House prices, bank balance sheets, and bank credit supply *

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Abstract

We examine the effect of house price appreciation on bank loan portfolios during the 1996-2006 period. Controlling for possible simultaneity between house prices and bank loan portfolio growth, we find that banks affected by greater house price appreciation became larger and increased their business lending as well as their mortgage lending. The added loans were largely funded by a rapid growth in non-core liabilities. We rely on bank origination of small business loans at the county level to decompose the growth in small business loans into supply shocks and demand shocks. We find that house prices have a significantly positive impact on bank supply of small business loans. Finally, we show that bank supply of small business loans is positively correlated with employment growth of small establishments at the county level.

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1 Introduction

Many believe that a credit boom and a housing boom together laid the foundation for the recent financial crisis (Acharya, Philippon, Richardson, and Roubini (2009)). Figure 1 shows that the credit to the private sector ranged from 100% to 120% of GDP for over 30 years since 1960 before it took off in mid-1990s and reached over 180% of GDP before the financial crisis. House prices exhibit a similar pattern during the same period. An extensive literature evaluates the causes of the pre-crisis housing and credit booms, citing easy monetary policy, a global savings glut, and securitization, among other things.[1] The relationship between the credit and housing booms remains unclear:

> Credit booms seem to often coincide with house price increases. The causality is not clear. Is it that financial intermediaries lower their lending standards and fuel house price increases? Or, are house prices going up (for some other reason) and intermediaries are willing to lend against collateral that is then more valuable? This is an area for future research. —(Gorton and Metrick, 2012, P. 137)

The difficulty of identifying the causal effect between credit and house prices lies in the fact that the direction of the causality could go both ways. When financial intermediaries increase credit supply, cheaper and more plentiful mortgage lending may raise house prices. Higher house prices may, in turn, encourage further lending for either of two reasons. First, higher real estate value increases borrowers collateral value and hence their borrowing capacities. We call this the "collateral channel." Second, existing bank loans secured by real estate become less risky because pledged collateral has risen in value, leading banks to take on more portfolio risk by making news loans.[2] We call this the "bank balance sheet channel."

We investigate the impact of rising house prices on the size and composition of bank balance sheets. The house price boom likely affected wealth and real-sector allocations in banks operating environments. Non-housing businesses were likely affected along with those

[1] Diamond and Rajan (2009), Brunnermeier (2009), Taylor (2009)

[2] New loans could be funded by adding new liabilities to the balance sheet or by reducing another asset category, such as commercial loans or securities.

devoted to housing. During the 1996 to 2006 period, we find that a 1% increase in house prices increases the size of bank balance sheets by more than 0.5%, primarily funded by growth in non-core liabilities. On the assets side, real estate loans have the fastest growth rate, followed by commercial and industrial (C&I) loans, and then by liquid assets. Thus an increase in house prices leads to an increase of real estate loans over bank total assets and an reduction of C&I loan share and liquid assets share. However, although the share of C&I loans falls, the dollar magnitude increases by virtue of the bank's increased asset size. Our estimation suggests when house prices rise by one percentage point, the amount of C&I credit rises by 0.2 to 0.4 percentage point. These findings partially answer the question raised by Gorton and Metrick (2012) by showing that real estate booms have a significant impact on credit booms.

The increased commercial lending could reflect either a supply shift (banks' existing loans become safer) or a demand shift (new or more expensive housing stimulates the demand for other goods and services or borrowers demand more credit on the basis of higher real estate collateral values). To determine the full impact of house prices on banks, we must go beyond the loan totals, which reflect a combination of supply and demand for credit. We therefore turn to Community Reinvestment Act (CRA) data describing one component of the corporate lending—small business loans, at the county level. We can then use within-county estimation to control for demand effects and estimate the supply effect on C&I loans.[3] We find that during the ten years from 1997 to 2006, a 1% increase in real estate price causes banks to increase small business lending by 0.52% to 0.76%. This finding suggests that the real estate boom did not crowd out bank lending to businesses, but increased business loan supply through the bank balance sheet channel.

[3]Essentially, we decompose loan growth into supply shocks and demand shocks by comparing the differential change in bank lending to the same counties. This approach is similar to the estimations in Khwaja and Mian (2008), Jimenez, Ongena, Peydro, and Saurina (2012), and Schnabl (2012).

We then go a step further, to investigate whether the expansion in bank credit supply induced by housing booms has affected the real economy. We show that the supply of small business loans within a county significantly increases employment at small establishments (those with nine or fewer employees) but not at large establishments. This "supply side" conclusion complements that of (Adelino, Schoar, and Severino (2014b)), who find that housing booms expand commercial loan demand by increasing potential borrowers' collateral values.[4]

Our paper is related to several other recent papers that examine the interaction of the real estate and financial sectors. Huang and Stephens (2015), Cunat, Cvijanovic, and Yuan (2014), and Bord, Ivashina, and Taliaferro (2015) also look at the impact of housing market on bank credit supply, but their focus is the financial crisis period and the credit crunch caused by housing bust. To our knowledge, the only other paper that studies the impact of real estate price booms on bank commercial lending, is Chakraborty, Goldstein, and MacKinlay (2014). During the 1988 to 2006 period, they find that banks that are located in strong housing markets reduce their commercial loan share and that their borrowers cut back on investments. They interpret their findings as evidence of the real estate sector crowding-out other sectors, which they present as a social cost of the housing boom. There are at least three explanations for our seemingly contradictory findings. First, Chakraborty et al. (2014) examine the effect of house prices on the share of C&I loans in bank assets, but not the amount of C&I credit, which we believe should be the focus if one is interested in how house prices affect the supply of business credit. Second, Chakraborty et al. (2014) focus on the borrowing and investment of large corporate borrowers, whereas we focus on the supply of small business loans. Perhaps the real estate price boom differentially affected bank

[4] In their appendix, Adelino et al. (2014b) do not find a significant correlation between C&I lending and house price growth from 2002 to 2007 and thus conclude that the positive impact of house prices on employment growth is unlikely to be due to a credit supply channel. In untabulated results, we perform the same tests as their Table A11 and find similar results when C&I loans are broken down into three size categories. However, when we look at all C&I loans at the bank holding company level we find that real estate price growth has a significantly positive impact on the aggregate C&I loan growth.

lending to large and small businesses. Third, the empirical methodologies used in these two papers are similar but also have important differences. In particular, we control differently for inter-temporal changes in commercial loan demand by using within borrower (county) estimation to absorb borrower specific changes in credit demand. Chakraborty et al. (2014) do not control for borrower-year fixed effects to absorb credit demand.

2 Property prices and bank credit supply: theoretical background

Existing theories of property prices and bank lending focus almost exclusively on the collateral channel, which simply specifies that banks will lend more on the strength of more valuable collateral (Kiyotaki and Moore (1997)). Herring and Wachter (1999) present a simple portfolio model of real estate prices and bank lending in which a bank invests in real estate loans and other loans and is concerned with maintaining a low probability of default. They argue that higher real estate prices strengthen a bank's balance sheet either because the bank's own holding of real estate rises in value or the market value of collateral on outstanding loans increases. A stronger balance sheet permits greater real estate lending because it is possible to lend more without increasing the probability of bankruptcy. Their model provides no explicit link to a bank's optimal size, or to other lending types that are assumed to be constant. However, the model's basic logic seems to imply that higher real estate prices will tend to expand all types of loans, by making existing loans safer. Rising real estate prices could also affect bank borrowing costs. In particular, a house price boom encourages sales and securitization of mortgage loans, which provides additional funding for banks and causes banks to expand credit supply (Loutskina and Strahan (2009) and Justiniano, Primiceri, and Tambalotti (2014)).

While we lack a unified theory of how bank credit supply reacts to property prices, existing studies suggest that rising house prices encourage greater bank credit supply by strengthening bank balance sheet and reducing bank financing costs. At the same time, house price appreciation tends to encourage mortgage lending relative to C&I lending, increasing real estate loans in the loan mix. Whether rising house prices shift the supply curve of C&I loan rightward or leftward depends on the net effect of the "scale effect" and the "compositional effect".

3 Econometric methodology

Estimating a causal effect of house price boom on bank credit supply encounters two challenging econometric issues: reverse causality and the confounding credit demand channel. We adopt an instrumental variable (IV) approach to deal with reverse causality and a within-borrower estimation approach to control for credit demand. We focus our discussion in this section on the IV approach, and leave our treatment of credit demand effects to Section 6.

3.1 Simultaneous relationship

The relationship between house prices and bank lending can be characterized by a simultaneous equation system:

$$L_{i,m,t} = \mu_i + \beta_1 Price_{m,t} + \beta_2 X_{m,t} + \beta_3 W_{i,m,t} + Year_t + \epsilon_{i,m,t}, \quad (1)$$

$$Price_{m,t} = \eta_m + \alpha_1 L_{i,m,t} + \alpha_2 X_{m,t} + \alpha_3 Z_{m,t} + Year_t + u_{m,t}, \quad (2)$$

where $L_{i,m,t}$ is a dependent variable of interest at the bank level, such as the size and composition of bank balance sheets or bank credit supply,[5]

i denotes bank,

[5] Bank credit supply is not directly observable, in Section 6 we estimate bank supply of small business loans using loan data at the bank-county level.

m denotes Metropolitan Statistical Area (MSA),

t denotes time,

$Price_{m,t}$ is real estate price of the MSA where bank i is located[6],

μ_i is bank fixed effects,

η_m is MSA fixed effects,

$Year_t$ is year fixed effects,

$X_{m,t}$ are factors that affect both house prices and bank lending,

$W_{i,m,t}$ are factors that only impact bank lending,

$Z_{m,t}$ are factors that only impact real estate prices.

We are interested in the impact of house prices on bank balance sheet structure and bank credit supply, i.e. β_1 in Eq. (1).[7] Unfortunately, estimating Eq. (1) by OLS would yield biased coefficients if loan supply affects house prices (i.e., $\alpha_1 \neq 0$). To estimate β_1 consistently, we need at least one exogenous variable (instrument) that can predict house prices in Eq. (2) but is uncorrelated with the error term $\epsilon_{i,m,t}$ in Eq. (1). This is the $Z_{m,t}$, which (as usual) must be highly correlated with $Price$, but affect bank behavior only through its effect on house prices.

For 96 MSAs, Saiz (2010) has developed a measure of housing supply elasticities that plausibly satisfy these conditions. The measure is constructed solely based on geographical constraints within MSAs such as the distance to oceans or big lakes and the presence of steep-sloped terrain. For example, coastal cities like Miami and San Francisco generally have low housing supply elasticities, whereas inland cities like Atlanta and Indianapolis tend to have

[6]In the estimation, for banks that have branches in more than one MSA, we will use the deposits-weighted real estate prices across all the MSAs where a bank has a depository branch.

[7]A few recent studies have examined the causal effect of credit supply on house prices using instrumental variables to measure variation in credit supply. The instruments have included changes in annual conforming loan limit (Adelino et al. (2014b)), state anti-predatory laws (Di Maggio and Kermani (2014)), and bank branching deregulation (Favara and Imbs (2014)). These studies generally conclude that mortgage credit expansion has a significantly positive effect on house prices. We study the other direction of causality by estimating the effect of exogenous house price changes on financial intermediaries lending and funding in the years before the financial crisis.

relatively high elasticities. Figure 2 plots the residential real estate prices for three MSAs—Miami, Atlanta, and Indianapolis from 1996 to 2006. Miami with a very low elasticity of 0.6 experiences a huge real estate boom during this period and Indianapolis with very elastic housing supply only experiences modest real estate price run-up.

What might cause Saiz' elasticity to be correlated with ϵ so that it is not a valid instrument? Two possibilities come to mind. First, similar to a point emphasized by Mian and Sufi (2011), it is possible that differential trends in inelastic and elastic MSAs during this time period would lead to differential bank behavior even in the absence of differential house price growth. For example, if inelastic MSAs experienced larger positive economic shocks during this period than elastic MSAs, the Saiz elasticity measures might be correlated with some part of loan demand in (1). This concern is partially addressed by including local economic indicators (such as total income and population) as control variables when we estimate Eq. (1). Furthermore, Table 1 indicates that Saiz' elasticities are not significantly correlated with income growth or population growth, despite their ability to explain a large portion of real estate price growth from 1996 to 2006. Similarly, Mian and Sufi (2011) report that Saiz' housing supply elasticities are not significantly correlated with local payroll or employment growth over the 2002 to 2006 period. In short, the evidence does not support the presence of a systematic relationship between Saiz' elasticities and local loan demand shocks (not induced by housing) during the recent real estate boom.

It is worthwhile to reiterate that the amount of bank loan $L_{i,m,t}$ in Eq. (1) reflects both loan supply and loan demand. As a result, the effects of house prices documented in other studies (that also use Saiz' elasticities as an instrument) on firm investment (Chaney, Sraer, and Thesmar (2012)), household consumption (Mian and Sufi (2011)), and small business employment (Adelino et al. (2014b)) through the collateral channel will be reflected in the effect of house prices on total bank loan, β_1. The contribution of the credit demand to β_1 is likely to be small due to the fact that loans secured by real estate are generally reported by banks as commercial real estate loans regardless of the purpose of the loan.[8] As a result, the C&I loans reported by commercial banks generally only include business loans not secured by real estate, and thus are less likely to be related to the appreciation of real estate collateral value. These demand-side effects induced by rising collateral value, however, will be eliminated by our within-borrower (county) estimation in the second part of the paper so that the effect of house prices on bank credit supply (holding credit demand constant) can be identified.

[Insert Table 1 near here]

Second, banks do not choose their locations randomly. Banks that are located in low-elasticity MSAs can be fundamentally different than those located in high-elasticity MSAs, which would also lead to a correlation between elasticities and $\epsilon_{i,m,t}$ in Eq. (1). Time-invariant bank characteristics are easily controlled for by including bank fixed effects in Eq. (1). We also control for observed bank characteristics that have been shown in the literature to affect bank loan growth. The identification threat is then that time-varying unobserved bank characteristics cause banks in high- and low-elasticity MSAs to behave differently even in the absence of differential real estate price cycles.

3.2 Preliminary stage regression

In our cross-sectional regressions where the dependent variable is the annual growth rate of banks from 1996 to 2006 or from 2001 to 2006, we use the housing supply elasticity (weighted by bank branch deposits) as an instrument for house price growth. In our panel estimation where the unit observation is bank-year, we adopt a "generated instrument" approach to create a time-varying instrument from the static elasticity, where the IV is constructed from a preliminary stage regression and then a standard two-stage IV estimation is performed.

[8] See the Call Report instructions for details http://www.ffiec.gov/PDF/FFIEC_forms/FFIEC031_FFIEC041_201303_i.pdf.

The preliminary stage regression we employ is,

$$REprice_{m,t} = \alpha_m + \rho_t Elasticity_m \times Year_t + \mu_t Year_t + u_{m,t}, \tag{3}$$

where $REprice_{m,t}$ is the annual inflation-adjusted residential house price index of MSA m in year t, $Elasticity_m$ is the housing supply elasticity of MSA m, $Year_t$ is an indicator variable for year, α_m is MSA fixed effects, and μ_t is year fixed effects. The rationale behind this regression is that the house prices of MSAs with low elasticities tend to fluctuate more with aggregate house prices—when house prices are on the rise due to booming economy or low mortgage rate or other shocks on the aggregate level, MSAs with inelastic land supply tend to experience bigger house price run-up than MSAs with elastic land supply. For ease of interpretation, we use the demeaned elasticity in the estimation so that the coefficients of the year dummies reflect the behavior of MSAs that have an average housing supply elasticity.

[Insert Table 2 near here]

Table 2 reports the results, where 1996 is the base year. Two obvious patterns emerge from Table 2. First, real estate prices are increasing every single year from 1997 to 2006, with the 2006 value about twice the 1996 value. Second, house prices in low-elasticity MSAs increase faster than high-elasticity MSAs in every single year after 2000. For example, the coefficient of $2006 \times Elasticity$ is -35.8, implying that a difference in elasticity of 3.4 (between Miami and Indianapolis) leads to a difference in price appreciation of 121.7 from 1996 to 2006 (relative to the 1996 value of 105.6).[9] The fitted value of the preliminary stage estimation, $\widehat{REprice} = \widehat{\rho} Elasticity \times Year_t + Year_t$, is then used as the IV for real estate price in the main regression Eq. (1)

[9]As can be seen from Figure 2, the implied difference in price growth (121.7) is actually much smaller than actual difference between Miami and Indianapolis, suggesting that the huge real estate boom in Miami from 1996 to 2006 was probably also due to other factors that is unrelated to land constraints but could be correlated with bank activities. The idea of the IV estimation is exactly about excluding these potential endogenous factors from biasing the estimated impact of real estate shocks on the banking sector.

The fact that year fixed effects enter into the preliminary stage regressions both linearly and interacted with elasticity does not make $\widehat{REprice}$ correlated with $\epsilon_{i,m,t}$. This is because of the fact that year dummies $Year_t$ are controlled for in Eq. (1) and the standard assumption that the expected value of $\epsilon_{i,m,t}$ is zero conditional on exogenous variables imply that $E(\epsilon_{i,m,t}|Elasticiy, Year_t) = 0$, which in turn implies the conditional expectation of $\epsilon_{i,m,t}$ is zero conditional on $\widehat{REprice}$. To see this, by law of iterated expectations, $E(\epsilon_{i,m,t}|\widehat{REprice}) = E[E(\epsilon_{i,m,t}|Elasticiy, Year_t)|\widehat{REprice}] = 0$, because $\widehat{REprice}$ is a function of $Elasticity$ and $Year_t$. (see Wooldridge, 2010, P.19).

4 Data and summary statistics

4.1 Bank balance sheet data

The balance sheet data of commercial banks are taken from the quarterly Consolidated Report of Condition and Income filed by commercial banks, commonly known as "call reports". Call reports contain detailed on- and off-balance sheet information such as assets, liabilities, income, and loan commitments. Call reports are prepared at the level of the bank, rather than the bank holding company (BHC). Each commercial bank is uniquely identified by the call report item RSSD9001. As discussed below, for our analysis we require commercial banks to have at least one depository branch located in MSAs where the residential house prices and housing supply elasticities are available. We also exclude banks that exist only for one year during the 1996 to 2006 sample period. Our sample includes 34,357 bank-year observations for 4,505 unique commercial banks, of which 3,640 belong to 3,062 bank holding companies (identified by RSSD9348). The number of commercial banks decline over time during this period as a result of consolidation.[10]

[10]Our unit of observation is the commercial bank as opposed to the bank holding company and the majority of our banks belong to a holding company. Bank-level measurements reflect the effect of internal capital markets among banks within multi-bank bank holding company (Houston, James, and Marcus (1997)). To

[Insert Table 3 near here]

Panel A of Table 3 reports the summary statistics of bank balance sheets during the 1996 to 2006 period. The definitions of the balance sheet items are reported in the appendix. On the assets side, on average, real estate loans and commercial and industrial (C&I) loans account for 44% and 11% of a bank's total assets. Liquid assets defined as the sum of cash, held to maturity securities, available for sale securities, and Federal funds sold account for 31% of a bank's total assets.[11] On the liability side, 69% and 20% of a bank's liabilities are core deposits and non-core liabilities respectively. Shareholders' equity represents 10% of a bank's total liabilities.

Panel B reports the annual growth rate of each balance sheet item in Panel A for all banks in the sample. The real estate boom is clearly reflected in the 29% mean growth rate of real estate loans on these banks' balance sheets, but the mean C&I loan growth is nearly as fast (25%). Given the rapid growth in the three indicated asset classes, the 17% annual growth rate of total assets at the sample banks is unsurprising. On the liability side in Panel B, non-core liabilities grow much more quickly (a mean of 31% per year) than core deposits (18%) or equity (14%).

Panel C reports the change in the balance sheet composition from 1996 to 2006 for banks that stay in the sample for the whole sample period. Again, the real estate boom is clearly indicated by the increase of 13 percentage points in real estate loans' share of the balance sheet. At the same time, C&I loans' share of bank balance sheets falls slightly (a mean of 1%) even while such loans expanded at an average of 25% per year. The higher real estate loan share is offset by a reduction in liquid assets. On the liability side, core deposits fall 11% as a fraction of total assets, while non-core liabilities offset this fall. The asset growth

the extent that bank holding companies manage an active internal capital market so that capital flows from banks in strong housing areas to those in relatively weak housing areas, our estimation using bank level data tend to underestimate the impact of house prices on bank credit supply.

[11] The growth rates in this table are generally overstated because part of the growth is due to bank mergers. In our estimation, we adjust the effect of bank mergers so that we focus on effect of housing market on bank internal growth. The adjustment is described in Section 4.7.

and portfolio changes at sample banks are accompanied by no change in equity's mean or median share of the balance sheet.[12]

4.2 Small business loans

Small business loan data are obtained from the Federal Financial Institutions Examination Council (FFIEC) web site. Small business loans are defined by FFIEC as loans whose original amounts are $1 million or less. Under the Community Reinvestment Act (CRA), all financial institutions regulated by the Office of the Comptroller of the Currency, Federal Reserve System, Federal Deposit Insurance Corporation (FDIC), and the Office of Thrift Supervision that meet the asset size threshold are subject to data collection and reporting requirements. Before 2005, commercial banks that own assets over $250 million or are members of bank holding companies with assets over $1 billion must report the data of small business lending. In 2005 an easing of report requirement only requires banks with assets over $1 billion to report and banks with assets under $1 billion have the option of reporting voluntarily. Figure 3 shows the time-series variation in the total amount of small business loan origination in the US from 1997 to 2011. What is remarkable is the sharp rise and fall of small business loans before and after the recent financial crisis.

During the 1997 to 2006 sample period, 1,431 commercial banks in our call report sample report small business lending under CRA. The median assets of these banks is about $500 million, compared to the median assets of $155 million of all commercial banks, reflecting the requirement for large banks to report. Of those banks that report, small business loans account for about 14% of a bank's total loans. The lending of small business loans are reported by each bank at the county level, covering a total of 3,232 counties during the sample period. The mean and median numbers of counties that a bank lends to in a given year are 60 and 14 respectively, reflecting the fact that a small fraction of large banks lend

[12] This is not the same as saying that regulatory capital ratios were unaffected.

to as many as several hundreds of counties. The availability of small business lending at the county level is crucial for identifying the impact of real estate shocks on bank credit supply in the paper. In total our small business loan sample includes 485,390 bank-county-year observations.

4.3 Real estate prices

The residential house price index at the MSA level is from the Federal Housing Finance Agency (FHFA). The FHFA's residential house price index represents the most comprehensive house price index covering most MSAs, with a starting date between 1976 and the mid-1980s. It is also available at the state level since 1975. To measure a bank's exposure to real estate prices, we look at the real estate shocks where banks have depository branches and construct a weighted house price index for each bank using the amount of deposits as the weight. The deposits data are obtained from FDIC's Summary of Deposits database. The locations of bank branches are matched to FHFA MSAs using a linking file from the Bureau of Economic Analysis (http://www.bea.gov/regional/docs/msalist.cfm). Any branch located where the residential house prices or the housing supply elasticity (discussed below) is not available, this branch will be ignored in our construction of real estate shocks.

4.4 Housing supply elasticity

Local housing supply elasticities are estimated by Saiz (2010) using satellite-generated geographic data on land use. Specifically, for each MSA Saiz (2010) measures the fraction of undevelopable area within 50-km radius from the metropolitan central city. Saiz (2010) emphasizes that this measure of exogenously undevelopable land represents an ex ante physical constraint on housing supply, as opposed to ex post ease of development. Saiz (2010) then shows land constrained cities have lower housing supply elasticities—the same change in housing demand causes the house prices in MSAs with more undevelopable area to increase more. Saiz (2010) provides the estimates of housing supply elasticities for 95 MSAs with population over 500,000 in the 2000 Census. For example, Miami has the lowest supply elasticity of 0.6, while Wichita, KS has the highest supply elasticity of 5.45. The elasticities for other MSAs are available in Table VI (p. 1283–1284) of Saiz (2010).

Because one of the MSAs in Saiz (2010) (Greenville-Spartanburgh-Anderson) corresponds to two MSAs in the FHFA house price data and the local economic data, merging these data sets results in a 1,056 year-MSA observations for 96 MSAs from 1996 to 2006, which is used in our preliminary stage regression.

4.5 Local economic conditions

To focus on the impact of real estate shocks, we control for local economic conditions in our estimations. We obtain GDP, income, population data at the MSA level from the Bureau of Economic Analysis. The GDP data at the MSA level are not available until 2001, so we use total personal income to measure local economic conditions. In the years when GDP data are available, the correlation between GDP and total personal income is 99.3%.

4.6 County employment

We obtain annual county level employment data from the County Business Patterns (CBP) released by the Census Bureau. The CBP employment data include the number of establishments by establishment size and industry. In our estimation, we follow Adelino et al. (2014b) to break down establishments into five categories: one to four employees, five to nine, ten to 19, 20 to 49, and 50 or more. Because the Census Bureau only reports the number of establishments by size category but not the total employment for each category, we also follow Adelino et al. (2014b) to calculate the employment in each category by multiplying the number of establishments and the middle point of employees in each category. The breakdown of establishments by the number of employees allows us to estimate the impact of loan supply on employment growth for each establishment category.

4.7 Bank mergers and acquisitions

We adjust the effect of bank mergers in analysing the impact of house prices on the growth and composition of bank balance sheets. We obtain bank mergers and acquisitions data from the Federal Reserve Bank of Chicago.[13] Among the 4,505 banks in our sample, 1,043 banks have acquired a total of 3,784 banks within or outside of our sample during the sample period. Acquired banks are automatically dropped out of the sample after the acquisitions. For acquiring banks, we adjust their balance sheet in the following ways. For mergers in year t, we calculate the ratio of the acquiring bank's balance sheet items to the sum of these items of the two merging banks in year $t-1$. In year t and beyond, we adjust each of the combined bank's balance sheet items by multiplying it by the pre-merger ratio. For multiple mergers by the same acquiring banks in the same year or over time, the adjustment is made in a similar manner.

For small business loans at the bank-county level, we make the adjustment for each bank-county pair. Specifically, if two merging banks make loans to same counties, we first calculate the ratio of loan amount made by the acquiring bank to the total amount of the two banks in year $t-1$. Then in year t and beyond, the surviving bank's small business loans to that county are adjusted by this per-merger ratio.

5 Bank balance sheet and real estate prices

In this section, we estimate the impact of house prices on the growth and composition of bank balance sheets and bank supply of small business loans. We then estimate the impact of bank supply of small business loans on the employment of local businesses at the county

[13] http://www.chicagofed.org/webpages/publications/financial_institution_reports/merger_data.cfm

level.

We measure house price shocks by the fluctuation in the weighted average of house prices in MSAs where a bank has depositary branches, with the weight being the amount of deposits in a given MSA. To control for economic conditions that also impacts the financial industry, we include weighted total personal income and weighted income per capita in the regressions. More importantly, to identify the causal effect of house prices on bank balance sheets and to exclude the potential bias that arises from reverse causality or omitted variables, we use housing supply elasticity as an IV for house price changes in cross-sectional regressions and the weighted predicted house prices ($\widehat{REprice}$) defined in Section 3.2 as an IV for the weighted house prices in the panel estimation.

Cross-sectional results

Our starting point is a simple cross-sectional estimation of the effect of house prices on bank balance sheets:

$$\Delta Y_i = \alpha + \beta_1 \Delta(REprice_i) + \beta_2 \Delta(Inc_i) + \beta_3 \Delta(Pop_i) + \rho Ln(Y_{i,0}) + \boldsymbol{\gamma X}_{i,0} + \epsilon_{i,t} \quad (4)$$

where the growth of bank balance sheet items is regressed on the growth of house prices, total personal income, population, and the logged beginning value of the variable of interest, and beginning values of bank characteristics that have been shown in the literature to affect bank credit supply such as bank size (log bank assets), capitalization (equity to assets ratio), income, and whether the bank belongs to a bank holding company. A similar regression framework is used by Mian and Sufi (2011) to analyze the effect of house price growth on household leverage growth. Balance sheet items are adjusted for mergers. The adjustment is described in Section 4.7.

[Insert Table 4 near here]

Table 4 reports the estimation results using data during the strong real estate booming period of 2001 to 2006. A bank is included in the analysis only if it appears in the sample in both 2001 and 2006. This leaves us with 2,279 banks. In the appendix (Table B1), we present the results of examining bank growth during the whole sample period of 1996 to 2006, where a smaller sample of 1,768 banks are analyzed.

Panel A of Table 4 reports the results of OLS estimation, and Panel B the results of IV estimation where the housing supply elasticity is used as an instrument for house price growth from 2001 to 2006. Both Panels show that real estate price appreciation leads to substantial growth in bank size, and the effect is larger in the IV estimation. Column (1) of Panel B shows that when real estate price increases by 1%, a bank's total assets increase by 0.94%. In particular, the growth is across all the major items on the bank's balance sheet. On the assets side, when real estate prices increase by 1%, real estate loans, C&I loans, and liquid assets increase by 1.38%, 0.29%, and 0.31% respectively.

Note that even though Table 4 shows that real estate loans grow faster than C&I loans when real estate prices rise, the fact that C&I loans also increase rapidly with real estate prices suggests that the growth in real estate credit does not seem to crowd out C&I credit. But of course the growth in C&I loans does not necessarily suggest banks increase their supply of C&I loans either—the expansion of C&I credit could be solely driven by demand. For example, when real estate prices rise, firms with substantial real estate holdings could decide to borrow more bank loans against the appreciated collateral value to either reduce borrowing costs or to make investments (Chaney et al. (2012), Adelino et al. (2014b), and Lin (2014)). To examine whether banks cut back on commercial lending during the real estate boom, in the next section, we turn our attention to bank lending of small business loans at the county level, which allows us to decompose the growth in lending into supply shocks and demand shocks.

From looking at the asset side, it is very clear that bank lending rises substantially during the real estate boom. How do banks finance the fast growth in their investment in loans? Traditionally the main source of funding of commercial banks is retail deposits. But because retail deposits generally grow in proportion to the size of the economy and when retail deposits can not keep pace with bank asset growth, banks turn to other funding sources such as federal funds, foreign deposits, and brokered deposits. Recent studies have shown that such wholesale funding became an important source of funding for the financial sector prior to the financial crisis and the reliance on wholesale funding partly contributed to the vulnerability of banks during the financial crisis (Demirg-Kunt and Huizinga (2010) and Hahm, Shin, and Shin (2013)).

In Columns (5) through (7) we look at how banks' funding responds to house prices. It is shown that none-core liabilities do have a larger sensitivity to house prices than equity or core deposits, suggesting that in the years leading up to the financial crisis, banks from regions with bigger house price booms became more reliant on non-traditional funding sources that are perceived by many to be unstable and risky.

Panel estimation: Pooled OLS results

Table 4 presents strong evidence that banks in real estate booming areas grow faster and make more loans in the years leading up to the financial crisis. Next, we examine whether this effect exists in the time series as well as across geographic locations by exploring the panel nature of our data. The first model we estimate is,

$$\Delta Y_{i,t} = \alpha + \beta_1 \Delta REprice_{i,t} + \beta_2 \Delta(Inc_{i,t}) + \beta_3 \Delta(Pop_{i,t}) + \rho Ln(Y_{i,t-1}) + \boldsymbol{\gamma} \boldsymbol{X}_{i,t-1} + \mu_t + \epsilon_{i,t} \quad (5)$$

where $\Delta Y_{i,t} = \frac{Y_{i,t} - Y_{i,t-1}}{Y_{i,t-1}}$ is the annual growth rate of bank balance sheet items such as real estate loans, C&I loans, core deposits, etc., $\Delta REprice$ is the growth rate of deposit-weighted house price index, ΔInc is the growth rate of weighted total personal income, and ΔPop is the growth rate of weighted population, and μ_t is year fixed effects.

[Insert Table 5 near here]

Panel A of Table 5 reports the estimation results. The estimated effect of house prices on bank growth is very close to that in Panel B of Table 4, with house prices having a slightly smaller effect on asset growth, real estate loan growth, and a larger effect on the growth of C&I loans. Bank level control variables also have same signs as in the cross-sectional regressions. The growth rate of balance sheet items are negatively correlated the starting values. Holding constant the size of a balance sheet item, the larger the bank (thus the smaller share this item is in the bank total assets or liabilities), the larger the growth rate is. Capitalization is significantly positively correlated with bank growth. Bank profitability, however, is significantly negatively correlated with bank growth in both the cross-sectional regression and in pooled OLS regressions. With respect to the impact of economy size and population, bank assets and credit generally increase with the size of the economy (total personal income) and decrease with income per capita, suggesting that if we hold the size of the economy constant, population has a positive impact on balance sheet size.

Panel estimation: First difference results

The next model we estimate is

$$\Delta Y_{i,t} = \alpha + \beta_1 \Delta(REprice_{i,t}) + \beta_2 \Delta(Inc_{i,t}) + \beta_3 \Delta(Pop_{i,t}) + \rho \Delta Y_{i,t-1} + \boldsymbol{\gamma} \Delta \boldsymbol{X}_{i,t-1} + \mu_t + \epsilon_{i,t} \quad (6)$$

where the lagged bank balance sheet items and bank level controls enter into the regressions in either growth rates or changes. This model serves to eliminate bank fixed effects—this specification is similar to having the log of bank balance sheet size as the dependent variable and then eliminating bank fixed effects by first-differencing Eq. (1). This can be seen if the growth rate is approximated by log changes. Then Eq. (6) is essentially the first difference of the following model,

$$Ln(Y_{i,t}) = \alpha_i + \beta_1 Ln(REprice_{i,t}) + \beta_2 Ln(Inc_{i,t}) + \beta_3 Ln(Pop_{i,t}) + \rho Ln(Y_{i,t-1}) + \boldsymbol{\gamma} \boldsymbol{X}_{i,t-1} + \mu_t + \epsilon_{i,t} \tag{7}$$

Panel B of Table 5 reports the estimation results. House prices continue to have a statistically positive effect on the growth of bank assets and all the major items except for liquid assets. The effect of house price appreciation on C&I credit growth is similar to that in Panel A and larger than those estimated in the cross-sectional regressions. Bank profitability is now positively correlated with bank growth.

It is well known that when the lagged dependent variable is included in the fixed effects estimation as in Eq. (6) or Eq. (7), the estimators could be inconsistent because of the correlation between the lagged dependent variable and the error term. To address this issue, we treat $\Delta Y_{i,t-1}$ as endogenous and use $Ln(Y_{i,t-2})$ and $\Delta Y_{i,t-2}$ as an instrument for $\Delta Y_{i,t-1}$, a approach proposed by Anderson and Hsiao (1982) and Arellano and Bond (1991). The results are reported in Panel C. Compared to the estimators in Panel B, the coefficients of $\Delta Y_{i,t-1}$ become much larger in most columns, suggesting potential underestimation of the path dependence in Panel B. The effects of house price growth, however, are largely in line with the estimation in Panel B, with the effect on C&I loan growth somewhat smaller.

Because real estate prices have a non-uniform impact on the growth of bank balance sheet items, it changes bank asset structure and liability structure. In Table B2, we examine how each balance sheet item as a fraction of total assets varies with real estate prices. As expected, when house prices increase, real estate loan shares increase while C&I loan share and liquid assets share drop. On the liability side, non-core liabilities become a more important funding source, relative to core deposits.

Taken together, the findings in this section partially answer the question raised by Gorton and Metrick (2012) about the causal relationship between credit booms and housing booms by showing that real estate boom causes the growth not only in real estate credit but also in C&I credit, even after controlling for the growth in local economy where banks operate. This suggests that real estate boom has a positive impact on banks' extension of C&I loans beyond the impact of local economic conditions. This could be due to that real estate boom increases the demand or supply of C&I loans or a combination of both. In the next section, we turn to small business lending in order to identify the impact of house prices on bank supply of C&I credit.

6 Bank supply of small business loans

In this section, we are interested in estimating the impact of real estate prices on bank supply of C&I loans. The challenge to identify credit supply is to control for the demand channel discussed above. For this purpose, we turn to the small business loan data obtained through CRA. Compared to call reports, the advantage of small business loans data is that the data are at the bank-county level instead of being aggregated at the bank level. This allows us to control for credit demand by comparing small business loan growth from different banks to the same county. We adopt two approaches to exploit the within-county variation in loan growth. To illustrate the two approaches, we start by following the literature to write the growth in lending as,

$$y_{i,j,t} = \alpha_{i,t} + \beta_{j,t} + \epsilon_{i,j,t} \tag{8}$$

where $y_{i,j,t}$ is the growth rate of small business loans extended by bank i to county j from year $t-1$ to year t, $\alpha_{i,t}$ captures the bank credit supply shocks, and $\beta_{j,t}$ captures the county credit demand shocks. To examine the impact of certain variables on bank credit supply, one could estimate Eq. (8) using a large set of time-varying county and bank fixed effects as in Greenstone and Mas (2012), and then estimate the effect of these variables on $\alpha_{i,t}$, which are purged of banks' differential exposure to regional variation in demand of small business loans. This is in similar spirit to the popular approach in the literature of regressing loan growth on variables of interest and controlling for credit demand using borrower-year fixed effects (Khwaja and Mian (2008), Jimenez et al. (2012), and Schnabl (2012)). The only difference is that banks with more borrowers have bigger impact in the borrower-year fixed effects estimation because the estimation is conducted at the bank-borrower level as opposed to the bank level.

Our first approach simply controls for credit demand by county-year fixed effects. The model we estimate here is,

$$\begin{aligned} Ln(Sbl_{i,j,t}) =& \alpha + \beta_1 Ln(REprice_{i,t}) + \beta_2 Ln(Inc_{i,t}) + \beta_3 Ln(Pop_{i,t}) + \beta_4 Ln(Sbl_{i,j,t-1}) \\ &+ \beta X_{i,t-1} + \mu_{i,j} + \gamma_{j,t} + \epsilon_{i,j,t} \end{aligned} \tag{9}$$

where $Sbl_{i,j,t}$ and $Sbl_{i,j,t-1}$ are the amount of small business loans originated by bank i to county j in year t and $t-1$ respectively, $\mu_{i,j}$ is bank-county fixed effects, and $\gamma_{j,t}$ is county-year fixed effects. The amount of small business loans is adjusted for mergers. The description of the adjustment is in Section 4.7.

Column (1) and (2) of Table 6 show that banks with positive house price shocks increase their supply of small business loans. Column (2) shows that a 1% increase in house prices leads to a 2.14% increase in the supply of small business loans. The results thus support the hypothesis that house price boom has a positive effect on business loans through the bank lending channel.

[Insert Table 6 near here]

The county-year fixed effects estimation, however, has some limitations. As argued by Amiti and Weinstein (2013), estimating Eq. (8) by fixed effects is not efficient because it ignores a large number of adding-up constraints. In particular, a county cannot borrow more without at least one bank lending more, and a bank cannot lend more without at least one county borrowing more. They show that ignoring the adding-up constraints produces estimates of bank lending growth that are widely different from the actual growth rates.

Thus our second approach follows Amiti and Weinstein (2013) to decompose growth in small business loans into supply shocks and demand shocks. The estimated bank supply shocks will also be used in Section 7 to examine whether bank credit supply affects local employment growth. By acknowledging the adding-up constraints, Amiti and Weinstein (2013) show that imposing the moment condition $E[\epsilon_{i,j,t}] = 0$ allows them to solve for $\alpha_{i,t}$s and $\beta_{j,t}$s from the following equations,

$$D^B_{i,t} = \alpha_{i,t} + \phi_{i,j,t-1}\beta_{j,t} \tag{10}$$

$$D^C_{j,t} = \beta_{j,t} + \theta_{i,j,t-1}\alpha_{i,t} \tag{11}$$

where $D^B_{i,t}$ is the growth rate of lending of bank i to all of its counties from year $t-1$ to year t, $D^C_{j,t}$ is the growth rate of borrowing of county j from all of its banks, $\phi_{i,j,t-1} = \frac{L_{i,j,t-1}}{\sum_j L_{i,j,t-1}}$ is the share of bank i's loans obtained by county j, and $\theta_{i,j,t-1} = \frac{L_{i,j,t-1}}{\sum_i L_{i,j,t-1}}$ is the share of county j's loans obtained from bank i. Eq. (10) and (11) provides a system of $B+C$ equations and $B+C$ unknowns in each period that enables solving for a unique set of bank and county shocks in each time period, where B is the total number of banks and C is the total number of counties in each period.

We follow Amiti and Weinstein (2013)'s methodology outlined above to estimate the growth in bank supply of small business loans in each year from 1998 to 2006.[14] Eventually, we end up with a sample of 7,855 bank-year observations, for which we are able to estimate the shocks to bank loan supply. The correlation between the estimated loan supply shocks and the actual growth rate in lending in our sample is 0.82.

[14]For detailed illustration of the decomposition, see P.5-7 and Appendix 1.1 of Amiti and Weinstein (2013).

We then estimate the impact of house prices on the growth of small business loan supply.

$$
\begin{aligned}
Loan\_G_{i,t} =& \alpha + \beta_1 Ln(REprice_{i,t}) + \beta_2 Ln(Inc_{i,t}) + \beta_3 Ln(Pop_{i,t}) + \beta_4 Ln(Sbl_{i,t-1}) \\
& + \beta X_{i,t-1} + \mu_{i,j} + \gamma_{j,t} + \epsilon_{i,j,t}
\end{aligned} \tag{12}
$$

where $Loan\_G_{i,t}$ is the estimated growth rate of loan supply from year $t-1$ to year t. We estimate the model both by standard fixed effects method and by Arellano and Bond (1991)'s "Difference GMM", where the lagged levels of the independent variables are used as instruments for the first difference of the independent variables. The log value of predicted house prices from Eq. (3) is still used as an IV for $Ln(REprice_{i,t})$. The results are presented in Column (3) and (4) of Table 6. The results show that real estate prices have a significantly positive impact on bank credit supply. A 1% increase in real estate prices causes banks to increase supply of small business loans by 0.76% based on fixed-effects estimation and 0.52% based on "Difference-GMM" estimation. This finding suggests that the real estate boom before the recent financial crisis did not crowd out bank lending to the real economy. On the contrary, it suggests that real estate price appreciation strengthened bank balance sheets and allowed banks to take more risks and increase their credit supply. Overall, the results in Section 5 and 6 provide novel evidence of a bank lending channel of property prices.

7 The real effect of house price booms through bank balance sheet channel

So far we have presented evidence that banks expand their credit supply when house prices appreciate. In this section, we investigate whether the credit expansion has any real effect. In particular, we examine whether house price shocks in one region where a bank is exposed to affect the employment growth in other regions where the banks lend to. This approach is similar in spirit to that in Murfin (2012) and allows us to test the real effect of house prices booms through the bank credit supply channel as opposed to the collateral channel that has been examined in the literature (Adelino et al. (2014b) and Loutskina and Strahan (2015)). Our bank housing shock at the county level is constructed as follows. For each bank i that has operations (deposits) in county j, we first compute the deposits weighted house price shocks in MSAs outside of county j's state that bank i has operations (deposits).

$$Housing\ shock_i = \sum_{s=1}^{N} \omega_s House\ price\ growth_s$$

Then for each county, the house price shocks to the banks are aggregated

$$Bank\ housing\ shock_j = \sum_{i=1}^{M} \omega_i Housing\ shock_i$$

where ω_i is the share of bank i's deposits in county j.

For this analysis, we again focus on the period of 2001 to 2006. Our county level bank housing shock has a mean of 0.529 and standard deviation of 0.194. The three counties with the highest bank housing shocks are Pueblo, CO, Outagamie, WI, and McLennan, TX. The largest bank by deposits share in each of the three counties is Wachovia, Marshall & Ilsley, and Guaranty Bank, respectively. All three banks had aggressively expanded in regions with large house price booms during this period. In particular, both Marshall & Ilsley Bank, and Guaranty Bank were both based in states with relatively quiet real estate markets during the period (Wisconsin and Texas, respectively) and also had operations in one of the hot real estate markets (Arizona for Marshall & Ilsley Bank and California for Guaranty). The exposure to hot housing market turned out to be disastrous for these two banks when the housing market eventually cooled down, but during the boom period presumably allowed them to grow fast and boost their profits.[15] Whether the house price appreciation in Arizona, Florida, and California has any effect on the local economy of Wisconsin and Texas through the bank credit supply channel is our focus in this section.

[15] For related press stories, see *"Departure from conservative origins doomed Marshall & Ilsley Bank"* and *"Texas bank hit by California dreaming"*.

We focus on the growth of employment in small businesses, defined as those with 50 or fewer employees. The reason is that large corporations are less likely to be restricted by local credit supply shocks because they tend to borrow from large national banks and their headquarters might be located in different places where their employees are located.

Table 7 presents the results. Column (1) shows that during the 2001 to 2006 period, a 10% increase in the real estate prices in other states banks operate leads to a statistically significant increase in the employment of small businesses by 1.5%.(The average employment growth of small businesses is 9.79% from 2001 to 2006 for the 1,028 counties in our estimation.) In column (2), to address the concern that house price shocks in other regions might be correlated with the county's own real estate price shocks and the effect might simply be driven by the collateral channel commonly shown in the literature, we also control for the county's own real estate price growth in the estimation. Doing so reduces the estimated effect of bank housing shock to 1.1% from 1.5%, the the effect remains statistically significant. In column (3), we further control for the the population shocks and income shocks in in other states banks operate (defined similarly to the *Bank housing shock*) and the starting population, total income, and employment of small businesses. Adding these controls further reduces the estimated effect of *Bank housing shock* to 0.7%. Population growth in different regions that banks are exposed to also has a significant positive effect on a county's employment growth. Lastly, in the last column, we report the results of the weighted OLS estimation where the weight is the small business employment in 2001.

8 Conclusion

Credit booms and housing booms often go hand in hand. While theories suggest that credit and house prices could impact and reinforce each other, empirical evidence on the causal effect of one on another has been very limited. This paper estimates the impact of house prices on bank lending, financing, and credit supply by exploiting the cross-sectional variation in the change of house prices across major US MSAs. To try to identify a causal relationship, we rely on the cross-sectional difference in real estate cycles caused by natural geographical constraints. We show that housing booms have a large positive impact on the growth of both real estate credit and C&I credit beyond the impact of local economic conditions. Banks meet the fast growth in credit by increasingly rely on nontraditional financing such as federal funds, foreign deposits, and brokered deposits. The positive effect of real estate prices on credit and especially C&I credit is likely to be a result of both credit demand channel (firms with appreciated real estate collateral demand more bank credit when real estate price rises) and credit supply channel (strengthened bank balance sheets allow banks to take more risk and extend more credit). To identify if the supply channel story is supported by the data, we analyze bank origination of small business loans at the county level so that we can decompose growth in lending into credit supply shocks and credit demand shocks. Our finding suggests that house price appreciation has a positive causal effect on bank credit supply. Lastly, we show that the shocks to small business loan supply are positively correlated with the employment growth of small establishments, suggesting that the housing booms could impact the real economy through the bank lending channel.

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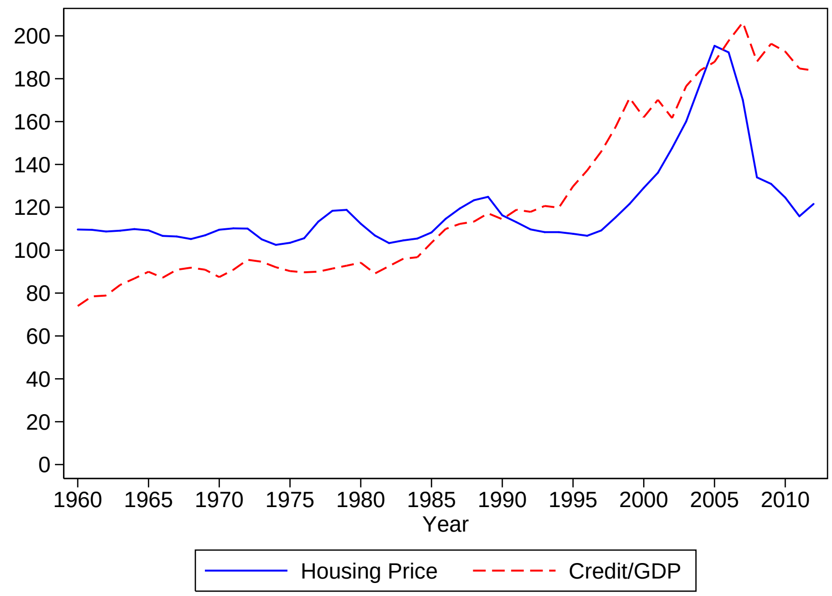

Fig. 1. U.S. Domestic credit to private sector (% of GDP) and house prices from 1960 to 2012. Source: World Bank and S&P/Case-Shiller Home Price Indices.

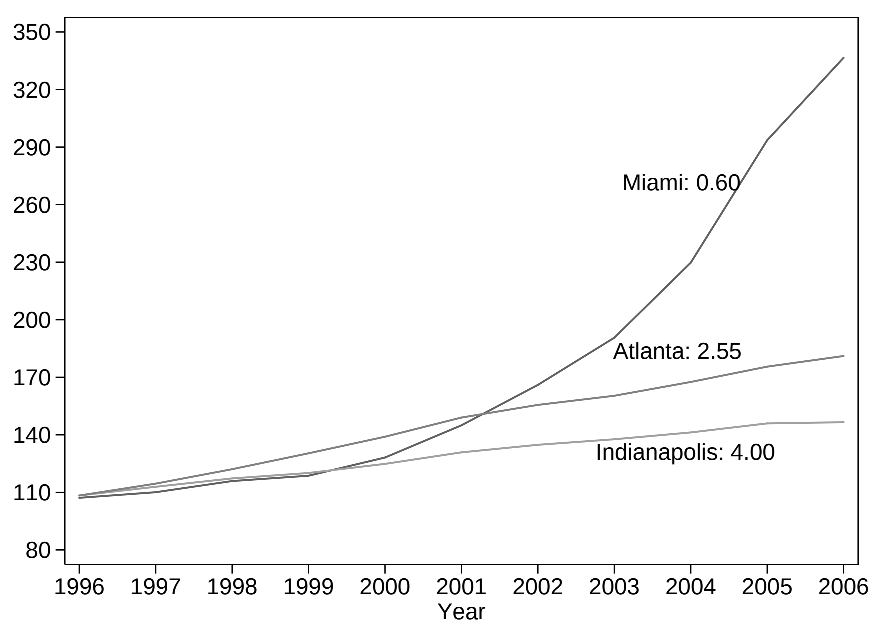

Fig. 2. House price index: 1993–2011. The house price index is the quarterly residential house price index at the MSA level from the FHFA. The number after each city name is the city's housing supply elasticity estimated by Saiz (2010).

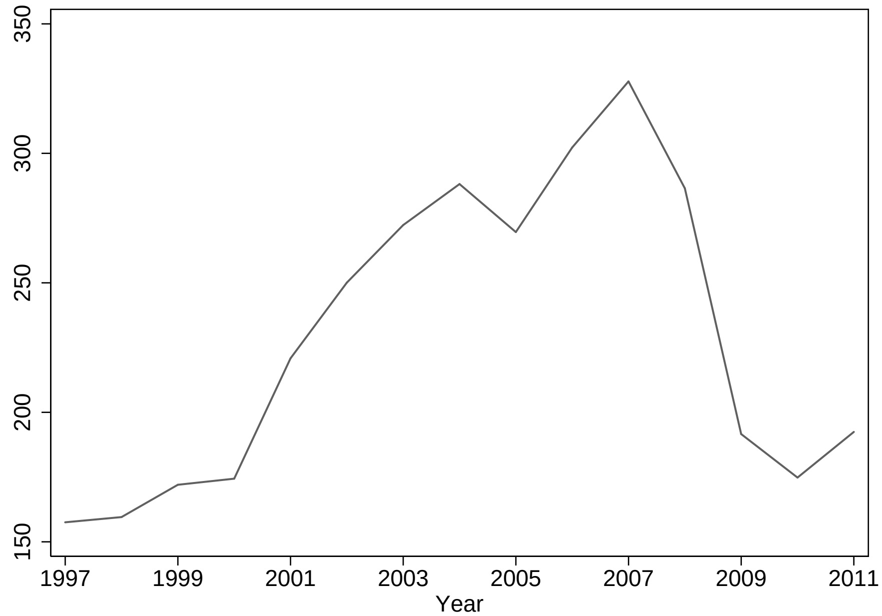

Fig. 3. Amount of small business loans originated (in $ billion): 1997–2011. Source: Federal Financial Institutions Examination Council (FFIEC). Small business loans are defined by FFIEC as loans whose original amounts are $1 million or less.

Table 1. Test of the correlation between local housing supply elasticity and local income and population growth

The dependent variable is the growth of real estate price, total personal income, and population at the MSA level from 1996 to 2006. *Elasticity* is the housing supply elasticity defined by Saiz (2010). Standard errors are in parentheses.

	(1)	(2)	(3)
	REprice growth	*Income growth*	*Population growth*
Elasticity	-0.36^{***}	-0.03	0.01
	(0.05)	(0.02)	(0.01)
Constant	1.61^{***}	0.81^{***}	0.12^{***}
	(0.10)	(0.05)	(0.03)
R-squared	0.381	0.025	0.003
N	96	96	96

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

Table 2. Preliminary-stage regression: the impact of local housing supply elasticity on house prices

The dependent variable is the annual residential real estate price index at the MSA level for 96 MSAs from 1996 to 2006. *Elasticity* is the demeaned housing supply elasticity defined by Saiz (2010). Standard errors are in parentheses.

	(1)	
	$HousingPrice$	
Constant	106.73***	(1.13)
(Year=1997)	3.26	(1.60)
(Year=1998)	9.04***	(1.60)
(Year=1999)	14.09***	(1.60)
(Year=2000)	20.61***	(1.60)
(Year=2001)	29.29***	(1.60)
(Year=2002)	35.78***	(1.60)
(Year=2003)	46.19***	(1.60)
(Year=2004)	62.49***	(1.60)
(Year=2005)	80.91***	(1.60)
(Year=2006)	90.18***	(1.60)
$(Year = 1997) \times Elasticity$	-.13	(1.11)
$(Year = 1998) \times Elasticity$	-.47	(1.11)
$(Year = 1999) \times Elasticity$	-1.15	(1.11)
$(Year = 2000) \times Elasticity$	-2.83*	(1.11)
$(Year = 2001) \times Elasticity$	-3.96**	(1.11)
$(Year = 2002) \times Elasticity$	-5.69***	(1.11)
$(Year = 2003) \times Elasticity$	-8.05***	(1.11)
$(Year = 2004) \times Elasticity$	-12.81***	(1.11)
$(Year = 2005) \times Elasticity$	-19.23***	(1.11)
$(Year = 2006) \times Elasticity$	-20.28***	(1.11)
MSA fixed effects	Yes	
R-squared	0.815	
N	2,893	

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

Table 3. Summary statistics

This table presents the summary statistics of bank balance sheet items. The sample period is from 1996 to 2006. Variables are defined in Appendix A.

	Mean	Median	Std	Min	Max	No. of Obs
Panel A: Balance sheet composition						
Assets						
Loans	0.64	0.65	0.15	0.00	1.00	34,357
Real estate loans	0.44	0.44	0.17	0.00	0.97	34,357
C&I loans	0.11	0.09	0.09	0.00	0.98	34,357
Personal loans	0.06	0.04	0.08	0.00	1.00	34,357
Other loans	0.03	0.01	0.05	0.00	0.80	34,357
Liquid assets	0.31	0.29	0.15	0.00	0.99	34,357
Fixed assets	0.02	0.02	0.02	0.00	0.25	34,357
Other assets	0.03	0.02	0.06	0.00	0.89	34,357
Liabilities						
Core deposits	0.69	0.72	0.14	0.00	0.95	34,357
Non-core liabilities	0.20	0.17	0.13	0.00	0.93	34,357
Equity	0.10	0.09	0.05	0.00	0.92	34,357
Other liabilities	0.01	0.01	0.02	0.00	0.60	34,357
Panel B: Annual growth rate of balance sheet items						
Assets	0.17	0.11	0.18	-0.07	1.03	4,505
Real estate loans	0.29	0.15	0.47	-0.18	3.35	4,505
C&I loans	0.25	0.13	0.46	-0.31	2.99	4,505
Liquid Assets	0.11	0.06	0.25	-0.28	1.61	4,505
Liabilities	0.17	0.11	0.18	-0.07	1.03	4,505
Core deposits	0.18	0.09	0.27	-0.15	1.67	4,505
Non-core liabilities	0.31	0.18	0.49	-0.25	3.41	4,505
Equity	0.14	0.10	0.16	-0.11	0.98	4,505
Panel C: Change in balance sheet composition from 1996 to 2006						
Assets						
Δ Real estate loans	0.13	0.13	0.15	-0.61	0.65	1,794
Δ C&I loans	-0.01	-0.00	0.07	-0.47	0.85	1,794
Δ Liquid assets	-0.13	-0.13	0.14	-0.71	0.57	1,794
Liabilities						
Δ Core deposits	-0.11	-0.10	0.13	-0.89	0.70	1,794
Δ Non-core liabilities	0.11	0.09	0.13	-0.71	0.87	1,794
Δ Equity	0.00	0.00	0.05	-0.63	0.49	1,794

Table 4. Bank balance sheet growth from 2001 to 2006

The dependent variables in Column (1) through (7) are annualized growth rate of the amount of total assets, real estate loans, C&I loans, liquid assets, equity, core deposits, and noncore liability, from 2001 to 2006. The main independent variable is the annualized growth rate of weighted average of house prices in which a bank has depository branches, with the weight being the amount of deposits in each branch. *Inc* is the weighted total personal income. *Pop* is the weighted population. Housing supply elasticity is used as an instrument for house price growth in the IV estimation. *Y* denotes the dependent variable (before the change). *Capitalization* is equity to assets ratio. *Net income* is the income to assets ratio. *BHC* is a dummy variable equals to one if a bank belongs to a bank holding company that owns more than one commercial banks, and 0 vice versa. Δ denotes the growth rate of the variable.

	Assets				Liabilities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Assets	*RE Loan*	*C&I Loan*	*Liquid*	*Equity*	*Core deposits*	*Noncore deposits*
$\Delta REprice$	0.84***	1.51***	0.67***	0.38***	0.97***	0.61***	2.03***
	(0.08)	(0.13)	(0.19)	(0.07)	(0.09)	(0.07)	(0.24)
ΔInc	−0.33**	−0.96***	−0.33	−0.10	0.08	−0.22	−0.94*
	(0.16)	(0.27)	(0.41)	(0.15)	(0.20)	(0.15)	(0.52)
ΔPop	0.74***	1.99***	0.72	0.25	0.29	0.59**	1.81**
	(0.27)	(0.45)	(0.67)	(0.24)	(0.32)	(0.24)	(0.85)
$Ln(Assets_{2001})$	−0.05***	0.59***	1.09***	0.63***	1.10***	0.52***	1.02***
	(0.02)	(0.07)	(0.06)	(0.04)	(0.29)	(0.08)	(0.13)
$Ln(Y_{2001})$		−0.69***	−1.07***	−0.62***	−1.14***	−0.57***	−1.15***
		(0.06)	(0.05)	(0.04)	(0.29)	(0.08)	(0.11)
$Capitalization_{2001}$	2.96***	5.15***	8.15***	1.07**	2.29	3.29***	11.11***
	(0.60)	(1.01)	(1.50)	(0.54)	(2.32)	(0.55)	(1.90)
$Net\ Income_{2001}$	−47.20***	−80.29***	−82.64***	−21.42***	−33.69***	−37.55***	−105.19***
	(2.70)	(4.45)	(6.71)	(2.39)	(3.24)	(2.45)	(8.68)
BHC_{2001}	0.02	−0.01	−0.16	0.01	−0.09	0.06	−0.16
	(0.06)	(0.11)	(0.16)	(0.06)	(0.08)	(0.06)	(0.20)
R-squared	0.214	0.273	0.230	0.148	0.144	0.215	0.175
N	2,379	2,379	2,379	2,379	2,379	2,379	2,379

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

	Assets				Liabilities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Assets	*RE Loan*	*C&I Loan*	*Liquid*	*Equity*	*Core deposits*	*Noncore deposits*
$\Delta REprice$	1.04***	2.08***	0.61*	0.29**	1.14***	0.65***	2.86***
	(0.14)	(0.23)	(0.34)	(0.12)	(0.17)	(0.12)	(0.44)
ΔInc	−0.41**	−1.20***	−0.30	−0.06	0.01	−0.24	−1.30**
	(0.17)	(0.28)	(0.42)	(0.15)	(0.20)	(0.15)	(0.54)
ΔPop	0.87***	2.36***	0.68	0.19	0.40	0.62**	2.34***
	(0.28)	(0.46)	(0.69)	(0.25)	(0.33)	(0.25)	(0.88)
$Ln(Assets_{2001})$	−0.05***	0.59***	1.09***	0.64***	1.11***	0.52***	0.98***
	(0.02)	(0.07)	(0.06)	(0.04)	(0.29)	(0.08)	(0.14)
$Ln(Y_{2001})$		−0.71***	−1.07***	−0.62***	−1.15***	−0.57***	−1.15***
		(0.06)	(0.05)	(0.04)	(0.29)	(0.08)	(0.11)
$Capitalization_{2001}$	2.87***	4.84***	8.17***	1.11**	2.30	3.27***	10.76***
	(0.61)	(1.02)	(1.50)	(0.54)	(2.32)	(0.56)	(1.91)
$Net\ Income_{2001}$	−45.96***	−76.76***	−83.03***	−22.00***	−32.61***	−37.28***	−100.02***
	(2.80)	(4.63)	(6.94)	(2.48)	(3.35)	(2.54)	(9.00)
BHC_{2001}	0.02	−0.01	−0.16	0.01	−0.09	0.06	−0.15
	(0.06)	(0.11)	(0.16)	(0.06)	(0.08)	(0.06)	(0.20)
R-squared	0.212	0.267	0.230	0.147	0.142	0.215	0.171
N	2,379	2,379	2,379	2,379	2,379	2,379	2,379

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

Table 5. Bank balance sheet size 1996-2006

This table reports the IV estimation of the impact of real estate prices on the size of bank balance sheets. The dependent variables in Column (1) through (7) are the annual growth rate of total assets, real estate loans, C&I loans, liquid assets, equity, core deposits, and non-core liabilities. The construction of the dependent variables are in the appendix. The main independent variable is the growth rate of weighted average of house prices in which a bank has depository branches, with the weight being the amount of deposits in each branch. ΔInc is growth rate of weighted total personal income. ΔPop is the growth rate of weighted population. The growth rate of weighted predicted house prices from Eq. (3) is used as an IV in the estimation. Y denotes the dependent variable (before the change). $Capitalization$ is equity to assets ratio. $Net\ income$ is the income to assets ratio. BHC is a dummy variable equals to one if a bank belongs to a bank holding company, and 0 vice versa. Δ denotes growth rate for variables measured in total amount and difference for variables measured in ratios. Standard errors clustered by bank are reported in the parentheses.

Panel A:							
	(1) *Assets*	(2) *RE Loan*	(3) *C&I Loan*	(4) *Liquid*	(5) *Equity*	(6) *Core deposits*	(7) *Noncore deposits*
$\Delta(REprice_{i,t})$	0.80***	1.13***	0.40**	0.35***	0.78***	0.71***	1.30***
	(0.08)	(0.11)	(0.16)	(0.12)	(0.10)	(0.08)	(0.20)
$\Delta(Inc_{i,t})$	−0.32***	−0.53***	−0.27	0.21	−0.22**	−0.15*	−0.81***
	(0.07)	(0.11)	(0.17)	(0.14)	(0.09)	(0.08)	(0.20)
$\Delta(Pop_{i,t})$	0.48***	0.72***	0.45**	−0.08	0.37***	0.26***	1.03***
	(0.08)	(0.12)	(0.20)	(0.16)	(0.11)	(0.09)	(0.22)
$Ln(Assets_{i,t-1})$	−0.00***	0.02**	0.07***	0.15***	0.34***	0.08***	0.13***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)
$Ln(Y_{i,t-1})$		−0.03***	−0.07***	−0.16***	−0.34***	−0.09***	−0.13***
		(0.01)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)
$Captalization_{i,t-1}$	0.27***	0.22**	0.68***	0.30***	1.74***	0.17***	1.12***
	(0.06)	(0.09)	(0.15)	(0.08)	(0.24)	(0.06)	(0.19)
$Net\ Income_{i,t-1}$	−1.58***	−3.15***	−3.36***	−0.83	−0.80***	−1.70***	−2.86***
	(0.30)	(0.49)	(0.59)	(0.54)	(0.22)	(0.31)	(0.70)
$BHC_{i,t-1}$	0.01**	0.01*	0.00	0.00	−0.00	0.01***	0.02***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	24,811	24,811	24,811	24,811	24,811	24,811	24,811

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

Panel B:

	(1) *Assets*	(2) *RE Loan*	(3) *C&I Loan*	(4) *Liquid*	(5) *Equity*	(6) *Core deposits*	(7) *Noncore deposits*
$\Delta(REprice_{i,t})$	0.46^{***}	0.55^{***}	0.40^{***}	0.11	0.60^{***}	0.41^{***}	0.69^{***}
	(0.05)	(0.08)	(0.14)	(0.12)	(0.09)	(0.06)	(0.18)
$\Delta(Inc_{i,t})$	-0.17^{***}	-0.24^{**}	-0.25	0.30^{**}	-0.14	-0.02	-0.51^{**}
	(0.06)	(0.10)	(0.16)	(0.15)	(0.09)	(0.08)	(0.20)
$\Delta(Pop_{i,t})$	0.27^{***}	0.34^{***}	0.34^{*}	-0.20	0.26^{**}	0.08	0.63^{***}
	(0.07)	(0.11)	(0.20)	(0.17)	(0.11)	(0.09)	(0.23)
$\Delta(Assets_{i,t-1})$	0.29^{***}	0.24^{***}	0.25^{***}	0.43^{***}	0.39^{***}	0.29^{***}	0.50^{***}
	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
$\Delta Y_{i,t-1}$		0.10^{***}	0.04^{***}	-0.18^{***}	-0.15^{***}	-0.05^{**}	-0.05^{***}
		(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)
$\Delta Captalization_{i,t-1}$	-0.08	-0.53^{***}	-0.00	0.58^{***}	1.65^{***}	-0.53^{***}	0.81^{**}
	(0.11)	(0.16)	(0.26)	(0.20)	(0.31)	(0.13)	(0.33)
$\Delta Net\ Income_{i,t-1}$	3.67^{***}	3.63^{***}	3.25^{***}	2.18^{***}	0.86^{**}	3.21^{***}	7.78^{***}
	(0.25)	(0.40)	(0.64)	(0.57)	(0.35)	(0.29)	(0.78)
$\Delta BHC_{i,t-1}$	0.04^{***}	0.05^{***}	0.07^{***}	0.03	0.05^{***}	0.02^{**}	0.13^{***}
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	24,811	24,811	24,811	24,811	24,811	24,811	24,811

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

Panel C: Using $Ln(Y_{i,t-2})$ and $\Delta Y_{i,t-2}$ as instruments for $\Delta Y_{i,t-1}$							
	(1) *Assets*	(2) *RE Loan*	(3) *C&I Loan*	(4) *Liquid*	(5) *Equity*	(6) *Core deposits*	(7) *Noncore deposits*
$\Delta(REprice_{i,t})$	0.51^{***}	0.42^{***}	0.25^{**}	0.12	0.53^{***}	0.43^{***}	0.61^{***}
	(0.06)	(0.07)	(0.10)	(0.11)	(0.12)	(0.06)	(0.16)
$\Delta(Inc_{i,t})$	-0.18^{***}	-0.10	-0.14	0.27^{*}	-0.09	-0.14^{*}	0.10
	(0.06)	(0.13)	(0.19)	(0.16)	(0.12)	(0.08)	(0.22)
$\Delta(Pop_{i,t})$	0.31^{***}	0.13	0.25	-0.14	0.14	0.21^{**}	0.07
	(0.08)	(0.15)	(0.22)	(0.18)	(0.19)	(0.09)	(0.27)
$\Delta(Assets_{i,t-1})$	0.29^{***}	-0.67^{***}	-0.47^{***}	0.20^{***}	-2.22	-0.25	-0.60^{***}
	(0.01)	(0.10)	(0.05)	(0.08)	(2.22)	(0.19)	(0.09)
$\Delta Y_{i,t-1}$		0.95^{***}	0.82^{***}	0.05	2.38	0.57^{**}	0.63^{***}
		(0.08)	(0.04)	(0.07)	(2.13)	(0.22)	(0.05)
$\Delta Captalization_{i,t-1}$	0.29^{**}	-0.23	1.08^{**}	0.86^{***}	-28.04	0.24	5.04^{***}
	(0.13)	(0.28)	(0.47)	(0.25)	(24.68)	(0.26)	(0.52)
$\Delta Net\ Income_{i,t-1}$	2.95^{***}	0.26	1.32	2.44^{***}	3.08^{***}	1.64^{***}	6.19^{***}
	(0.31)	(0.73)	(1.04)	(0.70)	(0.98)	(0.44)	(1.15)
$\Delta BHC_{i,t-1}$	0.03^{***}	0.05^{**}	0.07^{**}	0.02	-0.09	0.03^{**}	0.07^{**}
	(0.01)	(0.02)	(0.04)	(0.02)	(0.12)	(0.01)	(0.04)
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	20,834	20,834	20,834	20,834	20,834	20,834	20,834

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

Table 6. Bank supply of small business loans

Column (1) and (2) present the results of estimating the following model:

$$Ln(Sbl_{i,j,t}) = \alpha + \beta_1 Ln(REprice_{i,t}) + \beta_2 Ln(Inc_{i,t}) + \beta_3 Ln(Pop_{i,t}) + \beta_4 Ln(Sbl_{i,j,t-1}) + \beta_5 Ln(Assets_{i,t-1}) + \beta_6 Net\_income_{i,t-1} + \beta_7 BHC_{i,t-1} + \mu_{i,j} + \gamma_{j,t} + \epsilon_{i,j,t}$$

where the dependent variable is the log value of the amount of small business loans originated by bank i to county j in year t. $Sbl_{i,t-1}$ is the total small business loans originated by bank i in year $t-1$. Column (3) and (4) present the results of estimating the following model:

$$Loan\_G_{i,t} = \alpha + \beta_1 Ln(REprice_{i,t}) + \beta_2 Ln(Inc_{i,t}) + \beta_3 Ln(Pop_{i,t}) + \beta_4 Ln(Sbl_{i,t-1}) + \beta_5 Ln(Assets_{i,t-1}) + \beta_6 Net\_income_{i,t-1} + \beta_7 BHC_{i,t-1} + \mu_t + u_i + \epsilon_{i,t}$$

where the dependent variable is the estimated growth rate of supply of small business loans at the bank level, and $Sbl_{i,t-1}$ is the total small business loans originated by bank i in year $t-1$. In Column (3), the results from standard fixed-effects estimation are presented. In Column (4), the model is estimated with the Arellano and Bond (1991) "Difference GMM", where the lagged values of the independent variables in levels are used as instruments in the first-differenced equation. *REprice* is the weighted average of house prices in which a bank has depository branches, with the weight being the amount of deposits in each branch. *Inc* is the weighted total personal income. *Pop* is the weighted population. *Capitalization* is equity to assets ratio. *Net income* is the income to assets ratio. *BHC* is a dummy variable equals to one if a bank belongs to a bank holding company that owns more than one commercial banks, and 0 vice versa. The log value of weighted predicted house prices from Eq. (3) is used as an IV for the log value of weighted house prices in all regressions. Standard errors clustered by bank are reported in the parentheses.

	(1)	(2)	(3)	(4)
	County − year FE	*County − year FE*	*FE*	*Diff GMM*
$Ln(REprice_{i,t})$	2.76**	2.14*	0.76***	0.52**
	(1.25)	(1.17)	(0.21)	(0.24)
$Ln(Inc_{i,t})$	0.30	0.22	0.24*	0.17
	(0.38)	(0.33)	(0.13)	(0.48)
$Ln(Ipc_{i,t})$	−3.22	−4.05**	−0.76	−1.64
	(2.08)	(1.63)	(0.55)	(1.35)
$Ln(Sbl_{i,t-1})$		0.12***	−0.72***	−0.66***
		(0.02)	(0.05)	(0.09)
$Ln(Assets_{i,t-1})$		0.41***	0.14	0.11
		(0.11)	(0.08)	(0.21)
$Capitalization_{i,t-1}$		4.14*	0.81	0.52
		(2.21)	(0.66)	(1.29)
$Net\ Income_{i,t-1}$		0.22	−0.24	−1.48
		(2.58)	(0.87)	(1.03)
$BHC_{i,t-1}$		−0.13	−0.17	−0.01
		(0.11)	(0.08)	(0.24)
Bank-county fixed effects	*Yes*	*Yes*	*No*	*No*
County-year fixed effects	*Yes*	*Yes*	*No*	*No*
Bank fixed effects	*No*	*No*	*Yes*	*Yes*
Year fixed effects	*No*	*No*	*Yes*	*Yes*
R-squared	0.030	0.076	0.555	
N	485,390	313,895	6,715	5,516

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

Table 7. Bank housing shocks and employment growth

The dependent variable is annual growth of employment of small businesses at the county level. Bank housing shock, bank population shock, and bank income shocks are the deposits weighted growth rate of house prices, population, and total income in MSAs outside of the state where the county is in. Own housing shock is the house price growth in the MSA the county belongs to. Pop_{1998} are Inc_{1998} are the population and total income of the MSA, and small business employment in the county in 1998. Standard errors clustered by MSA are reported in the parentheses.

	(1)	(2)	(3)	(4)
Bank housing shock	0.16***	0.11***	0.07**	0.10***
	(0.03)	(0.03)	(0.03)	(0.02)
Bank pop shock			0.80***	0.69***
			(0.15)	(0.15)
Bank inc shock			−0.21**	−0.26**
			(0.08)	(0.08)
Own housing shock		0.10***	0.11***	0.09***
		(0.01)	(0.01)	(0.01)
$Ln(Pop_{1998})$			0.01*	0.02**
			(0.01)	(0.01)
$Ln(Inc_{1998})$			−0.01	−0.02**
			(0.01)	(0.01)
$Ln(Emp_{n-1})$			−0.00**	−0.00***
			(0.00)	(0.00)
R-squared	0.029	0.038	0.054	0.181
N	8396	8396	8239	8239

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

Appendix A Variable definition

Total assets: RCFD2170.
Total loans: RCFD2122.
Real estate loans: RCFD1410.
C&I loans: RCFD1766.
Personal loans: RCFD1975.
Fixed assets: RCFD2145.
Equity: RCFD3210.
Net income: RIAD4340.

Liquid assets equals to cash (RCFD0010) + held to maturity securities (RCFD1754) + available for sale securities (RCFD1773) + Federal funds sold (RCFD1350). (Definition follows Kashyap, Rajan, and Stein (2002).)

Core deposits equals the sum of all transaction accounts (RCON2215) + non-transaction money market deposit accounts (RCON6810) + non-transaction other savings deposits (excludes MMDAs) (RCON0352) + non-transaction time deposits of less than $100,000 (RCON6648) - fully insured brokered deposits $100,000 and less (RCON2343+RCON2344). (Definition follows FFIEC's Uniform Bank Performance Report.)

Non-core liabilities equals the sum of total time deposits of $100,000 or more (RCON2604) + other borrowed money (RCFD3190) + foreign office deposits (RCFN2200) + securities sold under agreements to repurchase + federal funds purchased (RCFD2800+RCONB993+RCONB995) + insured brokered deposits of less than $100,000 (RCON2343) + brokered deposits of $100,000 (RCON2344). (Definition follows FFIEC's Uniform Bank Performance Report.)

Appendix B Additional results

Table B1. Bank balance sheet growth from 1996 to 2006

The dependent variables in Column (1) through (7) are annualized growth rate of the amount of total assets, real estate loans, C&I loans, liquid assets, equity, core deposits, and noncore liability, from 2001 to 2006. Other variables are defined in Table 4

	Assets				Liabilities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Assets	*RE Loan*	*C&I Loan*	*Liquid*	*Equity*	*Core deposits*	*Noncore deposits*
$\Delta REprice$	1.04***	2.42***	1.36***	0.51***	1.43***	0.71***	4.54***
	(0.14)	(0.29)	(0.47)	(0.09)	(0.20)	(0.11)	(0.56)
ΔInc	−0.85***	−2.06***	−0.43	−0.17	−0.48	−0.41**	−3.32***
	(0.21)	(0.45)	(0.74)	(0.15)	(0.31)	(0.18)	(0.89)
ΔPop	2.38***	5.45***	1.96	0.69**	1.72**	1.32***	8.20***
	(0.46)	(0.98)	(1.61)	(0.32)	(0.67)	(0.38)	(1.93)
$Ln(Assets_{1996})$	−0.07	2.21***	4.68***	1.40***	6.84***	1.15***	3.44***
	(0.05)	(0.24)	(0.25)	(0.11)	(0.80)	(0.23)	(0.48)
$Ln(Y_{1996})$	0.00	−2.65***	−4.52***	−1.37***	−6.86***	−1.27***	−4.05***
	(.)	(0.22)	(0.19)	(0.11)	(0.80)	(0.24)	(0.36)
$Capitalization_{1996}$	2.17	7.56*	8.52	1.85	36.07***	3.78**	1.09
	(1.96)	(4.16)	(6.86)	(1.34)	(7.21)	(1.66)	(8.18)
$Net\ Income_{1996}$	−97.06***	−232.64***	−175.85***	−40.10***	−67.75***	−83.46***	−207.90***
	(10.33)	(21.91)	(35.75)	(7.05)	(15.28)	(8.60)	(43.53)
BHC_{1996}	0.26	0.45	0.29	0.34**	−0.24	0.37**	0.73
	(0.22)	(0.46)	(0.75)	(0.15)	(0.31)	(0.18)	(0.90)
R-squared	0.116	0.199	0.267	0.140	0.138	0.129	0.134
N	1768	1768	1768	1768	1768	1768	1768

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

		Assets			Liabilities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Assets	*RE Loan*	*C&I Loan*	*Liquid*	*Equity*	*Core deposits*	*Noncore deposits*
$\Delta REprice$	1.29***	3.44***	1.34*	0.56***	1.55***	0.94***	5.64***
	(0.22)	(0.47)	(0.76)	(0.15)	(0.32)	(0.18)	(0.92)
ΔInc	−0.88***	−2.15***	−0.42	−0.18	−0.49	−0.44**	−3.43***
	(0.21)	(0.46)	(0.74)	(0.15)	(0.31)	(0.18)	(0.89)
ΔPop	2.43***	5.64***	1.95	0.70**	1.75***	1.36***	8.41***
	(0.47)	(0.99)	(1.61)	(0.32)	(0.67)	(0.38)	(1.94)
$Ln(Assets_{1996})$	−0.09*	2.21***	4.69***	1.39***	6.84***	1.12***	3.32***
	(0.05)	(0.24)	(0.26)	(0.11)	(0.80)	(0.23)	(0.48)
$Ln(Y_{1996})$	0.00	−2.71***	−4.52***	−1.37***	−6.87***	−1.25***	−4.02***
	(.)	(0.22)	(0.19)	(0.11)	(0.80)	(0.24)	(0.37)
$Capitalization_{1996}$	1.97	6.66	8.54	1.81	36.05***	3.60**	0.24
	(1.97)	(4.19)	(6.87)	(1.35)	(7.21)	(1.66)	(8.21)
$Net\ Income_{1996}$	−93.63***	−218.35***	−176.18***	−39.43***	−65.96***	−80.24***	−192.35***
	(10.61)	(22.61)	(36.69)	(7.24)	(15.68)	(8.82)	(44.76)
BHC_{1996}	0.27	0.49	0.29	0.34**	−0.24	0.38**	0.78
	(0.22)	(0.46)	(0.75)	(0.15)	(0.31)	(0.18)	(0.90)
R-squared	0.114	0.194	0.267	0.140	0.138	0.127	0.132
N	1768	1768	1768	1768	1768	1768	1768

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

Table B2. Bank balance sheet composition 1996-2006

The dependent variables in Column (1) through (6) are changes in the ratio of real estate loans, C&I loans, liquid assets, equity, core deposits, and noncore liability, over bank total assets, measured in percentage points. The main independent variable is the growth rate of weighted average of house prices in which a bank has depository branches, with the weight being the amount of deposits in each branch. ΔInc is growth rate of weighted total personal income. ΔPop is the growth rate of weighted population. The growth rate of weighted predicted house prices from Eq. (3) is used as an IV in the estimation. Y denotes the dependent variable (before the change). $Capitalization$ is equity to assets ratio. $Net\ income$ is the income to assets ratio. BHC is a dummy variable equals to one if a bank belongs to a bank holding company, and 0 vice versa. Δ denotes growth rate for variables measured in total amount and difference for variables measured in ratios. Standard errors clustered by bank are reported in the parentheses.

Panel A						
	(1) *RE Loan*	(2) *C&I Loan*	(3) *Liquid*	(4) *Equity*	(5) *Core deposits*	(6) *Noncore deposits*
$\Delta(REprice_{i,t})$	0.18***	−0.06***	−0.08***	0.00	−0.05**	0.05**
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
$\Delta(Inc_{i,t})$	−0.11***	−0.00	0.12***	0.00	0.10***	−0.10***
	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.03)
$\Delta(Pop_{i,t})$	0.11***	0.01	−0.13***	−0.01	−0.11***	0.12***
	(0.03)	(0.02)	(0.03)	(0.01)	(0.04)	(0.04)
$Ln(Assets_{i,t-1})$	−0.00***	0.00***	0.00***	0.00**	−0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Y_{i,t-1}$	−0.06***	−0.09***	−0.09***	−0.15***	−0.06***	−0.06***
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
$Captalization_{i,t-1}$	−0.03*	0.01	−0.00	0.00	0.01	0.09***
	(0.01)	(0.01)	(0.02)	(.)	(0.01)	(0.02)
$Net\ Income_{i,t-1}$	−0.35***	−0.02	0.34***	0.10***	−0.03	−0.02
	(0.07)	(0.04)	(0.08)	(0.03)	(0.07)	(0.06)
$BHC_{i,t-1}$	−0.00	0.00	−0.00	−0.00*	0.00*	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	24,811	24,811	24,811	24,811	24,811	24,811

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

Panel B						
	(1) *RE Loan*	(2) *C&I Loan*	(3) *Liquid*	(4) *Equity*	(5) *Core deposits*	(6) *Noncore deposits*
$\Delta(REprice_{i,t})$	0.06^{***}	-0.05^{***}	-0.06^{***}	0.01^{***}	-0.04^{**}	0.03
	(0.02)	(0.01)	(0.02)	(0.00)	(0.02)	(0.02)
$\Delta(Inc_{i,t})$	-0.03	-0.01	0.10^{***}	-0.00	0.09^{***}	-0.09^{***}
	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.03)
$\Delta(Pop_{i,t})$	0.03	0.01	-0.11^{***}	0.00	-0.10^{***}	0.11^{***}
	(0.03)	(0.02)	(0.03)	(0.01)	(0.04)	(0.04)
$\Delta(Assets_{i,t-1})$	0.02^{***}	0.00	-0.01^{***}	-0.01^{***}	-0.02^{***}	0.02^{***}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$\Delta Y_{i,t-1}$	0.00	-0.05^{***}	-0.08^{***}	0.01	-0.06^{***}	-0.07^{***}
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
$\Delta Captalization_{i,t-1}$	-0.14^{***}	0.05^{*}	0.18^{***}	0.00	-0.21^{***}	0.12^{***}
	(0.03)	(0.02)	(0.04)	(.)	(0.04)	(0.04)
$\Delta Net\ Income_{i,t-1}$	0.11	0.05	-0.12	-0.24^{***}	-0.20^{**}	0.49^{***}
	(0.10)	(0.06)	(0.11)	(0.04)	(0.10)	(0.10)
$\Delta BHC_{i,t-1}$	0.00	-0.00	-0.00	-0.00	-0.01^{***}	0.01^{***}
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	24,811	24,811	24,811	24,811	24,811	24,811

$^{*}\ p < 0.1$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$