Do Asset Price Bubbles have Negative Real Effects?

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Abstract

In the recent recession and current economic recovery, policymakers have supported housing prices, expecting that improvement in the balance sheets of banks and consumers will spur economic activity. Considering the period of 1988 through 2006, we document that banks which are active in strong housing markets increase mortgage lending and decrease commercial lending. Firms that borrow from these banks have significantly lower investment. This decrease is especially pronounced for firms which are more capital constrained or borrow from smaller, more regional banks. From a policy standpoint, these results could mitigate any positive effects that come from supporting housing prices.

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A large literature in finance and macroeconomics—e.g., Bernanke and Gertler (1989), Holmstrom and Tirole (1997) and Kiyotaki and Moore (1997)— studies the positive effect of an increase in asset prices on productive real investment. According to these models, firms that are credit constrained due to moral hazard problems are able to borrow and invest more when their assets are worth more because they have more 'skin in the game' and/or they can provide higher value of collateral. Moreover, an increase in the value of assets of banks will strengthen this effect, enabling the banks to lend more and thus increasing firms' borrowing and investment further. These effects lead to an amplification of shocks—a positive shock to asset prices enables firms to borrow and invest more, magnifying the initial shock—which is studied widely in macroeconomics to explain the large swings in the economy and their relation to the financial system.

A related belief is in the basis of actions taken by policymakers following the recent mortgage crisis and the anemic economic recovery that followed it. In February 2009, through the Homeowner Affordability and Stability Plan, the Federal Reserve and U.S. Treasury purchased more than $1.4 trillion in agency mortgage-backed securities and provided resources to support Fannie Mae and Freddie Mac. Recently, in September 2012, the Federal Open Market Committee (FOMC) approved plans to purchase additional agency mortgage-backed securities at a rate of $40 billion per month.[1] The rationale being that, by putting downward pressure on mortgage rates, the FOMC would provide further support for the housing sector. As Chairman Bernanke mentioned during his September 13, 2012 press conference announcing the FOMC action:

> To the extent that home prices begin to rise, consumers will feel wealthier, they'll feel more disposed to spend...The issue here is whether or not improving asset prices generally will make people more willing to spend. One of the main concerns that firms have is there is not enough demand, there's not enough people coming and demanding their products. And if people feel that their financial situation is better...or for whatever reason, their house is worth more, they are more willing to go out and spend, and that's going to provide the demand that firms need in order to be willing to hire and to invest. (Bernanke (2012)).

The mechanism policymakers are relying upon is that through "improving asset prices," and specifically housing assets, consumers will increase demand, leading to increased firm investment and hiring. In other words, by improving the asset values of banks and consumers, there will be beneficial spillover effects to the larger economy.

[1]This amount is in conjunction with purchases of longer-term Treasury securities at the pace of $45 billion per month, totaling $85 billion per month in securities purchases.

However, these arguments are leaving out the potentially negative effect of asset-price increases. An increase in activity and asset value in one sector, such as mortgage lending, may crowd out resources from other sectors and activities, such as borrowing and investment by commercial firms. The classic theory of rational bubbles (e.g., Tirole (1985)) says that bubbles, by increasing interest rates, will crowd out real investment. Moreover, in the recent paper by Farhi and Tirole (2012), this effect is stronger when firms are financially constrained. Banks may substitute away from lending to commercial firms and focus on investing in bubbly assets (e.g., mortgages and real-estate). Similarly, Bleck and Liu (2013) consider the relationship between liquidity injections, asset prices, and economic growth in a model with two sectors. They find that if too much liquidity is injected into the economy, the sector receiving the liquidity can overheat and "crowd-out" the other sector. Miao and Wang (2013) also consider a two sector model, and find that bubbles, even in productive assets, may misallocate resources across sectors and reduce welfare. Based on such arguments, the focus on increasing asset prices, and in particular real-estate prices, may be wrong as the potential harm to commercial firms' borrowing and investment will hurt the economy as a whole.

To shed empirical light on these issues, our paper looks at the effect of housing prices on commercial lending from 1988 through 2006. Using the location of banks' deposit branches to proxy for the location of mortgage activity, we find evidence that an increase in housing prices leads to a *decrease* in commercial lending.[2] Specifically, if a bank's deposit base is in an area with a one standard deviation increase in housing prices, that bank decreases commercial and industrial lending by 0.74 percentage points, as a fraction of the bank's assets. This shift has marked effects on the firms associated with these banks: for the one standard deviation increase in housing prices, firms decrease investment by 4.7 percentage points. Banks reduce the size of loans to these firms by about 3.74 percentage points, as scaled by firms' asset value. Consistent with recent research, these firms are not fully able to recover the lost capital when their bank decreases commercial lending.[3]

When considering bank lending and firm investment, one needs to be cognizant of the interaction between loan supply and firm demand. If housing prices are correlated with changing investment opportunities, the results we observe may be driven by changing firm demand, rather than intentional reallocation of capital on the part of banks. Insofar as increased housing prices coincide with general economic growth, we expect a positive relation

[2] Our principal assumption is that banks are more likely to invest in mortgage assets if there is larger price appreciation in the areas where banks have branches. We discuss the appropriateness of our assumption with respect to traditional mortgage lending and mortgaged-backed securities in more detail in Section II.B.

[3] See Faulkender and Petersen (2006), Sufi (2009), Leary (2009), Lemmon and Roberts (2010), and Chava and Purnanandam (2011).

between housing prices and firm investment opportunities. This correlation implies that, if anything, our estimates are likely biased upward (i.e., the reduction in lending due to a shock to real-estate prices unrelated to firms' demand for capital is likely greater than we estimate).

We address this possible endogeneity between loan supply and firm demand in a few ways. First, to better account for this correlation between investment opportunities and housing prices, we include housing prices in the state where the firm is located as an additional control. The idea being that housing prices in the firm's state are more closely related to its investment opportunities than housing prices where the bank operates. Therefore inference about the impact of housing prices in the bank's area is less likely to be contaminated by correlation with investment opportunities. Consistent with this intuition, we find that the negative results associated with housing prices in the bank's location remain, and that housing prices in the firm's location can have a positive association with firm investment. We consider a subsample of firm-bank pairs where the bank's deposit base and firm location are in different states and find similar results. To best control for the correlation between a borrowing firm's investment opportunities and housing price appreciation, we take an instrumental variables approach.

Following Saiz (2010), we use an instrument that measures the availability of developable land in terms of topographic restrictions. In addition, we include a weighted-average of the state-level 30-year fixed mortgage interest rate where the bank has deposits, using the bank's deposits as weights. This average mortgage interest rate is interacted with the land unavailability measure. These instruments are motivated by the idea that for a given decrease in mortgage rates, there will be an increase in housing demand. In areas where land cannot be easily developed into new housing, this increase in housing demand should translate to higher housing prices, compared to areas that can easily accommodate more housing. Further, housing elasticity differences due to the presence of undevelopable land is not related to underlying economic activity. Thus the instruments provide a component of housing price appreciation that is unrelated to firms' financing and investment choices except through its effect on housing prices.[4]

Using these instruments we find much stronger effects: the one standard deviation increase in housing prices decreases firm investment by almost 6.3 percentage points. This decrease corresponds to 12% of a standard deviation for investment. Banks' decrease the amount of commercial lending by 2.66 percentage points, as a share of total assets. When accounting for the inherent endogeneity between housing returns and firm investment, the

[4] A somewhat similar approach is taken by Chaney, Sraer, and Thesmar (2012). We discuss our instruments in more detail in Section II.C.

negative impact of increased housing prices is even stronger than it first appears.

Consistent with prediction of Farhi and Tirole (2012), we find this effect is larger for financially-constrained firms. Using size as one measure of constraints, we find smaller firms decrease investment by 9.1 percentage points for a one standard deviation increase in housing prices in the bank's deposit states.[5] Also consistent with credit rationing, we find that the interest rate paid on commercial loans, as measured by a spread over LIBOR, increases 8 basis points for a one standard deviation increase in housing prices in the bank's states. We find evidence of quantity rationing as well—banks reduce the number of commercial borrowers by 33.6 percentage points and loan sizes by 6.4 percentage points, as scaled by the borrower's assets.[6] Along multiple dimensions our results are consistent with the housing bubble negatively impacting borrower-firms.

To the best of our knowledge, our paper is the first one to provide empirical evidence on a *negative* effect of asset-price increases on borrowing and investments. The negative effects of asset-price declines have been studied in greater detail. Bernanke (1983) argues that damage to financial institutions in the early 1930s propagated through the wider economy and contributed to the severity of the Great Depression. Gan (2007) documents reduced lending and firm investment in the context of the collapse of Japanese real estate market in early 1990s. Cuñat, Cvijanović, and Yuan (2013) consider the effects of the U.S. housing market crash in the late 2000s on bank lending and financing policies. They find that the banks most exposed to the real estate crash reduced lending—both real-estate related and otherwise—as a result of capital loses associated with the crash. This literature shows when asset values decline sharply, whether in housing markets or elsewhere, the impact on financial intermediaries translates through to the wider economy. Our paper finds that even while asset bubbles are on the rise, there can be negative effects for firms and the economy.

Our results also provide an interesting contrast to those of Chaney, Sraer, and Thesmar (2012), who find that increased real estate values for companies are related to increases in firm borrowing and investment.[7] They argue that their results are coming through a collateral channel, given the firms' pledgable real estate assets have higher values. In robustness checks, we too find a similar result, comparable in magnitude to the bank's reaction to changing housing prices. So although some of the adverse results associated with real estate price increases are mitigated by the firm's own real estate holdings, this effect is not strong enough

[5]This coefficient is found in our instrumental variables specification. We find similar results using payout policy and public bond ratings to determine constrained and unconstrained firms.

[6]This loan size result is from the IV regression. We find a 3.74 percentage point decrease in loan size in the respective non-instrumented baseline specification.

[7]In a related paper, Cvijanović (2013) investigates the impact of the collateral channel on the firm's capital structure decisions and finds results consistent with the firm's real estate collateral alleviating credit frictions.

to overturn the impact of banks' reallocation of capital away from commercial lending.

Besides Chaney, Sraer, and Thesmar (2012), our paper relates to a literature that considers the impact of the U.S. real estate boom on the larger economy. Adelino, Schoar, and Severino (2013) find increases in small business starts and self-employment in areas with large housing price appreciations. Not finding the same effects for larger firms in the same industries, they conclude that individual homes serve as an important source of collateral. Mian and Sufi (2011) find a housing-credit effect of consumers increasing consumption from rising home equity values. Loutskina and Strahan (2013) consider the role of financial integration among banks in amplifying housing-price shocks during this period. They find that banks moved mortgage capital out of low-appreciating housing markets and into high-appreciating housing markets within their own branch networks. Taken together, these papers suggest banks had an active role in the housing boom, and serve as a complement to our finding of the movement of bank capital away from commercial lending and into mortgage lending.

Overall, our empirical results on the negative effect of asset-price increases have important implications for the theoretical literature and for policy making. When considering amplification mechanisms in the macroeconomy, it is important to take account of the fact that asset-price increases may crowd out productive investment, leading to attenuation rather than amplification of the initial shock. Hence, more elaborate models are perhaps needed to capture the rich set of effects. For policymaking, our results imply that there may be room to scale back the actions to support and improve real-estate (and other asset) prices, as those attempts may lead to a crowding out effect for productive investments by commercial firms.

The remaining sections are organized as follows. Section I discusses the theoretical motivation behind this work. Section II describes the data used for analysis. Section III reports empirical results. Section IV discusses robustness tests. Section V concludes.

I Asset Prices, Bubbles, and Real Investment

There are two channels by which an increase in asset prices in the economy is thought to increase real investment. Both of these channels are featured in the model of Holmstrom and Tirole (1997). The first channel is the *Balance Sheet Channel*. Suppose that a firm needs to borrow money in order to finance an investment project. However, a moral hazard problem limits the amount that the firm can borrow: the manager/owner of the firm can take an action that reduces the value of the project but generates private benefits to him. Hence, lenders will be reluctant to provide unlimited financing to the firm. They would like to be assured that the firm does not have an incentive to take these actions that harm the investment projects or that the firm has assets whose liquidation value is high enough to provide them adequate return in case the project fails. Such assurance can be achieved if the firm's asset values go up. This assurance is because then the manager/owner of the firm has more 'skin in the game' which prevents him from pursuing value-damaging actions, or the firm can provide more valuable collateral to secure the return for the lender. Therefore, when the value of the firm's assets increases, the firm is able to raise more external capital and real investment will increase.

The second channel is the *Bank Lending Channel*. Banks are thought to have the ability to monitor borrowers and alleviate the moral hazard problems to some extent. They have expertise in monitoring and increasing collateral value, which is coming in part due to the relationships they develop with borrowers. Hence, when borrowing from banks, firms can increase their debt capacity, obtain more external financing, and increase their real investment. However, for banks to have the incentive to perform their monitoring role, it is necessary that they have sufficient capital at stake themselves (i.e., that they lend their own capital and not just raise capital from other investors). An increase in the bank's asset values will in turn enable the bank to lend more of its own capital, enhancing the monitoring role of the bank, and increasing the debt capacity and the real investment of the firms that borrow from the bank.

Based on these effects, an asset-price bubble can be beneficial in alleviating firms' credit constraints, providing them more liquidity, and enabling them to invest more in productive real investments. However, bubbles might also have a negative effect on productive real investments. The classic theory of rational bubbles (e.g., Tirole (1985)) predicts that they might crowd out productive real investments by increasing interest rates and making firms want to invest less. Moreover, in the presence of credit constraints, the increase in interest rates following a bubble might aggravate the credit rationing for financially-constrained firms (i.e., firms with severe moral hazard problems and lack of internal capital) reducing productive investments further. This effect is denoted as the *leverage effect* by Farhi and Tirole (2012). They analyze the negative effect that asset-price bubbles might have on investment and efficiency due to the leverage effect and contrast it with the positive effect that asset-price bubbles may have due to the *liquidity effect* discussed above. They provide results on which firms are more likely to benefit from a bubble and when.

Our empirical analysis investigates the effect of real estate price increases on lending by banks, which are exposed to the real estate shock, to the firms they have a relationship with. We also analyze the resulting effect on the investment of these firms. The liquidity effect mentioned above predicts a positive effect, as the increase in banks' asset values allows them to provide more capital and alleviate the constraints of the firms, enabling firms to raise more capital and invest more. The leverage effect mentioned above predicts a negative effect, as the ability of banks to invest in the bubble crowds out their lending to commercial firms, making them more constrained and reducing their ability to invest. Of course, in a world with no credit frictions, there will be no effect of the exposure of the bank to a bubbly asset on the firms that borrow from it.

To the best of our knowledge, our paper is the first one to document a negative effect of asset-price bubbles on investment; an effect that operates via the bank lending channel, but in an opposite direction to the one predicted by Holmstrom and Tirole (1997) mentioned above. So far, the empirical literature has focused on positive effects of asset-price increases on productive real investment. Using data similar to ours, Chaney, Sraer, and Thesmar (2012) find that increased real estate values benefited firms via the balance sheet channel. Our results show that the bank lending channel and balance sheet channel work in opposite directions in this case. Further, we show that the two effects are comparable in magnitude. Based on the bank lending channel, Gan (2007) documents reduced lending and firm investment following the collapse of the Japanese real estate market in early 1990s. Clearly, a sharp decline in asset prices is likely to have adverse effects on firms (see Farhi and Tirole (2012)), but we show that even the period where a bubble forms and real estate prices increase may have undesirable implications for commercial firms, as banks shift resources towards real-estate related assets rather than providing commercial loans.

Our results have important implications for understanding the role of asset prices and bubbles for the real economy and the potential for amplification or mitigation of real shocks. A large literature in macroeconomics going back to Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) discusses amplification due to the balance sheet channel. More recently, Gertler and Kiyotaki (2010) and Rampini and Viswanathan (2010) add a financial intermediary into such models and analyze additional amplification that may come due to the lending channel. Overall, the message in these models is that an increase in asset prices increases firms' debt capacity and promotes real investment, which serves to amplify the initial shock that led to the increase in asset price. Our empirical analysis shows that amplification is not the only possible outcome. Some asset-price increases hurt the ability of firms to borrow and invest, and so when building a macroeconomic model, it is important to account for this channel as well. This is consistent with the theoretical analysis of Farhi and Tirole (2012).

On the policy front, after the present mortgage crisis, besides the conventional monetary policy actions to stabilize the economy, policymakers have also attempted to stabilize corporate bond and mortgage markets. The rationale of policymakers is the classic belief that if banks' balance sheets improve, their ability to lend to firms also improves. We show that this is not always the case, and in some cases an improvement in the bank's balance sheet may lead it to shift resources away from commercial firms and towards the bubbly asset. This finding is consistent with the theoretical analysis of Bleck and Liu (2013), who show that in an economy with two sectors, the injection of liquidity by the government may hurt the more constrained sector, due to a crowding out effect that we capture in our empirical analysis.

II Data

We combine a few different data sources to test the impact of changes in housing prices on bank lending and firm investment. Besides data on firm investment, we need measures of the bank's lending activities, both in terms of total activity and to which firms in particular it has lending relationships. Second, we need a measure of housing prices, both where the bank is most likely to be involved in mortgage activity and also in the location where the firm operates. Finally, we need a measure of housing supply elasticity that provides exogenous variation in housing prices. In this section, we describe the sources of data we use and the characteristics of the constructed dataset.

II.A Sources

Bank Loan, Borrower, and Macroeconomic Data

To match banks with their specific borrowing firms, we use Thomson Reuters LPC's DealScan database. DealScan is a large database of private loans to corporations and includes many of the contract details of the loan at origination, including the lenders involved, the maturity, size, interest rate, and type of loan.[8] The summary statistics for the loan interest rate, measured by the all-in drawn rate over LIBOR, relative loan size as scaled by the borrowing firm's total assets, and months to loan maturity are included in Panel A of Table I. Variable definitions and details on variable construction are included in Panel B of Table I.

From Compustat, we take many standard firm-specific variables for our analysis.[9] These variables include investment, book leverage, market-to-book ratio, cash flow, asset tangibility, and Altman's Z-score.[10] As we are focusing on how financial intermediaries affect borrowing firms' investment decisions, we exclude any borrowing firms that are financial companies.

[8]See Chava and Roberts (2008) for more details.

[9]The borrower data in DealScan is merged with Compustat data using links generously provided by Michael Roberts.

[10]See Panel B of Table I for variable definitions. All ratio variables are winsorized at the 1 and 99 percentiles, with the exception of the cash flow variable. The cash flow variable is winsorized at the 2.5 and 97.5 percentile because of some extreme outliers. The housing price results are robust to winsorizing the cash flow variable at the 1 and 99 percentiles.

Also included is a measure of the market value of firm's buildings. Following Chaney, Sraer, and Thesmar (2012), the measure gives the approximate market value of a firm's real estate assets, scaled by the prior year's net property, plant, and equipment amount. Panel A of Table I includes the summary statistics for these variables.

We also include our main macroeconomic variables, which are the S&P 500 index's annual return, the annual change in the state unemployment rate where the firm is located, and the state-level GDP growth rate for the firm and the bank.[11] The prevailing state-level 30-year fixed mortgage interest rates are also included for use in the instrumental variables specifications.[12] We use these variables to control for macroeconomic changes that would affect the supply and demand of commercial and industrial loans.

Bank Asset and Housing Data

We hand-match the DealScan lender data to Call Report data for the 94 largest bank-holding companies.[13] For our analysis of the lending activity of banks, we use Call Report data from the fourth quarter of each year. We aggregate the bank data up to the bank-holding company (BHC) level, using the RSSD9348 variable. A bank's real estate exposure is measured by two key variables: MBS (RCFD8639) and loans secured by real estate (RCFD1410).[14,15] The Mortgage-Backed Securities (MBS) includes two major types: traditional pass-through securities and other security types, including Collateralized Mortgage Obligations (CMOs), Real Estate Mortgage Investment Conduits (REMICs), and Stripped MBS. The banks also denote whether these securities are composed of agency-backed mortgages (GNMA, FNMA, FHLMC) or non-agency mortgages. Loans secured by real estate includes all loans, regardless of purpose, that are secured primarily by real estate. Types of security include mortgages, deeds of trust, land contracts, and other instruments. These loans can be first or junior

[11] The state-level GDP growth rate for the firm is the state where the firm is headquartered. For the bank, the amount of deposits from the prior year's summary of deposits data is used to created an average GDP growth rate where the bank operates.

[12] State-level mortgage rates are available from HSH Associates on its website, `http:\www.hsh.com`.

[13] We specifically use 2000 as our principal reference year, although we do some additional matching in earlier and later years to make sure we are not missing large BHCs in our sample. In 2000, the largest matched BHC, Bank of America NA, had $610 billion in assets, compared to the smallest matched BHC, Hamiliton Bank NA, which had $1.75 billion in assets, about 0.2% the size of Bank of America. So although additional matching would be beneficial, the marginal addition will have relatively few assets and commercial loan activity.

[14] RCFD8639 only becomes available in 1994. To measure MBS before then, we use the sum of all holdings of private (non-agency) certificates of participation in pools of residential mortgages—book value (RCFD0408) and all holdings of U.S. government issued or guaranteed certificates of participation in pools of residential mortgages—book value (RCFD0602).

[15] Additional real estate exposure stems from premises and other fixed assets (RCFD2145) and other real estate owned (RCFD2150), which includes properties held from foreclosure and direct and indirect investments in real estate ventures. Including these variables does not materially affect our results.

liens (including equity loans and second mortgages on real estate) and stand in contrast to MBS holdings as they are not securitized pools. Our analysis also considers Commercial and Industrial Loans (RCFD1766) and Consumer Loans (RCFD1975). Consumer loans include all loans to individuals not secured by real estate, such as auto loans, credit card debt, and other personal loans.

These bank loan variables are all scaled by the bank's Total Assets (RCFD2170) and their summary statistics are reported in Panel A of Table I. For the bank holding companies in our sample, the average MBS holdings as a percentage of total assets is 9.19. This compares to real estate loans, which accounts for 31.7% of the bank's assets on average. Although average MBS holdings increase to 12% of assets in the second half of our sample (1998 onwards), the more traditional, non-securitized mortgage loans remain the dominant asset. Commercial and industrial loans account for 15.2% and non-mortgage consumer loans account for 9.17% of bank assets, on average.

Using the Federal Housing Finance Agency (FHFA) House Price Index (HPI), we create a weighted index of housing prices per bank holding corporation.[16] To construct the index, we first adjust each state's index by its median house price so that the index values are comparable in the cross-section.[17] We then calculate the exposure of each bank to each state based on the summary of deposits data from the prior year, aggregated to the bank-holding company level.[18] Using the percent of deposits in each state as weights, we create a bank-specific index of the level of median house prices across the states in which the bank operates. Annual changes in the index give us a proxy for the return on housing assets for the area where the individual bank holding corporation operates. Although housing price data and summary of deposits data is available on a finer level, large portions of the country are not connected to a specific metropolitan/central business statistical area (MSA/CBSA). In addition, about 20% of the summary of deposits data cannot be matched to a specific MSA/CBSA. We conduct our main analysis at a state level to include these parts of the data. In Section IV.A, we consider housing price indices and bank deposits at the MSA level and obtain similar results.

The average annual return on housing in our sample is about 8.9%. Figure 1 presents

[16]The HPI is a weighted, repeat-sales index, which measures average price changes in repeat sales or refinancings. The homes included in the HPI are individual single-family residential properties on which at least two mortgages were originated and subsequently purchased by Fannie Mae or Freddie Mac. The state-level house price indicies are normalized to 100 in the first quarter of 1980.

[17]Estimated median house price data is available for select years on the FHFA website. Specifically, we use the median price in North Carolina in fourth quarter of 2000 to rescale the state indices. (North Carolina is the median state for house prices in 2000.) In our rescaled indices, a value of 100 corresponds to $49,074.60.

[18]The summary of deposits data from 1994 onward is available on the Federal Deposit Insurance Corporation's website (`http:\www.fdic.gov`). We thank the FDIC for providing us the summary of deposits data for 1987–1993.

both the level of our index and the annual changes in our index for each bank. The figure shows that there is a upward trend in housing prices over our sample period of 1988–2006, but also substantial cross-sectional variation across bank-holding companies in any given year. This variation is even more apparent when considering annual changes in the index for banks. Even in an environment of increasing housing prices, about 9.7% of the bank-holding-company–year observations in the sample operate in areas with negative housing returns.

In Figure 2, we plot the relation between real estate related lending (both MBS and unsecuritized), commercial and industrial loans, and housing prices, using a local polynomial regression. We focus on the effect of changes in housing prices on a given bank's holdings by considering within-bank variation only, using the sample of the 94 matched bank-holding companies. The standard deviation of the housing price index for within-bank variation is about 105 points ($51,528 in year 2000 dollars), so we plot one standard deviation above and below each bank's average housing price index level. The top panel shows that the percentage of mortgage-backed securities and other real estate loans is generally increasing in the prior year's housing prices in the states where banks have their deposit bases. If the housing prices in the bank's region change from one standard deviation below the bank's average to one standard deviation above the bank's average, the percentage of the bank's assets that are in real estate related lending increases by about 15.4 percentage points.

The relation plotted in the lower panel of Figure 2 is between the within-bank variation in commercial and industrial loans and the within-bank variation in housing prices in a bank's depository region. Here, we see a negative relation between the prior year's housing prices and the percentage of assets committed to C&I loans. As in the top panel of Figure 2, we plot one standard deviation on either side of the bank's average housing price level. If housing prices in a bank's region change from one standard deviation below the bank's average to one standard deviation above the bank's average, the fraction of commercial and industrial lending decreases by about 2.4 percentage points. Figure 2 suggests banks are on average increasing real estate lending and decreasing commercial lending as housing prices increase in the bank's deposit area. In Section III.D, we investigate the relation between bank assets and housing prices more formally.

Land Availability Data

As a final piece, we merge the constructed dataset with data on geographical characteristics of different areas. We use a measure developed by Saiz (2010) of the area that is unavailable for residential or commercial real estate development in metropolitan statistical areas

(MSAs) to capture housing supply elasticity.[19] Using the deposit weights for bank holding companies' exposure to different states, we calculate the percentage of unavailable land in each bank holding company's region of operation. Presented in Panel A of Table I, the average percentage of unavailable land is 23.5%, with a standard deviation of about 7.3%. The more undevelopable the land in areas where bank holding companies operate, the more sensitive the housing prices to increases in demand in that area. These differences in housing supply elasticity are useful to disentangle the link between housing price appreciation and wider economic growth.[20]

II.B Assumptions of Constructed Dataset

In constructing this dataset, particular assumptions are made which warrant discussion. First, by using deposit-weighted state-level housing prices, we are assuming these prices serve as a proxy for the exposure of banks to real estate assets. In particular, we assume banks with deposits in areas with higher housing prices and higher housing returns are likely to be engaged in more mortgage activity. We believe this is a reasonable assumption for a few reasons. First, real estate loans are most likely to be originated in places where banks have branches and a general physical presence, as captured by the amount of deposits in particular states. As housing prices increase in these areas, banks are able to make larger mortgage loans due to the higher value of the underlying collateral. To the extent that mortgage lending is a profitable endeavor, banks in these areas will favor higher mortgage involvement. Similarly, if banks or households have speculative interests in real estate, higher expected housing returns will lead to more activity. Considering our results in Section III.D, the portion of MBS and real estate loans is clearly increasing in housing price levels.

The development of mortgage-backed securities, which allow banks that originate mortgages to unload the capital requirements and risk of these loans by organizing them into pools and selling shares of these assets, mitigates the concentration of real estate lending in the states where the banks have a physical presence. However, even when these loans are sold, banks are likely to remain as servicers of the mortgage and maintain exposure to

[19]Saiz (2010) calculates slope maps for the continental United States using USGS data. The measure is the share of land within 50 km of each MSA that has a slope of more than 15% or is covered by lakes, ocean, wetlands, or other internal water bodies. We use a version that is averaged to the state level by using population to determine the appropriate weights for different MSAs.

[20]We also run unreported specifications using the Wharton Residential Land Use Regulation Index (WRLURI) from Gyourko, Saiz, and Summers (2008) as an additional instrument. This measure captures differences in the the intensity of real estate growth restrictions, and includes such dimensions as local and state political involvement, zoning approval, state court involvement, and time delay in permit approval. The inclusion of this additional instrument does not materially change our main results, so we opt to use the land unavailability measure as our principal instrument.

the local market. Further, MBS contracts are structured such that banks are often liable to take back mortgages that are deemed unfit for a given mortgage pool. When banks sponsor (create) the mortgage-backed security, as opposed to simply selling the mortgages to another unrelated sponsor, they often maintain a certain share of the security as a signal of its quality.[21] When the securities are tranche-structured, as with a CMO, the sponsoring bank typically holds a share of the junior or equity tranche. These practices maintain some of the bank's local exposure to real estate, even if much of the risk is diversified.[22]

Even with the rise of MBS during our sample period, traditional real estate loans, that will not be similarly diversified, remain the dominant real estate asset on bank balance sheets. In our sample, banks have an average of 31.7% of assets in real estate loans, compared to 9.19% for mortgage-backed securities. Even focusing on the second half of our sample, when MBS gained in popularity, on average 12% of assets are MBS compared to 35% for traditional real estate loans. In Table VIII of Section III.D, we confirm that increasing housing prices have an economically significant positive effect on the amount of traditional non-securitized real estate loans held by banks. This result suggests that the increasing popularity of mortgage securitization is not diversifying the majority of a bank's mortgage assets away from its deposit base.

We define a bank and borrowing firm to have a relationship as long as the borrower has an outstanding loan which an entity of that bank is the lead agent.[23] Although a distinction between relationship and transactional banking can be made (Bharath, Dahiya, Saunders, and Srinivasan (2011)), we keep a broader designation of a relationship. In Section IV.C, we perform analysis on subsamples of firms that are smaller, more capital constrained, and more likely to engage principally in relationship banking. We find that our results are stronger for these firms. Even in the main sample, our results are economically significant enough to suggest that the majority of bank-borrower pairs have a relationship aspect.

II.C Endogeneity Concerns

A potential concern is that housing price level where banks operate is endogenous to the firm's investment decision. The most likely source of endogeneity is an omitted variables issue. An unobserved economic shock could impact both housing prices and the investment

[21]See Demiroglu and James (2012) for more details.

[22]For our assumption to hold, we only need banks that are located in states with higher housing prices to engage in a larger amount of real estate lending, even if some of that lending is geographically diversified through MBS.

[23]In determining the lead agent on a loan, we follow a procedure very similar to Bharath, Dahiya, Saunders, and Srinivasan (2011). Any loans where a single lead bank cannot be determined are excluded from the sample.

opportunities of the borrowing firm. If this economic shock is more localized and not captured by our macroeconomic variables, this omission could bias our estimate of the impact of housing prices on firm investment. This bias is most likely positive, as a positive economic shock would both increase housing prices and investment opportunities for the firm. We expect this bias to be most at issue when firms and banks operate in the same state or region. However, even geographically-distant firms, if connected to the region through a broader exposure, such as a common product market, would likely suffer from a bias in the same direction.

We take three steps to address this issue. First, we include housing prices in the location of the firm as a separate explanatory variable. This inclusion allows us to separate the impact of real estate prices on firms and banks. Similarly, we rerun the analysis on a subsample of observations for which the borrowing firm and lending bank are operating in separate states.[24] Both of these approaches are considered in Section IV. To most effectively deal with the endogeneity concern, we follow an instrumental variables approach. We use a measure of land area that is unavailable for residential or commercial real estate development as an instrument. This supply elasticity measure is interacted with the state-level 30-year mortgage rate, which serves as a measure for housing and mortgage demand for consumers in the states where the bank operates.[25]

The reasoning for the instruments is as follows. Over time, we expect higher housing prices in areas with less developable land. Similarly, for a given increase in housing demand, as measured by a drop in mortgage rates, we expect the areas with less developable land to experience faster price appreciation. An inability to easily increase the quantity of housing in these areas should translate into upward pressure on the prices of existing housing stock. These instruments should provide variation in housing prices that is not correlated with omitted economic shocks, whether the firm's investment opportunities are in that location or the firm is exposed to the region through a broader channel, such as a product market.

Table III presents the effect of the included instruments on housing prices in the sample. The unit of observation is a bank-year, where the bank observation is based on the DealScan lender id (*lcoid*) variable. The first specification shows that for a one standard deviation increase in the land unavailability (7.3%) in the bank's states of operation, the bank's housing price index increase by 127.2 points, which is about 78% of the sample standard deviation. In

[24]Specifically, we exclude observations if the state where the firm is located (data from Compustat) overlaps with any of the five most significant states for the bank's operations, as measured by percent of total deposits.

[25]Chaney, Sraer, and Thesmar (2012) use a similar interaction instrument that uses national mortgage rates to control for similar endogeneity concerns in house prices when measuring the impact of collateral on firm investment. We seek to measure the impact of housing prices directly on bank credit supply to firms and resulting changes in firm policy.

real terms, this change is about $62,423 in year 2000 dollars. Although the addition of year fixed effects (Column 2) reduces the effect of the land unavailability measure to increasing the housing price index by 78.6 points on average, this amount is still statistically significant at the 1% level. The land unavailability measure for specific banks clearly is relevant for housing prices in the same areas.

Columns 3 and 4 introduce the state-level 30-year fixed mortgage rate and the interaction between the mortgage rate and land unavailability measure as additional instruments. In the presence of year fixed effects, which remove any aggregate changes in the mortgage rate, the dispersion in the cross-section of mortgage rates is positively associated with housing prices. In other words, in the cross-section of states, demand for housing is raising both the mortgage rate and housing prices.[26] The interaction term, included in Column 4, is significantly negative at the 5% level. The intuition is that for a given decline in mortgage rates, which increases housing demand, prices should increase more in areas with more undevelopable land. Thus, a more negative interaction term is associated with a higher positive price increase, and hence the negative coefficient. The inclusion of this interaction term provides some additional dynamics for the instrumental variables in the panel.

Considering the behavior of housing prices over the sample period (Figure 1), we allow our instruments to have differential effects on house prices in the two parts of our sample, 1988–1999 and 2000–2006. The idea being that a given change in our instruments in the early part of sample may have a smaller impact on housing prices than during the height of housing bubble. Our main results are robust to restricting the instruments to have the same effect on house prices over the entire sample period.

The instruments satisfy the exclusion restriction as long as the only way the availability of land on local housing development, the 30-year state-level mortgage rate, and their interaction affects firm investment is through impacting housing prices. Satisfying this restriction is helped by the fact that the included land unavailability and mortgage rate variables are in the bank's region of operation, and not the firm's home state. To the extent that the firm and bank can be in the same state, the topographical restrictions of the area are permanent and exogenous to any unobserved economic shocks that might simultaneously affect housing prices and firm investment. Our main investment results in Section III.A are also robust to including the mortgage rate as a control (non-exogenous) variable and relying on the land unavailability measure and the interaction term as instruments, or simply using the land unavailability measure as the sole instrument.

[26]Without year fixed effects, the state-level mortgage rate has a strong negative association with housing prices, which suggests that the effect of a decline in mortgage rates increasing housing demand and prices tends to occur at a national level.

III Empirical Results

III.A Firm Investment

As discussed in Section I, rising asset-price bubbles have largely been hypothesized to increase firm investment through the *Balance Sheet Channel* and the *Bank Lending Channel*. However, as modeled in Farhi and Tirole (2012), it is also possible that the bank lending channel may have a dampening, rather than amplifying, effect. To see which case is dominant in practice, we consider the effect of housing price increases on firm investment.

Table IV reports results for investment regressions for firms with bank debt. The regression specification estimates the impact of various characteristics on the investment at time t of firm i that borrows from bank j:

$$\begin{aligned}\text{Investment}_{ijt} &= \alpha_{ij} + \gamma_t + \beta_1 \text{Housing Prices}_{jt-1} + \beta_2 \text{Firm Variables}_{it-1} \\ &\quad + \beta_3 \text{Macro Variables}_{ijt-1} + \varepsilon_{ijt}. \qquad (1)\end{aligned}$$

The unit of observation is at the firm-bank-year level. To be included as an observation in this panel, the firm and bank have to have originated or had an existing loan in that year.[27] This requirement, along with observations having non-missing data, gives 19,133 observations across 3,161 distinct firms. We are interested in estimating the impact of a specific bank's housing exposure on a borrowing firm's investment. Following the investment literature, we include lagged market-to-book ratio and contemporaneous cash flow as firm-level control variables.[28] Additional macroeconomic variables, namely the S&P 500 annual stock return, the change in the firm's state unemployment rate, and GDP growth rate in the firm's state and bank's states of operation are included at a one-year lag to capture aggregate changes that affect investment but are not related to the lending bank's housing exposure. Any persistent differences among firms, and more specifically a firm's relation with a particular bank, are captured by firm-bank fixed effects, α_{ij}. Some specifications include year fixed effects, γ_t, to remove common macroeconomic shocks and trends in the variables of interest.

To facilitate comparison of the economic importance of different variables, all independent variables are scaled by their sample standard deviations. The dependent variable, the ratio of investment to lagged PPE, is scaled by 100 to provide a percentage-like interpretation to the various coefficients.

[27] In this panel, we use the lender identifier from DealScan, rather than the bank-holding company identifier from the Call Report data, to organize the observations (and construct the fixed effects). There can be multiple lenders associated with a specific bank-holding company.

[28] See Fazzari, Hubbard, Petersen, Blinder, and Poterba (1988), Kaplan and Zingales (1997), Fazzari, Hubbard, and Petersen (2000) and Kaplan and Zingales (2000) among others.

In Column 1 of Table IV, firms invest 4.7 percentage points *less* when the housing prices in a bank's depository region increase by one standard deviation (about $80,000 in year 2000 dollars). This decrease amounts to about 9.1% of a standard deviation for investment, and is of greater economic importance than changes in the unemployment rate for the firm's state, the GDP growth rate in the firm's or bank's states, or the aggregate stock market return. This negative effect suggests that the bank lending channel hurts firm investment in the case of the housing bubble. At first pass, it does not appear that firms are benefiting from their lenders being involved in states with strong housing markets.

As discussed in Section II.C, it is plausible that housing prices may be endogenous to the firm's investment decision. Specifically, if the bank's regional housing prices are correlated with any omitted variables related to the investment opportunities of the borrowing firm, our estimate of the effect of the bank's housing exposure may be biased. As mentioned, we believe the source of the bias is likely positive, as housing prices are generally positively correlated with economic growth. Although the included macroeconomic variables help capture changes in economic conditions, it is possible that some regional effects are still omitted, especially if the bank and firm are in the same state or region. To address this issue, Column 2 of Table IV undertakes an instrumental variables approach.

We use the following instruments: the measure of land unavailability in the bank's region, the prevailing average state-level 30-year fixed mortgage rate in the bank's region, and the interaction of the two variables.[29] As discussed in Section II.C, there is a sharp increase in housing prices during the second half of our sample. To help capture this change in the instrumented results, we allow the instruments to have separate effects on housing prices in the two halves of our sample. When instrumented, the effect of the housing prices in a bank's region not only remains negative, but becomes significantly *more* negative. Column 2 shows a one standard deviation increase in housing prices is associated with a 6.3 percentage point decrease in investment. This effect corresponds to 12% of a standard deviation in investment. This finding also gives credence to our assertion that the non-instrumented results, which are still economically and statistically significant, are likely understating the true effect of housing prices on investment.

The evidence of the first two Columns of Table IV suggest that firms are on average negatively impacted by the housing price appreciation in the depository branch locations of banks. This effect suggests that for many banks, capital constraints are such that some credit rationing occurs for the borrowing firms. If this rationing is the case, we should expect this effect to be significantly weaker for banks that are not significantly constrained. Table II

[29] The share of the bank's deposits from the prior year are used to determine a weighted average mortgage rate for the bank.

lists the bank holding companies in decreasing order of size (as measured by total deposits) at the end of our sample period in 2006. The four largest bank holding companies—Bank of America, Chase Manhattan, Citibank, and Wells Fargo—each have over \$20 billion in deposits and have branches in as many as 30 states by this time. These four banks account for about 38% of the firm-bank-year observations in our panel. For these largest, most national banks, it is less likely that they would face the kind of capital constraints that would give rise to the observed effect. As such, in Columns 3 and 4 of Table IV, we allow for housing prices for these banks to have a differential effect on firm investment. The variable *National Banks* × *HPI, Bank's State(s)* is the interaction of an indicator for the four largest bank holding companies with their respective housing price indices.[30]

For the smaller, more regional banks, we indeed find a stronger effect. A one standard deviation increase in house prices corresponds to a 10.24 percentage point decrease in investment. At the same time, for the largest national banks, the difference in the housing effect is a positive and statistically significant 6.94 percentage points. However, combining the housing price estimate and the interaction term, the net effect of house prices on firm investment is still negative for the largest banks ($-10.24+6.94 = -3.30$). Further, this -3.30 percentage point decrease is significantly different from zero at the 1% level. The instrumented version in Column 4 yields similar results: for a one standard deviation increase in housing prices, firms that borrow from smaller banks decrease investment by 13.76 percentage points while firms that borrow from the largest banks decrease investment by 4.11 percentage points ($-13.76 + 9.65 = -4.11$), again significant at the 1% level.[31] Taken together, the effect is strongest outside of the largest banks, equating to 27% of a standard deviation using the results from Column 4. For the largest banks the effect of housing prices on investment is still negative for the borrowing firms, but on the order of 8% of a standard deviation.

Although we believe that the four banks we treat separately are truly distinct both in terms of their size and their national presence, our results do not depend on this distinction. We can include the fifth and sixth largest bank holding companies from Table II, U.S. Bank and First Union, and find results at similar levels of statistical and economic significance. Alternatively, in unreported analysis, we find designating the largest banks by taking top decile of banks as measured by total deposits on an annual basis generates similar results. In Section IV, we verify that our results are robust to dropping this top decile of banks entirely. Although we have some flexibility on how exactly we designate the largest banks,

[30] Although the indicator variable is included in the specifications as well, it is absorbed by the firm-bank fixed effects.

[31] Because we treat both the *Housing Price Index, Bank's State(s)* and the *National Banks* × *HPI, Banks State(s)* variables as endogenous, we include the interaction of the *Large National Banks* indicator and our instrumental variables as additional instruments for these specifications.

we find they consistently have a different effect on firm investment than those banks which are smaller and more regional.

Over the course of our sample period, there may be some concerns that the generally increasing house prices are picking up other, unrelated macroeconomic changes. Another concern may be that the majority of our effect is occurring in the time-series and not in the cross-section of firms. In other words, it is the difference between banks' exposure to housing prices in the early and later parts of our sample rather than the difference between banks' exposure to housing prices in any given period that drives the observed effect. To address these concerns, we introduce year fixed effects for the remaining specifications of Table IV. By removing any year-level variation in the sample, it allows the remaining effects to be interpreted as coming purely from differences in the cross-section of firms and banks.

Columns 5 and 6 show that the results are robust to the inclusion of year fixed effects. Without instrumentation, firms borrowing from the smaller banks are associated with a 5.6 percentage point decrease, which is significant at the 10% level. However, the positive bias from correlated unobserved investment opportunities remains in the presence of year fixed effects. In Column 6, where the housing price variables are instrumented by the land unavailability measure, state-level mortgage rates, and their interaction, the effect more than doubles in magnitude. Among the smaller banks, the increase in housing prices is associated with a 11.86 percentage point decrease in investment, which equates to about 23% of the sample standard deviation for investment and about as large as the specification in Column 4 that does not include year fixed-effects. For the four largest banks, the effect of housing prices on investment is smaller but still negative at 3.85 percentage points ($-11.86 + 8.01 = 3.85$). This effect remains statistically significant from zero at the 5% level.

Columns 7 and 8 go one step further and use firm-state–year fixed effects instead of year fixed effects. This specification removes any aggregate economic shocks in the firm's state for each year, which helps mitigate the concern that our results would be generated by an unobserved economic shock to the firm that is correlated with housing prices. For both the non-instrumented specification (Column 7) and instrumented specification (Column 8), we find results that are very similar to the specifications that use year fixed effects (Columns 5 and 6). In Column 7, firms that borrow from the more regional banks decrease investment by 5.98 percentage points for a one standard deviation increase in housing prices where the bank has deposits. In the instrumented specification (Column 8), the increase in housing prices is associated with a 8.97 percentage point decrease in investment for firms which borrow from the more regional banks.

In sum, the bank lending channel is not only working in a significantly negative direction for all but the largest banks in this housing bubble, but carries substantial economic significance for the borrowing firms. Even for those firms which borrow from the largest, least constrained banks, there is no positive effect associated with the housing bubble. Although it is difficult to directly quantify and compare the impacts of the balance sheet and bank lending channels, the 23% of a standard deviation effect of housing prices on investment is sizeable. Any measure of the balance sheet channel effect would have to increase firm investment by more than a couple standard deviations to render the negative bank lending channel result insignificant.

III.B Loan Interest Rate

Under the theory of rational bubbles (e.g., Tirole (1985)), both prices and expected returns should increase until the bubble bursts. The increase in expected returns should increase interest rates for other asset sectors as well, such as a firm's cost of capital. Farhi and Tirole (2012) also predict that the increase in liquidity from an asset bubble will have a positive effect on interest rates, regardless of whether there is a positive or negative overall effect on investment. Further, when banks engage in credit rationing, we expect an increase in the price of credit, which is measured in part by interest spreads. However, it is important to remember that bank loans have both price and non-price contract terms. So when a firm and bank negotiate a new loan, it is possible to mitigate increases in price terms by accepting lower loan amounts, different maturities or loan structures, and more stringent covenant restrictions.

We investigate the effect of housing prices on loan interest rates using the "All In Drawn" spread from DealScan, which is a standardized spread over LIBOR, inclusive of annual fees. Observations in this sample are at the firm-bank-package level. If a firm originates multiple loans in the same deal or package with the bank, we average the individual loan spreads using the dollar loan amounts as weights. The average maturity of the loans in months is calculated analogously, and then is log-transformed. The *Loan Amount to Assets* variable is the loan size of the package, scaled by the firm's book assets. Table V reports results for the effect of housing prices on the credit spread that firms pay on bank loans. The specification estimated is as follows:

$$\begin{aligned}\text{All In Drawn Spread}_{ijt} = {} & \alpha_i + \gamma_t + \delta_1\text{Housing Prices}_{jt-1} + \delta_2\text{Firm Variables}_{it-1} \\ & + \delta_3\text{Macro Variables}_{ijt-1} + \delta_4\text{Loan Characteristics}_{ijt} + \varepsilon_{ijt}. \quad (2)\end{aligned}$$

Only firm-bank-package observations are included in this panel if firms originate a new loan package with the specific bank, as opposed to having an outstanding loan as in Section III.A. Because of the reduction in sample size, fixed effects are calculated at the firm, rather than firm-bank, level (α_i). The specific firm variables included in this regression are lagged book leverage, lagged market-to-book ratio, and lagged Altman's Z-Score. The S&P 500 return, changes in the firm's state unemployment rate, the firm's state GDP growth rate, and changes in the bank's state(s) GDP growth rate are included at a one-year lag as macroeconomic variables. Finally, measures of the loan amount and maturity of the newly originated loans are included, in part to help control for the substitution between price and non-price contract terms discussed above.

Columns 1 and 2 of Table V represent the specifications that include housing price variables without year fixed effects (γ_t). A one standard deviation increase in housing prices is associated with a 8 basis point increase in interest spreads for the borrowing firm. This amount is statistically significant at the 1% level. Column 2 of Table V re-performs the analysis but includes the *Large National Banks* indicator variable for loans originated with the four largest national banks. Although allowing for separate effects for the smaller and larger banks is important in Section III.A, the same is not true for interest rate spreads. There is not a significant difference between the largest banks and the rest of the banks in the sample in terms of the level of interest rates. In Column 2, a one standard deviation increase in housing prices is associated with a 7.6 basis point increase in loan spreads. Combined with the positive but insignificant estimate of the intercept for the largest banks, it is unlikely that the largest banks differentiate themselves from their potentially more capital-constrained peers on loan price. This result is consistent with Farhi and Tirole (2012) to the extent that the increase in interest rates is a necessary, but not sufficient, mechanism for a negative effect on investment. In practical terms, it may be advantageous for smaller banks to ration more on quantity than on price.

Column 3 runs a similar specification to Column 1 but drops the aggregate S&P 500 return and includes year fixed effects. In this specification, the effect is similar in magnitude at about 9 basis points, which corresponds to about 7% of the sample standard deviation. Column 4 runs the same specification as Column 2 with the addition of year fixed effects. The result is similar in economic magnitude, and again the largest banks do not offer lower loan spreads. Similar results are obtained if the specifications are run using the instrumental variables, so they are not included here.

Although there are many economic factors affecting loan prices in our sample period, we are able to identify a significant positive effect of housing prices on interest rates. And to the extent that loan selection issues are only partially controlled for in these specifications, these effects may be understating the true magnitude of interest rate increases. Consistent with the proposed crowding out of investment that might occur in an asset bubble, we find an increase in the cost of capital for borrowing firms, as measured by loan spreads.

III.C Loan Amount

If the housing bubble is partially crowding out commercial borrowing and investment through the bank lending channel, we expect a decrease in the size of loans being given to firms. By considering the sizes of loans issued to firms in our panel, and also the change in the number of commercial loans being originated, we get some gauge of the effect of housing prices on the intensive and extensive margins of lending.

Extensive Margin

For the extensive margin, we compute the *Percent Change in Outstanding Loans* as the yearly percent change for each bank in the number of firms that have new or outstanding loans with that bank.[32] As this panel does not require borrower-specific information, we consider all commercial loan packages in DealScan for our matched lenders and not just those loans which are linked to a Compustat borrower. This measure, while simple, captures reductions along the extensive margin of credit that occur due to fewer new loans being initiated and outstanding loans being retired and not extended. Since we use the DealScan database for this measure, it is not comprehensive of the entire universe of borrowers. However, to the extent that DealScan borrowers are larger firms, it may be understating the true reduction in lending if these firms have more options and bargaining power than smaller firms. In addition, DealScan increases in data coverage over our sample, so we think it unlikely that observed results could be an artifact of the sample and variable construction.

Specifically, we estimate:

$$\text{Pct. Change Loans}_{jt} = \alpha_j + \gamma_t + \zeta_1 \text{Housing Prices}_{jt-1} + \zeta_2 \text{Macro Variables}_{jt-1} + \varepsilon_{ijt}, \quad (3)$$

where the housing price, macroeconomic variables, and year fixed effects (γ_t) are as in previous regressions. Bank-level fixed effects (α_j) are included to control for persistent differences in lenders.

Column 1 of Table VI presents the baseline specification without the housing price variable. In Column 2, when the housing price index is included, a one standard deviation increase in housing prices is associated with a 33.6% reduction in the number of firms with outstanding loans for a given bank. In Column 3, the *S&P 500 Return* variable is replaced with year fixed effects to remove any macroeconomic trends that could be confounding our results. Even though this specification removes any common component of housing price changes that affects a bank's lending decision, an increase in housing prices in the bank's

[32] This variable is winsorized to at the 1 and 99 percentiles to mitigate extreme observations from banks with relatively few loans in DealScan.

region is still associated with a statistically significant 9.2% decrease in the number of firms with outstanding loans for a given bank. The *Percent Change in Outstanding Loans* variable has a sample standard deviation of 69%, which means this effect accounts for 13% of a standard deviation. Housing price changes have a statistically and economically significant effect on the extensive margin of commercial lending, as measured by the percent change in firms with outstanding loans from specific banks in our panel.

Intensive Margin

To measure the intensive margin of commercial lending, we look at the relative size of new loans, measured as a percentage of the borrower's assets. Constructing the panel in a manner analogous to the interest rate analysis in Section III.B, we estimate the following equation:

$$\begin{aligned} \text{Loan Amt. to Assets}_{ijt} \; = \; & \alpha_i + \gamma_t + \theta_1 \text{Housing Prices}_{jt-1} + \theta_2 \text{Firm Variables}_{it-1} \\ & + \theta_3 \text{Macro Variables}_{ijt-1} + \varepsilon_{ijt}. \end{aligned} \tag{4}$$

Columns 1 and 2 of Table VII present the results without year fixed effects, whereas Columns 3 and 4 includes the year fixed effects (γ_t). Column 1 shows that a one standard deviation increase in housing prices reduces the size of the average loan by a statistically significant 3.74 percentage points, this corresponds to about 10% of the sample standard deviation. Column 2 runs the same specification with the instrumental variables, and finds a larger negative effect of 6.4 percentage points, which is about 16% of the sample standard deviation. Because the bias in the housing price variable matters in the case of the loan amounts, we use the instrumental variables approach for the remaining specifications.

Column 3, which includes year fixed effects, finds a similar result as Columns 1 and 2, although only significant at the 10% level. Given the differential results of the effect of housing prices between regional and national banks in Section III.A and the lack of difference in the cost of loans between regional and national banks in Section III.B, we may expect some differences in loan amount rationing depending on the size of the bank. In Column 4, we include the *Large National Banks* indicator variable for the four largest banks in our sample. Here, we find that over our sample, the largest banks on average give loans that are 4.3 percentage points larger than the other banks. At the same time, a one standard increase in housing prices are associated with a 4.5 percentage point decrease in loan sizes. So although loan sizes are negatively related to housing prices where the lending bank operates across all banks in our sample, for the largest banks this effect is offset somewhat by larger average loan amounts.

Consistent with the results for firm investment, borrowing firms are credit rationed when their bank is particularly exposed to the housing bubble. Evidence is found along the extensive margin, as measured by the number of firms with outstanding loans from individual banks, and along the intensive margin in terms of the size of loans as scaled by the firm's assets. Within a given cross-section, firms that borrow from the largest banks on average have larger loan sizes.

III.D Bank Activity

Figure 2 provides suggestive evidence that banks increased real-estate lending and decreased commercial lending in response to increasing housing prices. To more formally investigate how housing prices affect banks' balance sheets, we use the following regression specification for bank j in year t:

$$\text{Bank Asset}_{jt} = \alpha_j + \gamma_t + \lambda_1 \text{Housing Prices}_{jt-1} + \lambda_2 \text{Macro Variables}_{jt-1} + \varepsilon_{ijt}. \tag{5}$$

Unlike Sections III.B and III.C, bank observations in this panel are grouped at the bank-holding company level (*rssdhcr* from Call Report), rather than at the DealScan lender level. This difference is because the balance sheet items are organized at the bank-holding company level. Because this panel does not require DealScan or Compustat data, we use a larger panel based on Call Report, Summary of Deposits, and housing price data. Table VIII focuses on the following classes of bank assets: real estate assets (both MBS and traditional), commercial and industrial loans, and non-mortgage consumer loans.[33] Column 1 of Table VIII presents the marginal effect of housing prices on the amount of real estate loans as a percentage of total bank assets. We find that for a one standard deviation increase in housing prices in a bank's states, the amount of non-securitized real estate loans increases by 9.32 percentage points. This marginal effect corresponds to 60% of a sample standard deviation for real estate loan holdings. This increase is after controlling for the change in the GDP growth rate where the bank has depository branches and bank-holding-company fixed effects (α_j), which capture any persistent differences among bank-holding companies.

As Figure 1 suggests, variation in housing prices has a clear aggregate component as the housing boom affected most U.S. housing markets. It is possible, however, that other macroeconomic effects or trends may affect our estimate of the importance of housing prices, clouding inference. Column 2 includes year fixed effects (γ_t) to control for these concerns. In this specification, the effect of housing prices on real estate loans remains positive and

[33] Because this panel is constructed from a larger sample of bank holding companies than the main investment regressions, its summary statistics are slightly different than those presented in Table I. The sample standard deviations are as follows: housing prices (155.8), real estate loans (15.57), MBS (5.86), C&I loans (6.94), and consumer loans (5.67).

statistically significant at the 5% level, but is a smaller effect of 61 basis points. So although we are able to identify changes in real estate lending that are driven only by changes in the cross-sectional dispersion of housing prices among bank-holding companies, the majority of the economic impact is likely coming from variation in housing prices over time. However, in the interest of robust identification, we maintain year fixed effects through the remaining specifications of Table VIII.

Column 3 presents a similar specification for securitized real estate loans and we find a similar effect. A one standard deviation increase in the housing price index increases the share of MBS by a statistically significant 42 basis points. The positive relation between housing prices and real-estate lending by banks found in Figure 2 holds up to more rigorous scrutiny.

Now there remains the possibility that the relation between real estate holdings and housing prices is partially mechanical. If banks were completely passive, the valuation of existing real estate holdings might still increase and appear as an increase in the share of total assets. We believe this concern is negligible for a few reasons. The non-securitized real estate loans, which are the majority of bank real estate holdings, are generally accounted for at book value using an amortized cost approach and do not have market-value adjustments. The subset of non-securitized loans that are designated as available-for-sale may be accounted for using a fair value approach, which accounts for market-price changes. However, for the real estate loans component, banks are required to report the *lesser* of the asset values as determined by the amortized cost and fair value approaches.[34] This requirement would lead to downward adjustments of mortgage asset values for this subset of loans.

For the real estate lending that is organized into securitized pools, the banks use amortized cost or fair value accounting depending on whether the securities are designated as held-to-maturity or as available-for-sale, respectively. Although the portion of MBS designated as available-for-sale will have some market-price adjustments, this is only a portion of the total MBS holdings. Although it does not appear on the main balance sheet, banks are required to report the available-for-sale securities at an amortized cost. Substituting these values for the usual fair value amounts does not change our results.

Given that MBS and real estate loans increase as a share of total assets, the bank must be decreasing holdings of other asset types. Column 4 of Table VIII considers the amount of commercial and industrial loans as a percentage of total bank assets. Here, consistent with Figure 2, we find a negative effect of housing prices on loan activity. Specifically, a one standard deviation increase in housing prices is associated with a 74 basis point decrease in the amount of consumer loans that the bank holds as a percentage of total assets. Because

[34] See the Instructions to FFEIC Form 031 for more details, available at `http://www.ffeic.gov/`.

of the inclusion bank and year fixed effects, this statistically significant result is identified purely from the changes in the dispersion of housing prices across bank deposit areas at different points in time.

Due to the endogeneity concerns discussed in Section II.C, estimates of the effect of housing prices on commercial loan activity are likely biased. Namely, an omitted regional positive economic shock will both increase housing prices and firm investment activity. For firms that borrow from banks in the same region, this omitted shock will bias the estimate of the housing price effect in a positive direction. To control for this possibility, Column 5 instruments housing prices with the land unavailability measure, the average state-level 30-year mortgage rate where the bank operates, and their interaction.[35] We find that the marginal effect of housing prices on commercial lending is a decrease of 2.66 percentage points, as a percentage of the bank's total assets. This change equates to 38% of the sample standard deviation for commercial and industrial loans. This estimate is statistically significant at the 1% level.

Finally, in Column 6 we consider the effect of housing prices on the fraction of non-real-estate consumer lending. This asset category includes auto loans, student loans, credit card debt, and other forms of personal loans. Because any positive omitted economic shocks likely increase other forms of consumer loan demand, we expect a similar positive bias. As such, we instrument housing prices as in Column 5.[36] A one standard deviation increase in housing prices decreases non-mortgage consumer loan activity by 2.57 percentage points, which is about 45% of the sample standard deviation for consumer loans. Rather than increasing all types of consumer loan activity with higher housing prices, banks appear to shift into mortgage lending at the expense of other forms of consumer debt. Taken together, banks respond to higher prices in housing markets by increasing real estate loans and decreasing other consumer and C&I loans in terms of their overall asset portfolio.

IV Robustness

The results in Section III strongly suggest that banks move capital away from commercial lending and towards mortgage lending when situated in states with strongly increasing housing prices. Further, this effect has a negative impact on firm's investment levels, especially compared to peers that borrow from less constrained banks. A few points warrant further investigation. First, we consider a couple alternative housing variables. Second, we consider the role of the *Collateral Channel* as documented in Chaney, Sraer, and Thesmar (2012).

[35] As with our main investment regressions, we find economically and statistically similar results if we treat the state-level 30-year mortgage rate as an additional control, rather than as an instrument.

[36] Indeed, a non-instrumented specification suggests that housing prices do not have a statistically significant effect on consumer loans.

Third, we consider subsamples where there should be strong cross-sectional differences, such as between firms that are least or most likely to be capital constrained. Lastly, we check the robustness of our results to including housing prices in the firm's state as an additional control, excluding firms and banks that operate in the same state, and excluding the largest banks from our sample.

IV.A Alternative Housing Variables

Depending on the motivation of banks when they are allocating capital, a housing price level or a housing price growth variable may be more appropriate. A focus on collateral values would suggest a price level variable whereas an expectation of strong appreciation in the housing sector would suggest a growth or return variable. In Table IX, we present the main specification but use the return on the bank's housing price index instead of the level of the bank's housing price index as our variable of interest. We find results similar to Table IV—firms that borrow from banks with deposits in areas of high housing price growth invest significantly less than other firms. This effect is strongest for firms that borrow from the more regional banks.

An additional concern with our principal housing variable is that state-level housing prices are too coarse to identify the appropriate housing price effects. Given that summary of deposits data is available at a finer level, it is possible to use housing prices at the MSA (metropolitan statistical area), rather than state, level.[37] While potentially giving more precision to our measure of housing prices in places where the bank has depository branches, it has some drawbacks. For one, large regions of many states are not covered by a specific MSA. As a result, bank branches in these areas will be left out of the housing price calculation.[38] Second, in order to make different MSA housing price index levels comparable and thus able to be aggregated, sufficiently precise estimates of median house prices for MSA at the same point in time need to be found.[39] Although the same adjustment needs to be made at for price indices at the state level, the estimate of median house prices at the state level is likely less noisy.

Despite the potential drawbacks of MSA-level prices, in Table X, we reproduce our main investment results, although this time using housing prices that are matched at the MSA

[37]During the course of our sample, the geographical classification system changes from MSA (Metropolitan Statistical Area) to CBSA (Central Business Statistical Area). We convert between the two systems by matching on zip codes.

[38]About 20% of branch-level deposits from the summary of deposits data cannot be matched to a MSA/CBSA level housing price index.

[39]Here we use estimates of median house prices at the MSA level from the FHFA. The adjusted MSA level index value of 100 corresponds to $72,571.50.

level and aggregated using the bank's deposits from the prior year as weights. Despite these concerns, the results are strikingly similar in both economic and statistical terms. The similarity between our MSA-level and state-level housing price results suggests that we are not generating erroneous results by focusing on prices at the state level.

IV.B Firm Collateral

A recent paper by Chaney, Sraer, and Thesmar (2012) finds that increased real estate values for companies are related to increases in firm borrowing and investment. Using specific accounting variables available only to 1993, they calculate the market value of a firm's buildings for their sample of Compustat firms as of 1993. They proceed to use housing price changes in the state where the firm is headquartered to get an estimate of the market value of these building from 1993-2007. They find a one standard deviation increase in the market value of a firm's buildings is associated with a 10.5 percentage point increase in firm investment.[40] They argue that this result is evidence of a positive collateral channel associated with the housing bubble. When firms have more valuable collateral they are able to borrow and invest more. In this period the general real estate bubble increased the value of firms' collateral and so benefited the economy with increases in real investment.

In Table XI, we include the Chaney, Sraer, and Thesmar (2012) collateral variable, *Market Value of Buildings*, in our main investment regression specifications. As with our other specifications, we scale all independent variables by their sample standard deviations to aid in comparison of economic significance. Because of the limited availability of this new variable, our sample size shrinks from 19,133 observations of 3,161 firms to only 6,682 observations of 906 firms. In these specifications we switch to firm fixed effects rather than use firm-bank fixed effects due to the much smaller sample size. In our sample, we find a one standard deviation increase in the market value of a firm's buildings is associated with between a 4.19 and 5.04 percentage point increase in investment, depending on the specification. Even though we run a somewhat different specification on a different sample of firms, we find a statistically significant result only somewhat smaller in terms of economic magnitude to Chaney, Sraer, and Thesmar (2012).

In Column 2 of Table XI the housing price variable is instrumented using the land unavailability measure, the state-level mortgage rates, and their interaction.[41] In this specification, we find a one standard deviation increase in housing prices in the bank's states to

[40] This amount is derived using the sample standard deviations available in Table 1 of the paper combined with the first specification in Table 4.

[41] Chaney, Sraer, and Thesmar (2012) take a similar approach to instrumenting housing prices, although use the interaction between a housing supply elasticity measure and the national-level 30-year mortgage rate as their principal instrumental variable.

be associated with a 7.85 percentage point decline in investment. This decline is comparable in magnitude to the 4.4 percentage point positive marginal effect associated with the market value of the firm's buildings and in fact somewhat larger. In Column 3 where the largest national banks are allowed to have a differential effect on investment, we find that for the smaller banks the housing price effect is even larger, at about 19.8 percentage points, and for the largest banks the effect is still negative but smaller, at -4.84 percentage points ($-19.82+14.98 = -4.84$). For firms that do not borrow from the largest banks, the negative bank-driven effects of the housing price bubble dominate on average the positive benefits of increased firm collateral.

Column 4 adds year fixed effects to the instrumental variable specification of Column 3. In this case, a one standard deviation increase is associated with a 6.7 percentage point decrease in investment for the firms that borrow from all but the four largest national banks. For firms that borrow from the largest banks, the net effect of housing prices on investment is -2.12 percentage points ($-6.70+4.58 = -2.12$) The results compare to the market value of buildings having a positive marginal effect of 4.3 percentage points. Both the negative bank lending channel and positive collateral channel are at work during the housing bubble. For firms with sufficient real estate in areas with high price appreciation and that borrowed from the largest banks, the positive collateral channel probably offset or dominated the negative effects of the housing bubble we document. However, for many firms, especially those that borrowed from more regional banks and do not have significant real estate collateral, the negative bank lending channel is dominant.

IV.C Borrowers' Access to Alternative Capital

In the cross-section of firms, we expect our results to differ depending on the capital constraints of firms. In particular, for those firms which have ready access to alternative external capital, such as public debt or equity financing, we would expect weaker results. Firms that have larger internal capital reserves should be less affected by the negative aspects of the housing bubble as well. In Table XII, we consider subsamples of data depending on the firm's likelihood of being capital constrained. Following Chaney, Sraer, and Thesmar (2012), we use three different variables to capture differences in constraints: payout policy, firm size, and firm public debt credit ratings. For payout policy, constrained firms are those that did not pay a cash dividend in a given year, whereas unconstrained firms did pay a cash dividend. For the sake of focusing on investment of borrowing firms by ability to access capital, we use the more parsimonious specification without year fixed effects. A specification with year fixed effects and the distinction between larger national and smaller regional banks yields broadly similar results, but just includes more dimensions that need to be accounted for in the comparison. The coefficients from Columns 1 and 2 of Table XII come from running our main investment specification (with housing prices instrumented) on each subsample. The constrained subsample in Column 1 has a larger negative coefficient associated with housing prices in the bank's states (-7.97 percentage points) than the unconstrained subsample in Column 2 (-3.89 percentage points), and the difference is statistically significant at the 1% level.

If firms that are in the lowest tercile by firm size (as measured by book assets) are classified as constrained and compared to firms in the highest size tercile that are designated as unconstrained, there are again statistically and economically significant differences in the effect of housing price increases on investment. Comparing Columns 3 and 4 of Table XII, the marginal effect of an increase in housing prices on investment is about 2.5 times as large. For constrained firms, the marginal effect is a 9.1 percentage point decrease in investment, compared to a still significant 3.5 percentage point decrease for unconstrained firms. For small firms that are more constrained due to lack of access to internal and external capital, the negative bank lending channel effect is significant.

Columns 5 and 6 of Table XII use the presence of a public debt rating as a measure of constraint. Firms are classified as constrained if they have no public debt rating. Unconstrained firms are those with a public debt rating. The idea behind this classification is that capital is more easily raised for borrowers with access to public debt markets (proxied by existence of a debt rating) than firms which are not active in public debt markets. Comparing the marginal effect of a housing price increase on investment across Columns 5 and 6, the effect is significantly larger at the 1% level for the constrained firms.

IV.D Large Banks, Overlap in States, and Firm's State HPI

As discussed in Section II, we use the geographical deposit base of a bank as a measure of the geographical distribution of its real estate lending. Large banks may not necessarily satisfy this assumption if their lending patterns are weakly related to the geography of their deposit base. Berger, Miller, Petersen, Rajan, and Stein (2005) find that large banks lend at a greater distance, interact more impersonally with their borrowers, have shorter and less exclusive relationships, and do not alleviate credit constraints as effectively. Given the potential difference in strength of borrower-lender relationships depending on bank size, as an additional robustness test we exclude the largest decile of banks based on their total deposits in each year. Columns 1 and 2 Table XIII show instrumented versions of this specification excluding and including year fixed effects, respectively. Despite a significant reduction in sample size, our coefficient estimates of the effect of housing prices on investment are statistically significant and are similar in magnitude to our main results where the national banks are allowed a differential effect. This subsample analysis suggests that the obtained results cannot be attributed to possibly distinct lending behavior of extremely large banks.

We further check the robustness of our results to the potential issue of overlap in housing markets between borrowers and lenders and the potential biases that may arise from common omitted economic shocks. We consider a subsample where the state location of the borrowing firm does not overlap with any of the top five states for the bank-holding company, as measured by the concentration of its deposits. The results of this exercise are presented in Columns 3 and 4 of Table XIII. Again the results are largely similar to those of the main sample. Given the efficacy of our instruments in this subsample, it appears that the omitted economic shock is a concern, but not one that is entirely avoided by subsampling on location alone. With the multi-state if not multinational presence of many of firms in our sample, this finding is perhaps not surprising.

As an alternative measure to control for the potential endogeneity between loan supply and firm demand, Columns 5 and 6 include the housing price index in the state where the firm operates as an additional control. The estimated effect of housing prices in the bank's states on firm investment remains significantly negative and similar in magnitude to the results in Table IV. The effect of housing prices in the firm's state on investment is positive and in the specification without year fixed effects statistically significant. This result could be capturing positive economic conditions in the firm's primary location, a collateral effect similar to what is documented in Table XI, or a combination of the two.

V Conclusion

Much research focuses on the effect of crashes or burst bubbles for specific asset classes on real activity. Further, research on rising asset bubbles largely points to positive spillover effects for investment and real activity. Although theoretically considered in Tirole (1985), Farhi and Tirole (2012), and Bleck and Liu (2013), evidence of negative consequences from rising price bubbles have not been empirically documented to the best of our knowledge.

In this paper, we consider the impact of housing prices on firm investment. We find that from 1988–2006, a period of strong appreciation and booms in many housing markets, rising housing prices have some negative effect on firm investment. The channel at work is the bank's choice of capital allocation. We find in areas with high housing appreciation, banks increase the amount of mortgage lending and decrease the amount of commercial lending as a fraction of their total assets. This allocation results in firms receiving reduced loan amounts, paying higher interest rates, and reducing investment. If anything, firms should have more, instead of fewer, investment opportunities in the face strong housing returns and economic growth. The strong negative effect of housing prices on investment suggests that reduced debt capital supply from banks is the primary reason for lower investment, and not a reduction in the firm's demand for capital.

Policymakers have argued for the need to support important asset markets with the intention of increasing consumer wealth, consumer demand, and real economic activity. When considering intervention in certain asset markets, such as the housing and treasury markets, it is important to consider the potential negative effects on real activity. Such intervention may very well increase consumer wealth and consumer demand; however, if the banks are interested in capitalizing on these supported markets at the expense of commercial lending, firms may be unable to increase investment and real activity in response to that demand. As such, the magnitude and direction of the bank lending channel as compared to the balance sheet channel should be considered when implementing such policies.

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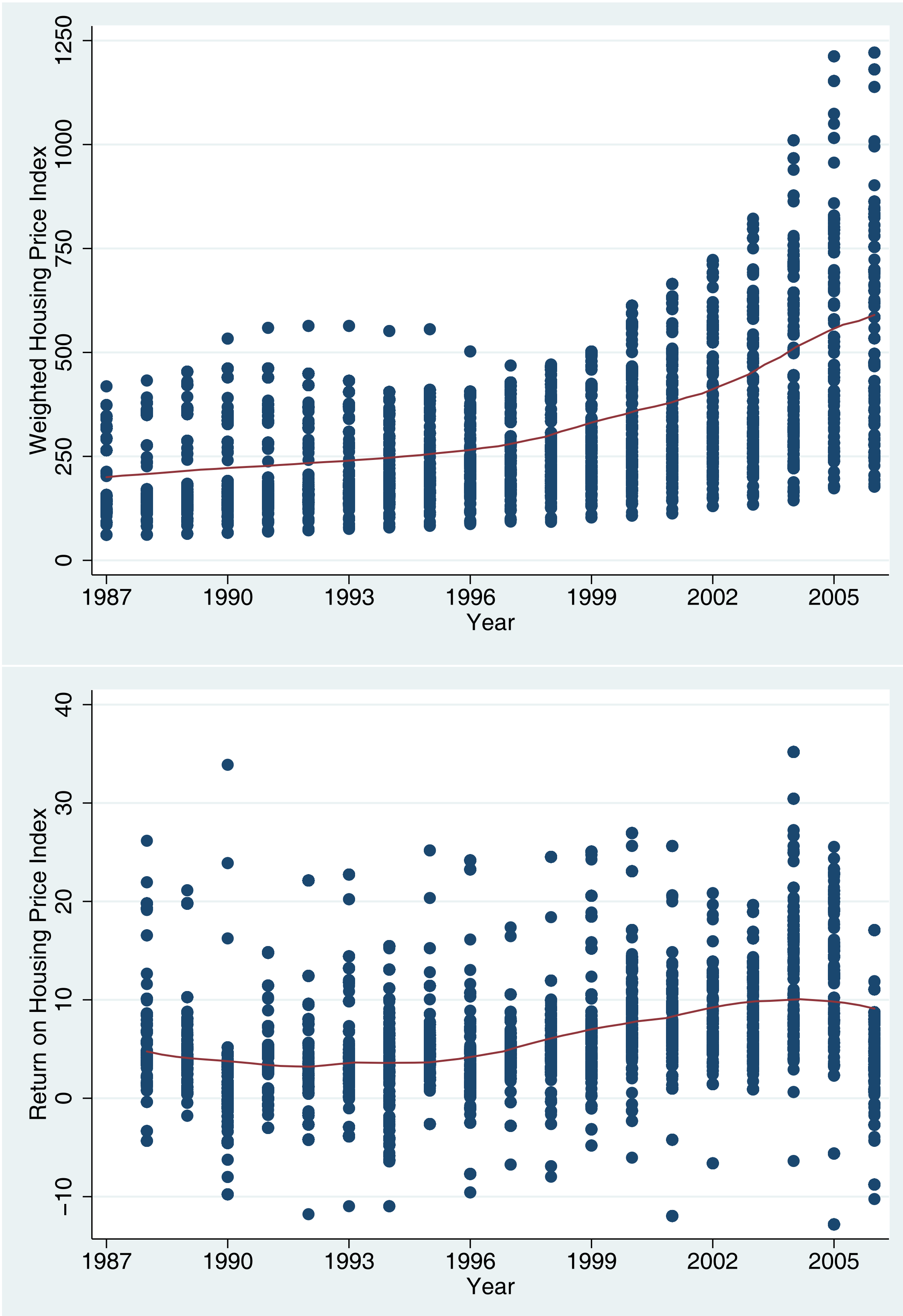

Figure 1: Housing Prices in Banks' Deposit Areas. This figure plots the weighted housing prices (top) and return on housing (bottom) in the location where the bank has depository branches.

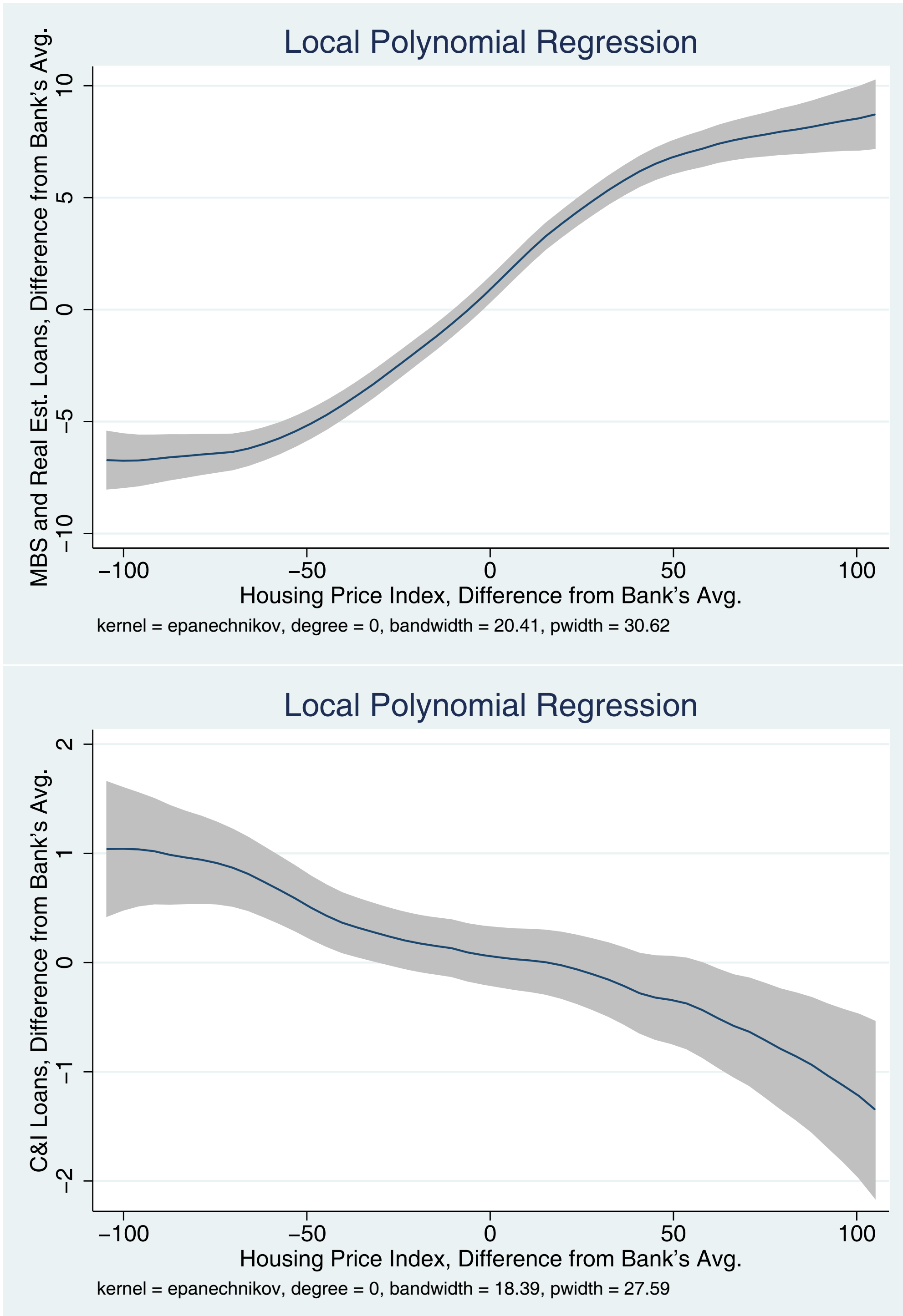

Figure 2: Relation between the housing price index and either MBS and real estate loans or commercial and industrial loans, demeaning each variable at the bank level. The top figure plots the fraction of the bank's total assets that are mortgage-backed securities and real estate loans against the prior year's housing prices where the bank has depository branches, relative to the bank's average levels. The bottom figure plots the fraction of the bank's total assets that are commercial and industrial loans against the prior year's housing price index where the bank has depository branches, relative to the bank's average levels. Both loan variables are scaled by 100 and are winsorized at the 1 and 99 percentiles. 95% confidence intervals provided for the local polynomial regression estimates.

Table I: Summary Statistics and Variable Definitions

Panel A presents summary statistics for the variables in our dataset and Panel B provides variable definitions and data sources. The sample consists of all firm-year observations from nonfinancial firms. Ratios are scaled by 100.

Panel A: Summary Statistics						
	Mean	Std Dev	25 Pctile	Median	75 Pctile	# Obs.
Bank Variables						
MBS	9.19	8.01	2.65	7.36	13.5	1,573
Real Estate Loans	31.7	14.4	22.6	31.0	40.8	1,573
Consumer Loans	9.17	5.91	4.26	9.02	13.2	1,573
C&I Loans	15.2	7.17	10.4	14.5	18.8	1,573
Loan Characteristics						
All In Drawn Spread (bps)	185.1	133.8	75	167.7	266.6	17,616
Loan Amount to Assets	31.9	39.2	8.67	19.9	40.2	16,170
Maturity (months)	41.0	27.1	17	36	60	17,616
Firm Variables						
Investment	29.5	51.6	9.16	17.5	32.7	36,256
Book Leverage	33.9	27.3	16.4	30.6	45.2	52,050
Market to Book	1.71	1.55	1.06	1.34	1.86	44,146
Cash Flow	38.6	101.0	9.51	24.8	55.3	51,105
Tangibility	35.1	24.6	14.3	29.6	53.6	52,045
Altman's Z-Score	1.16	3.55	0.64	1.45	2.31	49,030
Firm Size	6.66	2.12	5.19	6.61	8.12	52,185
Market Value of Buildings	1.35	2.45	0.29	0.71	1.35	15,164
Housing Variables						
Housing Price Index, Bank's State(s)	382.2	162.4	256.4	366.5	476.7	47,328
Return on Housing, Bank's State(s)	8.85	11.1	3.34	7.39	12.2	46,348
Land Unavailability, Bank's State(s)	23.5	7.29	19.4	22.0	27.6	47,310
Macroeconomic Variables						
S&P 500 Return	9.14	13.3	2	8.60	21.5	19
Change in Unemp. Rate, Firm's State	-0.064	0.81	-0.60	-0.20	0.30	8,282
GDP Growth Rate, Firm's State	5.67	2.33	4.18	5.43	7.18	8,282
GDP Growth Rate, Bank's State(s)	5.49	1.82	4.29	5.53	6.68	8,179
30-Year Mortgage Rate, Bank's State(s)	7.73	1.28	6.92	7.58	8.32	8,108

(continued)

Table I—*Continued*

Panel B: Variable Definitions

	Definition	Data sources
Bank Variables		
MBS	Mortgage-backed securities (RCFD8639) divided by total assets (RCFD2170). RCFD8639 is unavailable before 1994, so we use the sum of RCFD0408 and RCFD0602 instead.	Call Report
Real Estate Loans	Loans secured by real estate (RCFD1410) divided by total assets (RCFD2170)	Call Report
Consumer Loans	Consumer loans (RCFD1975) divided by total assets (RCFD2170)	Call Report
C&I Loans	Commercial and industrial loans (RCFD1766) divided by total assets (RCFD2170)	Call Report
Loan Characteristics		
All In Drawn Spread (bps)	Basis point spread paid over LIBOR for each dollar of loan drawn. For loan packages with multiple facilities, a dollar-weighted average is used.	DealScan
Loan Amount to Assets	Total amount available in a loan package divided by the borrowing firm's book assets	DealScan and Compustat
Maturity (months)	Loan package maturity (in months) at origination. Dollar-weighted average for packages with multiple facilities.	DealScan
Firm Variables		
Investment	Capital expenditures minus sale of PPE divided by lagged net PPE	Compustat
Book Leverage	Total debt divided by book assets	Compustat
Market to Book	Book assets plus closing stock price times shares outstanding minus common equity minus deferred taxes, all divided by book assets	Compustat
Cash Flow	Income before extraordinary items plus depreciation and amortization divided by lagged net PPE	Compustat
Tangibility	Net PPE divided by book assets	Compustat
Altman's Z-Score	Sum of 3.3 times pre-tax income, sales, 1.4 times retained earnings, 1.2 times the difference between current assets and current liabilities, all divided by book assets	Compustat
Firm Size	Log of book assets	Compustat
Market Value of Buildings	Buildings at historical cost (as of 1993) times change in HPI in firm's state divided by lagged net PPE. Change in housing price index is the inflation in state-level housing prices since the year the buildings are built, as estimated by the building age as of 1993. Building age as of 1993 is determined by accumulated depreciation for buildings in 1993 divided by buildings at historical cost in 1993 times 40. 1993-specific data replaced with current year for pre-1993 observations.	Compustat and FHFA; See Chaney, Sraer, and Thesmar (2012)
Housing Variables		
Housing Price Index, Bank's State(s)	State-level housing price index, adjusted by state median housing prices in 2000. Bank-specific weighting determined by prior year's summary of deposits.	Summary of Deposits and FHFA
Return on Housing, Bank's State(s)	Annual change in *Housing Price Index, Bank's State(s)*	Summary of Deposits and FHFA
Land Unavailability, Bank's State(s)	Percent of land unavailable for development in specific MSAs, averaged to state-level using population for weights. Bank-specific weighting determined by prior year's summary of deposits.	Summary of Deposits, Census (2000), and Saiz (2010)
Macroeconomic Variables		
S&P 500 Return	Annual return	FRED
Change in Unemp. Rate, Firm's State	Annual change in unemployment rate firm's headquarters state	Compustat and FRED
GDP Growth Rate, Firm's State	Annual GDP growth rate firm's headquarters state	Compustat and FRED
GDP Growth Rate, Bank's State(s)	Average annual GDP growth rate in states where bank has deposits, weighted by prior year's deposit amounts.	Summary of Deposits and FRED
30-Year Mortgage Rate, Bank's State(s)	Average 30-year fixed mortgage rate in states where bank has deposits, weighted by prior year's deposit amounts.	Summary of Deposits and HSH Associates

Table II: Bank Size and States of Operation

The table reports statistics on bank holding companies that operate between 1988 and 2006. *Total Deposits* are in billions USD for the year 2006. *Number of States* is the number of states the bank holding company has branches with deposits in 2006. The top 30 bank holding companies reported below are in decreasing order of total deposits in year 2006.

Bank Holding Company	Total Deposits	Number of States
Bank of America, National Association	72.28	30
Chase Manhattan Bank	54.31	26
Citibank, N. A.	20.22	14
Wells Fargo Bank, National Association	20.10	23
U.S. Bank National Association	16.25	26
First Union National Bank	11.12	16
SunTrust Bank	10.17	12
National City Bank	8.94	7
PNC Bank, National Association	8.84	10
Citizens Bank of Massachusetts	7.46	13
HSBC Bank USA	5.93	10
Bank of New York	4.74	8
Keybank National Association	4.06	13
Mellon Bank, National Association	3.50	7
Fifth Third Bank of Western Ohio	3.44	10
Comerica Bank	3.43	6
Bank of the West	3.16	17
Allfirst Bank	3.09	7
Harris Trust and Savings Bank	2.84	5
Bankers Trust Company	2.16	2
Northern Trust Company	1.84	15
Bank of Oklahoma, National Association	1.83	6
M&I Bank of Southern Wisconsin	1.56	7
Associated Bank Milwaukee	1.53	3
UMB Bank, National Association	1.41	6
Commerce Bank, National Association	1.32	4
Huntington National Bank	1.23	6
Colonial Bank	1.17	5
Wilmington Trust Company	1.07	4
Branch Banking and Trust Company	0.98	12

Table III: First-Stage Regression

Columns (1) through (4) are the First-Stage Panel Fixed Effect Regressions, with fixed effects at the bank (*lcoid*) level. *GDP Growth Rate, Bank's State(s)* is included as an additional control, as is *S&P 500 Return* for specifications without year fixed effects. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by bank.

	Housing Price Index, Bank's State(s)			
	(1)	(2)	(3)	(4)
Land Unavailability, Bank's State(s)	127.2***	78.55***	79.41***	103.6***
	(16.05)	(6.485)	(6.406)	(15.13)
30-Year Mortgage Rate, Bank's State(s)			46.34***	66.70***
			(12.90)	(12.83)
Land Unavailability × Mortgage Rate				-35.62**
				(17.13)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	Yes
Observations	3562	3562	3562	3562
Banks	448	448	448	448
Adjusted R^2	0.711	0.937	0.937	0.939

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table IV: Investment Regression

Columns (1) through (8) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. Columns (2), (4), (6), and (8) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	Investment							
	(OLS) (1)	(IV) (2)	(OLS) (3)	(IV) (4)	(OLS) (5)	(IV) (6)	(OLS) (7)	(IV) (8)
Lagged Market to Book	13.58***	13.71***	13.49***	13.22***	13.41***	13.00***	13.39***	12.70***
	(1.613)	(1.565)	(1.607)	(1.445)	(1.611)	(1.475)	(1.761)	(1.600)
Cash Flow	10.34***	10.53***	10.32***	10.55***	10.05***	9.916***	9.727***	9.486***
	(1.147)	(1.139)	(1.153)	(1.122)	(1.151)	(1.023)	(1.116)	(0.992)
S&P 500 Return	0.481	0.492	0.373	0.164				
	(0.448)	(0.433)	(0.433)	(0.279)				
Change in Unemp. Rate, Firm's State	-1.214***	-1.322***	-1.223***	-1.340***	-0.614	-0.380		
	(0.271)	(0.268)	(0.273)	(0.256)	(0.498)	(0.482)		
GDP Growth Rate, Firm's State	0.638	0.670*	0.564	0.722**	-0.218	-0.257		
	(0.439)	(0.401)	(0.441)	(0.347)	(0.481)	(0.424)		
GDP Growth Rate, Bank's State(s)	1.091**	1.126**	0.981**	1.054***	-0.452	-0.704	-0.417	-0.183
	(0.470)	(0.458)	(0.466)	(0.296)	(0.598)	(0.572)	(0.580)	(0.554)
Housing Price Index, Bank's State(s)	-4.679***	-6.334***	-10.24***	-13.76***	-5.601*	-11.86***	-5.982*	-8.965**
	(0.737)	(0.578)	(1.757)	(1.965)	(2.957)	(4.397)	(3.500)	(3.876)
National Banks × HPI, Bank's State(s)			6.942***	9.649***	4.451**	8.008***	4.462	6.600**
			(1.824)	(1.997)	(2.141)	(2.793)	(2.825)	(2.927)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes	Yes	No	No
Firm State-Year Fixed Effects	No	No	No	No	No	No	Yes	Yes
Observations	19133	19133	19133	19133	19133	19133	19133	19133
Firms	3161	3161	3161	3161	3161	3161	3161	3161
Adjusted R^2	0.422	0.422	0.423	0.422	0.427	0.427	0.436	0.436

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table V: Interest Rate Regression

Columns (1) through (4) are Panel Fixed Effect Regressions, with fixed effects at the firm level. The *All In Drawn Spread* is in terms of basis points. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	All In Drawn Spread			
	(1)	(2)	(3)	(4)
Lagged Book Leverage	13.65***	13.55***	11.33***	11.23***
	(3.602)	(3.560)	(3.563)	(3.520)
Lagged Market to Book	-7.897***	-7.986***	-7.547***	-7.653***
	(2.060)	(2.055)	(2.083)	(2.101)
Lagged Altman's Z-Score	-13.12	-13.08	-12.73	-12.74
	(8.761)	(8.747)	(8.737)	(8.722)
Loan Amount to Assets	5.642***	5.621***	6.091***	6.042***
	(1.886)	(1.869)	(1.988)	(1.966)
Log(Maturity)	-14.29***	-14.30***	-14.03***	-14.01***
	(1.957)	(1.958)	(1.987)	(1.985)
S&P 500 Return	-8.303***	-8.475***		
	(2.371)	(2.365)		
Change in Unemp. Rate, Firm's State	0.690	0.589	2.454	2.336
	(2.241)	(2.243)	(3.566)	(3.587)
GDP Growth Rate, Firm's State	-3.706	-3.727	-3.976	-3.986
	(2.314)	(2.316)	(2.435)	(2.433)
GDP Growth Rate, Bank's State(s)	-5.277**	-5.476**	-2.276	-2.757
	(2.288)	(2.326)	(3.511)	(3.643)
Housing Price Index, Bank's State(s)	8.043***	7.579***	9.039**	9.124***
	(2.502)	(2.428)	(3.528)	(3.487)
Large National Banks		3.483		3.446
		(4.775)		(5.124)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes	Yes
Observations	7113	7113	7113	7113
Firms	1894	1894	1894	1894
Adjusted R^2	0.583	0.583	0.586	0.586

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table VI: Outstanding Loans Regression

Columns (1) through (3) are Panel Fixed Effect Regressions, with fixed effects at the bank level. *Percent Change in Outstanding Loans* is calculated by taking the yearly percent change in the number of firms that have outstanding loans with each bank (*lcoid*-level). All independent variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Percent Change in Outstanding Loans		
	(1)	(2)	(3)
S&P 500 Return	5.559***	2.693**	
	(1.315)	(1.260)	
GDP Growth Rate, Bank's State(s)	0.934	1.838	-0.765
	(1.250)	(1.174)	(1.686)
Housing Price Index, Bank's State(s)		-33.61***	-9.172**
		(2.745)	(4.665)
Bank Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes
Observations	4247	4247	4247
Banks	575	575	575
Adjusted R^2	0.0294	0.101	0.144

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table VII: Loan Amount Regression

Columns (1) through (4) are Panel Fixed Effect Regressions, with fixed effects at the firm level. Columns (2) through (4) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	Loan Amount to Assets			
	(OLS)	(IV)	(IV)	(IV)
	(1)	(2)	(3)	(4)
Lagged Book Leverage	-3.733***	-3.351**	-2.924**	-3.057**
	(1.432)	(1.414)	(1.366)	(1.368)
Lagged Market to Book	-0.401	-0.328	-0.719	-0.861
	(1.010)	(0.985)	(0.964)	(0.971)
Lagged Altman's Z-Score	-3.184	-3.342	-3.354	-3.532
	(3.051)	(2.936)	(3.003)	(3.047)
S&P 500 Return	0.174	-0.415		
	(0.758)	(0.836)		
Change in Unemp. Rate, Firm's State	-1.038	-1.178	-0.908	-1.034
	(0.778)	(0.771)	(1.049)	(1.039)
GDP Growth Rate, Firm's State	-0.0340	-0.165	-0.416	-0.340
	(0.974)	(0.960)	(0.871)	(0.862)
GDP Growth Rate, Bank's State(s)	1.640***	1.430**	1.463	0.920
	(0.610)	(0.592)	(0.997)	(0.971)
Housing Price Index, Bank's State(s)	-3.741***	-6.395***	-4.831*	-4.522*
	(0.864)	(1.291)	(2.772)	(2.611)
Large National Banks				4.346**
				(1.762)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes	Yes
Observations	7490	7490	7490	7490
Firms	1971	1971	1971	1971
Adjusted R^2	0.354	0.356	0.362	0.363

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table VIII: Bank Asset Regression

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the bank holding company (*rssdhcr*) level. Columns (5) and (6) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. *Real Estate Loans* is the amount of non-MBS loans secured by real estate scaled by the bank's total assets, *MBS* is the amount of mortgage-backed securities scaled by the bank's total assets, *C&I Loans* is commercial and industrial loans scaled by the bank's total assets, and *Consumer Loans* is non-mortgage consumer loans scaled by the bank's total assets. Bank ratio variables are scaled by 100. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by bank holding company (*rssdhcr* level).

	Bank Assets					
	Real Estate Loans		MBS	C&I Loans		Consumer Loans
	(OLS)	(OLS)	(OLS)	(OLS)	(IV)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
GDP Growth Rate, Bank's State(s)	-0.437***	-0.223***	0.0639**	0.0762***	0.0444**	0.149***
	(0.0318)	(0.0381)	(0.0271)	(0.0223)	(0.0222)	(0.0171)
Housing Price Index, Bank's State(s)	9.322***	0.613**	0.419**	-0.740***	-2.659***	-2.572***
	(0.294)	(0.267)	(0.163)	(0.118)	(0.310)	(0.269)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	Yes	Yes	Yes	Yes
Observations	82238	82238	82238	82238	82238	82238
Banks	8246	8246	8246	8246	8246	8246
Adjusted R^2	0.805	0.844	0.647	0.743	0.744	0.775

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table IX: Investment Regression: Housing Returns

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. Columns (2), (4), and (6) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	Investment					
	(OLS) (1)	(IV) (2)	(OLS) (3)	(IV) (4)	(OLS) (5)	(IV) (6)
Lagged Market to Book	13.70***	13.43***	13.70***	12.30***	13.40***	12.35***
	(1.639)	(1.574)	(1.640)	(1.457)	(1.638)	(1.407)
Cash Flow	9.784***	9.465***	9.781***	9.529***	9.582***	9.707***
	(1.029)	(1.016)	(1.029)	(0.967)	(1.037)	(0.907)
S&P 500 Return	1.596***	0.857**	1.564***	-0.129		
	(0.446)	(0.431)	(0.435)	(0.403)		
Change in Unemp. Rate, Firm's State	-0.627**	-0.843***	-0.645***	-1.244***	-0.813*	-0.592
	(0.247)	(0.244)	(0.246)	(0.299)	(0.491)	(0.467)
GDP Growth Rate, Firm's State	0.106	1.034**	0.110	1.482***	-0.00718	0.278
	(0.434)	(0.466)	(0.433)	(0.378)	(0.456)	(0.351)
GDP Growth Rate, Bank's State(s)	1.107**	1.758***	1.128**	2.610***	-0.145	0.347
	(0.510)	(0.660)	(0.504)	(0.519)	(0.571)	(0.616)
Return on Housing, Bank's State(s)	-0.653**	-3.925***	-1.436*	-19.89***	-0.801	-11.11***
	(0.257)	(0.645)	(0.756)	(4.096)	(0.782)	(4.208)
National Banks × Return on Housing, Bank's State(s)			0.927	16.84***	0.650	10.10***
			(0.767)	(4.023)	(0.838)	(3.842)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes	Yes
Observations	18777	18777	18777	18777	18777	18777
Firms	3120	3120	3120	3120	3120	3120
Adjusted R^2	0.429	0.430	0.429	0.431	0.435	0.435

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table X: Investment Regression: MSA Level Housing Prices

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. Columns (2), (4), and (6) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	Investment					
	(OLS)	(IV)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	13.84***	13.39***	13.80***	13.40***	13.66***	12.86***
	(1.667)	(1.601)	(1.662)	(1.481)	(1.668)	(1.504)
Cash Flow	10.07***	10.41***	10.04***	10.45***	9.765***	9.918***
	(1.160)	(1.155)	(1.163)	(1.114)	(1.159)	(1.065)
S&P 500 Return	0.536	0.209	0.543	0.194		
	(0.483)	(0.456)	(0.479)	(0.297)		
Change in Unemp. Rate, Firm's State	-1.160***	-1.227***	-1.155***	-1.324***	-0.569	-0.248
	(0.290)	(0.280)	(0.289)	(0.268)	(0.526)	(0.506)
GDP Growth Rate, Firm's State	0.502	0.660	0.450	0.519	-0.265	-0.419
	(0.453)	(0.409)	(0.458)	(0.368)	(0.505)	(0.428)
GDP Growth Rate, Bank's State(s)	1.329***	1.758***	1.248**	1.512***	-0.314	-0.435
	(0.484)	(0.460)	(0.489)	(0.305)	(0.611)	(0.561)
Housing Price Index, Bank's MSA(s)	-5.723***	-9.016***	-8.862***	-18.70***	-3.213	-10.68**
	(0.756)	(0.931)	(2.843)	(3.088)	(2.564)	(4.981)
National Banks × HPI, Bank's MSA(s)			4.426	12.78***	2.695	7.959**
			(2.926)	(3.156)	(2.117)	(3.600)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes	Yes
Observations	18215	18215	18215	18215	18215	18215
Firms	3055	3055	3055	3055	3055	3055
Adjusted R^2	0.419	0.419	0.419	0.420	0.424	0.425

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table XI: Firm Collateral

Columns (1) through (4) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. Columns (2) through (4) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm and by bank.

	Investment			
	(OLS)	(IV)	(IV)	(IV)
	(1)	(2)	(3)	(4)
Lagged Market to Book	4.352***	4.367***	4.195***	4.308***
	(1.427)	(1.449)	(1.408)	(1.357)
Cash Flow	6.802***	7.213***	7.502***	6.480***
	(1.352)	(1.385)	(1.283)	(1.330)
S&P 500 Return	-0.141	-0.973**	-1.400***	
	(0.433)	(0.467)	(0.475)	
Change in Unemp. Rate, Firm's State	-0.191	-0.414	0.0342	0.541
	(0.341)	(0.349)	(0.323)	(0.601)
GDP Growth Rate, Firm's State	1.366**	1.708***	1.835***	1.050*
	(0.598)	(0.556)	(0.467)	(0.622)
GDP Growth Rate, Bank's State(s)	1.499***	1.617***	1.100***	0.423
	(0.321)	(0.322)	(0.339)	(0.515)
Housing Price Index, Bank's State(s)	-3.251***	-7.848***	-19.82***	-6.696*
	(0.692)	(1.734)	(4.569)	(3.947)
National Banks × HPI, Bank's State(s)			14.98***	4.581*
			(4.490)	(2.758)
Large National Banks			-33.96***	-10.93*
			(9.776)	(6.201)
Market Value of Buildings	4.187***	4.359***	5.039***	4.429***
	(1.623)	(1.640)	(1.558)	(1.588)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	Yes
Observations	6682	6682	6682	6682
Firms	906	906	906	906
Adjusted R^2	0.380	0.393	0.391	0.404

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table XII: Investment Regression for Constrained and Unconstrained Firms

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. All columns use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. Constrained firms as measured by payout policy are defined as those firms which did not pay a cash dividend during the year. Unconstrained firms as measured by payout policy are those firms which did pay a cash dividend during the year. Splitting the sample into terciles by firm size (*Log(Assets)*), constrained firms are the bottom tercile and unconstrained firms are the top tercile. Firms with a public bond rating are designated as unconstrained and firms without a public bond rating are designated as constrained. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm and by bank. The *Wald Test* provides the χ^2 statistic on whether the *Housing Price Index, Bank's State(s)* coefficient is statistically different across the constrained and unconstrained samples.

	Investment					
	Payout Policy		Firm Size		Bond Ratings	
	(Constrained)	(Unconstrained)	(Constrained)	(Unconstrained)	(Constrained)	(Unconstrained)
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	13.60***	7.902***	16.28***	8.351***	14.85***	6.996***
	(1.888)	(1.481)	(2.026)	(1.635)	(1.707)	(2.713)
Cash Flow	10.24***	19.92***	10.07***	6.481**	11.57***	13.30***
	(1.377)	(3.877)	(1.524)	(3.152)	(1.279)	(2.790)
S&P 500 Return	0.288	0.648**	0.610	0.250	0.169	0.974***
	(0.662)	(0.312)	(0.938)	(0.309)	(0.719)	(0.371)
Change in Unemp. Rate, Firm's State	-1.645***	-0.714***	-1.218**	-0.650***	-1.775***	-0.291
	(0.493)	(0.250)	(0.610)	(0.211)	(0.468)	(0.243)
GDP Growth Rate, Firm's State	0.848	0.175	0.518	-0.0238	0.615	0.562*
	(0.598)	(0.354)	(0.712)	(0.313)	(0.572)	(0.334)
GDP Growth Rate, Bank's State(s)	1.912***	0.278	-0.223	1.240***	0.180	0.942***
	(0.515)	(0.306)	(0.952)	(0.210)	(0.848)	(0.239)
Housing Price Index, Bank's State(s)	-7.969***	-3.893***	-9.095***	-3.541***	-8.593***	-3.952***
	(0.882)	(0.564)	(2.145)	(0.617)	(1.263)	(0.436)
Wald Test (Constrained = Unconstrained)	15.2***		6.19**		12.1***	
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10724	7801	8202	3969	11680	7083
Firms	2147	1271	1751	576	2272	1047
Adjusted R^2	0.409	0.557	0.392	0.538	0.410	0.444

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table XIII: Investment Regression: Robustness Checks

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the firm-bank level. All Columns use the unavailable land measure, the state-level 30-year mortgage rate, and their interactions as instruments. Columns (1) and (2) exclude firm-bank-year observations where the bank is in the largest decile of banks in a given year, as measured by total deposits. Columns (3) and (4) exclude firm-bank-year observations where the firm's state matches one of the bank's five largest deposit states. Columns (5) and (6) include the housing price index of the firm's state as an additional control. All independent variables are scaled by their respective standard deviations. Standard errors are clustered by firm and by bank.

	Investment					
	Exclude Largest Banks		Exclude Overlapping States		Include Firm's State HPI	
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	14.05***	12.21***	14.69***	14.48***	13.40***	13.01***
	(1.745)	(1.519)	(2.701)	(2.615)	(1.461)	(1.475)
Cash Flow	11.61***	11.00***	8.972***	9.404***	10.45***	9.910***
	(1.810)	(1.722)	(1.447)	(1.189)	(1.106)	(1.020)
S&P 500 Return	0.759		0.205		0.0963	
	(0.816)		(0.317)		(0.294)	
Change in Unemp. Rate, Firm's State	-1.890***	-0.345	-1.354***	-0.874*	-1.394***	-0.407
	(0.428)	(0.866)	(0.260)	(0.476)	(0.265)	(0.490)
GDP Growth Rate, Firm's State	0.353	-0.543	0.934**	0.148	0.696**	-0.253
	(0.637)	(0.875)	(0.394)	(0.460)	(0.348)	(0.421)
GDP Growth Rate, Bank's State(s)	0.0547	-1.240*	0.956***	0.631	1.064***	-0.703
	(0.573)	(0.753)	(0.238)	(0.535)	(0.302)	(0.573)
Housing Price Index, Bank's State(s)	-13.24***	-14.28**	-10.28***	-8.971*	-15.74***	-11.79***
	(2.179)	(6.578)	(3.216)	(4.838)	(2.151)	(4.359)
National Banks × HPI, Bank's State(s)			7.487**	6.527**	10.16***	7.780***
			(3.254)	(3.110)	(2.003)	(2.766)
Housing Price Index, Firm's State					2.999**	1.408
					(1.314)	(1.191)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes
Observations	7594	7594	10205	10205	19133	19133
Firms	1639	1639	1854	1854	3161	3161
Adjusted R^2	0.439	0.445	0.477	0.481	0.422	0.427

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01