The combination of FR Y-9LP and FFIEC 031/041 Call Report data enables us to view the parent internal investments in commercial bank subs as a panel structure. FR Y-9C data are also utilized to construct control variables representing balance sheet conditions of each consolidated financial institution.

Subsidiary-level measures of financial distress are obtained from two confidential supervisory sources, known as the CAMELS exam ratings and the SR-SABR database. Whereas the CAMELS score represents the subsidiary's most recent exam rating, the SR-SABR provides official, regulatory statistical estimates each quarter of the probability that a given subsidiary will fail or will experience a CAMELS downgrade in the near future, based on historical exam and Call Report information. Additionally, we collect information on the small business lending originations from subsidiaries to individual counties and states using data from the FFIEC Community Reinvestment Act database. Information on small business labor decisions is comprised of state-level employment, establishment, and payroll growth rates by firm size from the Census Bureau's Statistics of US Businesses (SUSB) database. Data for state-level average weekly wages (per employee) at small businesses are accessed from from the Bureau of Labor Statistics Quarterly Census of Wages and Employment (BLS QCEW) database. Note that we collect these variables specifically for small businesses, which we define as establishments with nine or fewer employees. While data are not reported for revenues at these small businesses, the Census Bureau does collect yearly revenue receipts at nonemployer firms in the Census Bureau's Nonemployer Statistics (NES) database. Nonemployer firms are small businesses that have no paid employees but are subject to federal income tax. They appear in practically every industry and comprise the majority of nearly 80 percent of industry subsectors. Examples include firms that operate museums and hobby shops; provide pet care services; manufacture clothing, electrical equipment, and machinery; sell real estate and process data.[14] Control variables for state-level macro time series on per capita real GDP growth and personal income growth are retrieved from the Bureau of Economic Analysis. Growth in housing price indices come from the Federal Housing Finance Agency's website (FHFA). Finally, aggregate annual realized returns on state-level stock portfolios are constructed from individual firm stock price data from the Center for Research in Security Prices (CRSP). This is constructed by summing the market capitalizations of all firms headquartered within each state and calculating their respective yearly realized returns.

Insert Table 1

Table 1 presents summary statistics at the subsidiary, bank holding company, subsidiary-county, and state macro levels. The data are comprised of 55 MBHCs owning 226 bank subsidiaries, and 185 SBHCs. MBHCs in the sample typically own five commercial bank subsidiaries. The median internal equity injection across all BHCs on the date of TARP CPP arrival was 53 basis points, where this variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's internal equity injection. Upon controlling for measures of preexisting financial distress (via CAMELS), excess internal equity injections average roughly zero; however, there are large standard deviations in the cross section of subsidiaries, pointing to heterogeneity of parents' outlook for post-crisis distress and future local investment conditions. The median CAMELS score for subsidiaries of TARP participants is roughly 2, while the regulatory estimates for the probability of subsidiary failure and CAMELS downgrade are 0.17 percent and 6.19 percent, respectively. The median annual growth in small business employment, establishments, and payroll (where small business is defined as

[14] See https://www.census.gov/programs-surveys/sbo.html

establishments employing nine or fewer workers) are negative 12, negative 305 basis points, and negative 253 basis points, respectively, from 2004 to 2011. Median annual nonemployer firm revenue growth in this period was 317 basis points. Control variables, such as per capital real GDP growth, housing price growth, and state-level stock returns, were 113 basis points, 10 basis points, and 637 basis points, respectively, through this period.

5. Empirical Analysis

a. The Internal Equity Injection Behavior of Parent Holding Companies

Our empirical framework starts by documenting the decision of parent holding companies to recapitalize their subsidiaries using TARP CPP funds during the 2008-09 financial crisis.

(1)

$$\frac{Internal\ Equity\ Injection_{s,p,t}}{Subsidiary\ RWA_{s,p,t-1}} = \beta_0 + \beta_1 \cdot \mathbb{1}\left[t = TARP\ Arrival\ Date_p\right]$$

$$+\beta_2 \cdot \mathbb{1}\left[t = TARP\ Arrival\ Date_p\right] \cdot \mathbb{1}\left[CAMELS_{s,p,t=TARP\ Arrival\ Date_p-1} == 2\right]$$

$$+\beta_3 \cdot \mathbb{1}\left[t = TARP\ Arrival\ Date_p\right] \cdot \mathbb{1}\left[CAMELS_{s,p,t=TARP\ Arrival\ Date_p-1} == 3\right]$$

$$+\beta_4 \cdot \mathbb{1}\left[t = TARP\ Arrival\ Date_p\right] \cdot \mathbb{1}\left[MBHC_p\right]$$

$$+\beta_5 \cdot Subsidiary\ Controls_{s,p,t-1}$$

$$+\beta_6 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{spt}$$

The left-hand side variable $\frac{Internal\ Equity\ Injection_{s,p,t}}{Subsidiary\ RWA_{s,p,t-1}}$ is the flow of new internal equity injections from the parent p into subsidiary s at time t as a share of the subsidiary's total risk-weighted assets in the previous quarter. This ratio represents the increase in the subsidiary's capital ratio that results from the internal equity injections provided by the parent. The regression spans 2006:Q1 to 2011:Q4 and isolates the internal equity injection on the date that CPP funds arrive from the US Treasury to the parent using an indicator function, $\mathbb{1}[t = TARP\ Arrival\ Date_p]$. The coefficients $\beta_1, \beta_2, \beta_3, and\ \beta_4$ comprise the key right-hand side coefficients of interest. The coefficient β_1 captures the average internal equity injection made on the date of TARP arrival from parents to subsidiaries with a CAMELS rating of 1, while β_2 and β_3 capture the same TARP arrival injections for CAMELS 2 and 3 subsidiaries, respectively.[15] The coefficient β_4 captures the difference in internal equity injections across MBHCs and SBHCs, all else being equal. Based on our research strategy, we hypothesize that $\beta_4 < 0$ because the "trapped" capital constraint is most costly for MBHCs. In this way, MBHCs will treat internal equity injections as a scarce resource and likely inject less on average. We further look at MBHC-only and SBHC-only subsample regressions and hypothesize that $\beta_3, \beta_2, \beta_1 > 0$ for the MBHC-only sample. This is consistent with the notion that MBHCs will inject equity to the subsidiary with the most need. For the SBHC-only sample, we hypothesize that $\beta_1 > 0$ and that neither β_2 nor β_3 will be statistically different from zero. Because there are no siblings for future reallocations, the SBHC parent does not need to portion injections based on need. The $Subsidiary\ Controls_{s,p,t-1}$ and $BHC\ Controls_{p,t-1}$ consist of capital ratios, asset liquidity ratios, deposit funding shares, profitability, and the natural log of total assets at the subsidiary and bank holding company levels, respectively. We use subsidiary and parent fixed effects to control for downstreaming "culture", which can be a strong driver when deciding how to allocate TARP funds. Time fixed effects are also applied to control for macroeconomic shocks. Standard errors are clustered at the bank holding company level.

[15] Dummy variables for subsidiaries with CAMELS 4 and 5 ratings are not needed in our specifications because none exist in our sample (a key eligibility criterion for a bank holding company to participate in the TARP CPP program was that it could not own subsidiaries with a CAMELS rating of 4 or worse.

In the next subsection, we explore if this internal equity allocation reveals the parent holding company's view of future post-crisis subsidiary outlook. Because internal equity injections provide the recipient subsidiary with additional capital cushion to protect against current and future distress, it is important to distinguish that there are two types of distress that the raw internal equity injections address. The first is distress associated with a preexisting (pre-crisis) condition. Supervisory exams, as represented via CAMELS scores, are designed to capture this backwards-looking distress component. The second is *future* (forward-looking) distress related to the deterioration of local investment opportunities that the parent anticipates will affect the subsidiary's condition in the future due to the crisis event (e.g., the Lehman bankruptcy). As our goal is to extract the bank's outlook about forward-looking outcomes due to the crisis event, we define "excess" internal equity injections as the injection residual to a given subsidiary s, specifically on parent p's date of TARP arrival, $\varepsilon_{s,p,t=TARP\ Arrival\ Date_p}$ from equation (1).[16] This quantity represents the amount of internal equity injections that exceed the average amount of injections expected for a subsidiary with a given CAMELS distress rating, probability of failure, probability of ratings downgrade, capital ratio, liquidity ratio, size, etc. Using a revealed information argument, we propose that if a parent decides to allocate an excess amount of the TARP CPP funds as new internal equity injections (controlling for the subsidiary's condition pre-Lehman), it is likely that the parent has information that future losses and distress at the recipient subsidiary will be large.

b. Excess Internal Equity Injections as a Predictor of Subsidiary-Level Post-Crisis Performance and Financial Distress

[16] This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection as of TARP arrival.

Equation (2) explores the informativeness of the parent's realized excess internal equity injection decision on the date of TARP arrival for forecasting the future profitability and financial distress of the recipient subsidiary.

(2)

$$Y_{spt} = \beta_0$$

$$+\beta_1 \cdot \mathbb{1}\left[t \geq TARP\ Arrival\ Date_p\right] \cdot Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p}$$

$$+\beta_2 \cdot SupPrbofFailure_{s,p,t-1} + \beta_3 \cdot SupPrbofRatingDowngrade_{s,p,t-1}$$

$$+\beta_4 \cdot \mathbb{1}\left[CAMELS_{s,p,t-1} == 2\right] + \beta_5 \cdot \mathbb{1}\left[CAMELS_{s,p,t-1} == 3\right]$$

$$+\beta_6 \cdot Subsidiary\ Controls_{s,p,t-1} + \beta_7 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{spt}$$

The dummy variable $\mathbb{1}\left[t \geq TARP\ Arrival\ Date_p\right]$ is a post-TARP indicator that equals 1 for all dates after TARP funding arrives to a given parent p, and $Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p}$ is the residual from equation (1) on TARP arrival. The left-hand side variable Y_{spt} represents a set of different post-crisis outcome variables at the subsidiary-level, where

$$Y_{s,p,t} \in \left\{\frac{Subsidiary\ Net\ Income_{s,p,t}}{Subsidiary\ Total\ Assets_{s,p,t-1}}, \frac{Subsidiary\ Net\ Income_{s,p,t}}{Subsidiary\ Total\ Equity_{s,p,t-1}}, CAMELSRating_{s,p,t}\right\} \quad .$$

Because MBHCs incur an opportunity cost when allocating equity capital to subsidiaries (i.e., the option value of debt deposits), we use a revealed preference argument that the MBHC will only find it optimal to incur this cost (by injecting equity) if the parent expects future subsidiary losses and distress to be higher in the post-crisis period. Thus, the parent injects capital in order to cushion against higher losses and distress anticipated in the future. To this end, the first set of tests explores whether the size of excess internal equity injections provided by parent holding companies on the day of TARP arrival reveals information that future subsidiary return-on-assets ($\frac{Subsidiary\ Net\ Income_{s,p,t}}{Subsidiary\ Total\ Assets_{s,p,t-1}}$) and return-on-equity ($\frac{Subsidiary\ Net\ Income_{s,p,t}}{Subsidiary\ Total\ Equity_{s,p,t-1}}$) will be worse ex-post. The second set of tests explores whether subsidiaries that received higher excess internal equity injections on the arrival of TARP perform worse in future supervisory exams ($CAMELSRating_{s,p,t}$). In this way, costly internal equity injections forecast future subsidiary distress.

The coefficient β_1 isolates the difference in post-crisis future performance and distress across subsidiaries that were chosen (by parents) to receive more versus lower excess internal equity injections on the date that TARP CPP funds arrived from the US Treasury. For subsidiaries of MBHCs, we predict that $\beta_1 < 0$ for future profitability and $\beta_1 > 0$ for future supervisory assessments (higher assessment scores indicate worse distress), because the "trapped" capital constraint makes internal equity injections costly. Namely, because MBHCs have multiple subsidiaries to manage, TARP CPP funds that become trapped as equity in one subsidiary (via injections) will not be available for future reallocations to other subsidiaries if shocks later arise. Using a revealed preference argument, if we observe that parents *choose* to incur the cost of trapping their TARP CPP funds by injecting large amounts, it likely reveals the parent's private information about the recipient subsidiary's future post-crisis outlook. It is the costliness of the regulatory constraint that makes the MBHC internal equity injection variable informative. Meanwhile, we predict that β_1 will be statistically insignificant for subsidiaries of SBHCs because the cost of trapped capital is low, as there are no bank siblings to reallocate capital towards. In this way, subsidiaries of SBHCs form a kind of placebo group for our tests because they are not subject to the same internal capital market cost and thus do not yield a predictive signal. It is important to note that SBHCs have also have their own expertise and private information, however, this information is not revealed through the internal equity injection variable because equity injections do not constitute a costly action for SBHCs. The $Subsidiary\ Controls_{s,p,t-1}$, $BHC\ Controls_{p,t-1}$, and fixed effects are the same as in equation (1). Standard errors are clustered at the bank holding company level.

c. Excess Internal Equity Injections as a Predictor of Local Post-Crisis Economic Outcomes

While section 5.b tests whether excess internal equity injections reveal the parent's expectations about the likelihood of future distress and losses related to the subsidiary's direct lending exposures, this section explores whether the signal has predictive power for post-crisis local macroeconomic outcomes as well. We proceed by aggregating all subsidiary-level signals (across MBHCs) by state. Using the definition below in equation (3), we calculate a weighted average of the excess internal equity injections across all competing banks that possess direct small business credit exposures in a given state (market m) pre-crisis.

(3)

$$Excess\ Internal\ Equity\ Injection\ Signal\ from\ MBHCs_{m,t=TARP\ Arrival}$$
$$= \frac{\sum_{s\epsilon m(s)} SmallBusinessExposure_{m,s,p,2005\leq t\leq 2007} \cdot Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p}}{\sum_{s\epsilon m(s)} SmallBusinessExposure_{m,s,p,2005\leq t\leq 2007}}$$

We denote the set of all MBHC subsidiaries s that compete within a given state m as m(s). The state-level measure is $Excess\ Internal\ Equity\ Injection\ Signal\ from\ MBHCs_{m,t=TARP\ Arrival}$, which is calculated as the weighted average of subsidiary-level injection residuals $Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p}$ (calculated from equation 1) for all MBHC banks competing within a given state m. Specifically, the weighting is done using the total dollar volume of pre-crisis small business credit originated by the subsidiary s in state m from 2005 to 2007. Note, as a placebo signal, we also calculate a parallel signal for SBHCs using the weighted average method in equation (3).

Utilizing this state-level excess injection measure, our local macro forecasting test is captured by equation (4).

(4)

$$
\begin{aligned}
Y_{m,t} &= \beta_0 \\
&+\beta_1 \cdot \mathbb{1}[t \geq 2009] \cdot Excess\ Internal\ Equity\ Injection\ Signal\ from\ MBHC_{m,t=TARP\ Arrival} \\
&+\beta_2 \cdot Per\ Capita\ Real\ GDP\ Growth_{m,t-1} \\
&+\beta_3 \cdot Per\ Capita\ Personal\ Income\ Growth_{m,t-1} \\
&+\beta_4 \cdot Small\ Business\ Credit\ Origination\ Growth_{m,t-1} \\
&+\beta_5 \cdot Housing\ Price\ Index\ Growth_{m,t-1} \\
&+\beta_6 \cdot State\ Portfolio\ Stock\ Price\ Return_{m,t-1} + \pi_m + \tau_t + \varepsilon_{mt}
\end{aligned}
$$

The left-hand side variable $Y_{m,t}$ represents a set of different post-crisis macroeconomic outcomes at the state level, where

$$
Y_{m,t} \in \left\{ \begin{array}{c} \frac{\Delta\ Small\ Business\ Employees_{mt}}{Small\ Business\ Employees_{m,t-1}}, \frac{\Delta\ Small\ Business\ Establishments_{mt}}{Small\ Business\ Establishments_{m,t-1}}, \frac{Nonemployer\ Firm\ Revenues_{mt}}{Nonemployer\ Firm\ Revenues_{m,t-1}}, \\ \frac{\Delta\ Small\ Business\ Payroll_{mt}}{Small\ Business\ Payroll_{m,t-1}}, \ln\left(Small\ Business\ Average\ Weekly\ Wage_{mt}\right) \end{array} \right\}
$$

If the aggregated excess injection signal is high in a given state m, this means that parents competing in this market have decided to inject excess levels of internal equity to subsidiaries with lending exposures to small businesses in state m. Via a revealed preference argument, the fact that parents are willing to accept the associated reallocation costs of trapped capital reveals that they likely anticipate future economic conditions in state m to worsen post-crisis (and therefore find it optimal to inject excess capital beforehand to protect against these future losses). Specifically, we posit that these state-level signals aggregate private information across competing banks, where the weighted average helps to filter out idiosyncratic information (from subsidiary excess injections) about specific small business borrowers that reside in the state m. Consequently, what remains is average bank expectation information about future post-crisis investment conditions in the state.[17]

The coefficient β_1 isolates the post-crisis difference in the growth of employment, establishments, payroll, and wages for small businesses (as well as revenues at nonemployer firms) located in the states where MBHCs chose to inject excess amounts of internal equity allocations on the date that TARP CPP funds arrived from the US Treasury. With respect to the signal aggregated from MBHC excess injections, we predict that $\beta_1 < 0$ because the cost of internal equity injections is high and thus yields an informative signal. In contrast, we predict that β_1 will be statistically insignificant if we instead use the state-level excess injection signal constructed from SBHCs, because SBHC internal equity injection amounts do not reveal bank expectations about borrower outlook—e.g., the cost of trapped capital (and the option value of debt) is low for SBHCs, as there are no bank siblings to reallocate capital towards. In this way, the aggregated signal from SBHCs forms a kind of placebo group for our tests because they are not subject to the same internal capital markets constraint that MBHCs are. We use $\mathbb{1}[t \geq 2009]$ as a post-crisis dummy that equals 1 for all years from 2009 onwards. $Per\ Capita\ Real\ GDP\ Growth_{m,t-1}$, $Per\ Capita\ Personal\ Income\ Growth_{m,t-1}$, $Small\ Business\ Credit\ Origination\ Growth_{m,t-1}$, $Housing\ Price\ Index\ Growth_{m,t-1}$, and

[17] Aggregating at the state rather than county allows for large enough numbers of competing subsidiaries to become part of the weighted average, allowing a better filter for borrower-specific information.

$State\ Portfolio\ Stock\ Price\ Return_{m,t-1}$ form lagged state-level controls of economic growth. Standard errors are clustered at the state level.

d. Do Banks Subsequently Divest from the States that Received the Largest Excess Internal Equity Injections?

Finally, we return to understand the post-crisis lending behavior of banks receiving excess internal equity injections. Specifically, if these injections do reveal bank expectations for poor post-crisis investment conditions, we next ask whether banks respond by divesting from these problem markets? This is explored in equation (5) below:

(5)

$$Ln(Small\ Business\ Credit\ Originations)_{c,s,p,t} = \beta_0$$

$$+\beta_1 \cdot \mathbb{1}\left[t \geq TARP\ Arrival\ Date_p\right] \cdot Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p}$$

$$+\beta_2 \cdot SupPrbofFailure_{s,p,t-1}$$

$$+\beta_3 \cdot SupPrbofRatingDowngrade_{s,p,t-1}$$

$$+\beta_4 \cdot Subsidiary\ Controls_{s,p,t-1}$$

$$+\beta_5 \cdot BHC\ Controls_{p,t-1}$$

$$+\gamma_{CAMELS} + \delta_s + \pi_p + \theta_c + \tau_t + \varepsilon_{spt}$$

The dependent variable of interest is the natural log of small business credit originations issued by subsidiary s (of parent p) at time t to small businesses in county c. We hypothesize that β_1<0 for the MBHC sample. Specifically, if large excess internal equity injections are informative of the parent's negative outlook regarding post-crisis investment conditions, we expect that recipient MBHC subsidiaries would be likely to limit future exposures by curtailing new credit. As before, we expect β_1

to be statistically insignificant for the SBHC sample. Our regression includes fixed effects for CAMELS score, subsidiaries, parents, and counties to control for unobserved time-invariant factors. We also use time fixed effects to control for aggregate national-level shocks to credit. To control for unobserved business cycle variation at the local level, we also include different combinations of interacted fixed effects, such as county*year and subsidiary*year, in alternative specifications.

6. Results

a. The Internal Equity Injection Behavior of Parent Holding Companies

Figure 3 presents a cross-sectional plot of the average internal equity injections received by bank subsidiaries with different CAMELS ratings prior to the date of TARP arrival. The top panel shows that MBHCs portion the usage of TARP CPP funds by providing higher internal equity injections to subsidiaries with worse regulatory distress ratings (i.e., a CAMELS rating of 3, 2, and then 1). This behavior suggests that the internal capital markets constraint was in fact costly for MBHCs during the crisis. Specifically, as equity injections lead TARP funds to become “trapped” in the recipient subsidiary ex-post, MBHCs lose the flexibility to reallocate these funds to sibling subsidiaries later in the crisis. In this way, MBHCs treat internal equity injections as a scarce good ex-ante and, thus, are more willing to incur this “trapped” capital cost when the subsidiary’s pre-crisis distress condition is worse. In comparison, the bottom panel of Figure 3 shows that SBHCs provide a uniform amount of internal equity injections regardless of the subsidiary’s distress rating. This behavior is consistent with the idea that injecting TARP funds as equity is not costly for SBHCs, as the ability to flexibly reallocate funds in the future is less valuable given that SBHCs do not have sibling bank subsidiaries to reallocate funds to. In this way, the SBHCs’ injection decisions are independent of subsidiary distress.

Insert Figure 3

Whereas Figure 3 explored the impact of the constraint on the cross section of internal equity injections upon TARP arrival, Figure 4 confirms the existence and bindingness of this internal capital markets constraint *in the time series* by plotting the average internal equity injections received by bank subsidiaries with CAMELS ratings of 1, 2, and 3.

The top panel corroborates the notion that MBHCs found this constraint costly, treating internal equity injections as a scarce resource by prioritizing recapitalizations at the most distressed subsidiaries sooner in time. Specifically, the top panel shows that subsidiaries with a CAMELS rating of 3 are immediately recapitalized on the first date that TARP CPP funds arrive at the MBHC parent. Meanwhile, recapitalizations at MBHC subsidiaries with a CAMELS rating of 2 are lower on date 0 and are smoothed through time post-TARP. Finally, recapitalizations at MBHC subsidiaries with a CAMELS rating of 1 are even lower on date 0 and are also smoothed through time. In contrast, the bottom panel shows the opposite: SBHCs do not treat internal equity injections as a scarce resource (e.g., "trapped" capital is not costly because there are no other siblings to reallocate to). Accordingly, they recapitalize their single subsidiary uniformly (regardless of distress level) on date 0, with no evidence of smoothing through time. The fact that MBHCs withhold injecting equity (on date 0) in subsidiaries with CAMELS ratings of 2 and 3 suggests they value the ability to reallocate funds in the future if and when shocks arise.

Insert Figure 4

Controlling for a host of bank characteristics, the results of Table 2 are consistent with the patterns shown in Figures 3 and 4. Specifically, column 2 finds that MBHCs provided a higher amount of internal equity injections on the date of TARP arrival to subsidiaries with a CAMELS 2 rating as compared to subsidiaries with a baseline CAMELS 1 rating—i.e., CAMELS 2 subsidiaries experienced an increase of 16 basis points in their capital ratios as compared to CAMELS 1 subsidiaries (which received no injections). Subsidiaries with a CAMELS 3 rating, accordingly, experienced an even higher relative increase of 64 basis points as compared to the baseline CAMELS 1 subsidiaries on the date of TARP arrival. In contrast, column 3 shows that SBHCs' internal equity injections on TARP arrival raised subsidiary capital ratios uniformly by 141 basis points, *regardless of CAMELS rating*. In column 1, the key variable of interest is the coefficient for the interaction term, MBHC * TARP Arrival Date. This column result combines SBHC and MBHC subsamples to show that, holding the CAMELS rating fixed, subsidiaries owned by MBHCs receive significantly lower internal equity injections than subsidiaries owned by SBHCs—i.e., capital ratios of MBHC subsidiaries rise 103 basis points less than those of SBHC subsidiaries on the date of TARP arrival. This point estimate represents an indirect estimate of the cost of the capital trapping constraint (or, equivalently, the option value associated with withholding the use of TARP funds for subsidiary recapitalizations). Put differently, controlling for CAMELS rating, MBHCs chose to withhold 103 basis points of subsidiary capital ratio stimulus in exchange for retaining the flexibility to inject equity later when future shocks arise (option value).

Insert Table 2

b. Excess Internal Equity Injections as a Predictor of Subsidiary-Level Post-Crisis Performance and Financial Distress

The results of Table 3 show that, controlling for various measures of ex-ante distress (such as the subsidiary's CAMELS rating, probability of failure, and probability of CAMELS rating downgrade), the amount of excess equity that the MBHC parent decides to internally inject reveals information about (and predicts) the subsidiary's ex-post performance after the crisis. As shown in columns 1 and 3, the recipient subsidiaries perform worse ex-post. Subsidiaries whose capital ratios increased by 100 basis points more via excess internal equity injections on the date of TARP arrival earned 43 basis points lower return on assets (and 329 basis points lower return on equity) each quarter in the post-crisis period. In other words, this result suggests that when an MBHC parent provides equity injections in excess of that which is warranted by the subsidiary's pre-existing distress level, this choice reveals private information about the subsidiary's future investment opportunities. The predictive nature of the MBHC's internal equity injection decision indicate that bank holding companies possess a significant amount of expertise and private information about the post-crisis performance of each subsidiary's preexisting investments as well as the post-crisis prospects for new investment opportunities. Notice that excess internal equity injections from SBHC parents do not hold any such predictive power for post-crisis subsidiary outcomes (as shown in columns 2 and 4), consistent with the notion that the equity injections from SBHC parents are not costly and thus are not informative of the SBHC's expectations for future subsidiary performance.

Insert Table 3

The next set of results show similar findings for regulatory measures of ex-post subsidiary distress. Specifically, the amount of equity that the MBHC parent decides to internally inject also predicts the evolution of post-crisis CAMELS exam scores. Referencing column 1 of Table 4, subsidiaries whose capital ratios rise by 100 basis points more via excess internal equity injections on the date of TARP arrival also experience a deterioration in CAMELS ratings by an average of 0.08 points post-crisis (higher CAMELS indicate a worse score). This is consistent with the idea that the expectations about future distress revealed by the parent's excess injection decision on the arrival date of

TARP eventually gets captured by future supervisory distress measures once tangible evidence of the worsening of profitability arrives on subsidiary balance sheets (such as the worsening post-crsisi profitability evident in Table 3). In this way, regulatory information eventually incorporates the parent's private information with a lag. Notice that the excess internal equity injections from SBHC parents do not hold any such predictive power for post-crisis subsidiary distress (as shown in column 2).

Insert Table 4

Figure 5 provides an illustration of this effect, plotting the time-specific coefficients in a slightly adjusted version of equation (2).[18] This shows that subsidiaries that received positive an excess amount of internal equity injections from their MBHC parents on the date of TARP arrival subsequently demonstrate worse CAMELS exam results several quarters after the crisis. In this way, the predictive nature of the excess internal equity injection decision suggest that bank holding companies hold a significant amount of expertise and private information about each subsidiary's post-crisis type.

c. Excess Internal Equity Injections as a Predictor of Local Post-Crisis Economic Outcomes

The results in subsection 6.b present evidence that MBHC parents plant equity at subsidiaries in anticipation of a future deterioration in profitability and distress. The next tables and figures explore whether the choice of how much TARP CPP funds to provide as excess internal equity injections also reveal bank expectations about the deterioration of *future* investment opportunities in geographical markets that the given subsidiary operates in.

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[18] Specifically, this figure plots the 90th percent confidential intervals for coefficients β_α estimated for each Date*Excess Internal Equity Injection term ($for\ \alpha\epsilon\{-5,5\}$) in the following specification: $CAMELS_{spt} = \beta_0 + \sum_{\alpha=-5}^{5} \beta_\alpha \cdot \mathbb{1}[t = TARP\ Arrival\ Date_p + \alpha] \cdot Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p} + \beta_6 \cdot Subsidiary\ Controls_{s,p,t-1} + \beta_7 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{spt}$.

We observe that the weighted-average excess amount of internal equity injections associated with banks that are competing within a state forms an aggregated signal of bank private information about future revenue growth at very small businesses (nonemployer firms), as displayed in Figure 6. Specifically, this figure shows a negative cross-sectional relationship between a state's ex-ante excess internal equity injection signal on the date of TARP arrival and the state's post-crisis three-year cumulative growth in revenues at nonemployer firms from 2009 to 2011.

Insert Figure 6

The regression results of Table 5 corroborate this evidence by showing that if the subsidiaries competing for small business credit investments within a state experience a weighted average excess equity injection of 100 basis points on the date of TARP arrival, revenues at nonemployer firms in that state subsequently grow 233 basis points *slower* per year during the post-crisis recovery period. Consistent with findings from the previous tables, this predictability only holds for the signal constructed using excess internal equity injections from MBHC parents (columns 1 and 2), and not the signal constructed using excess internal injections from SBHC parents (columns 3 and 4).

Insert Table 5

We also find evidence that the aggregated state-level signal of excess internal equity injections has predictive power for future employment growth at small businesses located in the state, as displayed in Figure 7. Specifically, this figure shows a negative cross-sectional relationship between a state's ex-ante excess internal equity injection signal on the date of TARP arrival and the state's post-crisis three-year cumulative growth in small business employment from 2009 to 2011.

Insert Figure 7

Table 6 corroborates this finding. Specifically, if the subsidiaries competing for small business credit investments within a state experience a weighted average excess internal equity injection of 100 basis points on the date of TARP arrival, employment growth at small businesses (i.e., defined as establishments with nine or fewer employees) is reduced by 97 basis points more per year during the post-crisis period. It is important to note that this predictability only holds for the signal constructed using excess internal injections from MBHC parents (columns 1 and 2), and not the signal constructed using excess internal injections from SBHC parents (columns 3 and 4), which do not incur costs from the trapped capital constraint.

Insert Table 6

Figure 8 shows that not only do larger excess internal equity injection signals from MBHCs predict lower post-crisis employment growth at a given establishment, but we also observe a reduction in the number of establishments located in these states (extensive margin). Specifically, this figure shows a negative cross-sectional relationship between a state's ex-ante MBHC excess internal equity injection signal on the date of TARP arrival and the post-crisis cumulative growth in small business establishments from 2009 to 2011.

Insert Figure 8

Table 7 corroborates this finding. Specifically, if the subsidiaries competing for small business credit investments within a state experience a weighted average excess equity injection signal of 100 basis points on the date of TARP arrival, establishment growth at small businesses is reduced by 108 basis points more per year during the post-crisis period. It is important to note that this predictability only holds for the signal constructed using excess internal injections from MBHC parents (columns 1 and 2), and not the signal constructed using excess internal injections from SBHC parents (columns 3 and 4), which do not incur costs from the trapped capital constraint.

Insert Table 7

Figure 9 complements the labor results on the decline in employment and establishments, as we also observe a reduction in payroll growth at small businesses located in states that experienced higher excess internal equity injection signals from MBHCs. Specifically, this figure shows a negative cross-sectional relationship between a state's ex-ante excess internal equity injection on the date of TARP arrival and the post-crisis cumulative growth in small business payroll from 2009 to 2011.

Insert Figure 9

Tables 8 and 9 corroborate this finding. Specifically, if the subsidiaries competing for small business credit investments within a state experienced a weighted average excess equity injection signal of 100 basis points on the date of TARP arrival, payroll growth and average wages at small businesses grew 174 basis points and 336 basis points slower during the post-crisis period, respectively. It is important to note that this predictability only holds for the signal constructed using excess internal injections from MBHC parents (columns 1 and 2), and not the signal constructed using excess internal injections from SBHC parents (columns 3 and 4), which do not incur costs from the trapped capital constraint.

Insert Tables 8 and 9

Tables 5 through 9 and Figures 6 through 9 show evidence consistent with the theme that the MBHC parent's choice to inject excess internal equity on TARP arrival reveals information about the general deterioration in the quality of future potential investment opportunities, reflected in the fact that geographies receiving excess internal injections experience a slowdown in small business revenues, employment, establishments, payroll, and wages. Table 10 as well as Figures 9 and 10 circle back to the subsidiary's post-crisis decisions with respect to new credit allocations in these regions. Specifically, Table 10 shows that if an MBHC subsidiary received an excess internal equity injection of 100 basis points, it subsequently reduced its *new* small business credit originations (flow) in the post-crisis period by an economically and statistically significant meaningful 48 percent per year. Figure 10 provides an illustration of this effect, plotting the time-specific coefficients in a slightly adjusted version of equation (5).[19] Figure 11 illustrates a negative cross-sectional relationship between a state's ex-ante MBHC excess internal equity injection signal on the date of TARP arrival and the post-crisis cumulative growth in small business credit originations. These findings are consistent with the notion that banks act on their own private information and subsequently curtail new lending exposures to these problematic regions post-crisis, which coincides with the underperformance of local macroeconomic conditions in these regions post-crisis demonstrated in Tables 5 through 9 and Figures 6 through 9. As discussed before, the excess injections signals constructed from SBHCs do not show any relationship with respect to their post-crisis small business credit originations.

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[19] Specifically, this figure plots the 90[th] percent confidential intervals for coefficients β_α estimated for each Date*Excess Internal Equity Injection term ($for\ \alpha \epsilon \{2005{,}2011\}$) in the following specification:

$$Ln(SmallBusinessCreditOriginations)_{cspt} = \beta_0 + \sum_{\alpha=2005}^{2011} \beta_\alpha \cdot \mathbb{1}[t=\alpha] \cdot Excess\ Internal\ Capital\ Injection_{s,p,TARP\ Arrival\ Date_p} + \beta_2 \cdot SupPrbofFailure_{s,p,t-1} + \beta_3 \cdot SupPrbofRatingDowngrade_{s,p,t-1} + \beta_4 \cdot Subsidiary\ Controls_{s,p,t-1} + \beta_5 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{spt}$$

Insert Table 10

7. Conclusion

Our paper shows that frictions or costs associated with banks' internal capital markets can be exploited to extract a credible signal of banks' private information. Our signal has unique predictive power for post-crisis real outcomes, which we introduce as the *revealed information* role of internal capital markets—a new contribution to the literature. Our identification strategy exploits a regulatory constraint imposed during the 2008 financial crisis on the bank internal capital market that made internal equity injections to bank subsidiaries difficult to reverse by limiting their ability to pay dividends upstream to their parent. When the US government initiated a $176 billion recapitalization program during the crisis, this constraint made it *costly* ex-ante for MBHCs to use these funds to recapitalize subsidiaries against anticipated future losses, because lending the funds to subsidiaries as debt instead was exempt from the constraint and thus carried an *option value* of future reallocations to sibling subsidiaries. SBHCs form a placebo group because they did not find this option valuable, as they have no sibling subsidiaries to reallocate funds towards. We show, first, that MBHCs treated internal equity injections as a scarce resource when emergency funds arrived, whereas SBHCs did not. Second, controlling for supervisory ratings, we find that "excess" internal equity injections by MBHCs reveal their private information about post-crisis subsidiary conditions (i.e., future profitability, supervisory ratings, default probabilities, credit originations). Third, the geographical aggregation of these individual bank signals from MBHCs predicts the real transmission effects of the Lehman bankruptcy on the "small firm" economy at the state level (i.e., growth in small business employment, number of establishments, payroll, wages, and nonemployer firm revenues). In contrast, excess internal equity injection signals from SBHCs have no ability to predict either subsidiary distress or real outcomes, consistent with the notion that these injections were not costly actions and thus not credible signals of their private information.

Rather than relying on the traditional tests that use borrower stock price reactions to loan announcements, our study provides a unique, more direct test of the special role that banks play in the economy as efficient information producers (e.g., Diamond (1984), Fama (1985)) by directly showing the predictive power of the costly bank internal equity injections for future financial and real outcomes. Consistent with this theory, our findings suggest that the information production technology of banks is likely very cost-efficient. Our results suggest that banks hold valuable private information that is useful for predicting small business outcomes at the state level, e.g., post-crisis growth in small business revenues, employment, establishments, payroll, and wages. To the best of our knowledge, this is the first study to establish a predictive signal that can be used in real time to forecast the real transmission effects of a systemic crisis on small firms across geographies.

One policy implication is that supervisors can potentially use this method to extract granular, private information in real time from banks about which local geographies they expect employment and welfare to be most impacted as a result of a systemic crisis. However, aside from imposing regulatory costs on internal injections, the signal's construction requires the presence of a large government-sponsored recapitalization program. Recapitalization programs typically only occur if the crisis event leads to a bank insolvency issue (which did not occur during the recent COVID crisis). However, when CPP-like programs do occur (33 worldwide in the past 40 years), our paper finds that there is an opportunity for regulators to utilize banks' special role as information producers. Extracting this information in real time during a downturn may aid in designing more targeted and efficient stimulus programs for small businesses. This has become particularly valuable given the novel kinds of targeted stimulus program that were introduced post-COVID (e.g., Paycheck Protection Program, Main Street Lending Program).

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Tables and Figures

Table 1. Summary Statistics

This table provides summary statistics for key panel variables at the subsidiary, bank holding company, and subsidiary-county levels, and various state-level macroeconomic data. The table reports the observations, mean, standard deviation, 10th, 25th, median, 75th, and 90th percentiles for each variable. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, FFIEC Community Reinvestment Act data, US Treasury TARP CPP Transaction Reports, Census Bureau (Nonemployer Statistics, Statistics of US Businesses), Bureau of Economic Analysis, Bureau of Labor Statistics, FHFA, CRSP.

Percentile	Obs	Std Dev	10th Perc	25th Perc	50th Perc	75th Perc	90th Perc
Bank Subsidiary Variables (Subsidiary-Quarter Level)							
Internal Equity Injection (%)	9037	0.46	0.00	0.00	0.00	0.01	0.40
Internal Equity Injection on TARP Arrival (%)	9037	1.04	0.00	0.00	0.53	1.92	2.63
MBHC Excess Internal Equity Injection on TARP Arrival (%)	4633	0.72	-0.63	-0.44	-0.19	0.13	1.06
SBHC Excess Internal Equity Injection on TARP Arrival (%)	4251	1.08	-1.49	-1.18	0.10	1.02	1.38
CAMELS Rating	9036	0.73	1.00	2.00	2.00	2.00	3.00
Sup-estimated Probability of Failure (%)	9036	11.80	0.01	0.03	0.17	0.84	5.25
Sup-estimated Probability of Ratings Downgrade (%)	9036	26.96	0.71	1.53	6.19	24.91	65.49
Nat. Log of Bank Sub Total Assets (Thous. USD)	9037	1.51	12.19	13.03	13.80	14.76	16.27
Bank Sub Tier 1 Capital Ratio (%)	9016	15.98	9.00	9.66	10.85	12.76	15.79
Bank Sub Liquid Asset Ratio (%)	9037	12.51	2.90	5.18	8.92	14.29	22.91
Bank Sub Deposit Ratio (%)	9037	15.58	64.69	73.03	79.51	84.19	87.43
Bank Sub ROA, Quarterly (%)	9037	0.52	-0.39	0.06	0.27	0.44	0.61
Bank Sub ROE, Quarterly (%)	9037	10.56	-4.33	0.64	3.16	5.30	7.27
Bank Holding Company Variables (BHC-Quarter Level)							
Nat. Log of BHC Total Assets (Thous. USD)	5663	1.53	13.31	13.66	14.28	15.27	16.69
BHC Tier 1 Capital Ratio (%)	5663	2.82	8.85	9.97	11.39	13.14	14.98
BHC Liquid Asset Ratio (%)	5663	8.15	5.45	7.82	11.83	16.95	23.13
BHC Deposit Ratio (%)	5663	8.37	66.33	72.32	78.36	82.98	86.06
BHC ROA, Quarterly (%)	5659	0.28	-0.27	0.04	0.15	0.25	0.32
Number of Subsidiaries per MBHC	-	5	2	2	3	5	10
TARP Arrival Date	-	-	08Q4	08Q4	09Q1	09Q1	09Q1
Small Business Lending Variable (Subsidiary-County-Year Level)							
Nat. Log of Small Bus. Loan Originations (Thous. USD)	191678	3.22	4.32	5.71	5.81	7.15	8.67

Table 1: continued

Percentile	Obs	Std Dev	10th Perc	25th Perc	50th Perc	75th Perc	90th Perc
Local Macro Variables (State-Year Level)							
MBHC Excess Internal Equity Injection on TARP Arrival (%)	352	0.20	-0.06	0.00	0.17	0.29	0.51
SBHC Excess Internal Equity Injection on TARP Arrival (%)	376	0.59	-1.11	-0.86	-0.52	-0.02	0.54
Annual Small Business Employment Growth (%)	370	1.78	-2.83	-1.52	-0.12	0.94	2.08
Annual Small Business Establishment Growth (%)	370	4.41	-8.17	-6.42	-3.05	-0.30	3.56
Annual Small Business Payroll Growth (%)	369	4.42	-7.70	-5.64	-2.53	0.82	3.52
Nat Log of Small Business Avg Weekly Wage	373	6.31	6.39	6.47	6.49	6.59	6.69
Annual Nonemployer Firm Revenue Growth (%)	311	-1.80	1.67	3.44	3.17	5.31	7.22
Annual Per Capita Real GDP Growth (%)	392	2.77	-2.99	-0.61	1.13	2.82	3.99
Annual Per Capita Personal Income Growth (%)	392	3.26	-2.01	2.67	4.23	5.67	7.20
Annual Small Business Credit Origination Growth (%)	392	15.83	-29.08	-12.38	-0.22	9.00	14.36
Annual House Price Index Growth (%)	392	7.20	-6.21	-2.63	0.10	5.25	11.45
Annual Return on State-Based Stock Portfolio (%)	389	27.29	-34.05	-6.25	6.37	20.16	32.13

Table 2: The Internal Equity Injection of TARP CPP Funds

This table presents regression results using panel data specification of equation (1) in the text. The observations are quarterly and span 2006:Q1 to 2011:Q4. The dependent variable is the magnitude of internal equity injections provided by the parent holding company to a given bank subsidiary. This variable is measured by the percentage point increase in the subsidiary's capital ratio that results due to the parent's internal equity injection. TARP Arrival Date is a 0/1 variable denoting the date when the parent receives TARP CPP funds from the US government. CAMELS 2 Sub and CAMELS 3 Sub are 0/1 variables denoting if the subsidiary has a CAMELS 2 and 3 rating, respectively, as of the date of TARP arrival. The baseline group are subsidiaries with a CAMELS 1 rating as of the date of TARP arrival. The CAMELS * TARP Arrival Date interaction coefficient captures the extra amount of internal equity injections that occur on the day of TARP arrival for subsidiaries with different CAMELS scores. MBHC is a 0/1 variable that equals 1 if the parent is multi-bank holding company, as opposed to a single-bank holding company (SBHC). The MBHC * TARP Arrival Date interaction coefficient captures the extra amount of internal equity injections that MBHC parents provide to a given subsidiary on the day of TARP arrival as compared to SBHC parents. This coefficient provides an implied estimate of the relative reallocation option value that MBHCs possessed when they withheld equity injections. Controls include lagged subsidiary and bank holding company level characteristics. All specifications include fixed effects for bank holding company, bank subsidiary, and date. Standard errors are clustered by bank holding company. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports.

	Internal Equity Injection / Total Sub Assets (%)		
VARIABLES	All BHCs	MBHCs	SBHCs
	(1)	(2)	(3)
TARP Arrival Date [0/1]	1.216***	0.054	1.407***
CAMELS 2 Sub [0/1] * TARP Arrival Date [0/1]	0.050	0.159*	-0.153
CAMELS 3 Sub [0/1] * TARP Arrival Date [0/1]	0.435**	0.643**	0.185
MBHC [0/1]	-0.025		
MBHC [0/1] * TARP Arrival Date [0/1]	-1.031***		
Lag Sup-estimated Prb(Failure)	0.001	0.003*	-0.003**
Lag Sup-estimated Prb(Ratings downgrade)	0.002***	0.003***	0.001***
Lag Ln(Bank Sub Total Assets)	-0.039	-0.032	-0.012
Lag Bank Sub Tier 1 Capital Ratio	-0.005*	-0.002	-0.091***
Lag Bank Sub Liquid Asset Ratio	0.002	0.001	0.003
Lag Bank Sub Deposit Ratio	0.000	0.000	0.005
Lag Bank Sub ROA	-0.056***	-0.066***	0.024
Lag Ln(BHC Total Assets)	0.022	0.058	-0.051
Lag BHC Tier 1 Capital Ratio	0.006	0.003	0.049***
Lag BHC Liquid Asset Ratio	-0.002	-0.002	-0.000
Lag BHC Deposit Ratio	0.000	0.000	-0.004
Lag BHC ROA	-0.045	-0.096**	-0.080
Constant	0.253	-0.422	1.375
Observations	9,037	4,708	4,315
R-squared	0.309	0.268	0.385
BHC FE, BankSub FE, Date FE	Y	Y	Y

Standard Errors Clustered by BHC

*** p<0.01, ** p<0.05, * p<0.1

Table 3: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Subsidiary Profitability

This table presents regression results using the panel data specification of equation (2) in the text. The observations are quarterly and span from 5 quarters before and after each BHC receives TARP CPP funds. The dependent variables represent the subsidiary-level annualized return-on-assets and return-on-equity. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS exam score. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. PostTARP is a 0/1 variable that equals 1 for all dates on and after the BHC receives TARP CPP funds. The interaction coefficient captures the relative difference in post-TARP subsidiary performance across subsidiaries that received different ex-ante amounts of excess internal equity injections from their respective parents upon TARP arrival. This result shows that the parent's excess internal equity injection predicts future subpar post-crisis performance by the subsidiary. MBHC is a 0/1 variable that equals 1 if the parent is a multi-bank holding company, as opposed to a single-bank holding company (SBHC). Controls include lagged subsidiary and bank holding company level characteristics. All specifications include fixed effects for bank holding company, bank subsidiary, and date. Standard errors are clustered by bank holding company. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports

	Bank Sub ROA		Bank Sub ROE	
VARIABLES	MBHC (1)	SBHC (2)	MBHC (3)	SBHC (4)
PostTARP * Excess Internal Equity Injection on TARP Arrival	-0.434**	0.036	-3.288**	0.363
Lag Sup-estimated Prb(Fail)	-0.017	0.010	-0.058	0.124
Lag Sup-estimated Prb(Downgrade)	-0.021***	-0.018***	-0.195***	-0.144***
Lag CAMELS score 2 [0/1]	-0.502	0.106	-4.913	0.281
Lag CAMELS score 3 [0/1]	-0.703	-0.476*	-5.636	-3.942*
Lag Ln(Bank Sub Total Assets)	0.507	-1.584	3.106	-10.509
Lag Bank Sub Tier 1 Cap Ratio	-0.018*	-0.198***	-0.033	-0.614
Lag Bank Sub Liquid Asset Ratio	0.002	-0.033	-0.029	-0.005
Lag Bank Sub Deposit Ratio	0.014	-0.135**	0.068	-0.054
Lag Ln(BHC Total Assets)	0.634	1.743*	5.885	13.966
Lag BHC Tier 1 Cap Ratio	0.117	0.083	0.549	-0.578
Lag BHC Liquid Asset Ratio	-0.008	0.021	-0.068	0.065
Lag BHC Deposit Ratio	0.008	0.128**	-0.196	-0.034
Constant	-18.372*	0.059	-115.886	-22.874
Observations	2,448	1,984	2,240	1,874
R-squared	0.605	0.480	0.606	0.539
BHC FEs, Bank Sub FEs, and Date FEs	Y	Y	Y	Y

Standard Errors Clustered by BHC
*** p<0.01, ** p<0.05, * p<0.1

Table 4: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Subsidiary Distress (Supervisory Ratings)

This table presents regression results using panel data specification of equation (2) in the text. The observations are quarterly and span 5 quarters before and after each BHC receives TARP CPP funds. The dependent variable represents the subsidiary-level CAMELS score assessed by supervisory onsite exams. A higher CAMELS rating means more distress. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS exam score. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. PostTARP is a 0/1 variable that equals 1 for all dates on and after the BHC receives TARP CPP funds. The interaction coefficient captures the relative difference in post-TARP supervisory assessments across subsidiaries that received different ex-ante amounts of excess internal equity injections from their respective parents upon TARP arrival. This result shows that the parent's excess internal equity injection predicts future post-crisis distress of the subsidiary. MBHC is a 0/1 variable that equals 1 if the parent is a multi-bank holding company, as opposed to a single-bank holding company (SBHC). Controls include lagged subsidiary and bank holding company level characteristics. All specifications include fixed effects for bank holding company, bank subsidiary, and date. Standard errors are clustered by bank holding company. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports.

	Subsidiary CAMELS Rating	
VARIABLES	MBHC (1)	SBHC (2)
PostTARP * Excess Internal Equity Injection on TARP Arrival	0.0792*	-0.0211
Lag Bank Sub Tier 1 Cap Ratio	0.00407	0.0290
Lag Bank Sub Liquid Asset Ratio	0.00441**	0.0316**
Lag Ln(Bank Sub Total Assets)	0.152	0.202
Lag Bank Sub Deposit Ratio	-0.000342	0.00586
Lag Bank Sub ROA	-0.0769***	-0.0344
Lag BHC Tier 1 Cap Ratio	-0.0387**	-0.0567***
Lag BHC Liquid Asset Ratio	0.00813	-0.0117
Lag Ln(BHC Total Assets)	-0.295	-0.930***
Lag BHC Deposit Ratio	0.0141***	0.000844
Lag BHC ROA	-0.140*	-0.181
Constant	3.800	12.28***
Observations	2,458	2,003
R-squared	0.760	0.685
BHC FE, Bank FEs, and Date FEs	Y	Y

Standard Errors Clustered by BHC
*** p<0.01, ** p<0.05, * p<0.1

Table 5: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Nonemployer Firm Revenue Growth at the State Level

This table presents regression results using panel data specification from equation (4) in the text. The observations are yearly and span 2004 to 2011. The dependent variable represents the annual growth rate in revenues of nonemployer firms in a given state and year. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. In this table, we use an aggregated version of these signals by calculating state-level averages of the individual bank-level excess injection signals, weighted by each subsidiary's ex-ante small business credit exposures in the given state. For the independent variable, the left panel uses the state-aggregated excess internal equity injection calculated from multi-bank holding companies (MBHCs), whereas the right panel uses the state-aggregated excess internal equity injection calculated from single-bank holding companies (SBHCs). Post Crisis is a 0/1 variable that equals 1 for 2009 onwards. The coefficient of the interaction term Post Crisis * State-Level Excess Internal Equity Injection captures the relative difference in post-crisis state-level annual revenue growth at nonemployer firms across states that experienced different ex-ante excess internal equity injection signals. Controls include lagged state-level macroeconomic variables. All specifications include fixed effects for state and year. Standard errors are clustered by state. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Nonemployer Statistics), Bureau of Economic Analysis, FFIEC Community Reinvestment Act data, FHFA, CRSP.

	State-Level Nonemployer Firm Annual Revenue Growth (%)			
	Signal from MBHCs		Signal from SBHCs	
VARIABLES	(1)	(2)	(3)	(4)
Post Crisis * State-Level Excess Internal Equity Injection on TARP Arrival	-2.292**	-2.325**	-0.718	-0.538
Lag State-Level Per Capita Real GDP Growth	0.146*	0.139	0.109	0.0979
Lag State-Level Per Capita Personal Income Growth	0.0312	-0.00179	0.0593	0.0346
Lag State-Level Small Business Credit Origination Growth	-0.00137	-0.0151	0.0100	-0.00535
Lag State-Level Housing Price Index Growth		0.0766**		0.0911***
Lag State-Level Stock Price Return		0.0118**		0.00909*
Constant	2.724***	2.406***	2.422***	2.098***
Observations	344	341	352	349
R-squared	0.718	0.729	0.703	0.714
State FEs, Year FEs	Y	Y	Y	Y

Standard Errors Clustered by State

*** p<0.01, ** p<0.05, * p<0.1

Table 6: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Small Business Employment Growth at the State Level

This table presents regression results using panel data specification from equation (4) in the text. The observations are yearly, spanning 2004 to 2011. The dependent variable represents the annual growth rate in employment in a given state and year (for establishments with nine or fewer employees). Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. For the independent variable, we use two aggregated versions of these signals by calculating state-level averages of the individual bank-level excess injection signals, weighted by each subsidiary's ex-ante small business credit exposures in the given state. The first version (left panel) uses the state-aggregated excess internal equity injection calculated from multi-bank holding companies (MBHCs), whereas the second version (right panel) uses the state-aggregated excess internal equity injection calculated from single-bank holding companies (SBHCs). Post Crisis is a 0/1 variable that equals 1 for 2009 onwards. The coefficient of the interaction term Post Crisis * State-Level Excess Internal Equity Injection captures the relative difference in post-crisis small business annual employment growth across states that experienced different ex-ante excess internal equity injection signals. Controls include lagged state-level macroeconomic variables. All specifications include fixed effects for state and year. Standard errors are clustered by state. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses), Bureau of Economic Analysis, FFIEC Community Reinvestment Act data, FHFA, CRSP.

	Small Business Annual Employment Growth (%)			
	Signal from MBHCs		Signal from SBHCs	
VARIABLES	(1)	(2)	(3)	(4)
Post Crisis * State-Level Excess Internal Equity Injection on TARP Arrival	-0.931*	-0.973**	-0.250	-0.158
Lagged State-Level Per Capita Real GDP Growth	0.0251	0.0254	0.0242	0.0233
Lagged State-Level Per Capita Personal Income Growth	0.145***	0.128***	0.146***	0.136***
Lagged State-Level Small Business Credit Origination Growth	0.0134**	0.00653	0.0176***	0.0106*
Lagged State-Level Housing Price Index Growth		0.0511***		0.0527***
Lagged State-Level Stock Price Return		0.00430		0.00365
Constant	-0.582***	-0.760***	-0.712***	-0.898***
Observations	339	335	349	345
R-squared	0.811	0.824	0.806	0.818
State FEs, Year FEs	Y	Y	Y	Y

Standard Errors Clustered by State
*** p<0.01, ** p<0.05, * p<0.1

Table 7: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Small Business Establishment Growth at the State-Level

This table presents regression results using panel data specification from equation (4) in the text. The observations are yearly, spanning 2004 to 2011. The dependent variable represents the annual growth rate in establishments in a given state and year (for establishments with nine or fewer employees). Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. In this table, we use two aggregated versions of these signals by calculating state-level averages of the individual bank-level excess injection signals, weighted by each subsidiary's ex-ante small business credit exposures in the given state. The first version (left panel) uses the state-aggregated excess internal equity injection signal calculated from multi-bank holding companies (MBHCs), whereas the second version (right panel) uses the state-aggregated excess internal equity injection signal calculated from single-bank holding companies (SBHCs). Post Crisis is a 0/1 variable that equals 1 for 2009 onwards. The coefficient of the interaction term Post Crisis * State Level Excess Internal Equity Injection captures the relative difference in post-crisis small business annual establishment growth across states that experienced different ex-ante excess internal equity injection signals. Controls include lagged state-level macroeconomic variables. All specifications include fixed effects for state and year. Standard errors are clustered by state. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses), Bureau of Economic Analysis, FFIEC Community Reinvestment Act data, FHFA, CRSP.

	Small Business Annual Establishment Growth (%)			
	Signal from MBHCs		Signal from SBHCs	
VARIABLES	(1)	(2)	(3)	(4)
Post Crisis * State-Level Excess Internal Equity Injection on TARP Arrival	-1.085**	-1.077**	-0.233	-0.106
Lag State-Level Per Capita Real GDP Growth	-0.0185	-0.0196	-0.00790	-0.0107
Lag State-Level Per Capita Personal Income Growth	0.173***	0.145***	0.156***	0.134***
Lag State-Level Small Business Credit Origination Growth	0.00406	-0.00560	0.00771	-0.00262
Lag State-Level Housing Price Index Growth		0.0641***		0.0677***
Lag State-Level Stock Price Return		0.00170		0.00185
Constant	-0.678***	-0.842***	-0.750***	-0.924***
Observations	346	342	352	348
R-squared	0.786	0.803	0.778	0.798
State FE, Year FE	Y	Y	Y	Y

Standard Errors Clustered by State
*** p<0.01, ** p<0.05, * p<0.1

Table 8: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Small Business Payroll Growth at the State-Level

This table presents regression results using panel data specification from equation (4) in the text. The observations are yearly, spanning 2004 to 2011. The dependent variable represents the annual growth rate in small business payroll expenses in a given state and year (for establishments with nine or fewer employees). Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. In this table, we use two aggregated versions of these signals by calculating state-level averages of the individual bank-level excess injection signals, weighted by each subsidiary's ex-ante small business credit exposures in the given state. The first version (left panel) uses the state-aggregated excess internal equity injection signal calculated from multi-bank holding companies (MBHCs), whereas the second version (right panel) uses the state-aggregated excess internal equity injection signal calculated from single-bank holding companies (SBHCs). Post Crisis is a 0/1 variable that equals 1 for 2009 onwards. The coefficient of the interaction term Post Crisis * State Level Excess Internal Equity Injection captures the relative difference in post-crisis small business annual payroll expense growth across states that experienced different ex-ante excess internal equity injection signals. Controls include lagged state-level macroeconomic variables. All specifications include fixed effects for state and year. Standard errors are clustered by state. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses), Bureau of Economic Analysis, FFIEC Community Reinvestment Act data, FHFA, CRSP.

	Small Business Annual Payroll Growth (%)			
	Signal from MBHCs		Signal from SBHCs	
VARIABLES	(1)	(2)	(3)	(4)
Post Crisis * State-Level Excess Internal Equity Injection on TARP Arrival	-1.723**	-1.743**	-0.351	-0.181
Lag State-Level Per Capita Real GDP Growth	0.0291	0.0229	0.0163	0.00690
Lag State-Level Per Capita Personal Income Growth	0.195**	0.154*	0.207***	0.176**
Lag State-Level Small Business Credit Origination Growth	0.00100	-0.00929	0.00569	-0.00537
Lag State-Level Housing Price Index Growth		0.0880***		0.0930***
Lag State-Level Stock Price Return		0.00767		0.00716
Constant	1.753***	1.470***	1.540***	1.243***
Observations	342	340	351	349
R-squared	0.714	0.725	0.702	0.714
State FE, Year FE	Y	Y	Y	Y

Standard Errors Clustered by State

*** p<0.01, ** p<0.05, * p<0.1

Table 9: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Small Business Average Weekly Wage at the State-Level

This table presents regression results using panel data specification from equation (4) in the text. The observations are yearly, spanning 2004 to 2011. The dependent variable represents the natural log of the average weekly wage in a given state and year (for establishments with nine or fewer employees). Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. In this table, we use two aggregated versions of these signals by calculating state-level averages of the individual bank-level excess injection signals, weighted by each subsidiary's ex-ante small business credit exposures in the given state. The first version (left panel) uses the state-aggregated excess internal equity injection signal calculated from multi-bank holding companies (MBHCs), whereas the second version (right panel) uses the state-aggregated excess internal equity injection signal calculated from single-bank holding companies (SBHCs). Post Crisis is a 0/1 variable that equals 1 for 2009 onwards. The coefficient of the interaction term Post Crisis * State Level Excess Internal Equity Injection captures the relative difference in post-crisis small business average log weekly wages across states that experienced different ex-ante excess internal equity injection signals. Controls include lagged state-level macroeconomic variables. All specifications include fixed effects for state and year. Standard errors are clustered by state. *, **, and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses), Bureau of Economic Analysis, FFIEC Community Reinvestment Act data, FHFA, CRSP.

	Ln(Small Business Avg Weekly Wage)			
	Signal from MBHCs		Signal from SBHCs	
VARIABLES	(1)	(2)	(3)	(4)
Post Crisis * State-Level Excess Internal Equity Injection on TARP Arrival	-0.0407**	-0.0331**	0.000616	0.00307
Lag State-Level Per Capita Real GDP Growth	0.000531	0.000402	0.000649	0.000500
Lag State-Level Per Capita Personal Income Growth	0.00146*	0.00152*	0.00152*	0.00162*
Lag State-Level Small Business Credit Origination Growth	0.000386***	0.000188*	0.000513***	0.000280**
Lag State-Level Housing Price Index Growth		0.000952***		0.00103***
Lag State-Level Stock Price Return		-6.03e-05		-6.81e-05
Constant	6.480***	6.478***	6.477***	6.476***
Observations	395	391	387	383
R-squared	0.986	0.987	0.985	0.987
State FE, Year FE	Y	Y	Y	Y

Standard Errors Clustered by State

*** p<0.01, ** p<0.05, * p<0.1

Table 10: The Predictive Value of Excess Internal Equity Injections for Post-Crisis Small Business Credit Originations

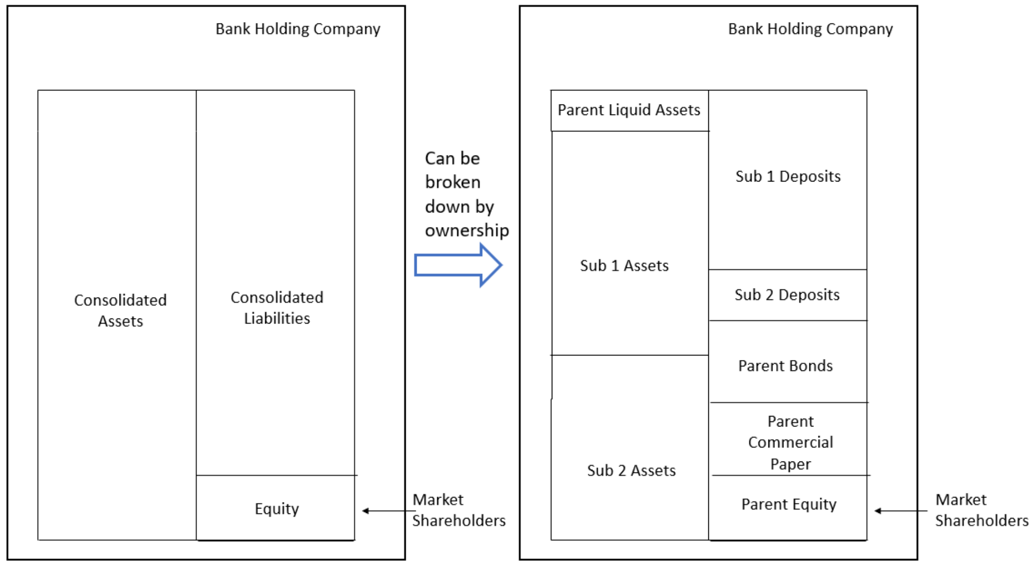
This table presents regression results using panel data specification from equation (5) in the text. The observations are yearly, spanning 2005 to 2011. The dependent variable represents the natural log of new credit originations by a subsidiary to small businesses located in a given county and year. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. PostTARP is a 0/1 variable that equals 1 for all dates on and after the BHC receives TARP CPP funds. The interaction coefficient captures the relative post-TARP difference in new county-specific credit originations across subsidiaries that received different ex-ante amounts of internal equity injections from their respective parents. MBHC is a 0/1 variable that equals 1 if the parent is multi-bank holding company, as opposed to a single-bank holding company (SBHC). Controls include lagged subsidiary and bank holding company level characteristics. All specifications include fixed effects for bank holding company, bank subsidiary, and year. Standard errors are clustered by bank holding company. *, **, and *** denote statistical significance at 10 percent, 5 percent, and 1 percent levels, respectively. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, FFIEC Community Reinvestment Act data.

	Ln(Small Business Credit Originations)					
VARIABLES	MBHC			SBHC		
	(1)	(2)	(3)	(4)	(5)	(6)
Post TARP * Excess Internal Equity Injection on TARP Arrival Date	-0.460***	-0.432***	-0.475***	-0.003	0.014	-0.012
Lag Sup-estimated Prb(Fail)	0.007	0.006	0.001	0.001	0.001	-0.002
Lag Sup-estimated Prb(Downgrade)	-0.002	-0.001	-0.002	0.000	0.001	-0.000
Lag Ln(Bank Sub Total Assets)	-0.146	-0.174	-0.030	0.254**	0.187	0.587***
Lag Bank Sub Tier 1 Cap Ratio	3.984	3.807	4.443*	8.247***	9.179***	1.601
Lag Bank Sub Liquid Asset Ratio	-2.299**	-2.429***	-2.895***	-0.806	-0.930	-0.774
Lag Bank Sub Deposit Ratio	-0.006**	-0.006**	-0.006**	0.002	-0.004	0.007
Lag Bank Sub ROA	0.155***	0.154***	0.152***	0.046	0.073*	-0.013
Lag Ln(BHC Total Assets)	0.093	0.091	0.131	-0.374	-0.285	0.171
Lag BHC Tier 1 Cap Ratio	-2.578	-3.551	-2.619	-2.642	-1.938	1.448
Lag BHC Liquid Asset Ratio	3.105	3.643**	3.540	-0.010	-0.179	-0.779
Lag BHC Deposit Ratio	0.011	0.014*	0.025***	-0.016	-0.010	0.008
Lag BHC ROA	-38.764***	-37.990***	-41.178***	-5.415	-9.731*	2.149
Constant	5.790	6.206	2.084	8.654**	8.220**	-7.131***
Observations	201,689	201,578	191,678	63,534	59,712	50,943
R-squared	0.538	0.561	0.892	0.307	0.356	0.873
BHC FE	Y	Y	Y	Y	Y	Y
CAMELS FE	Y	Y	Y	Y	Y	Y
BankSub FE	Y	Y		Y	Y	
County FE	Y			Y		
Year FE	Y			Y		
County*Year FE		Y	Y		Y	Y
BankSub*County FE			Y			Y

Standard Errors Clustered by County and BHC

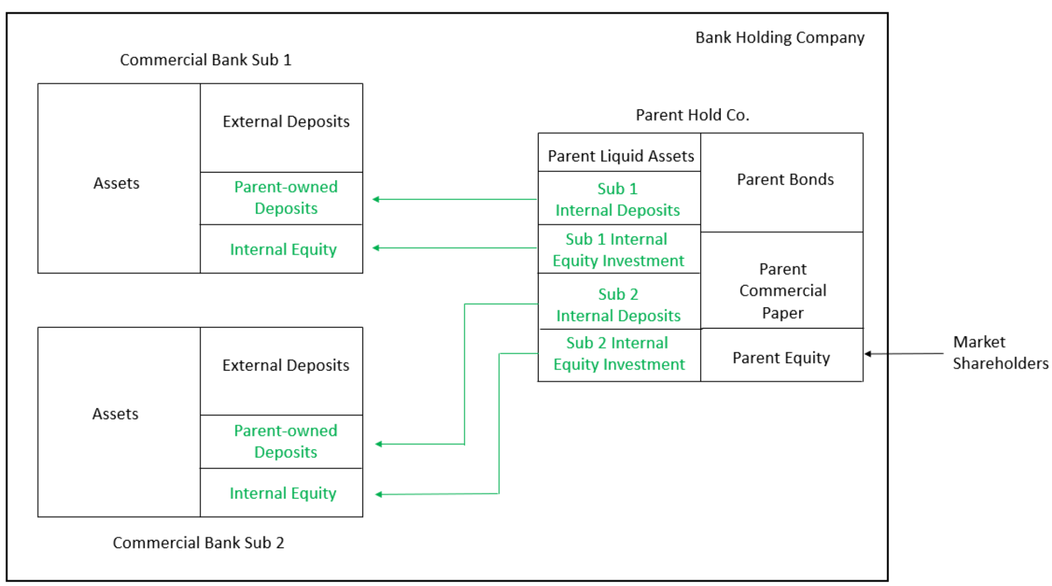
*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Consolidated View of Bank Holding Companies



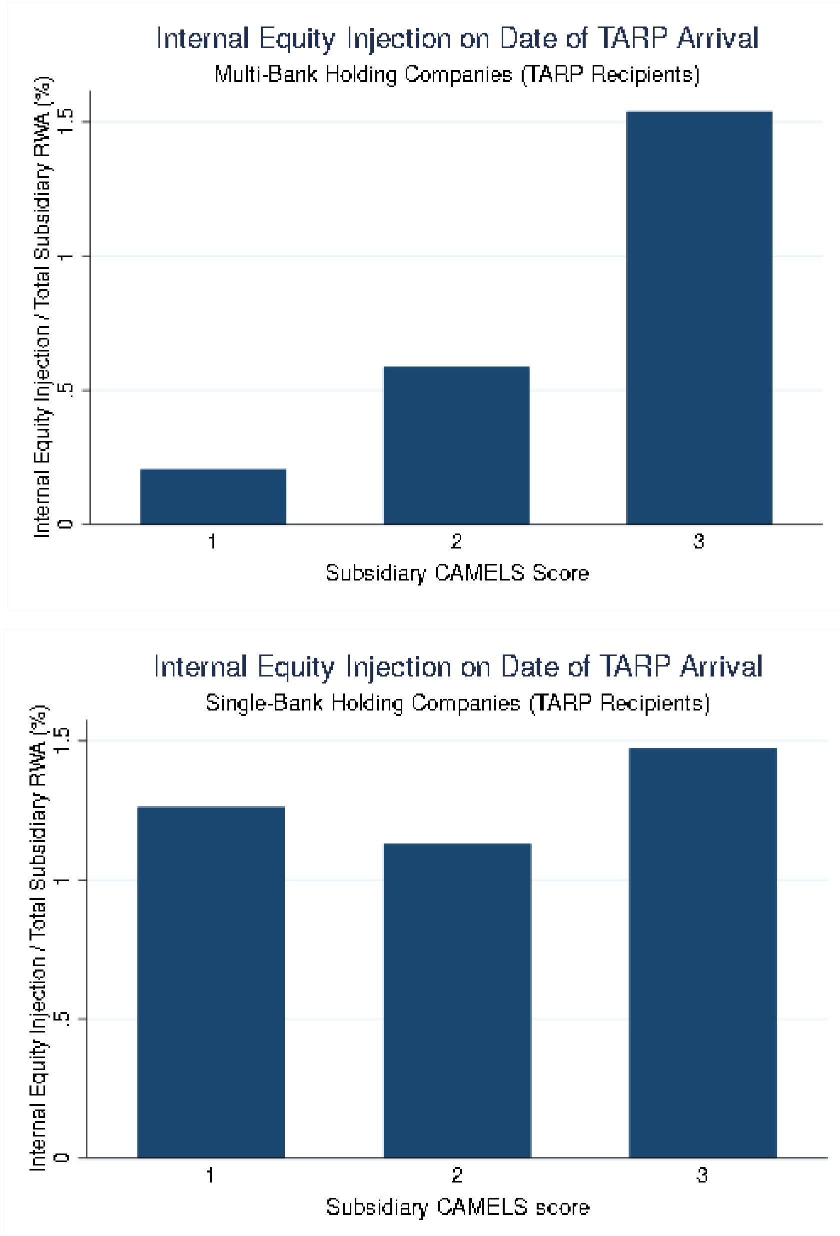
Note: This figure denotes a simplified representation of a bank holding company structure comprised of three legally-separate entities - namely, the parent holding company and two commercial bank subsidiaries. The left panel represents a traditional consolidated balance sheet of a bank holding company (similar to what might be presented in a 10-K annual report). The right panel shows that the consolidated balance sheet can be broken down by which assets and liabilities are owned by each legal entity.

Figure 2. Disaggregated "Internal Capital Markets" View of Bank Holding Companies.



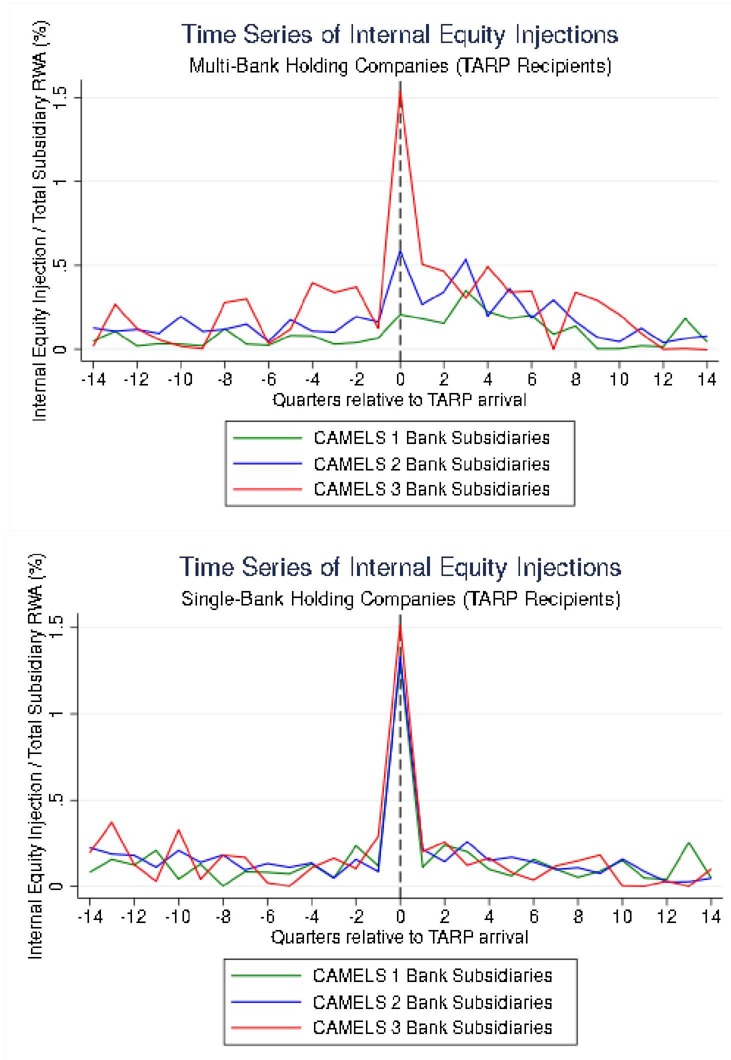
Note: This figure further disaggregates the balance sheet from the right panel in Figure 1 into three individual balance sheets (parent holding company-only, bank subsidiary 1, and bank subsidiary 2). It is important to note that the key variable of our study, the parent holding company's internal equity investment becomes visible in this disaggregated "internal capital markets" view of the banking organization.

Figure 3: Scarcity of Internal Equity Injections in the Cross Section



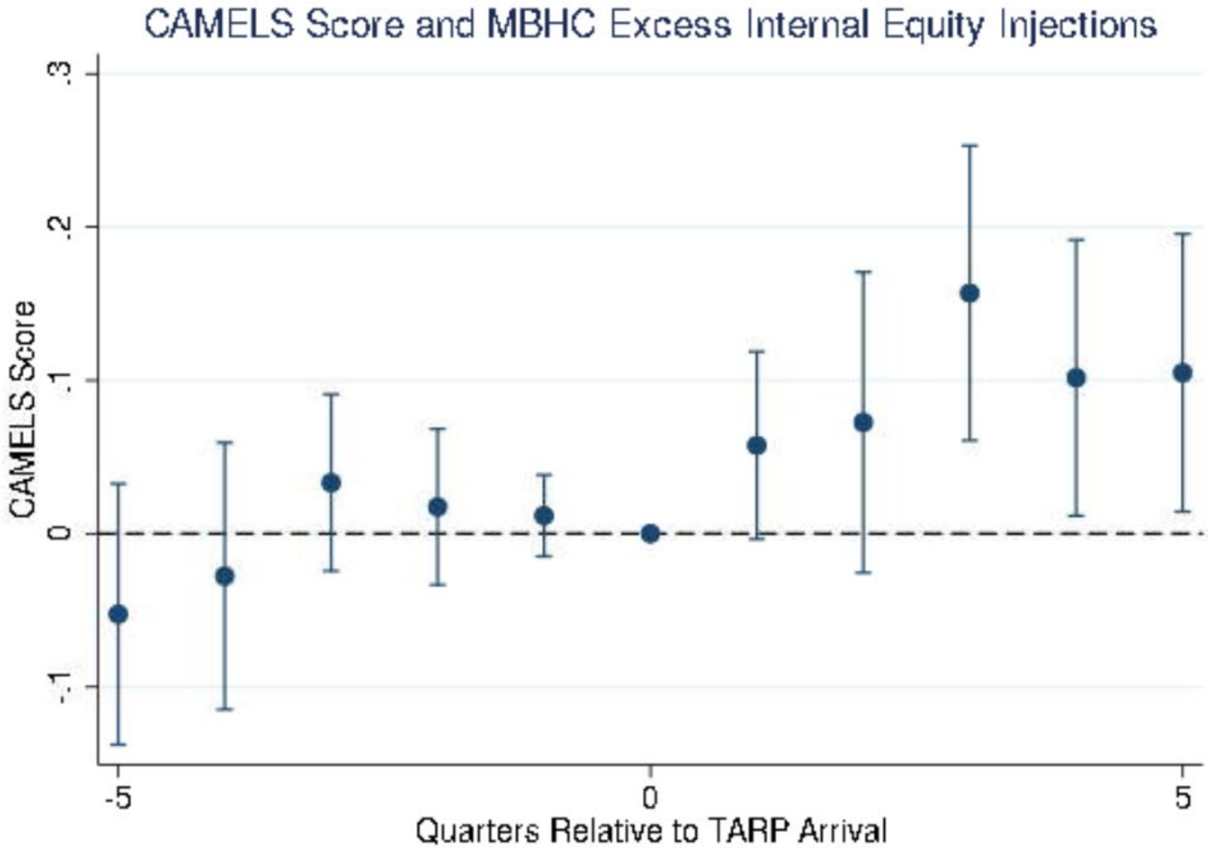
Note: This figure presents a cross-sectional plot of the average internal equity injections received by bank subsidiaries with a CAMELS ratings of 1, 2, and 3 on the date of TARP arrival. During the 2008 crisis, regulators imposed a constraint on the internal capital markets by making internal equity injections difficult to reverse. The top panel shows that multi-bank holding companies (MBHCs) portioned the use of TARP CPP funds by providing higher internal equity injections to subsidiaries with worse regulatory distress ratings (i.e., a CAMELS rating of 3, 2, and then 1). This behavior corroborates that this constraint was costly for MBHCs during the crisis, as injected equity could potentially have gotten "trapped" ex-post and thus be unavailable for reallocation to sibling subsidiaries if future shocks arose. In this way, MBHCs treated internal equity injections as a scarce good ex-ante and, thus, were more willing to incur this "trapped" capital cost when the subsidiary's pre-crisis distress rating was worse. In comparison, the bottom panel shows that single-bank holding companies (SBHCs) provided a uniform amount of internal equity injections regardless of the subsidiary's distress rating. This behavior is consistent with the notion that the regulatory constraint was not costly for SBHCs. SBHCs likely did not value the option to flexibly reallocate funds in the future, given that they had no sibling subsidiaries to reallocate funds to. Source: Call Reports, FR Y9C, CAMELS, SR SABR, US Treasury TARP CPP Transaction Reports.

Figure 4: Scarcity of Internal Equity Injections in the Time Series



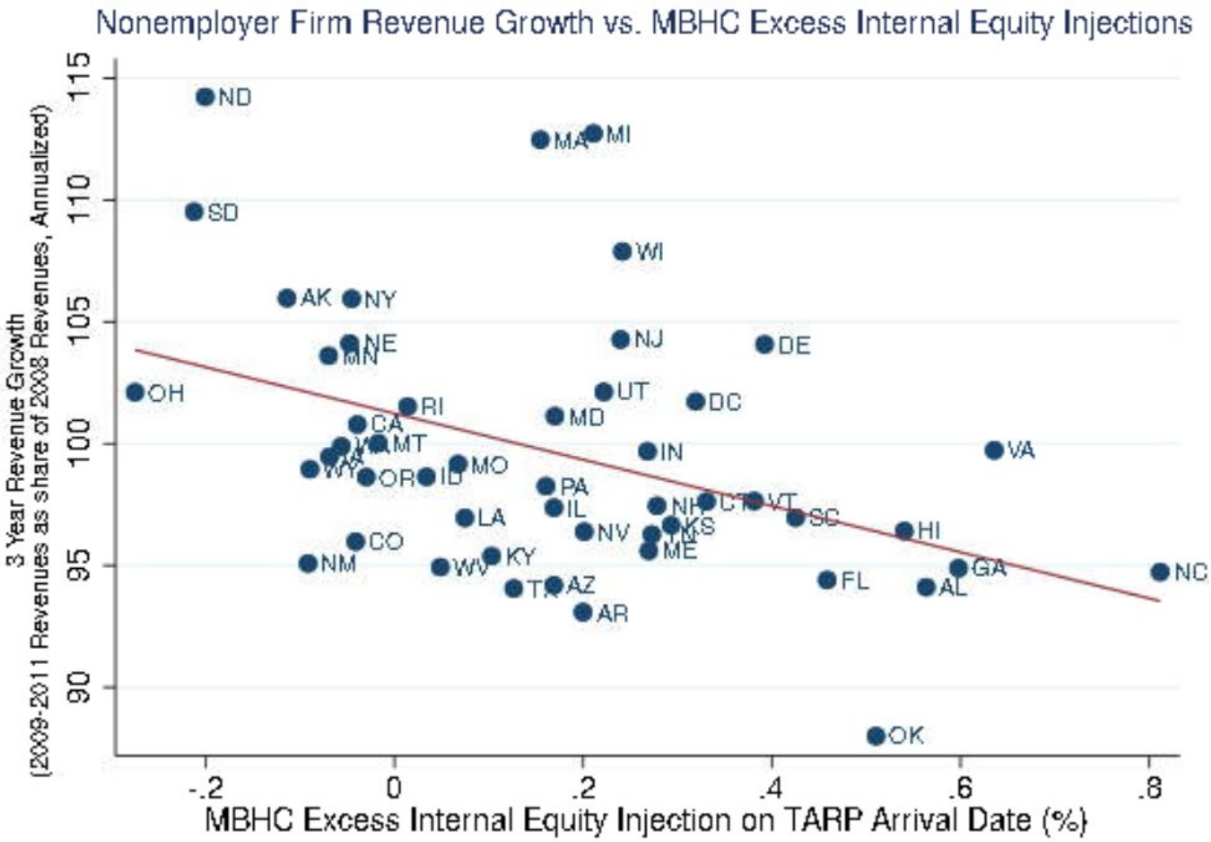
Note: This figure presents a time series plot of the average internal equity injections received by bank subsidiaries with a CAMELS ratings of 1, 2, and 3. During the 2008 crisis, enhanced scrutiny from regulators imposed a constraint on the internal capital markets by making internal equity injections difficult to reverse. This constraint created an option value for *lending* funds to the subsidiary instead of injecting equity because internal debt exposures were exempt and could be reallocated anytime. The top panel suggests multi-bank holding companies (MBHCs) found this constraint costly (because the possibility of "trapped" equity meant it could not be reallocated to sibling subsidiaries ex-post) and, thus, treated internal equity injections as a scarce resource by *prioritizing* recapitalizations at the most distressed subsidiaries sooner in time. Specifically, the top panel shows that subsidiaries with a CAMELS rating of 3 were immediately recapitalized on the first date that TARP CPP funds arrived at the MBHC parent. Meanwhile, recapitalizations at subsidiaries with a CAMELS rating of 2 were lower on date 0 and were smoothed after the arrival of TARP. Finally, recapitalizations at subsidiaries with a CAMELS rating of 1 were even lower on date 0 and also smoothed through time after the arrival of TARP. In contrast, the bottom panel shows the opposite: single-bank holding companies (SBHCs) did not treat internal equity injections as a scarce resource (e.g., the potential for "trapped" equity was less costly for SBHCs because they had no other sibling subsidiaries to reallocate to). Thus, SBHCs recapitalized their sole subsidiary uniformly (regardless of distress level) all in one shot on date 0, with no evidence of smoothing through time. The fact that MBHC internal equity injections to subsidiaries with CAMELS ratings of 2 and 3 were withheld on date 0 suggests MBHCs likely valued the flexibility to reallocate these funds as equity injections in the future in case shocks arose. Source: Call Reports, FR Y9C, CAMELS, SR SABR, US Treasury TARP CPP Transaction Reports.

Figure 5: Excess Internal Equity Injections Predicts the Subsidiary's Post-Crisis Distress (Future CAMELS Scores)



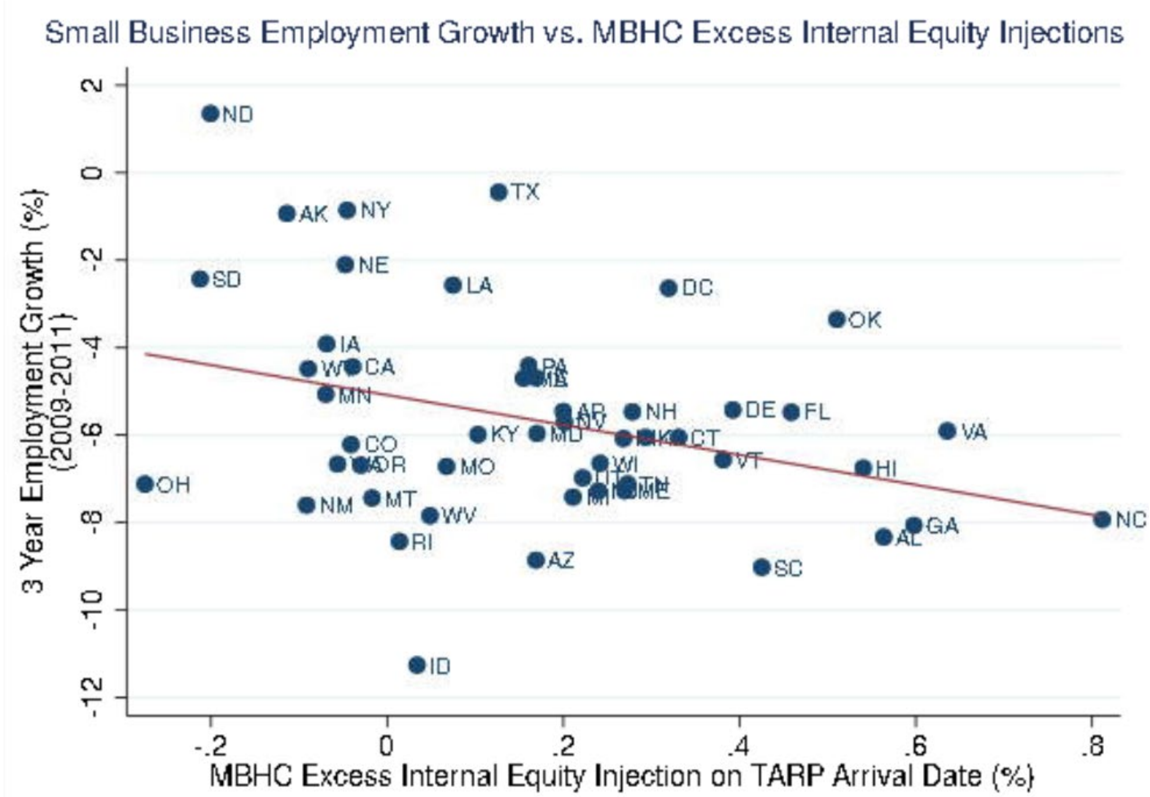
Note: This figure shows evidence that the amount of excess equity that the MBHC parent decided to internally inject upon TARP arrival revealed its private information about the subsidiary's ex-post distress post-crisis, as measured by future CAMELS ratings. Specifically, this figure plots the 90th percent confidential intervals for the estimated coefficients β_α for each Date*Excess Internal Equity Injection term ($for\ \alpha \epsilon \{-5,5\}$) in the following specification: $CAMELS_{s,p,t} = \beta_0 + \sum_{\alpha=-5}^{5} \beta_\alpha \cdot \mathbb{1}[t = TARP\ Arrival\ Date_p + \alpha] \cdot Excess\ Internal\ Equity\ Injection_{s,p,t=TARP\ Arrival\ Date_p} + \beta_6 \cdot Subsidiary\ Controls_{s,p,t-1} + \beta_7 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{s,p,t}$. S stands for subsidiary, p stands for parent holding company, and t stands for time. Note that a higher CAMELS score indicates more distress. The predictive nature of its excess internal equity injection decision reveals that bank holding companies possessed a significant amount of expertise and private information about each subsidiary's post-crisis type. Source: Call Reports, FR Y9C, CAMELS, SR SABR, US Treasury TARP CPP Transaction Reports.

Figure 6: Predictive Value of Excess Internal Equity Injections for Post-Crisis Nonemployer Revenue Growth (Cross Section)



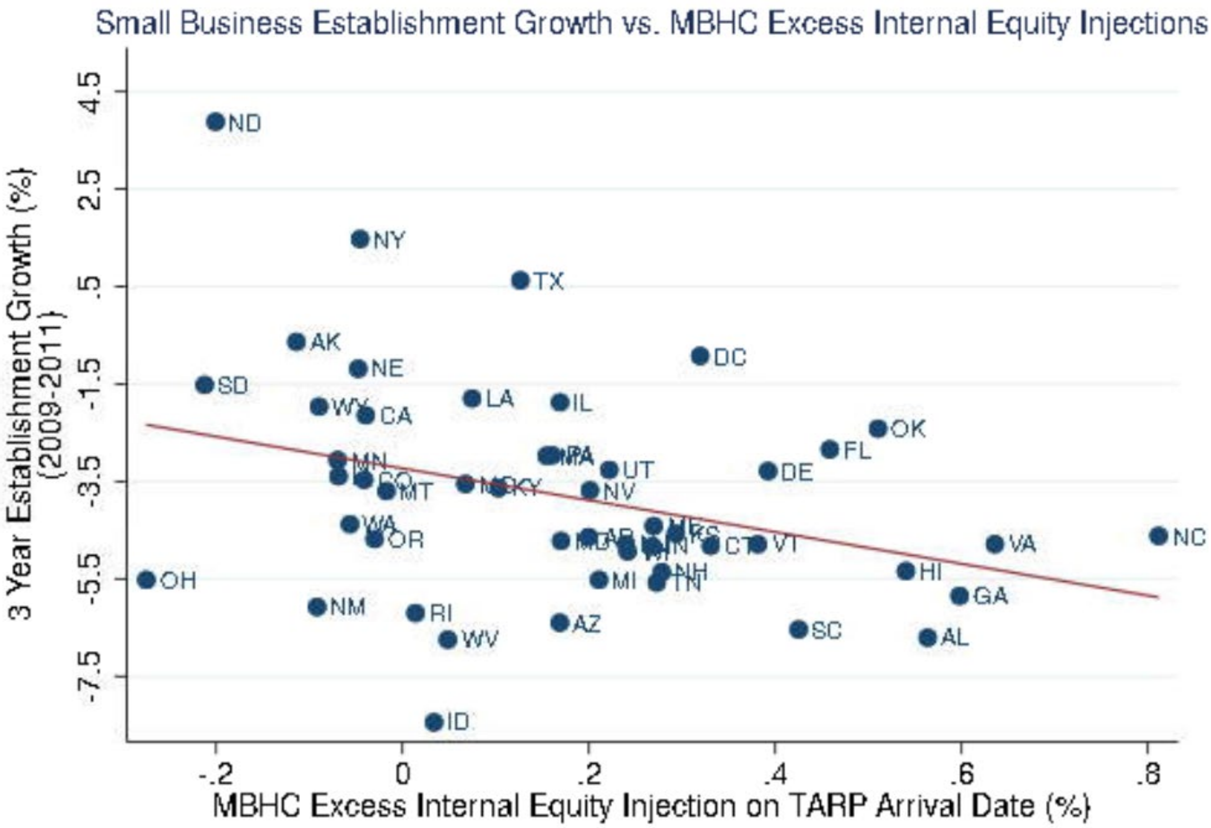
Note: This graph illustrates the predictive value of excess internal equity injections for the future post-crisis investment opportunities of very small businesses in the cross-section of states. Specifically, the x-axis shows the state-aggregated excess internal equity injections made by multi-bank holding companies (MBHCs) on the date of TARP arrival (during the 2008 crisis), while the y axis shows the post-crisis three-year cumulative growth in revenues at nonemployer firms from 2009-2011 within each respective state. Nonemployer firms are small businesses that have no paid employees but are subject to federal income tax. Nonemployer businesses appear in practically every industry and comprise the majority of nearly 80 percent of industry subsectors. Examples include firms that operate museums and hobby shops; provide pet care services; manufacture clothing, electrical equipment, and machinery; sell real estate and process data. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by its parent holding company on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. The state-aggregation of this variable (x axis) is constructed by calculating the average of the individual excess injection signals across banks that competed within a state, weighted by each subsidiary's ex-ante small business credit exposures in the given state. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Nonemployer Statistics).

Figure 7: Predictive Value of Excess Internal Equity Injections for Future Small Business Employment Growth (Cross Section)



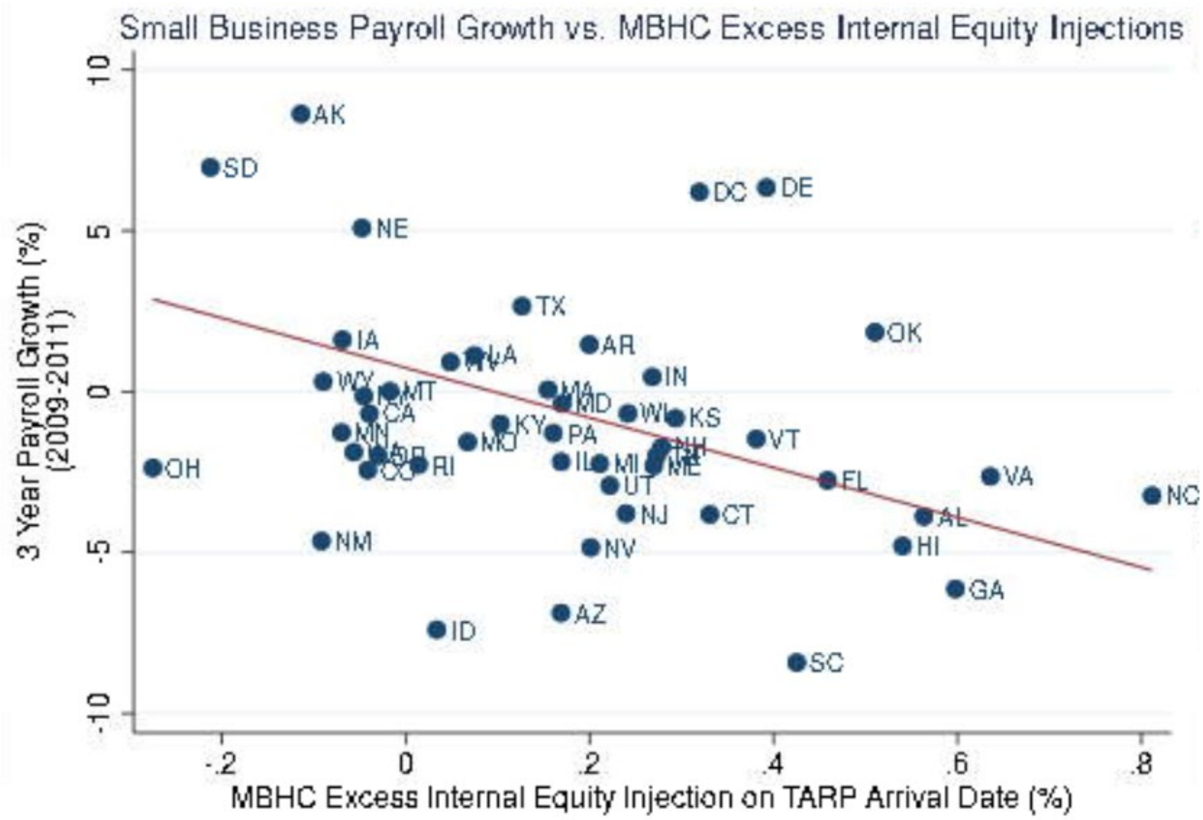
Note: This graph illustrates the predictive value of excess internal equity injections for the post-crisis employment growth of small businesses in the cross-section of states. Specifically, the x-axis shows the state-aggregated excess internal equity injections made by multi-bank holding companies (MBHCs) on the date of TARP arrival (during the 2008 global financial crisis), while the y axis shows the post-crisis 3-year cumulative growth in small business employment from 2009-2011 within each respective state. For small business employment, we focus on changes in employment at establishments with fewer than or equal to nine workers. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. The state-aggregation of this variable (x axis) is constructed by calculating the average of the individual excess injection signals across bank competing within a state, weighted by each subsidiary's ex-ante small business credit exposures in the given state. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses).

Figure 8: Predictive Value of Excess Internal Equity Injections for Future Small Business Establishment Growth (Cross Section)



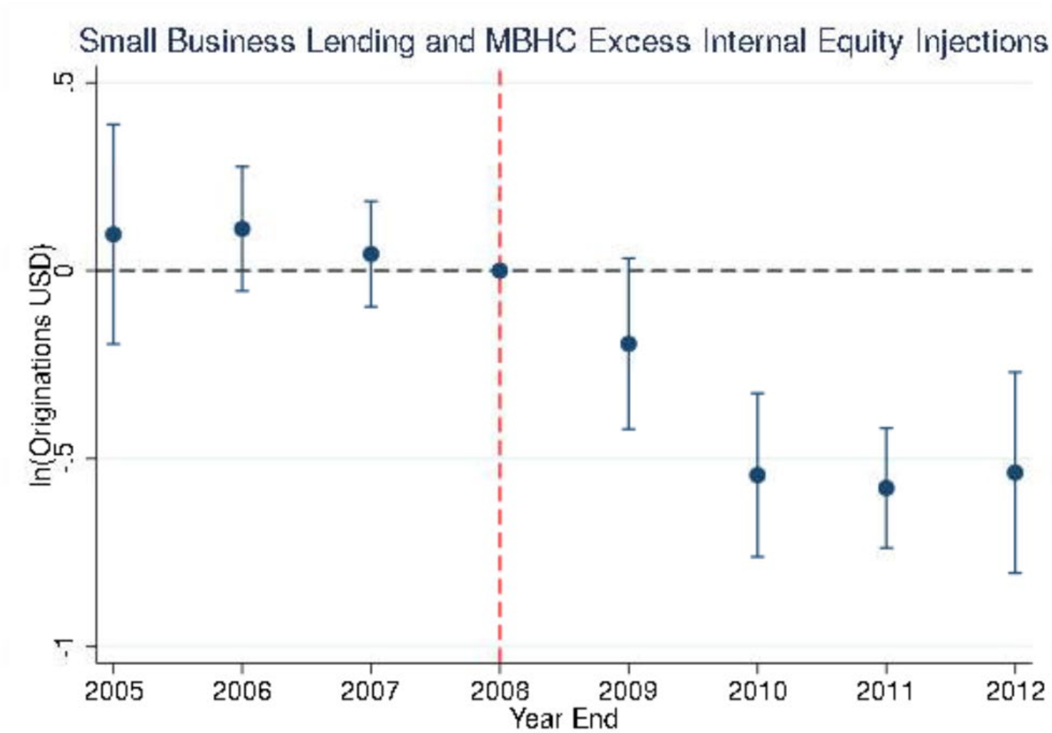
Note: This graph illustrates the predictive value of excess internal equity injections for the post-crisis establishment growth of small businesses in the cross-section of states. Specifically, the x-axis shows the state-aggregated excess internal equity injections made by multi-bank holding companies (MBHCs) on the date of TARP arrival (during the 2008 crisis), while the y axis shows the post-crisis three-year cumulative growth in small business establishments from 2009-2011 within each respective state. We define small business establishments as establishments employing fewer than or equal to nine workers. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that results from the parent's excess internal equity injection upon TARP arrival. The state-aggregation of this variable (x axis) is constructed by calculating the average of the individual excess injection signals across banks competing within a state, weighted by each subsidiary's ex-ante small business credit exposures in the given state. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses).

Figure 9: Predictive Value of Excess Internal Equity Injections for Future Small Business Payroll Growth (Cross Section)



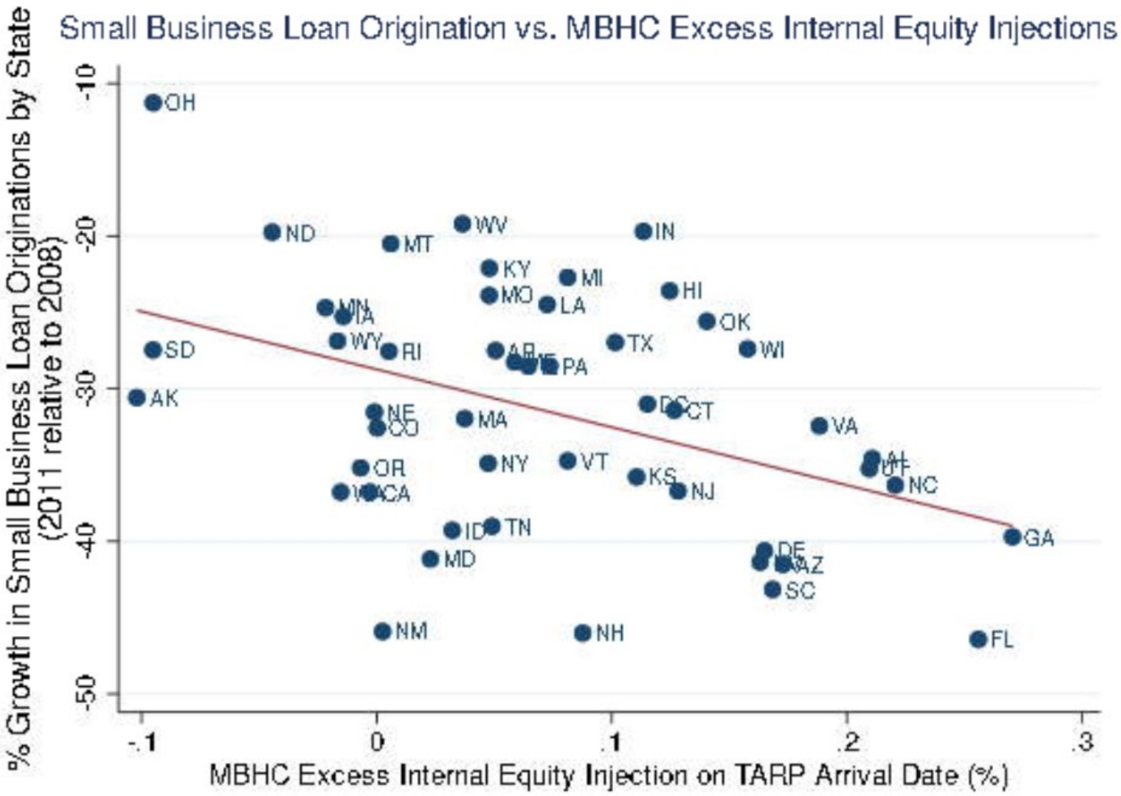
Note: This graph illustrates the predictive value of excess internal equity injections for the post-crisis annual payroll growth of small businesses in the cross-section of states. Specifically, the x-axis shows the state-aggregated excess internal equity injections made by multi-bank holding companies (MBHCs) on the date of TARP arrival (during the 2008 crisis), while the y axis shows the post-crisis three-year cumulative growth in small business payroll from 2009-2011 within each respective state. For small business employment, we focus on changes in payroll at establishments with fewer than or equal to nine workers. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that resulted from the parent's excess internal equity injection upon TARP arrival. The state-aggregation of this variable is constructed by calculating the average of the individual excess injection signals across banks competing within a state, weighted by each subsidiary's ex-ante small business credit exposures in the given state. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, Census Bureau (Statistics of US Businesses).

Figure 10: Predictive Value of Excess Internal Equity Injections for Future Changes in Small Business Credit Originations



Note: This figure shows the time-series growth in new small business credit originations across subsidiaries that received positive (versus negative) amounts of excess internal equity injections from the MBHC parent upon TARP arrival. Consistent with findings in previous charts and tables that excess internal equity injections revealed the banks' expectation for the post-crisis deterioration in investment opportunities, this chart suggests that banks accordingly divested from these regions by curtailing post-crisis new small business lending. Specifically, this figure plots the 90th percent confidential intervals for estimated coefficients β_α for each Date*Excess Internal Equity Injection term ($for\ \alpha\epsilon\{2005{,}2011\}$) in the following specification: $Ln(SmallBusinessCreditOriginations)_{cspt} = \beta_0 + \sum_{\alpha=2005}^{2012} \beta_\alpha \cdot \mathbb{1}[t = \alpha] \cdot Excess\ Internal\ Capital\ Injection_{s,p,TARP\ Arrival\ Date_p} + \beta_2 \cdot SupPrbofFailure_{s,p,t-1} + \beta_3 \cdot SupPrbofRatingDowngrade_{s,p,t-1} + \beta_4 \cdot Subsidiary\ Controls_{s,p,t-1} + \beta_5 \cdot BHC\ Controls_{p,t-1} + \delta_s + \pi_p + \tau_t + \varepsilon_{s,p,t}$. S stands for subsidiary, p stands for parent holding company, and t stands for time. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, FFIEC Community Reinvestment Act data.

Figure 11: Predictive Value of Excess Internal Equity Injections for Future Change in Small Business Credit Originations (Cross Section)



Note: This graph illustrates the predictive value of excess internal equity injections for the post-crisis credit originations at small businesses in the cross-section of states. Specifically, the x-axis shows the state-aggregated excess internal equity injections made by multi-bank holding companies (MBHCs) on the date of TARP arrival (during the 2008 crisis), while the y axis shows the post-crisis growth in new credit originations to small businesses (flows) within each state during 2011 with respect to 2008. We define small business establishments as establishments employing fewer than or equal to nine workers. Excess internal equity injections represent the excess amount of internal equity injections provided to a bank subsidiary by parent holding companies on the date of TARP arrival, after controlling for the subsidiary's CAMELS rating. This variable is measured as the percentage point increase in the subsidiary's capital ratio that resulted from the parent's excess internal equity injection upon TARP arrival. The state-aggregation of this variable is constructed by calculating the average of the individual excess injection signals across banks competing within a state, weighted by each subsidiary's ex-ante small business credit exposures in the given state. Source: Call Reports, FR Y9C, CAMELS, SR-SABR, US Treasury TARP CPP Transaction Reports, FFIEC Community Reinvestment Act data.