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ABSTRACT

Post-crisis stress tests have altered banks' credit supply to small business. Banks affected by stress tests reduce credit supply and raise interest rates on small business loans. Banks price the implied increase in capital requirements from stress tests where they have local knowledge, and exit markets where they do not, as quantities fall most in markets where stress-tested banks do not own branches near borrowers, and prices rise mainly where they do. These reductions in supply are concentrated among risky borrowers. Stress tests do not, however, reduce aggregate credit. Small banks increase their share in geographies formerly reliant on stress-tested lenders.

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I. Introduction

Credit to all classes of borrowers grew sharply during the run-up to the Great Recession, including loans to large and small businesses. During the early years of the crisis, bank originations of business loans fell by as much as 40% (Figure 1 and Figure 2). Lending to large businesses has bounced back since the Great Recession: in 2016, total real C&I loans on bank balance sheets were more than 50% *higher* than in 2007. The recovery of small business lending, however, continues to be slow. In 2016, small business loans on bank balance sheets remained *lower* than in 2007 (Figure 2). What explains the slow recovery in small business lending? One of the most prominent explanations has been increased regulation, including stress testing. The extant literature suggests that banks facing regulatory capital constraints cut their lending supply, and stress tests create a direct link from bank lending risk to capital.[1]

This paper provides new evidence that stress tests conducted by the Federal Reserve led to a decrease in affected banks' small business credit supply.[2] Banks more affected by stress tests reduce their supply of small business loans. They do so by increasing interest rates and by rebalancing their loan portfolios toward less risky loans. This reduction in supply by stress-test-affected banks, however, does not lead to aggregate declines in small business loan originations. The decline is largely absorbed by banks not subject to the stress tests. These small(er) banks increase their loan originations and claim larger market share in geographies formerly reliant on

[1] The Clearinghouse Association, an advocate for banks, points specifically to the stress tests as imposing unduly harsh (implicit) capital requirements on small business loans and on residential mortgages (Clearinghouse, 2017 and Covas, 2017). More generally, a large academic literature on bank "capital crunches" documents that shocks to bank equity capital have large contractionary effects on the supply of lending (Bernanke, 1983; Bernanke and Lown, 1991; Kashyap and Stein, 1995, 2000; Houston, James, and Marcus, 1997; Peek and Rosengren, 1997, 2000; Campello, 2002; Calomiris and Mason, 2003; Calomiris and Wilson, 2004; Cetorelli and Goldberg, 2012).

[2] Whether the Federal Reserve's stress-testing model implicitly imposes higher capital requirements on small business lending than on other types of lending is beyond the scope of this paper. Answering this question empirically is challenging as the Federal Reserve does not disclose the details of its models.

stress-tested lenders. Overall, our evidence does not support the notion that stress tests contributed to a slower recovery of small business lending.

Our empirical strategy exploits the heterogeneity in large banks' exposure to stress tests. Comparing stress-tested banks with non-tested banks is problematic because large stress-tested banks differ from small banks in many ways. We therefore focus most of our tests on the group of 32 stress-tested BHCs (and their subsidiary banks) and use a new measure – *stress-test exposure* – to capture cross-sectional variation in exposure to the test. Our *stress-test exposure* measure captures a potential decline in banks' capital under stress and equals the difference between the BHC's current capital ratio and the lowest implied capital ratio expected under the severely adverse stress-test scenario.[3]

Stress tests provide a systematic measure of how much a bank might lose during a hypothetical severe economic downturn, which then gets translated into a forecast of its regulatory capital ratios conditional on various stress scenarios. Larger projected declines in capital under stress scenarios (large values of *stress-test exposure*) are likely to incentivize affected banks to reduce their current loan portfolio risks or to improve their capital ratios (e.g., by reducing planned dividend distributions and/or share repurchases). We utilize the publicly available data on the stress-testing results in 2012 through 2016 to build the *stress-test exposure* variables based on three capital ratios: the Tier 1 capital ratio, the total risk-based capital ratio, and the Tier 1 leverage ratio, although our results are similar across all three measures.

[3] The Federal Reserve specifies three scenarios – baseline, adverse and severely adverse – and estimates the path of each bank's capital under each scenario over a nine-quarter planning horizon. We focus on the results from the severely adverse scenario, as it is most likely to constrain a bank's capital planning.

To strengthen identification and mitigate potential unobserved heterogeneity, we exploit heterogeneity in terms of loan risk and banks' access to local information.[4] Facing larger stress-test exposure, banks have an incentive to rebalance their loan portfolios toward less risky loans and to raise the interest rates on risky ones. Risk matters for several reasons. First, there is a direct link between the outcome of the stress tests and loan portfolio risk. By reducing the risk of their loans, banks can loosen their capital requirement. Second, by requiring banks to hold more capital, the stress tests may also reduce the moral hazard incentives to engage in excessive risk-taking stemming from underpriced deposit insurance or too-big-to-fail protections (e.g., Feldman and Stern, 2004; Strahan, 2013; Acharya, Mehran, and Thakor, 2016). Consequently, we expect the effect of banks' *stress-test exposure* to be more pronounced among riskier borrowers and/or riskier local markets.

Access to local information also affects how banks might respond to *stress-test exposure*. If small business loans are just commodities, then all of the variation in credit supply at the individual bank level would manifest in quantities rather than prices. Yet a large literature argues that small business lending often relies on soft information, which requires lenders to know and develop long-lasting relationships with their borrowers.[5] A number of papers in this literature use distance (whether a bank owns a branch near the borrower) to proxy access to local information. Physical proximity both improves information production at the outset of lending relationships and allows for better loan monitoring over the course of that relationship. Relationship lending, however, also creates hold-up problems that allow informed banks to

[4] For example, one can argue, that banks more inclined to grow their (relatively riskier) C&I lending would experience larger stress-induced declines in capital and hence higher *stress-test exposure* values. This would induce an upward bias in our coefficient of interest.

[5] See, e.g., Degryse and Ongena (2005); Berger et al (2005); Agarwal and Hauswald (2010); and Gilje (forthcoming).

extract higher rents from borrowers (Rajan, 1992). In our setting, banks exposed to larger *stress-test exposures* thus might increase loan interest rates instead of reducing quantities in geographies where they have a physical branch.

To test these ideas, we first evaluate annual small business loan origination volumes using data collected under the Community Reinvestment Act (CRA). These data capture growth in small business lending at the bank-county-year level. The granularity of the data allows us to absorb potential demand-side confounds with granular county-time fixed effects. We then build a county-level measure of local economy risk based on the sensitivity of local employment to overall national employment (similar to market beta). Using this new measure, we document that relative to less affected banks, those more affected by the stress tests reduce the quantity of lending to small businesses in risky markets (counties) relative to safe markets. The results are economically significant. A one-standard-deviation increase in *stress-test exposure*, for example, leads riskier markets (those in the top quartile of the employment beta distribution) to experience 2% greater declines in small business loan originations than safer markets.[6] The declines in quantities, however, *only* occur where banks do not have branches (and thus lack the informational advantage to price in the higher risk).[7]

To investigate loan interest rates, we turn to the *Survey of Terms of Business Lending* (STBL). These data provide loan-level price and non-price terms at quarterly frequency for a sample of randomly selected banks' lending to businesses. Specifically, the STBL collects data on new loan originations during a full business week each quarter from each bank in the survey.

[6] These magnitudes are roughly twice as large using the leverage ratio.

[7] It is possible that CRA requirements limit banks' willingness to reduce small business credit in CRA assessment areas (those with bank branches). However, we also show that the effects of a local branch presence affect loan pricing, and that these effects are concentrated among risky loans. It is hard to explain the pricing results by an economic mechanism different from the informational advantage.

Since the STBL skews its sampling procedures toward large banks/BHCs, it captures loans originated by banks owned by 26 out of 32 stress-tested BHCs. The STBL data offer a number of advantages. First, the STBL provides detailed data on loan conditions such as the interest rate, the commitment amount, maturity, collateral, etc. Second, each bank reports its internal assessment of loan risk on a 1-4 scale, which we exploit in our tests. In contrast to the CRA data, which reflect *all* of a bank's new lending within each county, the STBL offers data on individual loans originated by a subset of banks during a full business week window in each quarter and only offers state-level location of a borrower.

Using the STBL data, we document that banks more affected by the stress tests charge higher interest rates on their loans to small businesses, consistent with an inward shift in credit supply from the tests. The result is quantitatively important. A one-standard-deviation increase in a bank's *stress-test exposure* leads to about a 40-basis-point increase in the interest rate charged on their small business loans, which is large relative to the overall variation in loan interest rates (standard deviation = 127 basis points). The size of our estimated effect increases when we control for other loan terms such as loan maturity and collateralization. This occurs because non-price terms also tighten with *stress-test exposure*. As we show, a one-standard-deviation increase in exposure leads to a decline in loan maturity of about 17%. The effect on interest rates is significantly stronger in areas where banks have a local branch presence (local markets) and hence possess an informational advantage. A one standard deviation increase in a bank's *stress-test exposure* leads to about a 55-basis-point interest rate increase in a bank's local markets, whereas it leads to just a 15-basis-point increase in non-local markets.

We next contrast the effect of exposure to stress tests on risky versus safe loans. We find that the effect of *stress-test exposure* on the pricing of safe loans is near zero or perhaps

even slightly negative, reflecting exposed banks' desire to supply more low-risk credit. In contrast, *stress-test exposure* leads to higher interest rates for small business loans in the two highest loan risk categories. The effect is largest for riskier loans originated within banks' branch domains. Among these risky "local" loans, a one-standard deviation increase in a bank's *stress-test exposure* leads loan interest rates to increase by approximately 70 basis points. Consistent with these pricing patterns, the share of loans originated to safe borrowers increases with exposure to the stress tests. And this shift toward safe loans happens largely in non-local markets (i.e., those outside banks' branch domains). The effects of stress tests on the pricing of risky loans is therefore strongest where banks have a local information advantage, while its effects on quantities are strongest where they do not.

Overall, our evidence suggests that banks more affected by stress tests reduce quantity and raise interest rates on small business loans. The reductions in supply are concentrated in volatile markets and among risky borrowers. Furthermore, banks more affected by stress tests tend to exit the markets where they do not have branches and thus possess limited local knowledge; in contrast, interest rate increases are concentrated where banks do have branches. Effectively, banks price the implied increase in capital requirements from stress tests where they have a local informational advantage, and exit markets where they do not.

Do the reductions in supply at the individual bank level lead to aggregate declines in small business credit supply? To evaluate this question, we analyze county-level small business loan originations. Despite reduced supply by some stress-tested lenders, we find *no evidence* that overall credit origination at the market level declines owing to stress tests. Growth in small business lending is not lower in markets (counties) with more stress-test-affected lenders. Instead, we show that banks unaffected by stress tests make up the difference, as small banks

increase their loan origination volumes and grow their small business market share significantly in markets where banks with high *stress-test exposure* had previously been important lenders. The result suggests that stress tests lead to reallocation of the small business credit supply away from the large systemic banks and toward more local sources of credit.

This paper contributes to a few strands of the literature. First, and foremost, it links the stress-test exposure to a decline in large banks' willingness to supply small business loans following the 2008 financial crisis and the Great Recession. Acharya, Berger and Roman (forthcoming) document that stress-tested banks reduce large corporate loan supply and increase prices particularly for riskier borrowers, while Bassett and Berrospide (2017) do not find any negative impact of stress tests on bank loan growth in general. Chen et al. (2017) show a sharp decline in lending at the largest banks and offer evidence that this decline has hurt local economies more exposed to these large banks. We add to this literature by documenting the adverse effect of banks' stress-test exposure and their willingness to supply small business credit. Yet we go one step further and show that this stress-test-induced reduction in small business credit supply does not lead to the aggregate decline in small business loan originations. Small banks fill in the gap and increase their market share in geographies formerly reliant on stress-tested lenders.

Second, existing research suggests that small businesses have better access to credit if their local market contains more small banks and that this effect has gotten larger during the post-crisis period (e.g., Berger et al., 2017). Yet the banking industry continues to evolve toward one dominated by large banks and by banks relying heavily on non-traditional funding sources like securitization. Not surprisingly, the share of bank assets in the largest banks has grown steadily over time, as has their share of small business loans. Our results suggest that the stress

tests have had the effect of pushing back against this overall trend in the banking system, as more small business loans are now provided by small, local banks.

II. The Stress Tests

The 2008 Financial Crisis led to dramatic changes in regulation and supervision of financial institutions, and many of these changes have arisen from compliance with measures laid down by the Dodd-Frank Act (DFA). The DFA requires the Federal Reserve to conduct annual stress tests of a select group of large bank holding companies (BHCs) and non-bank financial institutions designated for stress testing by the Financial Stability Oversight Council (FSOC). Prior to passage of the DFA in 2010, the 2009 Supervisory Capital Assessment Program (SCAP) represented the first stress-testing effort. SCAP aimed to ensure that banks had sufficient capital coming out of the crisis to absorb losses under poor economic conditions but continue to be able to supply credit to the economy, thereby short-circuiting a negative feedback loop between real shocks and financial shocks.

Under SCAP, the Federal Reserve assessed the level of regulatory capital for the 19 largest BHCs under three potential paths of the economy. Nine BHCs "passed" the SCAP stress tests and continued operating without needing to raise new equity capital. Of the remaining ones, all but one succeeded in raising sufficient capital in private markets to meet their required capital ratio. The remaining institution came into government conservatorship and was later privatized. SCAP induced rapid recapitalization, which was widely seen as a successful turnaround of bank financial conditions coming out of the crisis.

Following the success of SCAP, the Federal Reserve continued to implement supervisory stress tests, renamed as the Comprehensive Capital Analysis and Review (CCAR). CCAR called for annual tests to see whether large BHCs have sufficient capital to absorb a

substantial economic and financial downturn, yet continue to be able to provide credit. CCAR began in 2011 with the same large BHCs as SCAP, those with total assets in excess of $100 billion. In 2012, however, the Federal Reserve expanded the set to the 32 BHCs with assets above $50 billion. Starting in 2013, the Fed began implementing dual stress tests: one based on the supervisory CCAR process, and the other based on compliance with the Dodd-Frank Act (DFAST). The key difference is that under CCAR, each BHC's *proposed* capital distribution plan is incorporated into the stress test; under DFAST, the assumed capital distribution is held at its current level. The tests are disclosed in March of each year.[8] In 2016, the report date for the stress-test disclosure was moved to June.

The stress tests forecast three possible scenarios for each BHC's regulatory capital ratios nine quarters into the future ("baseline," "adverse," and "severely adverse"). The scenarios capture possible paths for aggregate economic variables. The 2017 Federal Reserve *Supervisory Scenarios for Annual Stress Tests Requirements under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rules* requires modelling "(s)ix measures of economic activity and prices: percent changes (at an annual rate) in real and nominal gross domestic product (GDP); the unemployment rate of the civilian non-institutional population aged 16 years and over; percent changes (at an annual rate) in real and nominal disposable personal income; and the percent change (at an annual rate) in the Consumer Price Index."[9] Thus, the scenarios focus on aggregate rather than idiosyncratic risks of banks. This approach helps minimize the macro-prudential risk of banks becoming capital constrained collectively during broad economic downturns. The

[8] In 2014, the stress-test process was expanded to banks with total assets between $10 and $50 billion through the Dodd-Frank Act stress tests. However, stress tests of banks with assets between $10 billion and $50 billion are not disclosed. In other words, only the results from the CCAR BHCs are disclosed each year; hence, banks owned by CCAR-BHCs constitute our sample.

[9] See https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20170203a5.pdf.

Federal Reserve also develops a model to map the effects of the hypothetical economic and financial variables on each BHC's capital ratio over the forecast.

Alongside the scenarios and models provided by the Federal Reserve, the stress testing also requires data on individual BHC positions and exposures to various risk factors. Thus, the results of the stress tests reflect common scenarios and a common model (i.e., the one developed by the Federal Reserve), but they reflect differences in asset composition. The results are closely watched, not only by regulators but also by bank managers, analysts, and investors, as they might lead to forced reductions in a BHC's planned capital distributions, as well as other operating changes if the simulated decline in capital is sufficiently large.

Measuring Exposure to Stress Tests

We construct three measures of *stress-test exposure* for each tested BHC, based on stress test results disclosed publicly by the Federal Reserve for the years 2012-2016. These data offer the implied (modeled) capital ratios BHCs would experience under the most adverse stress scenario. Specifically, the Federal Reserve reports the minimum Tier 1 capital ratio, total risk-based capital ratio, and Tier 1 leverage ratio expected over the forward-looking nine-quarter planning horizon for each of the annual tests.[10] An implied minimum capital ratio significantly below the current capital ratio would indicate that the bank's losses would impair its equity position and hence threaten its ability to extend credit. The bigger the expected decline in a bank's equity capital, the more likely the regulatory authority is to interfere and pressure the bank, either with regard to its capital planning or the risks in its portfolio of assets.

[10] The banks also report similar results from their own models. These results, however, are less stringent than those based on the Federal Reserve's proprietary models about 75% of the time. Hence, we focus on the results from the Federal Reserve model, as it generally reflects the most binding constraint faced by banks.

In line with this intuition, our measure of *stress-test exposure* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Our measure reflects only changes in the value of BHC portfolios, *not* the effect of the capital distribution plan, as this variation would not be directly affected by lending decisions.[11] BHCs whose specific portfolios have the greatest downside risk under the test will have the largest value of *stress-test exposure.* These are the banks likely to face pressure from the regulators, either to reduce risk or improve their current capital ratios (e.g., by reducing planned dividend distributions and/or share repurchases). The measure is unlikely to be endogenous to banks' small business lending as it is driven by a bank's entire loan portfolio of which small business constitutes only a very small fraction.[12]

Panel A of Table 1 reports the summary statistics. The three measures of *stress-test exposure* average between 2.6 and 3.4 percentage points (or 2.3 to 3.1, at the median). These capture how much the typical bank's capital ratio would be expected to decline over the stress scenario. These modelled declines are economically significant, as they are similar in magnitude to a one-standard-deviation change in the corresponding capital ratio. *Stress-test exposure* varies substantially across banks as well, with a standard deviation of 1.3 to 1.7 percentage points, depending on the capital ratio. The *stress-test exposure* is also positively correlated with the level of the corresponding capital ratio at the start of the tests, with a correlation between 0.38

[11] Our data for 2012 are taken from the Fed's CCAR disclosure, but we use the series of results that do not include the bank's capital plan. Data from 2013-2016 are taken from the disclosure under the Dodd-Frank Act. In other words, our sample includes only the CCAR banks, but the measure of exposure is the one used for compliance with Dodd Frank, which does not incorporate the bank's capital distribution plan.

[12] For example, among banks with assets over $50 billion, small business loans outstanding averages less than 5% of their total assets (less than 3.5% since 2011). Hence, there is little possibility of reverse causality.

and 0.48. This is consistent with a notion that banks with riskier loan portfolios and hence larger stress-test exposure tend to maintain higher levels of capital ex-ante.[13]

Figure 3 plots the distribution of our three exposure measures year by year in a box plot. The figure shows that most of the variation reflects the cross-section; in contrast, the distribution of stress-test exposures exhibits very little time-series variation. There is slightly less cross-sectional variation in the last test in our sample (2016), but overall, there does not appear to be a strong trend in either the level or the variation in outcomes across banking companies.

Stress Test Related Literature

A number of studies have tried to assess the utility of stress tests in addressing some of the deficiencies in capital requirements and bank supervision that emerged in the wake of the financial crisis. One stream of the literature focuses on stress tests's efficacy. Hirtle et al. (2009) offer an early discussion of ways to use stress testing to improve bank supervision. Schuermann (2016) broadens the discussion of policy by contrasting its use during good times versus bad times. Frame et al. (2015) offer some empirical evidence calling into doubt the utility of stress tests by analyzing pre-crisis stress tests done by the regulator of Fannie Mae and Freddie Mac.

Other work evaluates the implications of public disclosure of stress-test results. Goldstein and Leitner (2017) analyze theoretically the tradeoffs faced by regulators regarding disclosure of stress-test results. Several papers have studied market reactions to U.S. or European stress test announcements, with mixed evidence on whether banking firms experience significant abnormal average stock returns when supervisory stress-test results are disclosed (Peristiani et

[13] Note that our results do not change substantially whether or not we include the initial capital ratio as a control variable.

al., 2010; Petrella and Resti, 2013; Candelon and Sy, 2015; Bird et al., 2015; and Fernandes, Igan and Pinheiro, 2015). Flannery et al. (2016) argue that stress-test disclosures reveal information to market participants, both negative and positive, thereby explaining the mixed results from directional event studies. They show that price volatility and volume increase reliably around disclosure dates.

Finally, a line of studies evaluate how bank exposure to stress tests affects their risk-taking and other operating decisions. These studies are closest to ours. Acharya, Berger and Roman (forthcoming), for example, document that stress-tested banks reduce large corporate loan supply and increase prices, particularly for riskier borrowers. Bassett and Berrospide (2017) evaluate banks' balance sheet loan volumes and do not find a negative effect of stress tests on bank loan growth in general. Calem, Correa, and Lee (2016) offer similar evidence in the market for jumbo mortgages. Cornett et al. (2016) study adjustments to bank dividends and overall measures of investment from Call Report data, finding that stress-tested banks are more likely to cut dividends and reduce lending. We add to this literature by documenting the effect of *stress-test exposure*s on small business loans and documenting the heterogeneity in these effects across intensive and extensive margins.

III. Empirical Tests and Results

In this section, we describe our empirical strategy, followed by the presentation and interpretation of results. To alleviate the identification problem stemming from stress-tested banks being different from non-stress-tested banks in many ways that extend well beyond the effect of CCAR regulation, we abstain from comparing lending of stress-tested and inherently different non-stress-tested banks. Rather, we focus solely on the group of banks owned by the 32

stress-tested BHCs. We start by evaluating the effects of *stress-test exposure* on small business loan quantities, followed by an analysis of the effect on loan pricing.

III.A. Stress Tests and Small Business Loan Quantities

To capture the response of small business loan quantities to *stress-test exposure*, we exploit CRA data on loan originations from 2012-2015, collected by the Federal Financial Institutions Examination Council at the subsidiary-bank level.[14, 15] The CRA focuses on loans with commitment amounts below $1 million originated by financial institutions with more than $1 billion in assets.[16] Under the CRA, banks report small business loans at a granular, community (county) level. Consequently, CRA data provide us with a complete record of new lending quantities by subsidiary banks of the stress-tested BHCs at the county-year level.

We use CRA data to build the annual growth rate of new loan originations under $1 million, which we interpret as loans to small businesses. The purpose of the CRA is to "encourage ensured depository institutions to help meet the credit needs of the communities where they are chartered." Individual subsidiary banks within stress-tested BHCs will have different incentives and obligations to "meet the credit needs" of the communities they serve. Consequently, we do not aggregate CRA data to the BHC level, but rather build the growth measures for subsidiary banks and map in *stress-test exposure* for each bank's BHC owner. In the regressions, we also control for these subsidiary banks' financial characteristics provided by the Call Report data. The resulting sample covers banks owned by 28 out of 32 stress-tested

[14] See, e.g., Bord, Ivashina, and Taliaferro (2017) for a more comprehensive description of CRA data.

[15] As of the date of this draft, the 2016 CRA data were not yet publicly available.

[16] The asset-size threshold for CRA data reporting was $250 million before 2005 and raised to $1 billion in 2005.

entities, since some of the stress-tested institutions did not conduct any lending that fell under CRA guidelines.

To mitigate the effect of outliers (e.g., due to a small denominator) we normalize the year-to-year change in lending volume by the mid-point of originations between the two years, as follows:

$$\text{Loan Growth}_{i,c,t} = \frac{\text{Loan Originations}_{i,c,t} - \text{Loan Originations}_{i,c,t-1}}{(\text{Loan Originations}_{i,c,t} + \text{Loan Originations}_{i,c,t-1})/2} \quad \textbf{(1)}$$

where i represents the bank, c represents the county, and t represents the year. With this definition, the variable is bounded above (+2) and below (-2). Furthermore, to eliminate noise stemming from counties with insignificant amounts of loans originated by a given bank, we restrict our sample to markets where a given bank made at least five loans in period $t-1$.

We then match the CRA small business loan-growth data and *stress-test exposure* data by mapping the annual origination data of subsidiary banks to stress-tested BHCs and then to the stress-test results. The stress tests are typically conducted over a three- to six-month period, with the final report published in March.[17] This timing inhibits our ability to perfectly capture the consequences of the stress tests in annual CRA data. In our matching procedure, we assume that the majority of the effect from the *stress-test exposure* is likely to manifest within the next nine months of the year in which the stress-test results are disclosed. In line with this assumption, we match, for example, CRA loan growth from December 2013 to December 2014 to the stress-test results reported in March 2014.

Panel B of Table 1 provides summary statistics of the financial characteristics of subsidiary banks. The sample covers a set of relatively large banks with average total assets of

[17] In 2016, the Federal Reserve started publishing the stress-test results in June. Yet this shift does not apply to our CRA results, as our CRA data only cover the 2012-2015 period.

$260 billion. The traditional financial characteristics are in line with those in other studies exploring large banks. Notably, while in the aggregate small business lending grew post-2008 (slowly but it grew) as evident from Figure 1, the banks in our sample on average experience an annual decline of 8.3% in small business loan originations.

To evaluate the effect of stress tests on small business loans, we implement the following regression analysis:

$$\text{Loan Growth}_{i,c,t} = \beta_1 Stress\text{-}test\ Exposure_{h,t} + \text{Bank Controls}_{i,t-1} + \gamma_{c,t} + \varepsilon_{i,c,t} \quad \textbf{(2)}$$

where we evaluate the annual growth in loan originations by subsidiary bank i of BHC h in county c in year t. The set of (subsidiary) bank controls includes log of total assets, share of C&I loans in a bank total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. We also control for the BHC-level initial capital ratio corresponding to the stress-test capital measure. All bank control variables are as of the beginning of the year to avoid reverse causality concerns. As discussed earlier, we use the *Stress-test exposure* variable in the same year *t* since the stress tests are conducted early in the year and, hence, affect bank-lending behavior through the rest of the CRA period. We cluster the standard errors by BHC-year, as this is the level of variation for our core variable of interest.

We expect that more severe *stress-test exposure*s are associated with declines in small business lending ($\beta_1 < 0$). We reduce the potential for credit demand to drive our results by incorporating high granularity county-year fixed effects ($\gamma_{c,t}$), which help capture local economic conditions ultimately affecting small business credit demand. Effectively, we compare banks operating in similar markets (and serving similar borrowers), but facing different *stress-test exposures*.

One can argue, however, that the CRA loan growth response to *stress-test exposure*s might also be subject to an unobserved heterogeneity bias. Banks more inclined to grow their (relatively riskier) C&I lending would experience larger stress-induced declines in capital and hence higher *stress-test exposure* values. This would induce an upward bias in our coefficient of interest. To mitigate this identification challenge, we exploit heterogeneous predictions based on risk and access to information. If, in response to a stress-test exposure, a bank attempts to reduce the riskiness of its loan portfolio, then we should observe more severe declines in small business lending to riskier borrowers or in riskier markets. Conversely, in markets where banks have access to local information, they can raise interest rates on risky loans, while in markets without such pricing power, adjustments in loan volumes ought to be larger.

Since CRA data do not provide information about individual borrower characteristics (e.g., borrower risk), we build an alternative risk measure. Specifically, we develop a new proxy that captures variation in risk at the county level, rather than at the borrower level. Using county employment data, we construct the "*employment beta.*" Similar to a stock beta, our proxy captures the sensitivity of a county's employment growth to changes in national employment growth. We first estimate a set of time-invariant, industry-level employment betas from time-series regressions of aggregate industry-level employment growth on economy-wide employment growth, using quarterly data from 1992 through 2015. We then compute county-year-level *employment beta* as a weighted average of industry-level betas, based on the share of different industries in each local economy:

$$\text{Employment Beta}_{c,t} = \sum \omega_{c,j,t} \times \text{Employment Beta}_{j} \qquad \textbf{(3)}$$

where Employment Beta_j is the time-invariant estimate of industry j's Employment Beta and $\omega_{c,j,t}$ is the share of jobs provided by industry j in county c at time t. Intuitively, the county employment beta is an industry portfolio beta of a given county at a given point in time.

Appendix Table A1 reports the industry-level betas used as the building blocks in Equation (3). The patterns appear economically sensible. Most of the sectors have positive betas, meaning that employment in the industry varies pro-cyclically. The major exceptions are Education Services and Public Administration, which exhibit much faster employment growth during economic downturns. Among the pro-cyclical industries, such as Construction and Entertainment, betas are well above one, as employment in these sectors grows sharply in booms (and vice versa in busts). To mitigate the effect of outliers, we winsorize the industry-level betas before constructing the county weighted averages. Overall these county-level employment betas mesh well with the intent of the stress test scenarios, which typically contemplate bad outcomes for economic and financial aggregates such as U.S. GDP growth and changes in the overall unemployment rate. Hence, counties whose economies move in lock-step with the overall economy will have greater effects on the results of stress tests.[18]

Armed with a granular measure of local economic risk, we evaluate the response of small business lending volumes to stress-test exposures using the following model:

[18]We have also tested other measure of county-level risk, such as one based on the decline in housing prices experienced during the post-boom crash and one based on industry-level beta built from stock prices. Neither of these risk metrics is significantly related to credit growth.

$$\text{Loan Growth}_{i,c,t} =$$

$$= \beta_1 \textit{Stress-test Exposure}_{h,t} + \beta_2 \textit{Stress-test Exposure}_{h,t} \times \text{Empl Beta}_{c,t-1} +$$

$$+ \text{Bank Controls}_{i,t-1} + \textit{County} \times \textit{Year FEs} + \varepsilon_{i,c,t} \quad \textbf{(4)}$$

Table 2 reports the results with Panels A, B and C exploiting the *stress-test exposure*s based on the Tier 1 capital ratio, the Total risk-based capital ratio, and the Tier 1 leverage ratio, respectively. Column (1) reports the results from simple models without the interaction term. The coefficients β_1 are not statistically significant, potentially reflecting the upward bias discussed earlier. Column (2) reports the results from equation (4). The coefficient β_2 is negative and statistically significant in all three cases. The results suggest that *stress-test exposure* leads affected banks to reduce small business lending more in risky local markets than in safer ones.

In column (3) of Table 2, we absorb all sources of bank-level heterogeneity by introducing bank-year fixed effects. In this setting, the direct effect of the *stress-test exposure* is fully absorbed, so we focus on the differential across market types. This approach is appealing in this setting because, although we lose identification on β_1, we can still identify the interaction term (β_2) while absorbing possible confounding effects at the bank-year level. The results are similar to those reported in column (2) and suggest that banks more exposed to stress tests are more likely to exit risky markets. Despite a dramatic increase in R^2 stemming from adding bank-year fixed effects, the interaction term coefficients retain their economic magnitude and statistical significance. The estimate reported in column (3) of Panel A suggests that in response to a one-standard-deviation increase in *stress-test exposure* in Tier 1 capital (1.7%), markets in

top quartile of the employment beta distribution (beta = 1.36) would see 2.0% greater decline in small business loan originations than those in the bottom beta quartile (beta = 0.96).[19]

In Table 3, we augment this analysis to evaluate whether we would observe a differential effect of stress-testing on lending quantities in markets where banks have an informational advantage through a branch presence. Columns (1) and (2) report the results where the data are confined to counties where subsidiary banks have at least one branch. Columns (3) and (4) evaluate the small business lending sensitivity to *stress-test exposure*s in counties where subsidiary banks do not have branches. We find that the adverse effect of *stress-test exposure* on loan quantities is pronounced in non-local markets, yet virtually non-existent (statistically and economically) in local markets where banks have branches.

Overall, the evidence provided in Tables 2 and 3 offers a direct link between declines in small business loan originations and *stress-test exposure*s. Moreover, the effect on quantities of loans supplied is more pronounced in riskier markets and in markets where banks lack local knowledge.

III.B. The Effect of Stress Tests on Small Business Loan Interest Rates

While the previous section evaluates the effect of *stress-test exposure* on small business loan quantities, this section offers complementary analysis of loan prices (interest rates) based on the confidential Q1-2013 to Q4-2016 *Survey of Terms of Business Lending* (STBL) data.

The STBL Data

To obtain timely information on the business lending environment, the Federal Reserve has instituted the STBL. The STBL collects data on loans originated by a random sample of

[19] The calculation equals the interaction term's coefficient multiplied by (1.7*(1.36-0.96)).

banks during a full business week every three months (February, May, August and November). The selection of banks is conducted in a way that creates a representative sample of C&I loans. Consequently, the large banks are more likely to be surveyed. The STBL data cover 26 out of 32 stress-tested BHCs.

The STBL provides detailed loan characteristics including loan size, the nominal interest rate, maturity, whether the loan comes with a pre-payment penalty, collateral status, whether these loans reflect a drawdown on a pre-arranged line of credit, the state of the borrower, etc. Given our focus on small business loans, we consider only originations with commitment amounts under $1 million. Furthermore, to focus on new credit creation, we exclude from consideration the drawdowns on existing lines of credit.

In addition to these characteristics, the STBL reports the lender's internal risk rating for each loan. The rating that we use ranges from 1 to 4, with 1 representing loans with the lowest risk level and 4 representing those with the highest risk.[20] While the risk ratings are reported by the banks independently, the Federal Reserve provides instructions on how to make the ratings consistent across institutions. It is still possible, however, that risk ratings are not fully compatible across banks.

Similar to the CRA, the STBL collects data at the subsidiary-bank level because the regulatory authority evaluates lending at the individual bank level rather than at the parent financial institution level. Hence, similar to the CRA analysis, we track subsidiary bank financial characteristics potentially affecting lending decisions based on quarterly Call Reports. Specifically, we use the nearest Call Report date *prior* to each STBL survey date. For example,

[20] The STBL also includes loans with a "0" rating, which indicates unrated loans, and loans rated "5" which indicates defaulted loans. We drop these two categories.

we merge the June 2013 Call Report data into the STBL survey taken in August 2013. We then merge the quarterly subsidiary-bank-level STBL data with the annual BHC-level *Stress-test exposures* on a rolling basis. Since we want the *stress-test exposure* to be pre-determined with respect to our outcomes from the STBL, we map the most recent data from a given stress test disclosure into the next four STBL quarterly surveys. So, for example, we map the March 2013 value of *Stress-test exposure* into STBL data from May 2013, August 2013, November 2013, and February 2014. We map the March 2014 value into the subsequent four STBL survey dates similarly, and so on.[21]

Panel C of Table 1 provides summary statistics for loan characteristics reported in the STBL data. An average (log of) loan size in our sample is about 11.14 (~$133,000), with maturity of about 15 months and an interest rate of 3.3%.[22] About one-third of these loans are originated in the riskiest loan category (risk rating = 4). Consistent with relatively low interest rates, 81% of these loans are secured. Most of the loans are also made by local banks, with 66% originated within a bank's branch domain (i.e., the bank has a branch in the state of the borrower).[23]

Evidence on Loan Pricing

We use the STBL data to evaluate the effect of *stress-test exposure*s on small business loan pricing. Our loan pricing regressions take the following form:

[21] The change in stress test timing in 2016 from March to June leads us to map the 2015 *stress-test exposure* data into the next five (rather than four) STBL surveys.

[22] We winsorize the interest rate at the 1st and 99th percentiles.

[23] About 13% of the loans are syndicated, which means that the originating bank shares the loan risk with other lenders. Hence, we have estimated all of our tests without these loans and find that they do not change materially.

$$\text{Loan Interest Rate}_{l,i,s,t} = \beta_1 \textit{Stress-test Exposure}_{h,t-1} + \text{Loan Controls}_{l,i,s,t} + \quad \textbf{(5)}$$
$$+ \text{Bank Controls}_{i,t-1} + \textit{State} \times \textit{Quarter FEs} + \varepsilon_{l,i,s,t}$$

where the dependent variable equals the nominal interest rate on loan l originated by subsidiary bank i within BHC h in state s at time t.[24] The state-quarter fixed effects help remove unobserved heterogeneity such as variation in loan demand due to (state-specific) business conditions.

On the loan side, we control for the (log of) loan size and the bank's assessment of borrower risk, which varies from 1 to 4 (with 4 being the highest risk category). On the subsidiary-bank side, we control for the time-varying subsidiary-bank size (log of assets), as well as an indicator variable set to one if the bank has a branch in the borrower's state (*Local Lender*). Our coefficient of interest depends on a BHC-level exposure, consequently we cluster the standard errors at the BHC-quarter level.

We further augment the model with other (possibly endogenous) loan-level variables. These include the log of maturity, an indicator for loans secured by collateral, an indicator for loans that are syndicated, an indicator for floating rate loans, an indicator for loans guaranteed by the Small Business Administration (SBA), and an indicator for loans with pre-payment penalties. We do not include bank fixed effects in the model because doing so would remove the vast majority of the relevant variation in the *stress-test exposure*. This is true both because our time series is short and also because *stress-test exposure* is quite persistent (recall Figure 3). Hence, we are explicitly getting identification from cross-sectional variation. In our view, this approach is the only reasonable one to take, but we recognize that leaving out bank fixed effects requires

[24] Note that the STBL does not contain a borrower identifier, which renders capturing borrower heterogeneity with fixed effects impossible.

us to establish robustness to potentially omitted bank-level heterogeneity. Hence, we demonstrate that our coefficients of interest are not sensitive to including a large set of bank characteristics (beyond size).

Table 4 reports our first set of pricing results and utilizes all three measures of the *stress-test exposure* defined above. In the baseline specifications (columns 1, 4, and 7) we only control for subsidiary-bank size, borrower risk rating, the local lender indicator, log of loan size, and year-quarter fixed effects. We intentionally do not control for other (possibly endogenous) non-price loan terms. In the second set of specifications we saturate the model with state-quarter fixed effects (columns 2, 5, and 8); in the last set of specifications (columns 3, 6, and 9), we control for the non-price loan terms. By adding loan terms to the regressions, we lose about 1/3 of the sample.

The coefficient on *stress-test exposure* is positive and significant across all specifications, with magnitudes ranging from 0.15 to 0.57. Magnitudes are not sensitive to adding more granular fixed effects, but they consistently increase sharply in the models that control for other loan terms. Column (1) implies that a one-standard-deviation increase in *stress-test exposure* (=1.7) would lead to an increase in the loan rate of 37 basis points (=1.7 x 0.218 x 100). This effect increases to about 53 basis points in the models with the full set of loan controls. The coefficients are larger in columns (7) through (9), which use the Tier 1 leverage ratio, but the economic impact is similar because this measure has lower cross-bank variation (standard deviation = 1.3).

The coefficients on the non-price terms are consistent with those in existing empirical studies of loan interest rates. Larger loans have lower interest rates and loans rated riskier by the lender carry higher interest rates, longer maturity loans have higher interest rates and loans

secured by collateral have lower interest rates.[25] The safest loans (risk category 1) tend to have interest rates about 100 basis points (=0.34 x (4-1)) lower than the interest rate on the riskiest loans (risk category 4). The coefficients on the *Local Lender* indicator variable suggest that interest rates on loans within subsidiary-bank branch domains are 25 to 50 basis points lower than interest rates on loans outside of the branch domain. The economic and statistical significance on the *Local Lender* indicator disappears, however, once we control for non-price loan terms.[26]

As noted, adding the non-price terms to our regressions increases the coefficient on *stress-test exposure* sharply, by about 50% to 100% depending on the measure. This suggests that banks respond to the stress tests not only by raising loan interest rates, but also by simultaneously tightening other terms such as shorter maturity, more and/or better collateral, and more restrictive covenants. Data limitations prevent us from analyzing the full set of non-price terms, but Table 5 provides strong evidence of this conjecture using one that is easily measured, loan maturity. We find that banks with higher *stress-test exposure* shorten (log) maturity.[27] The economic effect is substantial, as a one-standard-deviation increase in *stress-test exposure* (=1.7) reduces loan maturity by about 17% (column 1).

Table 6 offers additional robustness tests and solidifies evidence on the effect of *stress-test exposure* on loan interest rates. Here we augment the set of control variables utilized in Table 4 to include subsidiary-bank, time-varying financial characteristics. We include a set of backward-looking variables from Call Report data, and we also include a market-based measure

[25] On small business loans, see Berger and Udell (1990). For large loans, see Strahan (1999).

[26] These comparisons are difficult to interpret because a much larger fraction of non-local loans have missing values along the non-price dimensions.

[27] Our data contain a flag for whether or not the loan is secured by collateral but not details on the quality or quantity of the collateral. Since almost all of the loans have some kind of collateral, we are not able to explore this dimension in our regressions.

of risk, the stock-return volatility, as a more forward-looking measure. Each of these measures comes from the same quarter as the outcome. For brevity, Table 6 only reports models based on Tier 1 capital. The unreported analysis based on the remaining two *stress-test exposure* measures produces economically and statistically similar results. Controlling for the subsidiary-bank financial characteristics has little effect on the statistical significance and economic magnitudes of our coefficient of interest, which varies from 0.12 to 0.22 (relative to 0.19 in the comparable model from Table 4, column 2). Overall, the results suggest that in response to *Stress-test exposure*s, banks increase interest rates on small business loans.

Loan Pricing in Local Markets

Table 7 advances the analysis by evaluating whether local presence and the associated local informational advantage affect banks' pricing response to stress-test exposure. Here we add the interaction between *local lender* and *stress-test exposure* to our core models*:*

$$Loan\ Interest\ Rate_{l,i,s,t} = \quad \textbf{(6)}$$

$$= \beta_1 Stress\text{-}test\ Exposure_{h,t-1} + \beta_2 Stress\text{-}test\ Exposure_{h,t-1} \times Local_{i,s,t}$$

$$+ Loan\ Controls_{l,i,s,t} + Bank\ Controls_{i,t-1} + State \times Quarter\ FEs + \varepsilon_{l,i,s,t}$$

where $Local_{i,s,t}$ is an indicator variable equal to one when bank i of BHC h has a branch in state s.

The results suggest that stress tests affect loan pricing more in markets where banks have a local branch presence. In markets with branches, an increase in *stress-test exposure* of one standard deviation (=1.7) would lead to an increase in the loan interest rate of about 55 basis points (=1.7 x (0.089+0.233) x 100), using the coefficients from column (1). In contrast, interest rates increase by only about 15 basis points where banks do not have branches (=1.7 x 0.089). Similar patterns emerge using *Stress-test exposure* from the other capital metrics. The results are

consistent with the notion that banks with local knowledge are more able to increase prices when they can extract rents from borrowers due to their informational advantage.[28]

Loan Interest Rates and Borrower Risk

To capture heterogeneity in pricing responses based on the riskiness of a borrower, Table 8 reports estimates of Equation (6) for three sub-samples broken out by borrower risk. Panel A reports the regression results for safe loans, those rated 1 or 2.[29] Panel B reports results for medium-risk loans, those rated 3. Panel C reports results for the highest risk loans, those rated 4.

The pricing of low-risk loans (Panel A) does not increase with a bank's *stress-test exposure.* If anything, the results suggest a small negative effect of exposure to the stress tests on rates for safe loans that are local (summing the direct and interactive terms). This result provides suggestive evidence that banks that are expected to lose a lot of equity capital under stressed scenarios skew their credit provision toward safer borrowers by lowering rates.

Interest rates of medium-risk (rated "3") and high-risk loans (rated "4"), however, *do* increase robustly with increases in a bank's *stress-test exposure.* The effect on rates in these two categories is also larger in areas where banks have a local branch presence. Moreover, the marginal effect of *stress-test exposure* on loan rates is greatest for the high-risk loans in local markets. For example, using the Tier 1 capital measure, an increase in *stress-test exposure* of one standard deviation would lead to an increase in the loan rate of about 70 basis points (=1.7 x

[28] This differential response of prices can also be shown by splitting the sample based on whether or not a bank has a branch in the borrower's state. This latter approach is a bit less constrained, in that it allows all of the coefficients in the regression to vary across the two samples.

[29] We combine these two categories because the frequency of loans in the safest category is low (around 3% of the sample).

(0.166+0.242) x 100) for high-risk local loans (Panel C, column 1); a similar increase in *Stress-test exposure* would lead to an increase in the loan rate of about 53 basis points (=1.7 x (0.068+0.242) x 100) for medium-risk local loans (Panel B, column 1). Banks exposed to stress-test exposures increase the pricing of relatively high-risk loans in markets where they have an informational advantage.

The STBL-based Evidence on Loan Portfolio Composition

So far, we have documented that banks more affected by stress tests increase rates on risky, local loans. In contrast, they seem to decrease rates on low-risk loans. These findings therefore suggest that loan supply shifts *toward* safer borrowers because of the stress tests. Because banks are less able to raise rates on high-risk loans where they have little access to local information than where they do, we would expect a greater shift toward safety in these non-local markets. To test this notion, we model the relative quantities of loans in different risk categories as a function of the *stress-test exposures*. We construct a new outcome variable - *Risky Share* - equal to the share of loans in the STBL originated in the riskiest category (risk rating = 4) at the bank-state level. If the observed rate increases really come from a supply shift, then we ought to observe *Risky Share* decrease with *stress-test exposure*. If banks are unable to price risks in markets where they do not have information (i.e., in non-local markets), this shift ought to be larger.

To empirically investigate this, we estimate the following regression:

$$Risky\ Share_{i,s,t} = \beta_1 Stress\text{-}test\ Exposure_{h,t-1} + \beta_2 Stress\text{-}test\ Exposure_{h,t-1} \times Local_{i,s,t}$$
$$+\text{Avg Loan Controls}_{i,s,t} + \text{Bank Controls}_{i,t-1} + State \times Quater\ FEs + \varepsilon_{i,s,t} \quad \textbf{(7)}$$

where $Risky\ Share_{i,s,t}$ is the volume share of loans in the highest loan risk category originated by bank i in state s in quarter t. Since these regressions are implemented at the bank-state level, we control for averages of the non-price terms across loans made in each bank-state group for each survey date. As before, standard errors are clustered at the BHC-year level.

Table 9 reports the results following the regression in equation (7). As before, we report each specification with and without non-price loan terms. The results strongly support the supply interpretation of the pricing results. For states where banks do not have branches, the coefficient on *stress-test exposure* is negative and significant, both statistically and economically. A one-standard-deviation increase in *stress-test exposure* is associated with a 6 to 10 percentage point decline in *risky share*. This represents an economically large decline relative to the average *risky share* of about 34% of the portfolio (recall Table 1). The effect, however, is smaller – and close to zero– in markets where banks have branches. For example, the F-test on the sum of the two coefficients (*stress-test exposure* and its interaction with the local lender indicator) is not statistically significant in any of the models (although it does sign negatively).[30] Hence, the ability to raise prices on risky loans allows banks to continue to provide credit, even when facing large losses under the stress test.

These results are unlikely to reflect reverse causality – a connection running *from* bank loan supply *to* its outcome in the stress tests – for a number of reasons. First, the stress-test results are affected by the whole bank portfolio, and small business lending is a small component of the overall portfolios of large banks. Second, we use lagged values of the stress tests to allay concern about timing; for example, we merge stress-test results disclosed in March 2013 to the

[30] These conclusions are similar based on models in which we separate the sample by whether or not the bank has branches in the state of the borrower. This latter approach allows all of the coefficients to vary with *local lender*.

four subsequent quarters of STBL data (starting in May 2013). Third, any reverse causality would predict exactly the opposite of what we find. That is, reverse causality would predict that banks supplying more risky loans would be more affected by the stress test, which is the opposite of what we find. Our results are also unlikely to be related to credit demand. Our empirical strategy helps remove potential market-specific shocks at annual/quarterly frequency that might reflect demand conditions, yet whether or not we include these effects matters little to the size of our main coefficient.[31]

IV. Aggregate Effects on Credit Supply

Our results indicate that in markets where banks have relatively strong bargaining power with respect to their borrowers, due to things like location and access to private information, they tend to raise rates in response to the stress-test exposure. In markets where banks' small business loans are more like a commodity – one, for example, that could be made by any lender irrespective of having a local physical presence – we see a very strong effect on quantities but not on loan rates. Bottom line: banks affected by stress-test exposure reduce credit origination in markets where their comparative advantage is small, and raise rates where it is large.[32]

These results strongly suggest that individual banks' credit supply was affected by the stress tests, but leave the question: do stress tests constrain *overall* credit production? As we have documented, even stress-test-affected banks price in their higher cost of capital in markets where they have branches, thereby continuing to lend. Furthermore, other lenders, such as

[31] Including these effects, rather than just time effects, increases R^2 by about 60%.

[32] One can argue that the positive correlation between stress-test exposure and loan rates for risky loans might be due to the gaming of risk ratings. For example, if affected banks strategically reassign loans to lower-risk bins (to game the test), this would leave only the riskiest loans in the highest-risk category. This argument, however, does not explain the differences that we observe based on bank ownership of local branches.

small(er) banks not affected by stress tests, may have stepped in and continued to lend to displaced risky borrowers formerly served by stress-tested banks.

To test whether such substitution has occurred, we re-visit the CRA quantity data, but we now evaluate aggregate annual origination volumes in different markets (counties) and implement the following regression analysis:

$$Loan\ Growth_{c,t} = \quad \textbf{(8)}$$

$$= \beta_1 Local\ stress\text{-}test\ exposure_{c,t} + \beta_2\ Non\text{-}local\ stress\text{-}test\ exposure_{c,t} +$$

$$+\ County\ Controls_{c,t-1} + County\ FEs + Year\ FEs + \varepsilon_{i,c,t}$$

where $Loan\ Growth_{c,t}$ are growth rates in small business loan originations at the county c and year t level (rather than the bank-county-year level). Given that local and non-local banks respond differently to stress-test exposure, we construct two county-level measures of exposure. The first, *Local banks' stress-test exposure*$_{c,t}$, equals the average stress-test exposure for banks with branches in county *c* in year *t*, weighted by their local loan share in 2010 (before the first year of our sample). The second, *Non-local banks' stress-test exposure*$_{c,t}$, equals the average stress-test exposure for banks without branches in county *c* in year *t*, also weighted by their local loan share in 2010. We capture overall economic conditions at the county level with county and year fixed effects, as well as local time-varying drivers of loan demand (housing price growth, employment growth, and income growth).

Panel A of Table 10 reports the results from the county-level regressions of the growth in loan originations. We find no difference in aggregate credit origination across markets, regardless of local market reliance on small business lending from local and/or non-local stress-tested banks. Neither *Local banks' stress-test exposure* nor *Non-local banks' stress-test exposure* enters with a significant coefficient.

One possible explanation for this result is that non-tested (small) banks fill in the gap and lend to businesses stress-tested banks no longer serve. To verify this conjecture, we examine the relationship between *stress-test exposures* and the share of loans originated by local banks unaffected by stress tests: banks with assets below $10 billion.[33] We evaluate whether small, local banks increase their credit origination via the following regression analysis:

$$Small\ Bank\ Share_{c,t} = \quad \textbf{(9)}$$

$$= \beta_1 Local\ stress\text{-}test\ exposure_{c,t} + \beta_2\ Non\text{-}local\ stress\text{-}\ test\ exposure_{c,t} +$$

$$+\ County\ Controls_{c,t-1} + County\ FEs + Year\ FEs + \varepsilon_{i,c,t}$$

Panel B of Table 10 documents that *Small Bank Share* increases significantly in counties where non-local lenders faced high exposure to the stress tests. [34] In a county with 50% of small business credit provided by non-local stress-tested banks, a one-percentage-point increase in the stress-test exposure of non-local lenders leads to about one-percentage-point increase in the market share of small local banks.[35] Taken together, the results of Table 10, along with the earlier results, suggest that small banks unaffected by stress testing substitute in for large non-local banks.

Figure 4 illustrates the regression result by comparing market share changes for the stress-tested banks without local branches (labeled "CCAR Banks, Non-Local") to market share changes for small banks with local branches (labeled "Small Banks, Local"). The market share changes are reported separately for markets with above-median v. below-median *Non-local*

[33]Banks with assets between $10 and $50 billion are intermediate because these banks began to be subject to stress testing under the Dodd-Frank Act starting in 2014.

[34]Although our bank-county-level analysis suggests that stress-test-exposed banks exit high-systemic-risk markets more than lower risk ones, we do not find a significant interaction between the market-risk (employment) beta and the response of small bank market share to stress-test exposure.

[35] The calculation is 50% * 1 * 0.0186=0.93%, where 0.0186 is the coefficient on *Non-local banks' Stress-test exposure* in column 1 of Panel B of Table 9.

banks' stress-test exposure. The figure shows a striking difference in reallocation patterns. In markets with high exposure to the stress tests, the market share of non-local CCAR banks falls by about 8 percentage points; in contrast, their market share rises slightly in the less affected markets. We see the opposite patterns among the small local banks, whose share rises in markets heavily exposed to the stress tests and falls in other markets.

V. Conclusion and Policy Implications

Our results suggest that banks more affected by stress tests reduce their willingness to supply loans to small business, and this reduction has been concentrated among relatively riskier small-business borrowers. Quantities fall to a bigger extent in markets where stress-tested banks do not own branches near borrowers, and prices rise predominantly where they do. Aggregate credit has been reallocated away from the largest banks – especially those without a local presence – and toward small local lenders.

Policy implications are hard to assess fully. If large banks were taking too much risk before the financial crisis and extending too much credit, perhaps due to ineffective capital requirements, then the advent of stress testing likely improved efficiency in the credit markets. Moral hazard incentives from deposit insurance and "too big to fail" expectations are well known to potentially induce banks to supply too much risky credit. Regulations that accurately tie loan risk to required capital can help alleviate this distortion; hence, the stress tests may be achieving this objective. Moreover, the movement of credit supply from large non-local lenders toward smaller banks with more local knowledge may help enhance both financial stability and the efficiency of credit allocation.

On the other hand, advocates for large banks have argued that stress tests raise the implicit capital requirement on small business lending excessively – beyond the level justified by

the risk. This would also be consistent with many of our findings, but with very different normative implications. Without better information on the details of the models used to assess lending risk across market segments, we hesitate to take a firm stand on these policy debates.

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Figure 1: Total Small Business Lending Originations

The figure shows the total volume of small business loans originated by the Community Reinvestment Act (CRA) reporting banks in the USA, originated between 1997 and 2015. The data are aggregated to the national level from the CRA institution-level Disclosure Reports covering the lending activity of all institutions subject to the CRA reported to the Federal Financial Institutions Examination Council (FFIEC).

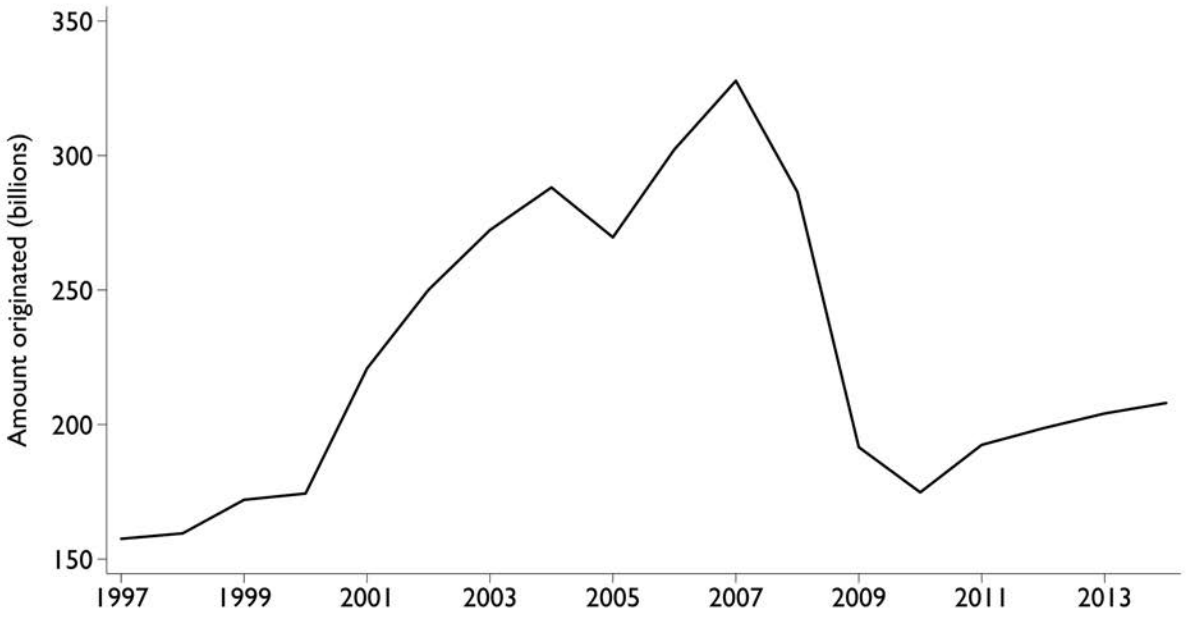

Figure 2: Total Outstanding C&I Loans

The figure shows the total amount of outstanding commercial and industrial (C&I) loans split by loan size between 1997 and 2016, indexed to 1997, in 2007 US dollars. The data are from the Consolidated Reports of Condition and Income (Call Reports), reported in June of each year. Non-commercial banks, foreign-controlled banks (with foreign ownership larger than 25%) and banks with missing data for assets, loans, equity, and deposits are excluded.

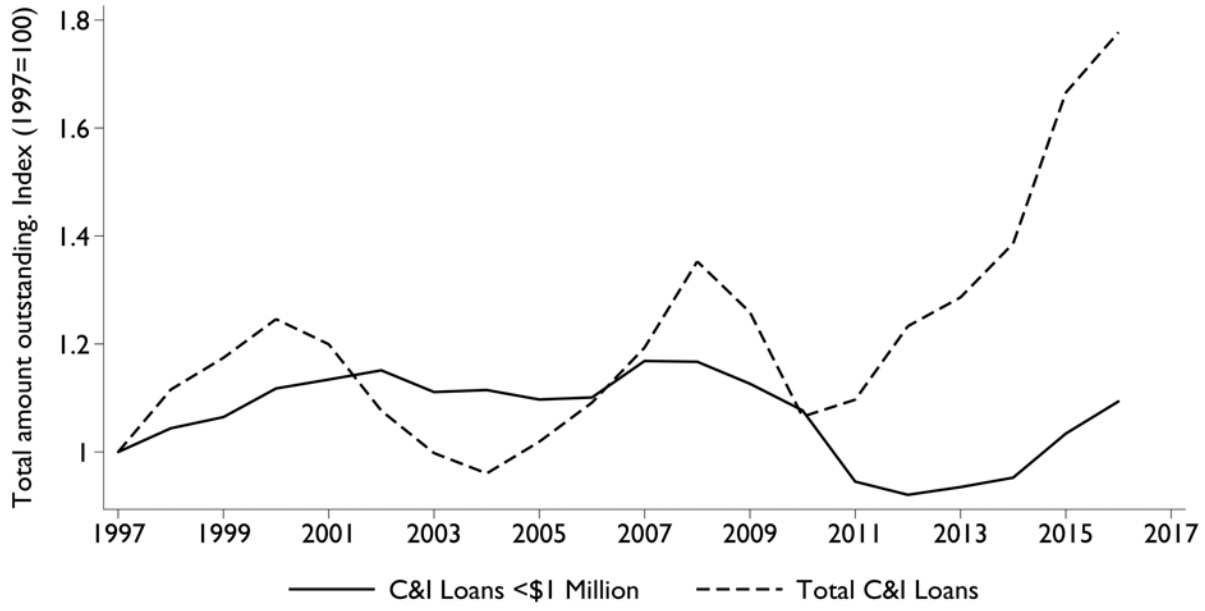

Figure 3: Distribution of Stress Test Exposure

This figure shows the cross-sectional distribution of the three stress-test exposure variables for each year between 2012 and 2016. The stress-test exposure for a BHC equals the difference between the BHC's capital ratio at the start of the stress testing and the lowest capital ratio expected by the Federal Reserve under the severely adverse scenario. Panels A, B, and C present the box plots of Tier 1 capital ratio, total risk-based capital ratio, and Tier 1 leverage ratio stress-test exposure measures, respectively. An "*" marks an outlier.

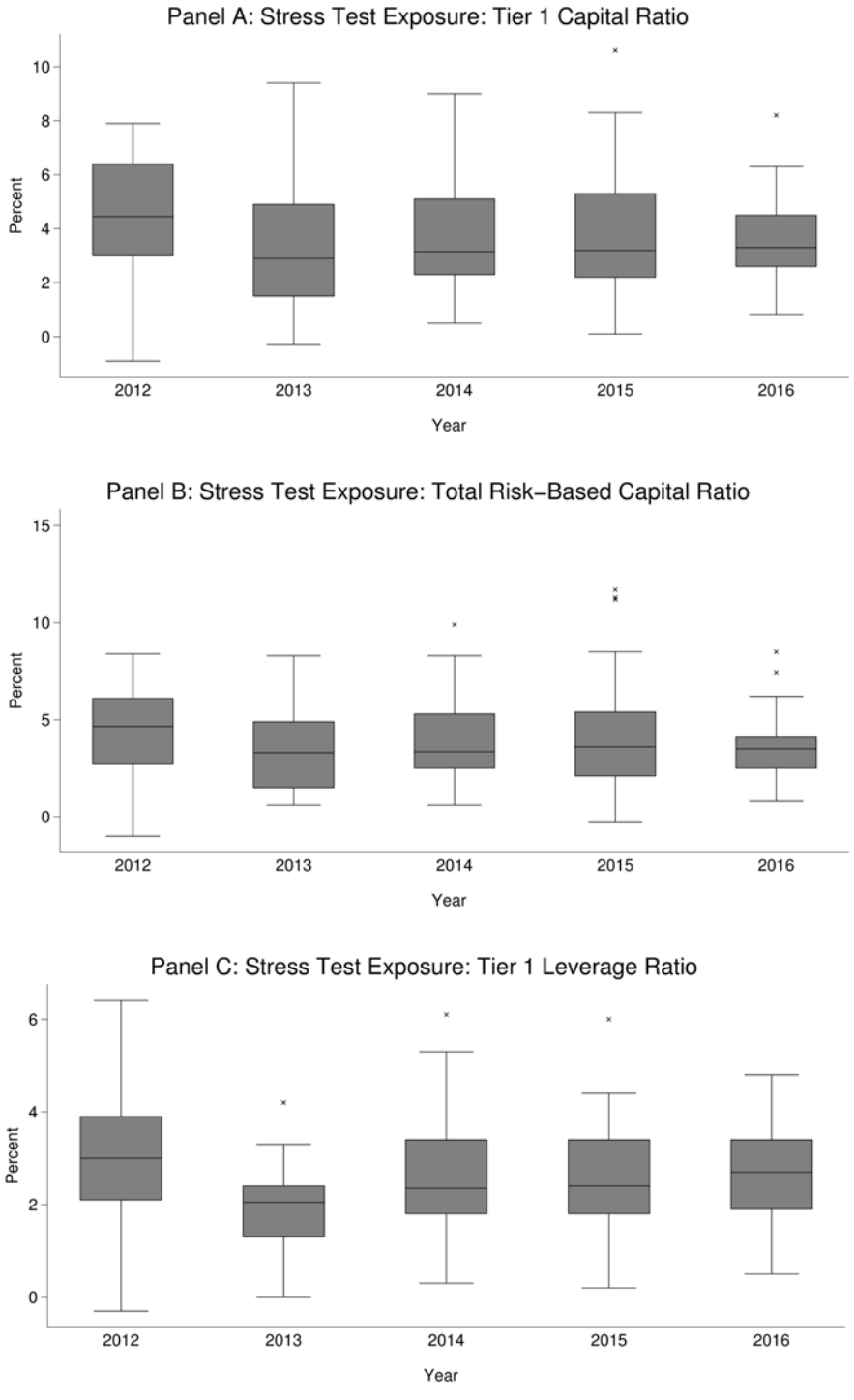

Figure 4: Changes in Shares of Small Business Loan Origination by Non-Local Banks' Stress-Test Exposure

This figure shows changes in market shares of small business loan originations between 2011 and 2015 for non-local CCAR and small local banks in markets (counties) with above-median and below-median *Stress-Test Exposure of Non-Local Banks*; these markets are labeled *High Exposure Markets* and *Low Exposure Markets*, respectively. The *Stress-Test Exposure of Non-Local Banks* is measured in two steps. First, in each year we calculate the average county-level *Stress-Test Exposure* for banks without local branches weighted by their small business loan share in 2010. Then, for each county we calculate the average of this measure over 2012-2016 and split all counties in our sample into those with above-average or below-average *Stress-Test Exposure of Non-Local Banks*. The bars on the left show the average changes (across counties) in small business lending market shares for stress-tested banks without local branches (Non-Local CCAR Banks) and the bars on the right show the average changes in small business lending market shares for small non-CCAR, banks with local branches (Small Local Banks).

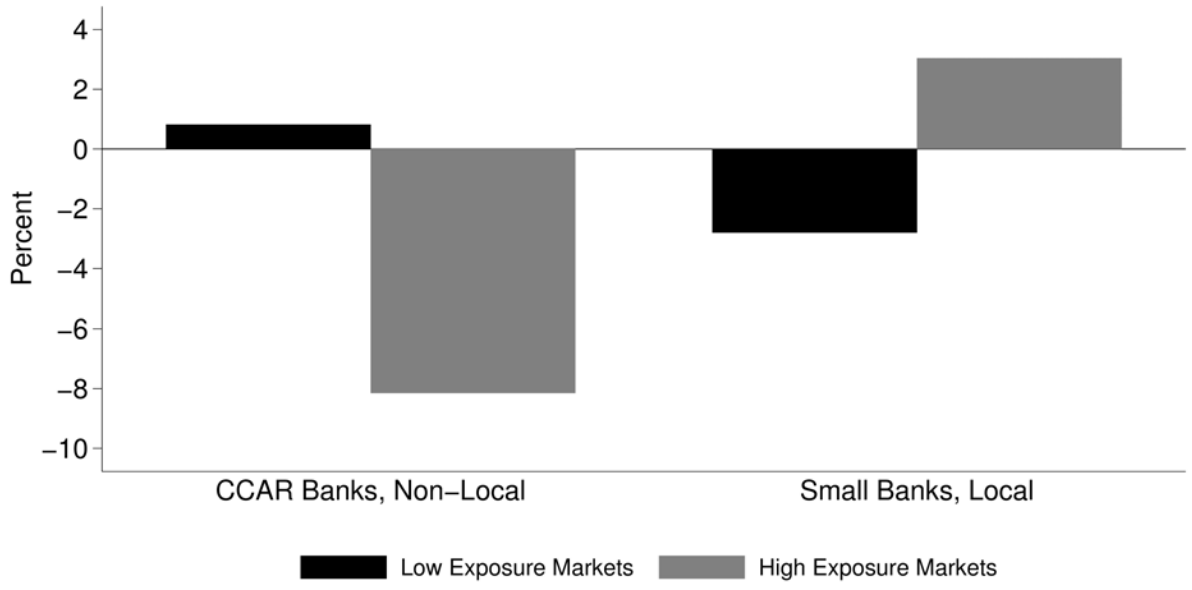

Table 1: Summary Statistics

This table reports summary statistics for the stress-test exposures, bank characterisitcs, Community Reinvestment Act (CRA) small business loan originations, and small business lending loan terms. Data sources are public release of the stress-test results by the Federal Reserve, Consolidated Report of Condition and Income (Call Reports), CRA, and Survey of Terms of Business Lending (STBL), respectively. STBL data covers the period between 2013Q1 and 2016Q4, Call Reports and CRA data cover 2012-2015.

	Mean	Median	Standard Deviation
Panel A: Stress Test Exposures			
Stress-Test Exposure (Tier 1 Capital Exposure)	3.35	2.80	1.71
Stress-Tests Exposure (Total Risk-Based Capital Exposure)	3.37	3.10	1.74
Stress-Test Exposure (Tier 1 Leverage Exposure)	2.63	2.30	1.29
Tier 1 Capital	13.42	12.70	2.95
Risk-Based Capital	16.17	15.52	3.03
Tier 1 Leverage	8.93	9.02	1.90
Panel B: Bank Characteristics			
Log of Bank Assets	19.41	19.00	1.15
Deposits / Total Liabilities	75.2%	77.2%	8.1%
NPL / Loans	1.4%	1.2%	1.2%
ROA	0.2%	0.2%	0.1%
C&I Loans / Assets	15.1%	15.2%	9.2%
Cash + Securities / Assets	33.9%	25.4%	17.4%
Stock Return Volatility	1.3%	1.2%	0.4%
Growth in CRA Loans	-8.3%	-2.6%	52.7%
Panel C: STBL Loan Terms			
Loan Rate (percentage points)	3.29	3.25	1.27
Log of Loan Size	11.14	10.97	1.12
Maturity (months)	15.43	11.00	17.36
Rating (1=safest; 4=riskiest)	3.19	3.00	0.73
Share of Risky Loans (Rating = 4)	0.34	0.23	0.35
Local Lender? (Branch in Borrower's State)	66%	-	-
Loan is Secured?	87.1%	-	-
SBA Loan?	2.0%	-	-
Syndicated Loan?	13.3%	-	-
Prepayment Penalty?	9.5%	-	-
Floating Rate Loan?	92.5%	-	-
Panel D: Local Risk Measures			
Employment Beta	1.29	1.12	0.69

Table 2: The Effect of Stress Tests on Loan Growth by Market (CRA Data)

This table reports the results from the OLS regressions following equation (2). The dependent variable is the growth in small business loan originations by bank i in county c at time t, as reported by the CRA data and defined in equation (1). *Stress-Test Exposure* equals the difference between the starting value of the capital ratio at the outset of the stress test and the lowest capital ratio implied by the severely adverse stress scenario. County-year-level *Employment Beta* is calculated as the weighted average of industry betas based on the shares of different industries in a county (equation (3)). Bank-level controls are log of total assets, share of C&I loans in a bank's total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. In all specifications we control for county times year fixed effects. In column (3) we replace all bank-level controls with bank times year fixed effects. The sample covers the period between 2012 and 2015. Standard errors are clustered by BHC-year.

	Dependent Variable = Growth in CRA Loan Originations		
	(1)	(2)	(3)
Panel A: Tier 1 Capital			
Stress-Test Exposure	-0.008	0.036	
	(0.14)	(0.60)	
Stress-Test Exposure x County Employment Beta		-0.039**	-0.029**
		(2.61)	(2.29)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.20	0.20	0.57
Panel B: Total Risk-Based Capital			
Stress-Test Exposure	0.036	0.07	
	(0.64)	(1.25)	
Stress-Test Exposure x County Employment Beta		-0.030*	-0.029**
		(1.94)	(2.33)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.20	0.20	0.57
Panel C: Leverage Ratio			
Stress-Test Exposure	0.064	0.137*	
	(0.99)	(1.83)	
Stress-Test Exposure x County Employment Beta		-0.064**	-0.060**
		(2.24)	(2.56)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.25	0.25	0.57

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 3: The Effect of Stress Tests on Loan Growth in Local and Non-local Markets

This table reports the results from the OLS regressions following equations (2) and (4), split by whether or not the bank has a branch in the market. The dependent variable is the growth in small business loan originations by bank i in county *c* at time *t*, as reported by the CRA data and defined in equation (1). *Stress-Test Exposure* equals the difference between the starting value of the capital ratio at the outset of the stress test and the lowest capital ratio implied by the severely adverse stress scenario. County-year-level *Employment Beta* is calculated as the weighted average of industry betas based on the shares of different industries in a county (equation (3)). We classify a county as a bank's *local* market if the bank has a branch in that county. Bank-level controls are log of total assets, share of C&I loans in a bank's total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. In all specifications we control for county times year fixed effects. In columns (2) and (4) we replace all bank-level controls with bank times year fixed effects. The sample covers the period between 2012 and 2015. Standard errors are clustered by BHC-year.

	Dependent Variable = Growth in CRA Loan Originations			
	(1)	(2)	(3)	(4)
	Local		Non-Local	
Panel A: Tier 1 Capital				
Stress-Test Exposure	-0.064*		0.077	
	(1.74)		(1.10)	
Stress-Test Exposure x County Employment Beta	0.015	0.011	-0.054***	-0.034***
	(1.19)	(1.05)	(3.55)	(2.80)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.25	0.66
Panel B: Total Risk-Based Capital				
Stress-Test Exposure	-0.054		0.109	
	(1.62)		(1.62)	
Stress-Test Exposure x County Employment Beta	0.013	0.007	-0.044***	-0.034***
	(0.90)	(0.68)	(2.84)	(2.85)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.25	0.66
Panel C: Leverage Ratio				
Stress-Test Exposure	-0.044		0.218**	
	(0.86)		(2.31)	
Stress-Test Exposure x County Employment Beta	-0.004	0.007	-0.097***	-0.071***
	(0.18)	(0.42)	(2.97)	(2.82)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.31	0.66

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 4: The Effect of Stress Tests on Loan Interest Rates

This table reports the results from the OLS regressions following equation (5). The dependent variable is the individual-level interest rate for each small business loan reported in the STBL. Stress-Test-Exposure equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for year-quarter or state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)								
	Tier 1 Capital			Total Risk-Based Capital			Leverage Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stress-Test Exposure	0.218***	0.192***	0.309***	0.176***	0.153***	0.286***	0.279***	0.243***	0.576***
	(3.37)	(3.81)	(4.51)	(3.02)	(3.56)	(4.76)	(2.83)	(3.17)	(5.30)
Log Loan Size	-0.132**	-0.162***	-0.080*	-0.135**	-0.164***	-0.079*	-0.137**	-0.165***	-0.101**
	(2.27)	(3.69)	(1.81)	(2.28)	(3.75)	(1.76)	(2.35)	(3.75)	(2.49)
Log Bank Assets	-0.064	-0.064	0.051	-0.05	-0.046	0.07	0.008	0.006	0.126*
	(1.02)	(1.34)	(0.67)	(0.77)	(0.90)	(0.84)	(0.14)	(0.15)	(1.93)
Rating (1=safest; 4=riskiest)	0.337***	0.341***	0.335***	0.337***	0.342***	0.340***	0.327***	0.335***	0.305***
	(4.62)	(4.83)	(5.46)	(4.58)	(4.80)	(5.46)	(4.67)	(4.82)	(5.17)
Local Lender	-0.372***	-0.255**	0.081	-0.535***	-0.407***	0.065	-0.443***	-0.329***	0.01
	(3.55)	(2.57)	(0.82)	(4.85)	(4.24)	(0.68)	(3.86)	(3.09)	(0.11)
Log Maturity			0.130***			0.127***			0.136***
			(2.96)			(2.87)			(3.20)
Loan is Secured?			-0.211**			-0.198*			-0.211**
			(2.03)			(1.80)			(2.29)
SBA Loan?			1.719***			1.785***			1.602***
			(8.23)			(8.31)			(7.44)
Syndicated Loan?			-0.197			-0.213			-0.134
			(1.42)			(1.47)			(1.09)
Pre Payment Penalty?			-0.991***			-0.948***			-1.121***
			(5.77)			(5.34)			(7.34)
Floating Rate Loan?			0.305*			0.308*			0.004
			(1.85)			(1.80)			(0.04)
Quarter Effects	Yes	-	-	Yes	-	-	Yes	-	-
State x Quarter Effects	-	Yes	Yes	-	Yes	Yes	-	Yes	Yes
R^2	0.17	0.24	0.33	0.16	0.23	0.32	0.16	0.24	0.36
Number of observations	340,333	336,141	205,703	340,333	336,141	205,703	340,333	336,141	205,703

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 5: The Effect of Stress Tests on Loan Maturity

This table reports the results from the OLS regressions similar to those of equation (5), with a different outcome: the dependent variable is the individual-level log of maturity for each small business loan reported in the STBL. *Stress Test Exposure* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for year-quarter or state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Log(maturity)								
	Tier 1 Capital			Total Risk-Based Capital			Leverage Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stress-Test Exposure	-0.102***	-0.075***	-0.073***	-0.101***	-0.073***	-0.067***	-0.126***	-0.090***	-0.102***
	(4.37)	(3.76)	(3.21)	(4.57)	(3.87)	(3.15)	(4.84)	(4.47)	(3.74)
Log Loan Size	0.110***	0.109***	0.090***	0.110***	0.109***	0.090***	0.112***	0.110***	0.092***
	(6.23)	(6.48)	(7.32)	(6.11)	(6.40)	(7.15)	(6.35)	(6.59)	(7.80)
Log Bank Assets	-0.084***	-0.126***	-0.110***	-0.090***	-0.130***	-0.115***	-0.117***	-0.153***	-0.131***
	(4.03)	(5.64)	(4.10)	(4.79)	(6.34)	(4.18)	(5.49)	(7.68)	(5.21)
Rating (1=safest; 4=riskiest)	0.092	0.093*	0.115***	0.09	0.092	0.114***	0.103	0.099*	0.119***
	(1.44)	(1.69)	(2.77)	(1.41)	(1.66)	(2.76)	(1.59)	(1.80)	(2.86)
Local Lender	-0.604***	-0.478***	-0.382***	-0.602***	-0.477***	-0.378***	-0.580***	-0.455***	-0.366***
	(6.31)	(7.31)	(7.00)	(6.32)	(7.35)	(7.08)	(5.74)	(6.88)	(6.46)
Loan is Secured?			0.164*			0.161*			0.167*
			(1.94)			(1.93)			(1.96)
SBA Loan?			0.957***			0.942***			0.971***
			(4.54)			(4.48)			(4.71)
Syndicated Loan?			0.694***			0.699***			0.684***
			(7.96)			(8.09)			(7.81)
Pre-Payment Penalty?			0.232*			0.222			0.250*
			(1.70)			(1.63)			(1.86)
Floating Rate Loan?			0.077			0.078			0.145*
			(0.96)			(0.99)			(1.75)
Quarter Effects	Yes	-	-	Yes	-	-	Yes	-	-
State x Quarter Effects	-	Yes	Yes	-	Yes	Yes	-	Yes	Yes
R^2	0.09	0.11	0.18	0.09	0.11	0.18	0.09	0.11	0.18
Number of observations	209,877	205,705	205,705	209,877	205,705	205,705	209,877	205,705	205,705

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 6: The Effect of Stress Tests on Loan Interest Rates, Robustness to Other Bank Characteristics

This table reports the results from the OLS regressions following equation (5). The dependent variable is the individual-level interest rate for each small business loan reported in the STBL. Stress-Test-Exposure equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Stress-Test Exposure (Tier 1 Capital)	0.193***	0.185***	0.199***	0.158***	0.222***	0.203***	0.187***	0.115***
	(3.85)	(3.83)	(3.86)	(3.80)	(4.47)	(3.86)	(3.24)	(2.71)
Log Loan Size	-0.162***	-0.172***	-0.168***	-0.167***	-0.160***	-0.161***	-0.153***	-0.195***
	(3.69)	(3.87)	(3.80)	(4.14)	(3.65)	(3.66)	(-3.18)	(-4.34)
Log Bank Assets	-0.065	-0.053	-0.189	-0.005	0.087	-0.035	-0.007	0.192
	(1.23)	(1.14)	(1.45)	(0.09)	(1.25)	(0.54)	(-0.12)	(1.46)
Rating (1=safest; 4=riskiest)	0.341***	0.336***	0.334***	0.329***	0.357***	0.342***	0.400***	0.389***
	(4.85)	(4.79)	(4.58)	(4.48)	(5.17)	(4.90)	(4.58)	(4.59)
Local Lender	-0.256**	-0.443***	-0.324***	-0.336***	0.05	-0.222**	-0.122	-0.382***
	(2.54)	(4.17)	(3.02)	(2.94)	(0.46)	(2.11)	(-0.97)	(-3.73)
Initial Capital Ratio	-0.001	0.04	0.008	-0.007	-0.043	-0.006	-0.033	0.067
	(0.03)	(0.68)	(0.15)	(0.14)	(1.01)	(0.12)	(-0.72)	(1.23)
Deposits / Total Liabilities		1.436*						3.809***
		(1.73)						(4.11)
NPL / Loans			12.289					12.22
			(0.97)					(1.38)
ROA				-225.605**				-397.887***
				(2.26)				(-3.97)
C&I Loans / Assets					3.717***			5.138***
					(4.38)			(3.33)
Cash + Securities / Assets						-0.571		0.044
						-1.11		(0.05)
Stock Return Volatility							0.934***	0.603**
							(3.29)	(2.56)
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.24	0.24	0.24	0.25	0.25	0.24	0.24	0.28
Observations	336,141	336,141	336,141	336,141	336,141	336,141	284,089	284,089

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 7: The Effect of Stress Tests on Local Branch Loan Interest Rates

This table reports the results from the OLS regressions following equation (6). The dependent variable is the individual-level interest rate for each small business loan reported in the STBL. Stress-Test Exposure equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. The Stress-Test-Exposure is based on the Tier 1 Capital in columns (1) and (2), total risk-based capital in columns (3) and (4), and the leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Stress-Test Exposure	0.089***	0.150**	0.057**	0.158***	0.114**	0.391**
	(2.72)	(2.48)	(2.25)	(2.75)	(2.44)	(2.36)
Local Lender?	-1.008***	-0.583***	-1.132***	-0.504***	-1.249***	-0.508*
	(6.43)	(3.85)	(6.09)	(3.51)	(6.20)	(1.88)
Local Lender x Stress Test Exposure	0.233***	0.218***	0.225***	0.174***	0.343***	0.220**
	(4.43)	(5.13)	(4.25)	(4.37)	(4.13)	(2.19)
Rating (1=safest; 4=riskiest)	0.332***	0.323***	0.338***	0.331***	0.322***	0.301***
	(4.71)	(5.35)	(4.75)	(5.37)	(4.64)	(5.14)
Log Loan Size	-0.168***	-0.084*	-0.169***	-0.081*	-0.180***	-0.102**
	(3.96)	(1.89)	(4.05)	(1.82)	(4.22)	(2.50)
Log Bank Assets	-0.123**	0.025	-0.097*	0.052	-0.014	0.118*
	(2.27)	(0.32)	(1.72)	(0.62)	(0.34)	(1.87)
Log Maturity		0.129***		0.125***		0.138***
		(2.99)		(2.86)		(3.29)
Loan is Secured?		-0.194*		-0.184		-0.204**
		(1.87)		(1.65)		(2.22)
SBA Loan?		1.698***		1.777***		1.589***
		(8.16)		(8.29)		(7.42)
Syndicated Loan?		-0.16		-0.186		-0.126
		(1.16)		(1.27)		(1.03)
Pre-Payment Penalty?		-0.988***		-0.942***		-1.123***
		-5.79		-5.3		-7.42
Floating Rate Loan?		0.322*		0.324*		-0.009
		(1.94)		(1.87)		(0.07)
R^2	0.25	0.33	0.25	0.33	0.25	0.36
Number of observations	336,141	205,703	336,141	205,703	336,141	205,703
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 8: The Effect of Stress Tests on Loan Interest Rates by Risk Rating

This table reports the results from the OLS regressions following equation (6). The dependent variable is the individual-level interest rate for each small business loan reported in the STBL. Stress-Test Exposure equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. We split our sample by the loan risk rating groups, where a rating equal to one represents the lowest loan risk. Risk ratings are assigned by each bank for its indivual loans and are mapped to a scale from the Federal Reserve for better comparison across banks. The Stress-Test Exposure is based on the Tier 1 capital in columns (1) and (2), total risk-based capital in columns (3) and (4), and the leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
Panel A: Low-Risk Loans (Rating = 1 or 2)						
Stress-Test Exposure	-0.002	-0.012	-0.011	0.001	0.026	-0.004
	(0.09)	(0.62)	(0.57)	(0.06)	(0.86)	(0.07)
Local Lender?	-0.238	0.143	-0.298**	-0.02	-0.006	0.086
	(1.51)	(0.88)	(2.10)	(0.14)	(0.03)	(0.39)
Local Lender x Stress-Test Exposure	-0.066	-0.048	-0.044	0.006	-0.157**	-0.035
	(1.50)	(1.14)	(1.12)	(0.16)	(2.49)	(0.42)
R^2	40.9%	42.8%	40.9%	42.7%	41.1%	42.7%
Number of observations	51,085	19,616	51,085	19,616	51,085	19,616
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Medium-Risk Loans (Rating = 3)						
Stress-Test Exposure	0.068**	0.068	0.046**	0.075*	0.087**	0.392***
	(2.60)	(1.64)	(2.33)	(1.91)	(2.22)	(3.40)
Local Lender?	-1.095***	-1.173***	-1.186***	-1.104***	-1.418***	-1.001***
	(6.46)	(6.91)	(6.01)	(6.90)	(5.99)	(4.20)
Local Lender x Stress-Test Exposure	0.242***	0.310***	0.224***	0.262***	0.390***	0.305***
	(4.23)	(5.96)	(3.95)	(5.59)	(3.68)	(3.56)
R^2	34.8%	38.3%	34.2%	37.7%	35.2%	42.5%
Number of observations	164,115	102,251	164,115	102,251	164,115	102,251
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: High-Risk Loans (Rating = 4)						
Stress-Test Exposure	0.166***	0.316***	0.120***	0.325***	0.194***	0.463***
	(3.54)	(3.72)	(3.04)	(3.88)	(2.95)	(3.56)
Local Lender?	-0.852***	-0.051	-1.060***	0.058	-0.983***	-0.11
	(3.93)	(0.32)	(4.35)	(0.30)	(4.11)	(0.62)
Local Lender x Stress-Test Exposure	0.242***	0.064	0.253***	0.016	0.305***	0.105
	(3.69)	(1.25)	(3.98)	(0.28)	(3.59)	(1.49)
R^2	0.21	0.34	0.20	0.33	0.19	0.35
Number of observations	120,941	83,836	120,941	83,836	120,941	83,836
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table 9: Share of High-Risk Loans

This table reports the results from the OLS regressions following equation (7). The dependent variable is risky share, which is defined as the share of high-risk (rating = 4) loans originated by bank *i* in state *s* during year *t* as reported in the STBL. Stress-Test Exposure equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. The Stress-Test Exposure is based on the Tier 1 capital in columns (1) and (2), total risk-based capital in columns (3) and (4), and the leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects.

	Dependent Variable = Share of Loans in Risk Category = 4					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Stres-Test Exposure	-0.047***	-0.037***	-0.040***	-0.034***	-0.074***	-0.069**
	(-5.37)	(-4.61)	(-5.15)	(-4.38)	(-3.48)	(-2.44)
Local Lender?	-0.130**	-0.173***	-0.083*	-0.145**	-0.154***	-0.195***
	(-2.64)	(-2.83)	(-1.92)	(-2.44)	(-2.65)	(-3.02)
Local Lender x Stress Test Exposure	0.033**	0.034**	0.018	0.022*	0.064**	0.057**
	(2.18)	(2.25)	(1.53)	(1.70)	(2.50)	(2.21)
Log Bank Assets	0.047**	0.061**	0.051**	0.064**	0.038	0.057**
	(2.05)	(2.11)	(2.28)	(2.27)	(1.60)	(2.01)
Average Log Maturity		-0.001*		-0.001*		-0.001
		(-1.77)		(-1.79)		(-0.75)
Fraction of Secured Loans		-0.027		-0.035		-0.023
		(-0.35)		(-0.45)		(-0.29)
Fraction of SBA Loans		0.07		0.072		0.079
		(0.58)		(0.58)		(0.70)
Fraction of Syndicated Loans		-0.117		-0.119		-0.161*
		(-1.44)		(-1.50)		(-1.91)
Fraction of Loans with Pre Payment Penalty		-0.111		-0.116		-0.106
		(-1.60)		(-1.63)		(-1.52)
Fraction of Loans with a Floating Rate		0.228***		0.231***		0.255***
		(4.78)		(4.80)		(5.10)
R^2	0.17	0.22	0.16	0.22	0.14	0.21
Observations	5,837	4,888	5,837	4,888	5,837	4,888
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% leve

Table 10: The Effect of Stress Tests on Overall Loan Growth (CRA Data)

This table reports county-year level regressions of growth in small business loans (SBL) in Panel A and market share of banks with under $10 billion in assets, both as functions of the market-level average exposure to the stress tests, as in Equations (8) and (9). Local banks' stress-test exposure equals the average stress-test exposure for banks with branches lending to the market, weighted by their loan share before the first stress test (2010). Non-local banks' stress-tests exposure equals the average stress-test exposure for banks without branches, also weighted by their loan shares in 2010. (Banks not part of stress tests (non-CCAR) receive zero weight in both calculations.) In all specifications we control for county and year fixed effects. Standard errors are clustered by county.

Panel A: Dependent Variable = County-Level SBL Growth			
	Tier 1 Capital	*Total Risk-Based Capital*	*Leverage Ratio*
	(1)	(2)	(3)
Local banks' Stress-Test Exposure (county average)	0.008	0.010	0.012
	-1.05	-1.16	-1.19
Non-local banks' Stress-Test Exposure (county average)	0.033	0.026	0.030
	-1.47	-1.12	-0.98
Home Price Growth	0.052	0.053	0.052
	-0.47	-0.48	-0.48
Employment Growth	0.169	0.173	0.180
	-0.71	-0.72	-0.75
Personal Income Growth	0.220*	0.218*	0.217*
	-1.75	-1.73	-1.73
County Effects	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Observations	10,608	10,608	10,608
R^2	0.13	0.13	0.13
Panel B: Dependent Variable = Market Share of Small, Local Banks Not Owned by Stress Tested BHCs			
	Tier 1 Capital	*Total Risk-Based Capital*	*Leverage Ratio*
Local banks' Stress-Test Exposure (county average)	-0.001	-0.0002	-0.003
	(0.74)	(0.11)	(1.11)
Non-local banks' Stress-Test Exposure (county average)	0.019***	0.021***	0.014*
	(3.36)	(3.62)	(1.94)
Home Price Growth	0.056**	0.056**	0.058**
	(2.06)	(2.05)	(2.11)
Employment Growth	0.279***	0.278***	0.285***
	(3.70)	(3.68)	(3.77)
Personal Income Growth	-0.035	-0.036	-0.036
	(1.06)	(1.08)	(1.04)
County Effects	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Observations	10,608	10,608	10,608
R^2	0.774	0.774	0.773

T-statistics reported in parentheses. A '*' denotes significance at the 10% level, '**" the 5% level, and '***' the 1% level.

Table A1: Employment Betas for 2-Digit NAICS Industries

This table reports time-invariant, industry-level employment betas, where beta equals the coefficient from a time series regression of industry-level employment growth on overall economy-level employment growth, based on quarterly data from 1992 through 2015.

NAICS2	Industry Title	Winsorized Employment Beta
11	Agriculture, Forestry, Fishing and Hunting	4.93
21	Mining	1.05
22	Utilities	0.49
23	Construction	2.91
31	Manufacturing: Food, Beverage, Textiles	0.88
32	Manufacturing: Wood, Paper, Chemicals	0.69
33	Manufacturing: Metals, Machinery, Equipment	0.49
42	Wholesale Trade	0.61
44	Retail Trade	1.17
45	Retail Trade: Specialty Stores (e.g., florists)	1.64
48	Transportation and Warehousing	0.76
49	Transportation and Warehousing: Specialty Services (e.g., postal transportation)	0.69
51	Information	0.46
52	Finance and Insurance	0.34
53	Real Estate Rental and Leasing	1.13
54	Professional, Scientific, and Technical Services	-0.03
55	Management of Companies and Enterprises	-0.10
56	Administrative and Support and Waste Management and Remediation Services	1.76
61	Educational Services	-0.98
62	Health Care and Social Assistance	0.23
71	Arts, Entertainment, and Recreation	4.93
72	Accommodation and Food Services	1.36
81	Other Services (except Public Administration)	0.76
99	Public Administration	-0.98