Do Asset Price Booms 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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The years leading up to the recent financial crisis have been characterized by a significant boom in real estate prices. A similar pattern has been observed in previous episodes, whereby real estate prices increase leading up to a crisis and then crash at the onset of the crisis. A lot has been written about the negative real effects of asset price crashes (see, e.g., Gan (2007a), Gan (2007b) and Peek and Rosengren (2000)). The logic behind this effect is that firms, who own real estate, can borrow less and invest less following the decline in the value of their assets (the *collateral channel*). In addition, banks exposed to real estate prices decrease their lending following the crash causing further deterioration in firms' access to capital and investment (the *lending channel*).

Much less is known, however, about the real effects of the boom phase in asset prices. We explore these effects in this paper. Specifically, we study the effect of housing prices on bank commercial lending and firms investments in the US in the period between 1988 and 2006. We document a crowding-out effect, whereby the lending opportunities in the real estate market, following the boom in real estate prices, have led banks to reduce commercial lending. This has caused firms who depend on these loans to reduce investment, hence having a negative real effect.

Our empirical analysis hinges on the cross sectional differences across banks in their exposure to the real estate market. We use the location of banks' deposit branches to proxy for the location of mortgage activity, assuming that banks are more likely to invest in mortgage assets if there is larger price appreciation in the areas where they have branches.[1] We find evidence that an increase in housing prices leads to a *decrease* in commercial lending. Specifically, if a bank's deposit base is in an area with a one standard deviation above the mean increase in housing prices, the bank decreases commercial and industrial lending by 0.58 percentage points, as a fraction of the bank's assets. The increase in housing prices also corresponds to a 20.1% decrease in the number of outstanding commercial loans. As discussed below, these effects are magnified once we add instruments to the empirical analysis. In addition, we show that the decrease in lending translates to a real effect, as it leads to a decrease in the investments of firms that have a relationship with the affected banks.

These results stand in sharp contrast to the theme often coming out of the empirical literature, according to which asset prices have a positive relation to lending and real investment. The papers mentioned above are based on the collateral channel and lending channel, where increases in asset prices alleviate financial constraints of banks and firms enabling more lending, borrowing, and investment. These papers have documented a negative effect of house price depreciation. In a similar vein, a recent paper by Chaney, Sraer, and Thesmar (2012) documents that US firms owning real estate benefited from the increase in real estate prices during the period of our study due to the collateral channel. While we confirm their results in our data, we document an additional effect operating in the opposite direction: Firms that depend on bank loans are harmed by the appreciation in real estate prices if their banks had large exposure to real estate markets that led them to divert resources to real estate loans at the expense of commercial loans. This empirical result is related to the model of Farhi and Tirole (2012) that produces a similar substitution effect.

[1] We discuss the appropriateness of our assumption with respect to traditional mortgage lending and mortgaged-backed securities in more detail in Section II.D.

As far as we know, such an effect has not been shown empirically before.

This result has important implications for models in macroeconomics. Such models —e.g., Bernanke and Gertler (1989) and Kiyotaki and Moore (1997)— often emphasize the positive effect of an increase in asset prices on real investments. Hence, they generate amplification of shocks—a positive shock in the economy leads to an increase in asset prices enabling firms to borrow and invest more and thus magnifying the initial shock. However, we show that the opposite occurs also: positive shocks to asset prices sometimes discourage real investment, leading to a dampening of the initial shock. There are also important implications for policy, as policymakers often attempt to support real estate prices in hope that this will help boosting the real economy. Our results demonstrate that this may not be the case. Our results do not say directly whether the decrease in lending and real investment following real estate price appreciation is bad for welfare and efficiency. Making such a statement would require us to at least know whether the appreciation is a result of a bubble or not. We just document the negative relation in our setting and point to the fact that macroeconomists and policymakers should not assume that asset price booms translate to a boost in economic activity, as the opposite occurs in some cases. We provide further discussion of where our model fits in the existing literature in the next section.

An important issue in interpreting our empirical results, as in most papers in empirical corporate finance, is endogeneity. Is the reduction in commercial loans and firms' investments a result of a decrease in the supply of loans from the banks given their opportunities in the real-estate markets, as we argue, or does it stem from a decrease in firms' investment opportunities? Overall, it should be emphasized that the endogeneity concern is much less pertinent in our paper than in much of the literature. Insofar as increased housing prices coincide with general economic growth, one would expect a positive relation between housing prices and firm investment opportunities. This correlation should make it more difficult to find our result, implying that, if anything, any estimates of the effect of house prices on firm investment are likely biased upward, i.e., the reduction in lending and investment due to a positive shock to real-estate prices unrelated to firms' demand for capital is likely greater than we estimate.

Still, we formally address the possible endogeneity of the firms' investments in a couple of ways. First, 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 of the firm once the housing price in the firm's area is controlled for.[2] 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. Going further in this direction, we also consider a subsample of firm-bank pairs where the bank's deposit base and firm location are in different states and find similar results.

[2] While we do most of the analysis using data on the banks' and firms' states, we also repeat the analysis using data on the locations at the MSA level.

Second, 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 are 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.[3]

Using these instruments, we find much stronger effects of exogenous housing price appreciations for the firms which borrow from banks exposed to these appreciations: a one standard deviation above the mean increase in housing prices decreases firm investment by almost 4.3 percentage points. This decrease corresponds to 9.5% of a standard deviation for investment. This result contrasts to an insignificant estimate without instrumentation. It appears, once the endogeneity between loan supply and firm demand is addressed, that a bank's reduction in commercial lending is translating into a significantly reduced firm investment. Using the instruments enables us also to uncover a stronger effect on lending: With instrumentation, we find that banks decrease the amount of commercial lending by 2.35 percentage points, as a share of total assets. Banks also reduce the number of outstanding loans by 42.6% for a one standard deviation above the mean increase in housing prices. Loans that are originated are on average 39.7 percentage points smaller for a one standard deviation increase in housing prices, as scaled by the firm's lagged net property, plant, and equipment. So, increasing housing prices translate into fewer commercial loans and smaller loan sizes.

The channel we explore in this paper is an extension of the bank lending channel, whereby shocks to banks affect their ability to lend and end up affecting the firms that borrow from them. A classic paper in this literature is Bernanke (1983). At the heart of this channel stand two important premises: One is that banks are financially constrained and the other one is that firms are financially constrained. Such constraints have been thoroughly discussed and analyzed in the theoretical literature originating from frictions such as moral hazard and adverse selection. For example, Stein (1998) develops a model where banks are constrained in their ability to raise uninsured capital given their superior information about the loans they can make. Holmstrom and Tirole (1997) is a classic reference for the analysis of capital constraints in firms and financial intermediaries due to moral hazard problems. As we discuss in the next section, there has been

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

extensive empirical evidence by now in support of the bank lending channel, essentially validating these two premises. A novel feature of our empirical analysis is that the shock to the bank is not a typical negative shock to capital, but rather a positive shock to the bank's other lending opportunities which lead to substitution away from commercial loans. This bears resemblance to the discussion in the internal-capital-markets literature where constrained headquarters have to decide how to allocate resources among competing projects, as in Stein (1997), and so will allocate less to some projects when other projects appear more profitable.

In line with the above premises, one would expect that our results will be most pronounced for relatively constrained firms who borrow from relatively constrained banks. Indeed, we show that the effects are concentrated among those firms who borrow from banks which are not in the group of the largest bank holding companies. Similarly, we find that the effects are larger for financially-constrained firms. Using size as one measure of constraints, we find that smaller firms decrease investment by 17.4 percentage points for a one standard deviation above the mean increase in housing prices in the bank's deposit states, versus 4.3 percentage points for the full sample.[4] We find similar results using public bond ratings to determine whether a firm is constrained or unconstrained.

Finally, another important piece of evidence supporting the credit rationing story concerns the effect of housing price appreciations on interest rates. We find that the interest rate paid on commercial loans, as measured by a spread over LIBOR, increases by 5.8 basis points for a one standard deviation above the mean increase in housing prices in the bank's states. Such an effect should not have been observed if the decrease in loans and investments came from decreased demand for capital rather than decreased supply of capital.

The remaining sections are organized as follows. Section I discusses the theoretical motivation behind this work and the relation to the existing empirical literature. Section II describes the data used for the analysis. Section III reports the empirical results. Section IV addresses some additional robustness exercises. Section V concludes.

I Theoretical Motivation and Link to Prior Empirical Literature

At a broad level, our paper contributes to the large literature on financial constraints. The theory behind financial constraints goes back at least to Stiglitz and Weiss (1981). They pointed out that credit may be rationed in equilibrium, not finding an interest rate that will clear the market and equate demand to supply. The reason is that there are frictions that make the quality of the loans dependent on the amount and terms of credit. Stiglitz and Weiss (1981) and the vast literature that followed them pointed to two important frictions. One is adverse selection, whereby borrowers know more about the quality of the projects they invest in, which makes lenders reluctant to provide credit even at a high price (which might attract worse loans). The other one is moral hazard, whereby borrowers can take actions that affect the profitability of projects, and when they

[4]This coefficient is found in our instrumental variables specification.

are heavily indebted they lose incentives to take the value-maximizing action.

Importantly, these frictions affect both financial firms and non-financial firms. Financial firms (banks) are constrained in the funds they can raise to provide loans to non-financial firms due to the adverse selection or moral hazard problems between the banks and their capital providers. At the same time, non-financial firms are constrained in the amount of capital they can raise to make real investments due to the frictions that stand between them and their capital providers (including banks). Holmstrom and Tirole (1997) provide a canonical model, where both banks' capital and firms' capital play an important role in determining real investment in equilibrium due to the double moral hazard (between firms and banks and between banks and their creditors). Stein (1998) analyzes the constraints faced by banks due to the adverse selection problem and the implications these constraints have for the real effect of monetary policy.

The literature highlighted two channels via which asset-price increases can alleviate financial constraints and boost investments. Both these channels are present in Holmstrom and Tirole (1997). The first one is the *Balance Sheet Channel* or the *Collateral Channel.* Firms owning real estate, for example, will be able to post more collateral and raise more capital for investment when prices of real estate go up. Empirical evidence in support of this channel have been provided by Gan (2007a) and more recently by Chaney, Sraer, and Thesmar (2012). The second channel is the *Bank Lending Channel*, according to which banks benefit from the increase in real estate prices, which alleviates their capital constraints and allows them to lend more. This effect has been documented empirically on the downside – a crash in real estate prices makes banks more constrained and leads them to cut lending – by Peek and Rosengren (2000) and Gan (2007b) in the context of the collapse of the Japanese real estate market in early 1990s and more recently by Cuñat, Cvijanović, and Yuan (2013) in the context of the U.S. housing market crash in the late 2000s. More broadly, there is a large literature documenting how negative shocks to bank capital reduce lending, e.g., Bernanke (1983), Kashyap and Stein (2000), Ashcraft (2005), Khwaja and Mian (2008), Paravisini (2008), and Schnabl (2012). Importantly, for this to have a real effect, firms must depend on banks and cannot easily switch to another source of capital – a premise that has been prominently shown in the empirical literature, e.g., Faulkender and Petersen (2006), Sufi (2009), Leary (2009), Lemmon and Roberts (2010), and Chava and Purnanandam (2011).

To the best of our knowledge, our paper is the first one to show a negative real effect of housing prices appreciation. Our effect is a variant of the bank lending channel, in that it is based on a shock to the bank that affects its lending and the investment of firms that borrow from the bank. However, the shock in our setting is a shock to the investment opportunity of the bank, rather than to its balance sheet. Specifically, housing price booms present an opportunity to banks to make real-estate loans. Given that they are financially constrained – due to the frictions mentioned above, they cannot raise as much uninsured capital as they would like – they then divert resources from commercial loans to real-estate loans to take advantage of this opportunity. Hence, at the core of our story, just like in the papers mentioned above, is the premise that banks and firms are constrained, but the implications are completely different, leading to a negative effect of asset price booms. Note that an alternative constraint that might be generating our results is an organizational constraint faced by banks: They might be limited in expanding their lending capacity and hiring new loan officers, and so when lending opportunities come up in the real-estate market, they choose to exploit them by diverting resources away from other businesses, such as commercial loans.

Thinking about the theoretical literature, the substitution effect we document here between real estate loans and commercial loans resembles the ideas discussed in the literature on internal capital markets, see, e.g., Stein (1997) and Scharfstein and Stein (2000). In this literature, a financially constrained headquarters has to make a decision on how to allocate resources across different divisions. An improvement in the investment opportunities in one division will cause diversion of resources from other divisions to this division. Banks may face similar decisions and allocate resources to real estate loans at the expense of commercial loans in the face of real estate price appreciations.

Our effect is also related to the theory of bubbles, which represent one kind of an asset price boom. In Tirole (1985), bubbles 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* (similar to the positive effects of asset price appreciations discussed above). They provide results on which firms are more likely to benefit from a bubble and when. Note that the leverage effect in Farhi and Tirole (2012) can occur even without a bubble, but just when there is another asset that can act as a store of value. So, one can link this effect to our empirical results without taking a stand on whether the boom in real estate prices before 2006 was a bubble or not.

Our results have important implications for understanding the role of asset prices for the real economy and the potential for amplification or mitigation of 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. These conclusions are supported by the vast empirical evidence mentioned above, such as Chaney, Sraer, and Thesmar (2012). Our analysis is conducted for the same period as Chaney, Sraer, and Thesmar (2012), and demonstrates 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. Hence, 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). We do not take a stand on whether such diversion across sectors is inefficient. It is more likely to be inefficient if the real estate price appreciation represents a bubble, but this is hard to prove. We just show that price appreciation does not always lead to positive spillovers, as is often argued in the literature, and the opposite effect sometimes occurs.

Our paper may also carry important insights for policymakers. Much effort has been devoted in the recent crisis and its aftermath to support asset prices and real estate prices in particular. 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.[5] 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. We show that this is not always the case, and in some cases an artificial increase in asset prices might lead banks 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.

Finally, our paper is related to the quickly growing literature studying the impact of the U.S. real estate boom on the larger economy. One paper in this literature is Chaney, Sraer, and Thesmar (2012), which we discussed already. In a related paper, Cvijanović (2014) investigates the impact of the collateral channel on the firm's capital structure decisions and finds results consistent with

[5] 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.

the firm's real estate collateral alleviating credit frictions. 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.

II Data

Our empirical analysis rests on understanding how changes in housing prices in the states where banks operate affect firms that borrow from them. Our data panel therefore needs units of observation that are specific to each borrowing-firm and lending-bank pair. To create such a panel, we perform the following: 1) determine which firms are borrowing from which banks and when; 2) measure how housing prices vary across the lending banks; 3) document how housing prices are affecting the investment levels of the firm, the terms of the loans that are being originated between borrowing firms and lending banks, and the balance sheets of the bank-holding companies themselves. We also integrate some geographically-based instruments to more clearly identify the forces at work and address any endogeneity issues inherent in the relationship between housing prices and firm investment.

Performing these tasks requires a fair amount of matching and integrating across datasets. To provide a clear view onto how this data panel is constructed, we describe each of the issues in turn: first, how we construct the borrowing-firm and lending-bank pairs that are at the heart of the panel; second, how we construct our measure of housing prices, some preliminary evidence relating it to bank loan activity, and some assumptions implicit in the measure; finally, we discuss the instruments we incorporate and what endogeneity concerns we address with them.

II.A Relationships Between Firms and Banks

We use the DealScan database, which provides information on syndicated and sole-lender loan packages, to determine our firm-bank relationships. DealScan provides loan origination information, which gives us information on the borrower, the lender (or lenders in the case of a loan syndicate), and the terms of the loan package, including the size, interest rate, maturity, and type the loan or loans being originated. We consider the presence of any loan between the bank and borrowing firm to be evidence of a relationship. In the case of syndicated loans with multiple lenders, we consider the relationship bank to be the one which serves as lead agent on the loan.[6] The length of the relationship is defined as follows: it begins in the first year that we observe a loan being originated between the firm and bank and ends when the last loan observed between the firm and bank matures, according to the original loan terms. Firms and banks are considered in an active relationship both in years that new loans are originated and years in which no new loan originations occur with that bank. Panel A of Table I provides statistics on length and number of relationships. The median relationship last five years and contains two distinct loan packages. Although loan packages can have many individual loan facilities (we have a max of 11 in our sample), the majority of our packages contain one or two separate facilities only. For those observations without sufficient maturity data to determine the relationship length, we assume the median sample relationship length of five years.[7]

As DealScan focuses on providing detailed information about the terms of the loan packages, it provides only limited data on the borrowing firms and lending banks. Following Chava and Roberts (2008), we link the DealScan borrowers to Compustat for firm-specific information using their link table. For the lending banks, we create our own link table which matches DealScan lenders to their bank holding companies in the Call Report data. As the DealScan lending data is for individual bank or financial companies, there can be multiple DealScan lenders to each bank-holding company. We choose to match to the bank-holding company as it provides the most complete picture of the bank's finances—this choice assumes that the bank holding company influences its subsidiary banks' policies for lending, which we believe to be reasonable. We are able to match 753 DealScan lenders to 120 bank-holding companies in the Call Report data.[8] These matches are determined by hand using the FDIC's Summary of Deposits data, which gives the bank-holding company of individual banks for each year, and any other available data of historical bank-holding company structures. We present the statistics on the number of relationships between borrowers, DealScan lenders, and bank holding companies in Panel A of Table I. The median bank holding company in our sample

[6] In determining the lead agent on a loan, we follow a procedure very similar to Bharath, Dahiya, Saunders, and Srinivasan (2011). There are two variables in DealScan that are useful in determining the lead agent, a text variable that defines the lender role and a yes/no lead arranger credit variable. After carefully investigating the use of these variables in the data, we developed the following ranking hierarchy: 1) lender is denoted as "Admin Agent", 2) lender is denoted as "Lead bank", 3) lender is denoted as "Lead arranger", 4) lender is denoted as "Mandated lead arranger", 5) lender is denoted as "Mandated arranger", 6) lender is denoted as either "Arranger" or "Agent" and has a "yes" for the lead arranger credit, 7) lender is denoted as either "Arranger" or "Agent" and has a "no" for the lead arranger credit, 8) lender has a "yes" for the lead arranger credit but has a role other than those previously listed ("Participant" and "Secondary investor" are also excluded), 9) lender has a "no" for the lead arranger credit but has a role other than those previously listed ("Participant" and "Secondary investor" are also excluded), and 10) lender is denoted as a "Participant" or "Secondary investor". For a given loan package, the lender with the highest title (following our ten-part hierarchy) is considered the lead agent. About 90% of the matched loan packages in our sample has a bank that falls under the one of the first six categories. Any loans where a single lead agent cannot be determined are excluded from the sample, which accounts for about 20% of loan packages.

[7] 1,014 of 14,363 firm-bank pairs do not have sufficient data to determine the relationship length. We can also set the missing relationship lengths to the median loan maturity of three years (as opposed to general relationship length of five years), one year (assuming the relationship exists only in the year of origination), or exclude these firm-bank pairs entirely. Our main results are robust to these different assumptions.

[8] Of these 753 lenders, 654 lenders (and 106 bank holding companies) have borrowers that can be matched to Compustat and are included in our main sample.

has 15 DealScan lenders associated with it. The median borrower in our sample has relationships with two DealScan lenders. The median DealScan lender has 181 different Compustat-matched borrowers in our sample, whereas the median bank holding company has 466 borrowers. In our analysis, we sometimes consider the DealScan lender as the effective bank unit, whereas at other times consider the entire bank holding company as the effective bank unit. We try to make clear which level of aggregation we are considering for a given result.

There is a significant amount of consolidation in the US banking sector during our sample period. As such, we make sure to update the current holding company for lenders over time. The Summary of Deposits data is helpful for this task, as are historical press releases about different mergers between banks. We assume that the relationship between borrower and lender continues under the new bank holding company for the length of the loan, and any subsequent loans under that same DealScan lender. The main difference is that the bank characteristics that we use as controls change with mergers to reflect the new bank holding company.

II.B Bank, Firm, and Macroeconomic Data

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 lagged Net Property, Plant, and Equipment, and months to loan maturity are included in Panel A of Table I. In the case of a loan package having more than one facility, the interest rate and loan maturity are determined by averaging the individual facilities by their respective dollar amounts. Variable definitions and details on variable construction for these and other variables are included in Panel C of Table I.

As discussed above, we match specific lenders on DealScan, which are used to determine firm-bank relationships, to their parent bank holding companies in the Call Report data, which allows us to consider the bank balance sheets. For our analysis we use Call Report data from the fourth quarter of each year. Although the Call Report data is available at a finer level, we aggregate the bank data up to the bank-holding company (BHC) level using the RSSD9348 variable.[9] A bank's real estate exposure is measured by two key variables: MBS (RCFD8639) and loans secured by real estate (RCFD1410).[10,11] 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

[9] We believe this aggregation is best because we believe the entire bank holding company's balance sheet may influence loan activity and because the level of partition of bank companies in DealScan and Call Report are not the same, which makes going to the bank holding company level both safer and more feasible.

[10] 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).

[11] 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.

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 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 B of Table I. For the bank holding companies in our sample, the average MBS holdings as a percentage of total assets is 8.59. This compares to real estate loans, which accounts for 28.9% 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 16.4% and non-mortgage consumer loans account for 9.17% of bank assets, on average. We also include four additional bank variables: the bank's size, equity ratio, net income, and cost of deposits, which are defined in Panel C of Table I. We use these four variables to control for broad differences in bank holding companies and whether they are likely to be capital constrained.

From Compustat, we include several firm-specific variables for our analysis. These variables include investment, book leverage, market-to-book ratio, cash flow, asset tangibility, and Altman's Z-score, and firm size.[12] As we are focusing on how financial intermediaries affect borrowing firms' investment decisions, we exclude any borrowing firms that are financial companies. 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 B of Table I includes the summary statistics for these variables.

We also include our main macroeconomic variables, which are the annual change in the state unemployment rate where the firm is located, and the annual change in the state unemployment rate where the bank is located.[13] The prevailing state-level 30-year fixed mortgage interest rates are also included for use in the instrumental variables specifications.[14] We use these variables to control for macroeconomic changes that would affect the supply and demand of commercial and industrial loans.

[12]See Panel C of Table I for variable definitions. All firm and bank variables that are ratios 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.

[13]For the bank-specific unemployment rate, the amount of deposits from the prior year's summary of deposits data is used to created an average change in unemployment rate where the bank operates.

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

II.C Housing Exposure of Banks

An important variable of interest is the weighted index of housing prices per bank holding corporation. We use the Federal Housing Finance Agency (FHFA) House Price Index (HPI) data as the basis for this variable.[15] To determine the exposure of each bank-holding company to different state-level housing prices, we use the summary of deposits data from the prior year, aggregated to the bank-holding company level.[16] For example, a bank that in 2003 had 75% of its deposits in California and 25% of its deposits in Arizona would have a 2004 price index which is a combination of 75% of California's state-level price and 25% of Arizona's state-level price. Using the percent of deposits in each state as weights, we create a measure of house prices which is specific to each bank and each year. 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 are available on a finer level, large portions of the country are not included in 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 our Robustness Section, we consider housing price indices and bank deposits at the MSA/CBSA level and obtain similar results.

One issue that arises in this framework is comparability across state price indices. Because all the state-level FHFA indices are set to 100 in 1980, the index value of 100 corresponds to different dollar amounts in each state.[17] If unadjusted, the price level of banks located in high-price states will be understated compared to banks located in lower-price states. As the geography of deposit bases for each bank holding company are varying annually, this mismeasurement will not be fixed by a BHC-level fixed effect. To address this issue, we adjust each state's HPI so that each state's index level corresponds to the same dollar amount. Specifically, we use the estimated median house price in the fourth quarter of 2000 divided by the state HPI in that quarter to find the state's index value in dollars.[18] We then scale each state's index so that an index value of 100 corresponds to $50,000 in every state.[19]

The average annual return on housing in our sample is about 6.4%. Figure 1 presents 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

[15]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.

[16]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.

[17]This problem is even more apparent in the MSA/CBSA data, where the indices are set to 100 in 1995. If unadjusted, all banks, regardless of geographical deposit variation, would have a value of 100 in that year.

[18]Estimated median house price data is available for select years on the FHFA website.

[19]We perform the same correction for the MSA/CBSA level housing price indices, although we use the available median house price estimates from the fourth quarter of 2008 to set the indices such that 100 again corresponds to $50,000.

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 11.4% of the bank-holding-company–year observations in the sample experience declines in their house price index.

In Figure 2, we plot the relation between banks' real estate related lending (both MBS and unsecuritized), commercial and industrial lending, 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 106 bank-holding companies we match to Compustat borrowers. The standard deviation of the housing price index for within-bank variation is about 107 points ($53,500 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 13.9 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 2.1 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.

II.D Assumptions of Housing Variable

In constructing this housing price exposure variable for banks, 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 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.[20] 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.[21]

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 28.9% of assets in real estate loans, compared to 8.59% for mortgage-backed securities. Even focusing on the second half of our sample, when MBS gained in popularity, on average 12.5% of assets are MBS compared to 33% 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.

II.E 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 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

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

[21] 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.

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.[22] Both of these approaches are considered in Section IV.C. 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.[23]

This measure of supply elasticity, developed by Saiz (2010), is the area that is unavailable for residential or commercial real estate development in metropolitan statistical areas (MSAs).[24] 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 B of Table I, the average percentage of unavailable land is 24.5%, with a standard deviation of about 8.4%. 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.[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 65.6 points, which is about 40% of the sample standard deviation. In real terms, this change is about $32,800 in year 2000 dollars. This coefficient is statistically significant at the 1% level.

[22]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.

[23]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.

[24]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.

[25]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 land unavailability measure for specific banks clearly is relevant for housing prices in the same areas.

Columns 2 and 3 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 3, is significantly negative at the 10% 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 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.

III Empirical Results

III.A Firm Investment

As discussed in Section I, rising asset-prices 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,

[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.

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:

$$\begin{aligned}\text{Investment}_{ijt} = \alpha_{ij} + \gamma_t + \beta_1\text{Housing Prices}_{jt-1} + \beta_2\text{Firm Variables}_{it-1} \\ + \beta_3\text{Bank Variables}_{jt-1} + \beta_4\text{Macro Variables}_{ijt-1} + \varepsilon_{ijt}.\end{aligned} \quad (1)$$

The unit of observation is at the firm-bank-year level.[27] In the construction of our panel, we include both years in which a loan has been originated and years in which no new loans have been originated with that specific lending bank (see Section II.A for more details). We believe this panel structure allows us to capture both firm investment rates that are affected by specific bank loans (an intensive margin) but also allow the possibility that investment rates are affected by firms not originating additional loans with these banks for the purpose of investment (an extensive margin). These requirements, along with observations having non-missing data, gives 38,608 observations across 4,806 distinct firms and 436 different DealScan lenders.

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, contemporaneous cash flow, lagged firm size, and lagged investment as firm-level control variables.[28] We include additional controls to capture differences in banks over time—these variables include the bank's size, equity ratio, net income, and cost of deposits. 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}.

Over the course of our sample period, the upward trend in house prices may pick up other, unrelated macroeconomic changes. Another concern is that the majority of the 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 include year fixed effects (γ_t) 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.

For any more localized economic effects, the change the state unemployment rate in both 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. In later

[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.

specifications we include firm-state by year fixed effects to further address this concern.[29]

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.

Column 1 of Table IV includes the bank's housing price index with these various controls. It appears for the entire sample of firms and banks that housing prices have a negligible effect on firm investment. The most important determinants of firm investment is the firm's market-to-book ratio, contemporaneous cash flow, and size. An increase in unemployment in the firm's headquarter state also has a negative relation to firm investment. It does not appear that the characteristics of the lending bank matter significantly, at least when the time-invariant characteristics of the firm-bank relationship and any macroeconomic effects are removed using fixed effects.

As discussed in Section II.E, 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, the 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.[30] As discussed in Section II.E, 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 but becomes significantly negative. Column 2 shows a one standard deviation increase in housing prices (about \$74,800 in year 2000 dollars) is associated with a 4.3 percentage point decrease in investment. This effect is statistically significant at the 5% level and corresponds to 9.4% of a standard deviation in investment. This finding also gives credence to our assertion that the non-instrumented results are likely understating the true effect of housing prices on investment.

The evidence in Column 2 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

[29]We have included GDP growth rates in the firm's and bank's states, but it does not have any significant effect in the presence of year fixed effects, so we omit them.

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

that are not significantly constrained. Table II 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 three largest bank holding companies—Citigroup, Bank of America, and JPMorgan Chase—each have over $695 billion in deposits and have branches in as many as 30 states by this time. These three banks account for about 40% of the firm-bank-year observations in our panel. For these largest, most national banks, it is less likely that they face the kind of capital constraints that 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.[31]

For the smaller, more regional banks, we indeed find a stronger effect. A one standard deviation increase in house prices corresponds to a 3.19 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 2.97 percentage points. Combining the housing price estimate and the interaction term, the net effect of house prices on firm investment is not significant for the largest banks ($-3.19 + 2.97 = -0.22$). Because these estimates are non instrumenting for the endogeneity of housing prices on investment, it may understate the true effect. The instrumented version in Column 4 yields stronger results: for a one standard deviation increase in housing prices, firms that borrow from smaller banks decrease investment by 11.52 percentage points while firms that borrow from the largest banks decrease investment by 3.29 percentage points ($-11.52 + 8.23 = -3.29$), although this total effect is not statistically significant from zero.[32] Taken together, the effect is strongest outside of the largest banks, equating to 25% of a standard deviation using the results from Column 4. Firms which borrow from the large national banks are not strongly effected by changes in housing prices, and may still have a small negative effect on investment.

Although we believe that the three 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 fourth and fifth largest bank holding companies from Table II, Wachovia and Wells Fargo, and find results at similar levels of statistical and economic significance. In Section III.E, we consider other approaches to splitting bank holding companies by the likelihood of being capital-constrained, and find similar differences. In Section IV.C, 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, we find they consistently have a different effect on firm investment than those banks which are smaller and more regional.

Columns 5 and 6 go one step further and introduces firm-state by year fixed effects, which should control for any local macroeconomic conditions in the firm's headquartered state. Without

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

[32] 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.

instrumentation, firms borrowing from the smaller banks are associated with a 3.5 percentage point decrease, which is significant at the 5% level. 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 9.76 percentage point decrease in investment, which equates to about 21% of the sample standard deviation for investment and about as large as the specification in Column 4 that does not include state-year fixed-effects. In the instrumented specification (Column 6), the effect of housing prices on investment is negative for even the three largest banks at 4.0 percentage points ($-9.76 + 5.76 = -4.0$). This effect is statistically significantly at the 1% level.

In sum, the bank lending channel is not only working in a significantly negative direction for all but the largest banks in this housing boom, 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 21% 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:

$$\text{All In Drawn Spread}_{ijt} = \alpha_i + \gamma_t + \delta_1 \text{Housing Prices}_{jt-1} + \delta_2 \text{Firm Variables}_{it-1} \\ + \delta_3 \text{Bank Variables}_{jt-1} + \delta_4 \text{Macro Variables}_{ijt-1} + \delta_5 \text{Loan Characteristics}_{ijt} + \varepsilon_{ijt}. \quad (2)$$

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 relationship 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. Bank size, equity ratio, net income, and cost of deposits are included as bank control variables. Changes in the firm's state and bank's state(s) unemployment 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 with year fixed effects (γ_t). A one standard deviation increase in housing prices is associated with a 5.8 basis point increase in interest spreads for the borrowing firm. This amount is statistically significant at the 5% level. Column 2 of Table V re-performs the analysis but includes the *Large National Banks* indicator variable for loans originated with the three 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 5.6 basis point increase in loan spreads. Combined with the negative 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 includes firm-state by year fixed effects to further control for any national or local economic shocks that may affect loan pricing. In this specification, the effect is similar in magnitude at about 4.6 basis points, and is significant at the 10% level. Column 4 runs the same specification as Column 2 with the addition of the state-year fixed effects. The result is similar to Column 3 in economic magnitude and statistical significance and again there is not clear effect of loan price differences for the large national banks. Column 5 allows the three large national banks to have a differential effect for housing prices on loan spreads. This differential effect is not statistically significant, and although it does not meaningfully reduce the economic magnitude of the *Housing Price Index, Bank's State(s)* estimate, it is no longer able to estimated with statistical significance. Similar results, although less statistically precise, are obtained if the specifications in Table V are run using the instrumental variables, so they are not included here.

An important difference between this panel and the panel constructed in Section III.A is what criteria are used for observations to be included. Because we are only considering the prices for originated loans, firm-bank observations only appear in the year a specific loan package is originated. This distinction motivates us to use firm-level, rather than firm-bank level fixed effects for an important reason. In our sample, a significant portion of firms (793 firms, or 30% of firms included in Table V) only originate one loan package with a specific DealScan bank. To include firm-bank level fixed effects would exclude these firms and this exclusion is far from random. These firms that have only one loan package with a specific bank are on average 47% smaller ($2.336 billion average book assets versus $4.406 billion average book assets) and are less likely to have an investment-grade bond rating (15.6% with investment-grade ratings versus 29.3%) than those firms that originate multiple loan packages with the same bank. The holding companies of these banks are also smaller, with an average deposit base of $183 billion versus $215 billion, or about 15% smaller. The firm-bank observations that would be excluded by using firm-bank fixed effects are precisely those instances where we expect our effect to be strongest—indeed we are not able to find economically or statistically significant results for the remaining firms that have multiple packages with the same lender. Our panel in Section III.A did not face this problem, as even these single-package firm-bank observations would often have outstanding lending relationships of more than one year.[33]

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 boom 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.

[33] Even the use of firm-level fixed effects is not completely innocuous. It excludes any firms that do not have more than one observed loan package across all banks, which are even smaller (average asset size of $1.807 billion) and less likely to have an investment grade rating (6% of these firms). This restriction excludes 1939 firms and 54 DealScan banks from the sample. Consistent with these observations being where our effects should be stronger, we find a marginal effect for house prices on loan spreads of 9.66 basis points (with only year fixed effects) or 9.43 basis points (with only state-year fixed effects), if firm-level fixed effects are omitted and these 1939 firms are included. Both estimates are significant at the 1% level.

Extensive Margin

For the extensive margin, we construct the variable *Log(Outstanding Loans)*, which is the log-transform of the number of loan packages in a given year that are outstanding with each bank. 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 measures, 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:

$$\begin{aligned}\text{Log(Outstanding Loans)}_{jt} = \alpha_j + \gamma_t + \zeta_1 \text{Housing Prices}_{jt-1} + \zeta_2 \text{Bank Variables}_{jt-1} \\ + \zeta_3 \text{Macro Variables}_{jt-1} + \varepsilon_{jt},\end{aligned} \tag{3}$$

where the housing price, bank, and macroeconomic variables are the same as in the previous regressions. Year-level (γ_t) and bank-level fixed effects (α_j) are included to control for macroeconomic shocks and persistent differences in lenders, respectively. Because there are no firm-specific observations in this specification, we do not use firm-state by year fixed effects.

Column 1 of Table VI presents a non-instrumented specification for the *Log(Outstanding Loans)*. A one standard deviation increase in housing prices is associated with a 20.1% decrease in the number of outstanding loan packages at each bank. When the housing price variable is instrumented (Column 2), the effect changes to a 42.6% decrease in the number of outstanding loan packages. With a sample standard deviation for *Log(Outstanding Loans)* of 1.684, these marginal effects correspond to 12% and 25% of a sample standard deviation and are significant at the 10% and 5% levels, respectively. It appears there is an economically significant effect of housing prices on the extensive margin of commercial lending, as measured by the number of outstanding loan packages from the banks in our panel.

Because this panel is constructed at the DealScan lender level rather than bank holding company level, multiple lenders are associated with the same bank holding company. This structure allows us to use the interaction term, *National Banks × HPI, Bank's State(s)*, to see if there is a differential effect for lenders associated with the three largest BHCs—Bank of America, JPMorgan Chase, and Citigroup. These three bank holding companies account for 65 of the 567 DealScan lenders in this panel. Columns 3 and 4 include this additional variable and we find that similar to the results in III.A, these large bank holding companies do not cut back on commercial lending in response to housing prices as strongly as the other banks. In the non-instrumented specification (Column 3), the more regional banks decrease lending by 26.7%, whereas the large national banks decrease lending by a statistically insignificant 4.5% ($-0.267 + 0.222 = -0.045$). Addressing the endogeneity of housing prices in Column 4, the large national banks decrease the number of firms with loans outstanding by 24.2% ($-0.552 + 0.31 = -0.242$) for a one standard deviation increase in housing prices, compared to a decrease of 55.2% for the other banks. While the estimate for the regional banks is statistically and economically significant at 33% of a sample standard deviation for *Log(Outstanding Loans)*, the effect for the three national banks is not statistically different than zero at conventional levels.

The results in Table VI suggest that the extensive margin of commercial lending is highly sensitive to housing prices, especially for the regional banks which are more likely to face constraints on capital. Because *Log(Outstanding Loans)* measures the number of outstanding loan packages, decreases represent both firms which do not take out additional loans with their lender and firms which do not begin new relationships with commercial lenders. These results provide support that the decrease in firm investment results are likely coming from banks reducing the amount of capital available to these firms.

Intensive Margin

To investigate the rationing channel further, 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:

$$\begin{aligned}\text{Loan Amount}_{ijt} = \alpha_i + \gamma_t + \theta_1 \text{Housing Prices}_{jt-1} + \theta_2 \text{Firm Variables}_{it-1} \\ + \theta_3 \text{Bank Variables}_{jt-1} + \theta_4 \text{Macro Variables}_{ijt-1} + \varepsilon_{jt}. \qquad (4)\end{aligned}$$

Although this specification only captures the size of loans made to firms in our sample, it allows us to control for possible confounding effects at the borrower level. The results are presented in Table VII. Our dependent variable, *Loan Amount*, is scaled by lagged net PPE and multiplied by 100 to aid in comparison with our investment results in Section III.A. To control for other macroeconomic effects that may confound our estimates, Columns 1 and 2 use year fixed effects (γ_t) and Columns 3 and 4 use firm-state by year fixed effects. For the same sample selection reasons as discussed in Section III.B, we choose to use firm level fixed effects (α_i) rather than firm-bank level fixed effects in these specifications.

In Column 1, which does not control for the endogeneity of housing prices, there is no statistically significant effect of housing prices on loan amounts. Column 2 runs the same specification with the instrumental variables, and instead finds a significant negative effect of 39.7 percentage points, which is about 5% of the sample standard deviation. Because the bias in the housing price variable matters significantly for loan amounts, we use the instrumental variables approach for the remaining specifications.

For Column 3, which uses firm-state by year fixed effects, the effect is stronger at negative -57.24 percentage points. This effect corresponds to about 7.6% of a sample standard deviation for

Loan Amount and is significant at the 1% level. This effect compares to an effect of -9.6 percentage points for firm investment (Table IV, Column 6), as both dependent variables are scaled by lagged net PPE. The magnitude of the lending and investment effects are therefore comparable but larger for lending. This difference in magnitudes is expected if firms are able to substitute different sources of capital for investment or if investment reductions are spread out over several years rather than concentrated entirely in the year the loan is taken.

Column 4 includes an indicator to see if the three largest bank-holding companies have larger average loan sizes, but it is not significant. Likewise, Column 5 allows the banks that are owned by the three large national bank-holding companies to have a differential effect for housing prices. The coefficient for the remaining banks is similar to Columns 3 and 4 and statistically significant at the 5% level. The differential coefficient for the large national banks, while positive, is not statistically different from zero. These results suggest that the main difference between the reaction of the large national banks and the more regional banks to housing prices is in the number of outstanding loans, rather than the size or price of the individual loan packages.

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:

$$\text{Bank Asset}_{jt} = \alpha_j + \gamma_t + \lambda_1 \text{Housing Prices}_{jt-1} + \lambda_2 \text{Bank Variables}_{jt-1} + \lambda_3 \text{Macro Variables}_{jt-1} + \varepsilon_{ijt}. \tag{5}$$

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 of 8242 bank holding companies based on Call Report, Summary of Deposits, and housing price data. Across these specifications, we include BHC fixed effects (α_j), year fixed effects (γ_t), and the change in unemployment rate in the bank's states as a macroeconomic control. The bank holding company's size, equity ratio, net income, and cost of deposits are used as additional controls, 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.[34] Given the evidence in the previous sections that there may differences in lending for the less-constrained bank holding companies, we present two panels: Panel A uses the entire sample of bank holding companies, whereas Panel B excludes the largest quintile of BHCs by deposits for each year. Panel B is thus designed to focus

[34]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 (128.2), real estate loans (15.57), MBS (7.54), C&I loans (6.94), and consumer loans (5.67).

on the banks that are more likely to be capital constrained.

Columns 1 and 2 of Table VIII presents the marginal effect of housing prices on the amount of real estate loans as a percentage of total bank assets and MBS as a percentage of total bank assets, respectively. We find that for all-BHC sample in Panel A, the majority of the effect is concentrated in the securitized real estate lending. For a one standard deviation increase in housing prices in a bank's states, the amount of non-securitized real estate loans does not increase by a significant amount. The effect for MBS is 30 basis points, or about 4% of a sample standard deviation and significant at the 10% level. In Panel B, the opposite is true: an increase in housing prices increases non-securitized real estate loan by 1.06 percentage points, but does not significantly impact MBS holdings. Comparing the two panels, banks appear to be shifting their real estate related loan assets in response to housing prices. The largest BHCs are acquiring more securitized loans whereas the smaller BHCs are acquiring more traditional real estate loans. Together these estimates confirm a positive relation between housing prices and real estate lending, as suggested in Figure 2. The magnitude of the effect in Figure 2 compared to Table VIII suggests much of the economic magnitude of the effect is concentrated in the change in housing prices over time, and not from differences in prices in the cross-section of banks in each period.

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.[35] 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, Panel A 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

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

deviation increase in housing prices is associated with a 58 basis point decrease in the amount of consumer loans that the bank holds as a percentage of total assets. For Panel B, which focuses on the smaller BHCs, the effect is very similar in magnitude and significance, at -65 basis points. Although there is some heterogeneity among banks in how real estate assets change, there is a clear reduction in C&I loans.

Due to the endogeneity concerns discussed in Section II.E, 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 4 instruments housing prices with the land unavailability measure, the average state-level 30-year mortgage rate where the bank operates, and their interaction.[36] We find in Panel A that the marginal effect of housing prices on commercial lending is a decrease of 2.35 percentage points, as a percentage of the bank's total assets. This change equates to 34% of the sample standard deviation for commercial and industrial loans. This estimate is statistically significant at the 1% level. Panel B has a similar effect of negative 2.8 percentage points, again significant at the 1% level.

Finally, in Columns 5 and 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 in Column 6. In Column 5, we find weakly positive (Panel A) or insignificant (Panel B) estimates for the effect of housing prices on consumer loan holdings. With instrumentation, a one standard deviation increase in housing prices decreases non-mortgage consumer loan activity by 1.62 percentage points (Panel A), which is about 29% of the sample standard deviation for consumer loans. Panel B finds an even stronger effect of -2.8 percentage points. 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.

III.E Constraints at the Firm and Bank Level

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 IX, we consider subsamples of data depending on the firm's likelihood of being capital constrained. We use two different variables to capture differences in constraints: firm size and

[36] 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.

investment-grade public debt credit ratings. For the sake of focusing on investment of borrowing firms by ability to access capital, we focus on the instrumental variables specification with firm-state by year fixed effects. The coefficients from Columns 1 and 2 of Table IX come from running our main investment specification (with housing prices instrumented) on each subsample. The constrained subsample (no investment-grade rating) in Column 1 has a large negative coefficient associated with housing prices in the bank's states (-7.6 percentage points), where the unconstrained subsample (investment-grade rating present) in Column 2 (0.30 percentage points) is not significant. The difference is statistically significant at the 5% level, and suggests that firms which have access to the investment-grade public debt markets are on average not negatively impacted by rising housing prices where their bank is located.

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 IX, the marginal effect of an increase in housing prices on investment is again concentrated in the constrained firms. For constrained firms, the marginal effect is a 17.4 percentage point decrease in investment, compared to an insignificant 0.88 percentage point increase 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.

Another assumption of our channel is that capital constraints need to apply in some form to banks. The national/regional bank split in Section III.A goes in this direction, but further investigation is warranted. In Table X, we consider two additional measures to try and capture differences in the capital available to banks: bank size and bank leverage. The assumptions are that larger bank holding companies should have more ready access to capital than smaller bank holding companies, and bank holding companies with more equity capital (less leverage) should be able to engage in more commercial lending than highly levered bank holding companies, since capital requirements will be less of a binding constraint.

Table X splits the sample into constrained and unconstrained groups, and again uses the instrumented specification with the full set of controls, firm-bank, and firm-state–year fixed effects as described in Section III.A. Treating BHCs in the largest quintile by deposits as unconstrained and the remaining BHCs as constrained, we see significant differences in the effect on firm investment. Firms borrowing from the constrained banks have a marginal effect of -18.8 percentage points for housing prices on investment, compared to -4.5 percentage points for the unconstrained banks. Both estimates are statistically significant as is the difference between them.

Using bank leverage as a different measure of constraints, we again find significant differences between bank holding companies. We consider BHCs in the lowest two quintiles of equity ratios (highest leverage) constrained and the remaining BHCs as unconstrained. Firms that borrow from constrained banks have a marginal effect of housing prices on investment of -33.5 percentage points, compared to a still significant -5.2 percentage points for unconstrained banks. The difference between the coefficients for the two samples is significant at the 5% level. Besides separating the three largest national BHCs, we find evidence that the negative investment effect for firms is concentrated in smaller and more levered bank holding companies in general.

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 of alternative housing variables. Second, we consider the role of the *Collateral Channel* as documented in Chaney, Sraer, and Thesmar (2012). Third, 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 XI, 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

[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.

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 XII, we reproduce our main investment results, although this time using housing prices that are matched at the MSA 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 XIII, 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 38,608 observations of 4,806 firms to only 13,815 observations of 1,421 firms. Because of the age requirement to construct this market value of buildings variable (firm is present in 1993), this sample will be on average larger and less constrained than our full sample, so we do not expect as strong results. Indeed, for the first three specifications, we are able to find our result at a smaller magnitude, but not with sufficient statistical precision. In the final specification, which uses firm-state by year fixed effects and our instrumental variables, we are able to recover the effect. A one standard deviation increase in housing prices in the bank's region is related to a 4.28 percentage point decrease in investment. This result is significant at the 5% level.

In our sample, we find a one standard deviation increase in the market value of a firm's buildings is associated with between a 5.11 and 5.33 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

[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.

Chaney, Sraer, and Thesmar (2012).

Both the negative bank lending channel and positive collateral channel are at work during the housing boom. 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 boom 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 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 quintile of banks based on their total deposits. Columns 1 and 2 Table XIV show non-instrumented and instrumented versions of this specification, respectively.[41] 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 XIV. 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.[42] 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 not statistically significant in either specification.

[41]Here the specifications are analogous to those in Table IV with the use of firm-bank and firm-state by year fixed effects.

[42]Because the index varies at the firm-state level, we use year rather than state-year fixed effects for these specifications.

This result suggests that house price effect is indeed operating through the lending bank and not where the firm's local real estate conditions.

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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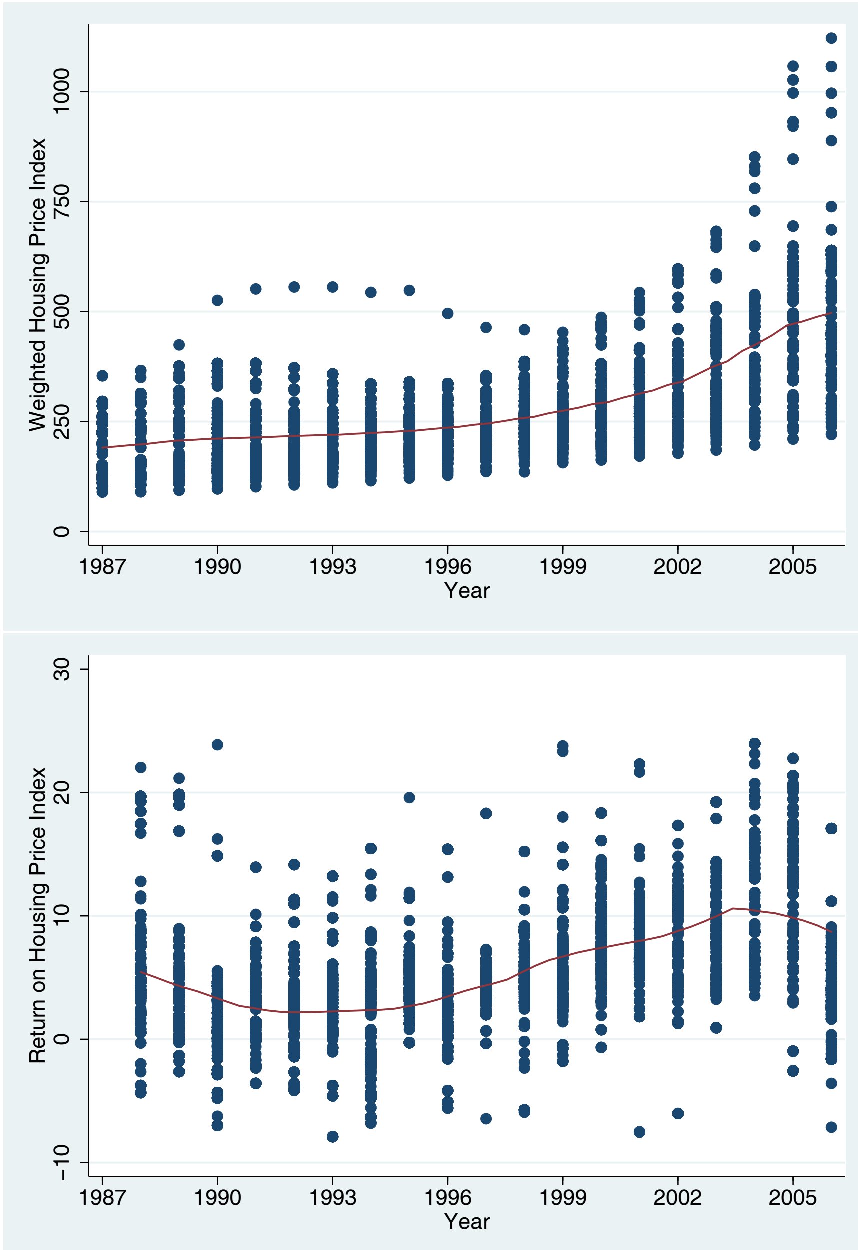

Figure 1: Housing Prices in Banks' Deposit Areas. This figure plots the weighted housing prices (top) and return on housing (bottom) in the location where the bank has depository branches.

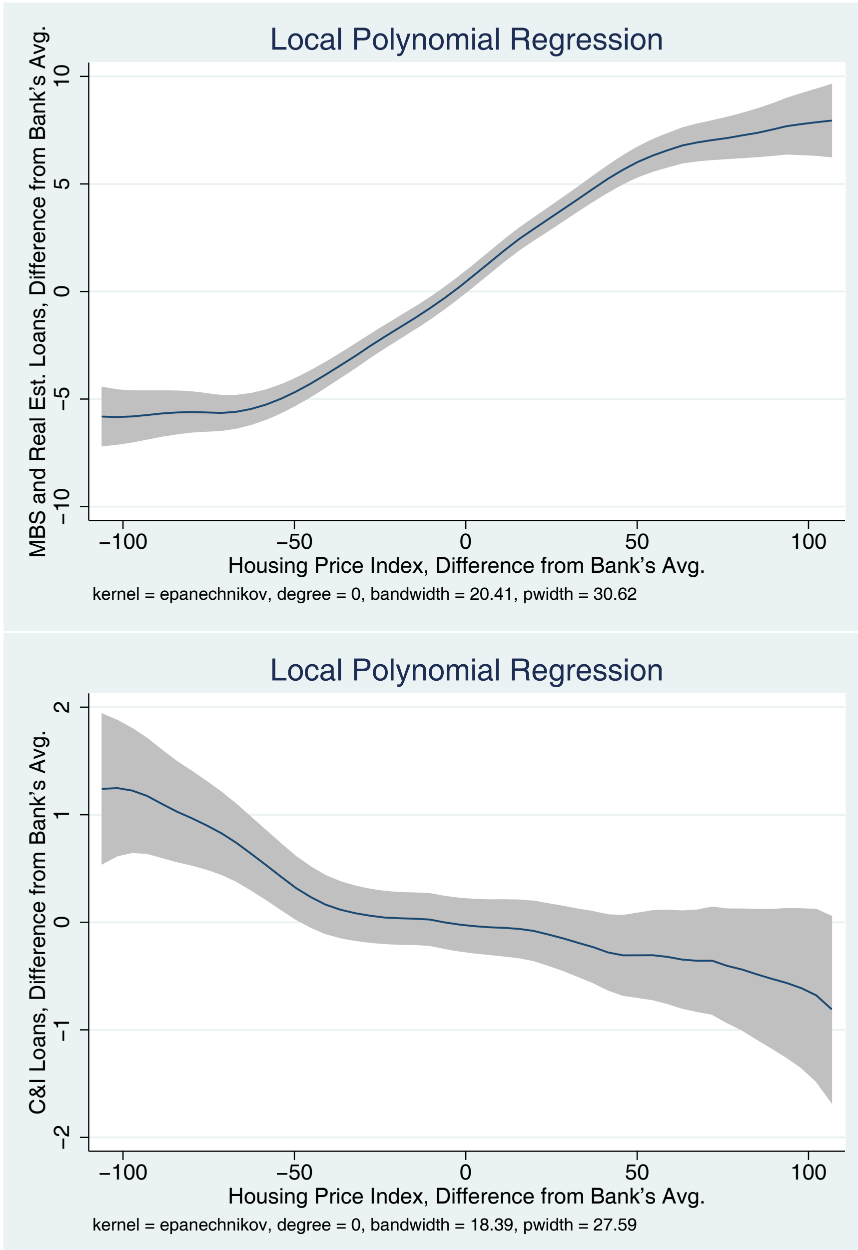

Figure 2: Relation between the housing price index and either MBS and real estate loans or commercial and industrial loans, demeaning each variable at the bank level. The top figure plots the fraction of the bank's total assets that are mortgage-backed securities and real estate loans against the prior 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

This table presents summary statistics of the merged sample of bank holding companies and borrowing firms as obtained from Call Report, Dealscan, and Compustat databases. The sample consists of all firm-year observations from nonfinancial firms. Ratios are scaled by 100.

Panel A: Relationship and Loan Statistics						
	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Number of Relationships						
DealScan Lenders per Borrower	2.87	1.82	1	2	4	14,363
Bank Holding Companies per Borrower	2.45	1.53	1	2	3	12,881
Borrowers per DealScan Lender	316.7	375.8	62	181	457	14,363
Borrowers per Bank Holding Company	750.8	684.4	222	466	1800	12,881
DealScan Lenders per Bank Holding Company	21.9	18.3	7	15	33	654
Length/Frequency of Relationships						
Length of Relationship	5.17	3.66	3	5	7	14,363
Number of Loan Packages	2.33	1.87	1	2	3	19,085
Loan Facilities per Loan Package	1.40	0.75	1	1	2	19,085
Loan Characteristics						
All In Drawn Spread (bps)	181.9	131.5	75	162.5	262.5	21,510
Loan Amount	280.8	757.5	26.0	78.9	211.9	19,826
Maturity (months)	41.7	27.1	18	36	60	21,510

Table I—*Continued*

Panel B: Bank, Firm, and Other Variable Statistics						
	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Bank Variables						
MBS	8.59	7.78	2.38	6.86	12.3	1,498
Real Estate Loans	28.9	13.6	20.0	28.9	38.4	1,498
Consumer Loans	9.17	5.90	4.33	8.97	13.1	1,498
C&I Loans	16.4	7.56	11.3	15.7	20.2	1,498
Bank's Size	16.3	1.62	15.2	16.2	17.5	1,498
Bank's Equity Ratio	8.19	2.10	6.92	7.88	8.99	1,498
Bank's Net Income	1.08	0.49	0.90	1.12	1.33	1,498
Bank's Cost of Deposits	3.29	1.49	2.35	3.13	4.10	1,498
Firm Variables						
Investment	29.8	45.2	10.5	18.5	32.8	61,015
Book Leverage	34.6	27.2	17.2	31.3	45.8	62,775
Market to Book	1.68	1.46	1.05	1.33	1.83	53,403
Cash Flow	38.6	99.4	9.84	24.9	54.9	61,521
Tangibility	35.5	24.5	15.0	30.0	53.8	62,770
Altman's Z-Score	1.28	3.18	0.70	1.50	2.35	59,173
Firm Size	6.51	2.03	5.11	6.45	7.85	62,942
Market Value of Buildings	1.27	2.24	0.29	0.68	1.30	19,451
Housing Variables						
Housing Price Index, Bank's State(s)	371.4	149.6	266.3	350.4	449.2	66,428
Return on Housing, Bank's State(s)	6.36	11.1	1.27	5.28	11.1	65,462
Land Unavailability, Bank's State(s)	24.5	8.43	19.8	23.0	28.9	66,410
Macroeconomic Variables						
Change in Unemp. Rate, Firm's State	-0.049	0.91	-0.60	-0.20	0.40	6,367
Change in Unemp. Rate, Bank's State(s)	-0.050	0.84	-0.61	-0.18	0.29	6,597
30-Year Mortgage Rate, Bank's State(s)	8.16	1.41	7.10	8.06	9.29	6,502

Table I—*Continued*

Panel C: Variable Definitions		
	Definition	Data sources
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	Total amount available in a loan package divided by the borrowing firm's lagged net PPE	DealScan and Compustat
Maturity (months)	Loan package maturity (in months) at origination. Dollar-weighted average for packages with multiple facilities.	DealScan
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
Bank's Size	Log of total assets (RCFD2170)	Call Report
Bank's Equity Ratio	Total equity capital (RCFD3210) divided by total assets (RCFD2170)	Call Report
Bank's Net Income	Net income (RIAD4340) divided by total assets (RCFD2170)	Call Report
Bank's Cost of Deposits	Interest on deposits (RIAD4170) divided by total deposits (RCFD2200)	Call Report
Firm Variables		
Investment	Capital expenditures 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		
Change in Unemp. Rate, Firm's State	Annual change in unemployment rate firm's headquarters state	Compustat and FRED
Change in Unemp. Rate, Bank's State(s)	Annual change in unemployment rate 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 the year 2006.

Bank Holding Company	Total Deposits	Number of States
CITIGROUP INC.	841.36	14
BANK OF AMERICA CORPORATION	772.27	30
JPMORGAN CHASE & CO.	695.15	26
WACHOVIA CORPORATION	356.10	16
WELLS FARGO & COMPANY	327.19	23
U.S. BANCORP	135.94	26
SUNTRUST BANKS, INC.	126.57	12
HSBC HOLDINGS PLC	110.58	10
ROYAL BANK OF SCOTLAND GROUP PLC, THE	101.94	13
NATIONAL CITY CORPORATION	86.95	7
BB&T CORPORATION	83.59	12
STATE STREET CORPORATION	78.25	1
FIFTH THIRD BANCORP	72.08	10
ABN AMRO HOLDING N.V.	69.23	3
PNC FINANCIAL SERVICES GROUP, INC., THE	68.21	10
BANK OF NEW YORK COMPANY, INC., THE	67.54	8
KEYCORP	61.70	13
BNP PARIBAS SA	46.35	17
COMERICA INCORPORATED	45.88	6
NORTHERN TRUST CORPORATION	43.76	15
ALLIED IRISH BANKS, P.L.C.	40.34	7
MARSHALL & ILSLEY CORPORATION	34.43	7
BANK OF MONTREAL	30.46	5
MELLON FINANCIAL CORPORATION	28.86	7
HUNTINGTON BANCSHARES INCORPORATED	25.55	6
COMPASS BANCSHARES, INC.	23.30	6
DEUTSCHE BANK AKTIENGESELLSCHAFT	18.56	2
COLONIAL BANCGROUP, INC., THE	16.25	5
BOK FINANCIAL CORPORATION	12.46	6
COMMERCE BANCSHARES, INC.	11.75	4

Table III: First-Stage Regression

Columns (1) through (3) are the first-stage Panel Fixed Effect Regressions, with fixed effects at the bank (*lcoid*) level. *Change in Unemp. Rate, Bank's State(s)* is included as an additional control. All independent variables scaled by their respective standard deviations. Standard errors are clustered by bank (*lcoid*) and year.

	Housing Price Index, Bank's State(s)		
	(1)	(2)	(3)
Land Unavailability, Bank's State(s)	65.64***	65.49***	93.31***
	(7.172)	(7.166)	(20.54)
30-Year Mortgage Rate, Bank's State(s)		40.58*	65.39***
		(21.26)	(22.65)
Land Unavailability × Mortgage Rate			-35.68*
			(21.36)
Bank Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	4585	4585	4585
Banks	584	584	584
Adjusted R^2	0.934	0.935	0.936

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

Table IV: Investment Regression

Columns (1) through (6) are Panel Fixed Effect Regressions. 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, bank, and year.

	Investment					
	(OLS) (1)	(IV) (2)	(OLS) (3)	(IV) (4)	(OLS) (5)	(IV) (6)
Lagged Market to Book	9.068***	9.098***	9.067***	9.218***	8.970***	8.821***
	(0.700)	(0.608)	(0.694)	(0.649)	(0.757)	(0.665)
Cash Flow	8.561***	8.895***	8.559***	8.987***	8.496***	9.194***
	(1.167)	(1.117)	(1.170)	(1.106)	(1.173)	(1.114)
Lagged Firm Size	-19.52***	-18.54***	-19.48***	-18.45***	-19.35***	-18.24***
	(2.672)	(2.592)	(2.665)	(2.567)	(2.778)	(2.522)
Lagged Investment	0.236	0.309	0.214	0.00904	0.149	-0.110
	(0.866)	(0.810)	(0.866)	(0.831)	(0.879)	(0.814)
Bank's Size	-1.321	-2.059	-1.979	-3.953**	-2.266	-3.537**
	(1.405)	(1.350)	(1.394)	(1.601)	(1.465)	(1.554)
Bank's Equity Ratio	0.00211	0.0564	0.108	0.523	0.152	0.397
	(0.429)	(0.399)	(0.386)	(0.385)	(0.405)	(0.382)
Bank's Net Income	0.0893	-0.0266	0.0177	-0.314	0.0293	-0.313
	(0.280)	(0.292)	(0.274)	(0.295)	(0.265)	(0.231)
Bank's Cost of Deposits	0.00603	-0.156	0.0825	-0.0239	0.184	0.385
	(0.871)	(0.893)	(0.778)	(0.769)	(0.611)	(0.607)
Change in Unemp. Rate, Firm's State	-0.915***	-0.895***	-0.893***	-0.793***		
	(0.284)	(0.270)	(0.284)	(0.265)		
Change in Unemp. Rate, Bank's State(s)	0.845	0.793	0.933	1.004*	0.559	0.956
	(0.565)	(0.551)	(0.575)	(0.553)	(0.664)	(0.623)
Housing Price Index, Bank's State(s)	-0.722	-4.345**	-3.189*	-11.52***	-3.490**	-9.616***
	(1.007)	(1.761)	(1.638)	(3.917)	(1.600)	(3.075)
National Banks × HPI, Bank's State(s)			2.971**	8.228***	3.253***	5.987***
			(1.198)	(2.520)	(1.132)	(1.941)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	No	No
State-Year Fixed Effects	No	No	No	No	Yes	Yes
Observations	38608	38608	38608	38608	38565	38565
Firms	4806	4806	4806	4806	4802	4802
Banks	436	436	436	436	435	435
Adjusted R^2	0.472	0.472	0.473	0.471	0.474	0.473

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table V: Interest Rate Regression

Columns (1) through (5) are Panel Fixed Effect Regressions. 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, bank, and year.

	All In Drawn Spread				
	(OLS)	(OLS)	(OLS)	(OLS)	(OLS)
	(1)	(2)	(3)	(4)	(5)
Lagged Book Leverage	13.11***	13.12***	12.52***	12.52***	12.52***
	(3.374)	(3.373)	(3.057)	(3.055)	(3.062)
Lagged Market to Book	-10.65***	-10.57***	-10.94***	-10.85***	-10.86***
	(2.486)	(2.493)	(2.448)	(2.472)	(2.466)
Lagged Altman's Z-Score	-20.38**	-20.35**	-17.88**	-17.86**	-17.86**
	(9.347)	(9.340)	(8.653)	(8.649)	(8.644)
Lagged Firm Size	-40.99***	-41.04***	-42.34***	-42.38***	-42.37***
	(5.716)	(5.763)	(5.444)	(5.516)	(5.530)
Loan Amount to Assets	10.87***	10.87***	10.31***	10.34***	10.38***
	(2.125)	(2.122)	(1.922)	(1.905)	(1.890)
Log(Maturity)	-14.59***	-14.66***	-13.73***	-13.83***	-13.82***
	(3.125)	(3.133)	(3.039)	(3.038)	(3.046)
Bank's Size	-2.718	-0.695	-2.820	0.125	0.127
	(2.507)	(2.735)	(2.390)	(2.757)	(2.761)
Bank's Equity Ratio	4.071**	4.607***	3.873**	4.676***	4.712***
	(1.688)	(1.753)	(1.743)	(1.759)	(1.817)
Bank's Net Income	-0.662	-0.575	-0.154	0.00874	-0.0416
	(1.786)	(1.801)	(1.684)	(1.728)	(1.731)
Bank's Cost of Deposits	3.556	3.649	3.138	3.332	3.496
	(3.180)	(3.197)	(3.418)	(3.444)	(3.471)
Change in Unemp. Rate, Firm's State	-1.549	-1.496			
	(1.550)	(1.543)			
Change in Unemp. Rate, Bank's State(s)	-1.999	-2.178	-1.259	-1.559	-1.482
	(2.789)	(2.801)	(2.783)	(2.790)	(2.792)
Housing Price Index, Bank's State(s)	5.780**	5.591**	4.616*	4.332*	3.596
	(2.420)	(2.469)	(2.483)	(2.518)	(2.993)
Large National Banks		-5.101		-7.392	-11.39
		(4.640)		(4.824)	(9.995)
National Banks × HPI, Bank's State(s)					1.646
					(3.508)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	No	No	No
State-Year Fixed Effects	No	No	Yes	Yes	Yes
Observations	9946	9946	9871	9871	9871
Firms	2601	2601	2589	2589	2589
Banks	350	350	348	348	348
Adjusted R^2	0.681	0.681	0.689	0.689	0.689

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

Table VI: Outstanding Loans Regression

Columns (1) through (4) are Panel Fixed Effect Regressions, with fixed effects at the bank level. *Log(Outstanding Loans)* is calculated by taking the log-transform of 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 and year.

	Log(Outstanding Loans)			
	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)
Bank's Size	-0.110	-0.0908	-0.117	-0.0822
	(0.110)	(0.107)	(0.110)	(0.103)
Bank's Equity to Assets	-0.0321	-0.0223	-0.0199	-0.00638
	(0.0209)	(0.0217)	(0.0189)	(0.0207)
Bank's Income to Assets	-0.153*	-0.161**	-0.149*	-0.174**
	(0.0812)	(0.0817)	(0.0796)	(0.0779)
Bank's Cost of Deposits	-0.0693	-0.0730	-0.0310	-0.0333
	(0.0677)	(0.0629)	(0.0690)	(0.0614)
Change in Unemp. Rate, Bank's State(s)	-0.00131	0.00685	0.00172	0.0111
	(0.0352)	(0.0299)	(0.0361)	(0.0288)
Housing Price Index, Bank's State(s)	-0.201*	-0.426**	-0.267**	-0.552***
	(0.106)	(0.193)	(0.108)	(0.203)
National Banks × HPI, Bank's State(s)			0.222**	0.310**
			(0.105)	(0.133)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	4469	4469	4469	4469
Banks	567	567	567	567
Adjusted R^2	0.761	0.760	0.762	0.760

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

Table VII: Loan Amount Regression

Columns (1) through (5) are Panel Fixed Effect Regressions. Columns (2) through (5) use the unavailable land measure, the state-level 30-year mortgage rate, and their interactions as instruments. Standard errors are clustered by firm, bank, and year.

	Loan Amount				
	(OLS)	(IV)	(IV)	(IV)	(IV)
	(1)	(2)	(3)	(4)	(5)
Lagged Book Leverage	-47.11***	-47.43***	-43.39***	-44.52**	-42.94***
	(17.28)	(16.65)	(16.16)	(17.30)	(15.95)
Lagged Market to Book	38.45***	36.66***	38.37***	37.59***	37.20***
	(10.62)	(10.55)	(9.763)	(10.08)	(9.579)
Lagged Altman's Z-Score	-51.89	-58.60	-53.63	-56.64	-59.87
	(44.06)	(41.74)	(40.04)	(41.11)	(39.02)
Lagged Firm Size	-265.4***	-263.9***	-254.6***	-255.3***	-251.4***
	(53.43)	(51.65)	(53.67)	(54.88)	(52.89)
Bank's Size	23.39**	30.28***	25.11**	22.47*	20.51*
	(10.41)	(8.959)	(10.35)	(12.03)	(12.09)
Bank's Equity Ratio	0.829	8.804	11.28	10.89	10.29
	(6.503)	(7.630)	(8.792)	(8.944)	(8.621)
Bank's Net Income	-0.0278	-2.337	-9.784	-9.963	-9.022
	(4.575)	(4.492)	(6.361)	(6.724)	(6.208)
Bank's Cost of Deposits	2.141	9.172	15.18	14.82	9.719
	(6.564)	(6.381)	(9.437)	(9.671)	(12.46)
Change in Unemp. Rate, Firm's State	4.039	5.409			
	(6.134)	(5.862)			
Change in Unemp. Rate, Bank's State(s)	4.895	0.991	-4.940	-3.926	31.18
	(7.092)	(6.421)	(9.041)	(9.176)	(70.54)
Housing Price Index, Bank's State(s)	3.430	-39.72**	-57.24***	-56.66***	-54.28**
	(9.721)	(16.99)	(20.24)	(20.80)	(24.97)
Large National Banks				6.829	-19.79
				(17.19)	(66.91)
National Banks × HPI, Bank's State(s)					10.09
					(26.51)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	No	No	No
State-Year Fixed Effects	No	No	Yes	Yes	Yes
Observations	10805	10805	10729	10729	10729
Firms	2804	2804	2790	2790	2790
Banks	357	357	355	355	355
Adjusted R^2	0.767	0.767	0.760	0.760	0.760

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. Panel A uses the entire sample of bank holding companies and Panel B excludes the largest quintile of bank holding companies by deposits for each year. Columns (4) and (6) use the unavailable land measure, the state-level 30-year mortgage rate, and their interaction as instruments. 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) and year.

Panel A: Bank Assets, All Bank Holding Companies						
	Real Estate Loans	MBS	C&I Loans		Consumer Loans	
	(OLS)	(OLS)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Bank's Size	3.942***	0.628***	-0.373	0.00226	-1.590***	-1.021***
	(0.485)	(0.237)	(0.262)	(0.255)	(0.158)	(0.168)
Bank's Equity Ratio	-0.557***	-0.277***	-0.0822	-0.0413	-0.233***	-0.163***
	(0.122)	(0.0766)	(0.0742)	(0.0735)	(0.0453)	(0.0494)
Bank's Net Income	0.329***	-0.129**	0.00731	0.0317	0.155***	0.207***
	(0.0902)	(0.0532)	(0.0375)	(0.0390)	(0.0368)	(0.0348)
Bank's Cost of Deposits	0.793***	-0.0824	-0.247**	-0.223**	-0.150**	-0.0736
	(0.306)	(0.0870)	(0.119)	(0.105)	(0.0629)	(0.0751)
Change in Unemp. Rate, Bank's State(s)	0.350***	-0.137***	0.0838	0.0910	-0.119**	-0.122**
	(0.105)	(0.0531)	(0.0620)	(0.0953)	(0.0479)	(0.0610)
Housing Price Index, Bank's State(s)	0.560*	0.0601	-0.459***	-2.191***	0.240***	-1.626***
	(0.291)	(0.144)	(0.112)	(0.520)	(0.0842)	(0.488)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	82187	82187	82187	82187	82187	82187
Banks	8242	8242	8242	8242	8242	8242
Adjusted R^2	0.850	0.650	0.745	0.739	0.777	0.766

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

Table VIII—*Continued*

Panel B: Bank Assets, Small Bank Holding Companies						
	Real Estate Loans	MBS	C&I Loans		Consumer Loans	
	(OLS)	(OLS)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Bank's Size	5.373***	-0.722**	0.605*	0.788**	-1.815***	-1.507***
	(0.578)	(0.282)	(0.337)	(0.338)	(0.221)	(0.242)
Bank's Equity Ratio	-0.390***	-0.378***	0.00770	-0.0245	-0.239***	-0.255***
	(0.123)	(0.0848)	(0.0866)	(0.0865)	(0.0541)	(0.0597)
Bank's Net Income	0.237***	-0.0831	-0.0139	0.00824	0.161***	0.226***
	(0.0829)	(0.0528)	(0.0365)	(0.0404)	(0.0363)	(0.0360)
Bank's Cost of Deposits	0.636**	-0.0425	-0.242*	-0.209	-0.126*	-0.0763
	(0.251)	(0.0904)	(0.147)	(0.145)	(0.0661)	(0.0686)
Change in Unemp. Rate, Bank's State(s)	0.227*	-0.106*	0.0958	0.160	-0.0832*	-0.0220
	(0.119)	(0.0633)	(0.0750)	(0.0979)	(0.0427)	(0.0560)
Housing Price Index, Bank's State(s)	1.325***	-0.173	-0.465***	-2.493***	0.0609	-2.537***
	(0.367)	(0.187)	(0.148)	(0.559)	(0.109)	(0.665)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	65598	65598	65598	65598	65598	65598
Banks	7104	7104	7104	7104	7104	7104
Adjusted R^2	0.851	0.649	0.746	0.741	0.773	0.761

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

Table IX: Investment Regression for Constrained and Unconstrained Firms

Columns (1) through (4) are Panel Fixed Effect Regressions. All columns use the unavailable land measure, the state-level 30-year mortgage rate, and their interactions as instruments. Firms with a investment-grade public bond rating are designated as unconstrained and firms without a investment-grade public bond rating are designated as constrained. Splitting the sample into terciles by firm size (*Log(Assets)*), constrained firms are the bottom tercile and unconstrained firms are the top tercile. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm, bank, and year. 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			
	Bond Ratings		Firm Size	
	(Constrained)	(Unconstrained)	(Constrained)	(Unconstrained)
	(1)	(2)	(3)	(4)
Lagged Market to Book	9.503***	2.794***	8.669***	4.020***
	(0.754)	(0.958)	(1.476)	(1.362)
Cash Flow	7.957***	10.51***	6.458***	8.831***
	(1.160)	(2.223)	(1.300)	(1.706)
Lagged Firm Size	-21.20***	-12.75***	-25.40***	-12.71***
	(3.153)	(1.968)	(5.567)	(2.036)
Lagged Investment	-0.201	4.259***	-2.113**	8.032**
	(0.906)	(1.470)	(0.971)	(3.626)
Bank's Size	-3.265	1.166	-4.827	-0.374
	(1.992)	(0.894)	(4.009)	(1.799)
Bank's Equity Ratio	0.547	-0.0385	0.940	-0.146
	(0.546)	(0.190)	(1.135)	(0.322)
Bank's Net Income	-0.0976	-0.0241	0.222	-0.248
	(0.366)	(0.285)	(0.535)	(0.359)
Bank's Cost of Deposits	0.738	0.464	1.577	-0.0635
	(0.704)	(0.517)	(1.029)	(0.660)
Change in Unemp. Rate, Bank's State(s)	0.803	0.135	0.426	1.147
	(0.797)	(0.471)	(1.329)	(0.964)
Housing Price Index, Bank's State(s)	-7.604***	0.306	-17.36***	0.879
	(2.798)	(1.455)	(5.244)	(2.025)
Wald Test:				
(Constrained Firms = Unconstrained Firms)	6.29**		10.12***	
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes
State-Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	29880	8530	13523	11166
Firms	4267	882	2562	1176
Banks	427	154	363	155
Adjusted R^2	0.456	0.693	0.459	0.751

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

Table X: Investment Regression for Constrained and Unconstrained Banks

Columns (1) through (4) are Panel Fixed Effect Regressions. All columns use the unavailable land measure, the state-level 30-year mortgage rate, and their interactions as instruments. Banks in the largest quintile by deposits are designated as unconstrained and banks outside the largest quintile are designated as unconstrained. Banks above the second quintile level of equity ratios are designated as unconstrained and banks in the first two quintiles are designated as constrained. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm, bank, and year. 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			
	Bank Size		Bank Leverage	
	(Constrained)	(Unconstrained)	(Constrained)	(Unconstrained)
	(1)	(2)	(3)	(4)
Lagged Market to Book	8.883***	8.982***	9.140**	8.833***
	(1.905)	(0.762)	(3.845)	(0.737)
Cash Flow	8.519***	7.679***	12.38***	7.269***
	(1.802)	(1.263)	(3.742)	(1.012)
Lagged Firm Size	-21.76***	-18.22***	-29.77***	-19.60***
	(4.298)	(3.559)	(6.481)	(3.197)
Lagged Investment	-3.999**	1.303	-1.755	1.147
	(1.741)	(1.027)	(1.788)	(0.789)
Bank's Size	-8.274**	-2.634	-1.807	-3.305
	(3.878)	(1.947)	(4.658)	(2.170)
Bank's Equity Ratio	0.264	0.620	2.854	-0.241
	(1.762)	(0.694)	(3.802)	(0.518)
Bank's Net Income	0.0534	-0.0419	-0.817	-0.224
	(0.392)	(0.610)	(0.595)	(0.613)
Bank's Cost of Deposits	1.299	-1.983	2.893	-1.134
	(0.915)	(1.230)	(2.206)	(0.798)
Change in Unemp. Rate, Bank's State(s)	-0.548	0.117	-1.675	0.774
	(0.878)	(0.751)	(1.079)	(0.815)
Housing Price Index, Bank's State(s)	-18.81***	-4.508*	-33.51**	-5.203**
	(6.965)	(2.447)	(14.03)	(2.562)
Wald Test:				
(Constrained Banks = Unconstrained Banks)	3.75*		3.94**	
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes
State-Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	8997	29062	6283	30323
Firms	1879	3855	1555	4258
Banks	244	281	193	388
Adjusted R^2	0.515	0.494	0.603	0.511

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

Table XI: Investment Regression: Housing Returns

Columns (1) through (6) are Panel Fixed Effect Regressions. 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, bank, and year.

	Investment					
	(OLS)	(IV)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	9.072***	9.127***	9.069***	8.820***	8.968***	8.397***
	(0.702)	(0.668)	(0.703)	(0.618)	(0.765)	(0.597)
Cash Flow	8.560***	9.018***	8.559***	8.688***	8.495***	9.452***
	(1.168)	(1.119)	(1.168)	(1.153)	(1.174)	(1.113)
Lagged Firm Size	-19.54***	-18.46***	-19.56***	-19.77***	-19.43***	-17.95***
	(2.689)	(2.588)	(2.689)	(2.686)	(2.799)	(2.288)
Lagged Investment	0.242	0.134	0.242	0.379	0.184	0.152
	(0.864)	(0.857)	(0.865)	(0.846)	(0.877)	(0.816)
Bank's Size	-1.056	-0.941	-1.137	-1.230	-1.327	-2.261*
	(1.369)	(1.774)	(1.349)	(1.216)	(1.451)	(1.195)
Bank's Equity Ratio	-0.0766	-0.210	-0.0677	-0.159	-0.0249	-0.196
	(0.407)	(0.362)	(0.404)	(0.412)	(0.432)	(0.378)
Bank's Net Income	0.165	0.132	0.175	0.468	0.202	0.219
	(0.273)	(0.337)	(0.278)	(0.429)	(0.262)	(0.302)
Bank's Cost of Deposits	0.0347	0.0610	0.0257	0.0429	0.101	0.845*
	(0.875)	(0.852)	(0.862)	(0.812)	(0.652)	(0.455)
Change in Unemp. Rate, Firm's State	-0.916***	-0.842***	-0.911***	-0.888***		
	(0.286)	(0.277)	(0.286)	(0.279)		
Change in Unemp. Rate, Bank's State(s)	0.756	0.516	0.719	0.108	0.311	-0.135
	(0.579)	(0.709)	(0.584)	(0.767)	(0.682)	(0.811)
Return on Housing, Bank's State(s)	-0.226	-0.0554	-0.598*	-5.409	-0.795**	-2.842
	(0.228)	(1.365)	(0.346)	(3.322)	(0.358)	(2.151)
National Banks × HPI, Bank's State(s)			0.542*	5.817**	0.711***	3.885*
			(0.282)	(2.720)	(0.254)	(2.079)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	No	No
State-Year Fixed Effects	No	No	No	No	Yes	Yes
Observations	38608	38608	38608	38608	38565	38565
Firms	4806	4806	4806	4806	4802	4802
Banks	436	436	436	436	435	435
Adjusted R^2	0.472	0.472	0.472	0.469	0.474	0.472

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table XII: Investment Regression: MSA Level Housing Prices

Columns (1) through (6) are Panel Fixed Effect Regressions. 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, bank, and year.

	Investment					
	(OLS)	(IV)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	9.407***	9.340***	9.408***	9.403***	9.288***	9.232***
	(0.693)	(0.573)	(0.687)	(0.611)	(0.764)	(0.654)
Cash Flow	8.818***	9.290***	8.820***	9.317***	8.715***	9.104***
	(1.271)	(1.211)	(1.273)	(1.224)	(1.269)	(1.203)
Lagged Firm Size	-19.28***	-18.66***	-19.29***	-18.00***	-19.23***	-18.15***
	(2.725)	(2.663)	(2.731)	(2.500)	(2.838)	(2.561)
Lagged Investment	0.192	0.287	0.169	0.0399	0.0912	-0.0911
	(0.798)	(0.752)	(0.796)	(0.752)	(0.818)	(0.699)
Bank's Size	-1.715	-2.425*	-1.804	-3.217**	-2.351	-3.506**
	(1.570)	(1.448)	(1.506)	(1.527)	(1.626)	(1.568)
Bank's Equity Ratio	0.0440	-0.213	0.0969	-0.234	0.189	0.129
	(0.561)	(0.479)	(0.524)	(0.418)	(0.526)	(0.504)
Bank's Net Income	0.0863	0.101	0.0231	-0.203	0.0840	-0.0660
	(0.326)	(0.314)	(0.312)	(0.322)	(0.290)	(0.236)
Bank's Cost of Deposits	-0.319	-0.568	0.00544	-0.598	-0.173	0.0268
	(1.075)	(1.280)	(0.886)	(1.142)	(0.736)	(0.869)
Change in Unemp. Rate, Firm's State	-0.906***	-0.956***	-0.890***	-0.925***		
	(0.330)	(0.282)	(0.330)	(0.269)		
Change in Unemp. Rate, Bank's State(s)	0.870	0.649	0.984*	0.719	0.485	0.224
	(0.547)	(0.531)	(0.543)	(0.539)	(0.626)	(0.568)
Housing Price Index, Bank's MSA(s)	-0.616	-3.261**	-2.673*	-11.69***	-3.203**	-12.07***
	(1.112)	(1.294)	(1.369)	(3.349)	(1.381)	(3.384)
National Banks × HPI, Bank's State(s)			3.166**	6.179***	3.231***	9.933***
			(1.270)	(2.100)	(1.197)	(3.669)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	No	No
State-Year Fixed Effects	No	No	No	No	Yes	Yes
Observations	36048	36048	36048	36048	35990	35990
Firms	4638	4638	4638	4638	4632	4632
Banks	426	426	426	426	425	425
Adjusted R^2	0.471	0.471	0.472	0.469	0.473	0.472

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table XIII: Firm Collateral

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

	Investment			
	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)
Lagged Market to Book	6.506***	6.496***	6.563***	6.525***
	(1.272)	(1.272)	(1.209)	(1.207)
Cash Flow	10.83***	10.83***	10.89***	10.86***
	(2.084)	(2.086)	(1.877)	(1.872)
Lagged Firm Size	-9.334***	-9.309***	-9.624***	-9.575***
	(2.714)	(2.690)	(2.647)	(2.614)
Lagged Investment	8.039***	8.040***	8.160***	8.150***
	(1.929)	(1.930)	(1.730)	(1.731)
Bank's Size	-1.103	-1.211	-1.713*	-2.245**
	(0.926)	(0.985)	(0.921)	(1.125)
Bank's Equity Ratio	0.603***	0.646***	0.721***	0.897***
	(0.191)	(0.222)	(0.209)	(0.247)
Bank's Net Income	-0.341	-0.368	-0.352	-0.458*
	(0.270)	(0.268)	(0.237)	(0.246)
Bank's Cost of Deposits	0.341	0.321	0.710	0.681
	(0.514)	(0.518)	(0.544)	(0.577)
Change in Unemp. Rate, Firm's State	-0.190	-0.188		
	(0.254)	(0.254)		
Change in Unemp. Rate, Bank's State(s)	0.204	0.226	-0.151	-0.0497
	(0.529)	(0.540)	(0.505)	(0.516)
Housing Price Index, Bank's State(s)	-1.325	-2.029	-1.153	-4.284**
	(1.060)	(1.512)	(0.936)	(1.990)
National Banks × HPI, Bank's State(s)	1.464**	1.675*	1.823***	3.378***
	(0.712)	(0.972)	(0.657)	(1.174)
Market Value of Buildings	5.107***	5.108***	5.337***	5.329***
	(1.702)	(1.701)	(1.616)	(1.612)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	No	No
State-Year Fixed Effects	No	No	Yes	Yes
Observations	13815	13815	13720	13720
Firms	1421	1421	1412	1412
Banks	273	273	273	273
Adjusted R^2	0.573	0.573	0.597	0.596

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

Table XIV: Investment Regression: Robustness Checks

Columns (1) through (6) are Panel Fixed Effect Regressions. Columns (2), (4), and (6) 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 quintile of banks, 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, bank, and year.

	Investment					
	Exclude Largest Banks		Exclude Overlapping States		Include Firm's State HPI	
	(OLS)	(IV)	(OLS)	(IV)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Market to Book	8.912***	9.724***	8.894***	7.758***	9.061***	9.056***
	(1.907)	(1.566)	(1.384)	(1.131)	(0.689)	(0.682)
Cash Flow	8.695***	7.992***	6.972***	7.991***	8.557***	8.562***
	(1.822)	(1.668)	(1.411)	(1.290)	(1.170)	(1.171)
Lagged Firm Size	-22.33***	-22.02***	-21.77***	-22.09***	-19.48***	-19.33***
	(4.516)	(4.414)	(4.603)	(4.402)	(2.666)	(2.659)
Lagged Investment	-3.935**	-4.537***	0.153	-0.408	0.211	0.182
	(1.730)	(1.612)	(1.024)	(0.924)	(0.866)	(0.872)
Bank's Size	-8.497**	-9.800***	-1.967	-3.766**	-1.944	-2.914*
	(3.662)	(3.422)	(2.011)	(1.659)	(1.371)	(1.515)
Bank's Equity Ratio	-0.294	-0.636	0.0432	0.0190	0.103	0.374
	(1.694)	(1.709)	(0.640)	(0.641)	(0.389)	(0.384)
Bank's Net Income	0.231	0.148	0.0696	0.175	0.0204	-0.172
	(0.356)	(0.341)	(0.283)	(0.286)	(0.274)	(0.292)
Bank's Cost of Deposits	1.662	1.407	0.503	1.278	0.0836	-0.00592
	(1.059)	(0.919)	(0.955)	(1.039)	(0.774)	(0.758)
Change in Unemp. Rate, Firm's State					-0.876***	-0.862***
					(0.289)	(0.285)
Change in Unemp. Rate, Bank's State(s)	-1.036	-1.395*	0.717	0.0151	0.937	1.085*
	(0.848)	(0.743)	(0.770)	(2.844)	(0.575)	(0.587)
Housing Price Index, Bank's State(s)	-8.114***	-14.77***	-4.184**	-6.682*	-3.133*	-7.473**
	(2.975)	(5.230)	(1.958)	(3.547)	(1.600)	(3.008)
National Banks × HPI, Bank's State(s)			3.342**	3.014	2.960**	4.709**
			(1.376)	(2.059)	(1.177)	(1.868)
Housing Price Index, Firm's State					-0.711	-0.473
					(1.203)	(1.137)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	Yes	Yes
State-Year Fixed Effects	Yes	Yes	Yes	Yes	No	No
Observations	8898	8898	20739	20739	38608	38608
Firms	1856	1856	2900	2900	4806	4806
Banks	243	243	318	318	436	436
Adjusted R^2	0.518	0.517	0.483	0.482	0.473	0.472

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