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Abstract: This paper examines the relationship between real estate prices during the home price boom from the late 1990s into 2005 and competition among mortgage lenders. The mortgage lending business, especially with the rise of the originate-to-distribute model, had competitors with very different non-mortgage activities and regulation. I show that in local markets, when banks increased their share of mortgages relative to lenders such as mortgage brokers, home prices started increasing at a faster pace. Home prices also affected market shares, but primarily through changes at the national level. When national home prices increased at a faster pace, there was a shift from banks to mortgage brokers in local markets.

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The role of lenders in the home price boom

After much discussion of whether, starting in the late 1990s, home prices deviated from their "fundamental" values (see, e.g., Haines and Rosen, 2007, for a review), the rapid decrease in home prices since 2006 convinced many that there was, in fact, a price bubble that had burst. Since then, a lot of attention has been paid to the causes of the ups (and downs) in home prices. Several studies have examined the contribution of changes in lending standards (see, e.g., Mian and Sufi, 2008), finding looser lending standards, perhaps abetted by the rise of securitization, played a major role. Others have examined whether so-called behavioral reasons can explain some of the upward momentum in prices (e.g., Shiller, 2007; Mayer and Sinai, 2007). In this paper, I take a different focus. I examine the relationship between the pursuit of market share among lenders and home prices.

The path of home prices in recent years makes clear the bubble argument. Figure 1 charts the median sale price of an existing U.S. single-family home over the last 25 years (in constant 2007 dollars).[1] Until the late 1990s, (real) prices generally increased at a moderate rate, with an average annual increase of 1.0% from 1983-1996. In the late 1990s, prices started to increase at a faster pace, going up at a 2.8% annual rate during 1997-2001. At that point, home prices really began to accelerate. Prices went up at an annual rate of 7.6% from the end of 2001 to their peak in June 2005. From that point through September of 2008, prices fell 6.6%, which some saw as the bursting of the alleged bubble.[2]

In this paper, I focus on the period of rising prices, examining the impact of competition among lenders. Home buyers can get mortgages from a variety of sources, including commercial banks, thrifts, credit unions, and mortgage brokers. Mortgage lending and regulation play different roles at these lenders. This can affect the way they compete for borrowers, meaning that the distribution of lender types may affect the nature of competition in mortgages markets (similar to the way that bank size structure affects small business lending, see Berger, et al., 2006). I show that the distribution of lender types affected home price increases in recent years, especially during the period when prices increases started to accelerate.

While lender competition may have played a role in price increases, there were other factors as well. This study adds to a long literature examining the root causes of home price increases. The home price changes in the last decade undoubtedly have many

[1] I use the CPI less shelter index as our deflator.

[2] See, for example, "The Sound You Hear? The Market Coming Down to Earth" (New York Times, April 2, 2006) and "Hot Homes Get Cold" (Wall Street Journal, April 12, 2006).

causes. As home prices increased, some argued that the rise was justified by changes in underlying fundamentals, as incomes were increasing and mortgage rates were decreasing (e.g., McCarthy and Peach, 2004). Higher incomes and lower mortgage rates naturally push up demand, leading to higher prices. Other studies claim that where housing supply is restricted, small changes in demand can lead to large price increases (e.g., Glaeser, et al., 2005). This is consistent with cross-sectional differences in home price increases, since many areas with rapid price increases have strict zoning laws or limited geographic scope.

Alternatively, the demand for homes may have increased because purchasers had unrealistic expectations about future prices based on such factors as "boom psychology" (Shiller, 2007). Expecting strong home price increases, buyers were willing to bid up prices. This set up a feedback loop, as price increases offer positive feedback, leading to more price increases. The ratio of home prices to rents gives evidence in support of a change in the relationship between prices and fundamentals beginning in the late 1990s. An owner-occupied house combines a flow of services with an investment good. The homeowner gets to live in the house in lieu of renting a similar unit and also gets a potential return on the equity in the house. One way to decompose the change in home prices into the rental equivalent portion and the return on equity portion is to compare home prices to rental prices. I use the owners' equivalent rent component of the consumer price index (CPI-OER) as a proxy for the stream of earnings from renting a house.[3] The increase in home prices relative to rents in the late 1990s (see Figure 1) can be explained by an increase is expectations about future price increases such as might happen when there is a boom psychology.

More recently, some studies have argued that mortgage loan supply factors played an important role in recent home price changes. In the traditional model of mortgage lending, a bank or other depository institution (DI) originates and funds a loan. However, the ability of banks to securitize mortgages allows them to use the originate-to-distribute (OTD) model, where the objective is to originate but not fund mortgages. The bank packages the mortgages it makes and either securitizes them or sells them to another party to be securitized. This reduces the need for the bank to raise expensive capital and liabilities. Initially, securitization was primarily available for high-quality (prime, conforming) mortgages, but in the early 2000s, it became increasingly available for lower-quality (subprime) loans. Some argue that this increased the supply of loans available to borrowers (Mian and Sufi, 2008).

As in Mian and Sufi (2008), this paper examines the supply of mortgages while controlling for fundamental factors. The OTD model that allows DIs to make mortgage

[3] Other rent indices give similar results.

loans without adding (much) capital also allows other financial firms such as mortgage brokers easy access to lending markets. The non-DI firms typically have lower entry costs and less regulation. However, they also have less opportunity for cross-selling and may benefit less from reputation. These tradeoffs, influencing both costs and benefits, can affect how potential lenders compete.

I find that the presence of banks and other DIs relative to mortgage bankers is associated with *faster* price growth, where mortgage bankers include non-DI lenders such as some mortgage brokers. The finding that home prices increase faster in markets with more bank lending relative to that by mortgage bankers leaves open the question of why banks are moving into and out of particular markets. I examine how changes in the rate of increase of home prices affect future market shares of banks and other lenders. In essence, this allows a check of whether certain types of lenders are chasing hot markets. A hot market for lenders can be defined two ways: The first is where prices are growing, because that can lead to more loans if for no other reason than that more existing homeowners can refinance their loans. The second type of hot market is one where home purchases are growing. More purchases equal more mortgage loans for lenders to make.

There has long been a dictum in real estate that all markets are local. But the recent price boom may offer some exceptions. I present evidence that when home prices or home purchases are increasing at a faster rate, banks cede market share to mortgage bankers. However, the driving factors are national changes in prices or purchases. It is not so much that brokers are flooding to a hot local market, but that they are an increasing presence overall when markets are strong. While prices and purchases are generally increasing over my sample period, the importance of national market indicators is not the result of a trend toward mortgage bankers and away from banks. The results hold even with trend controls. Also, they are not solely a result of banks becoming less important during a period when prices were increasing. Banks made a larger share of loans in 2005, the final year of the sample period, than they did in 1993, the first year (although the bank share reached its peak in 2003).

Competition- or securitization-induced supply changes, by leading to higher home prices, can induce Shiller's boom psychology. A boom psychology that leads to an upward price spiral should be reflected in both persistent price increases and in higher home prices leading to more demand. I find support for the first of these, as price changes are positively correlated with lagged price changes, even after controlling for changes in fundamental conditions. The relationship between home prices and the level of purchases is more interesting. An increase in purchases during a quarter is associated with a larger increase in home prices, consistent with a boom psychology being trigger by purchase activity. Yet, an increase in prices in a market does not lead to more home

purchases in that market. Thus, potential buyers do not see rising prices as a reason to jump in and buy a home. However, when national home prices rise at a faster pace, local home sales go up. This may be a case where hearing about higher prices gets borrowers excited about future returns (further evidence of a boom psychology), but if local prices go up, borrowers are less able to afford to purchase a home.

In the next section, I present the data. The following section examines the effect of lender composition on home prices. I then turn to the effect of home prices on lender composition in section IV. The fifth section examines robustness and the final section concludes.

II. Data

Lenders have only an indirect impact on home prices. They offer mortgages to borrowers, but it is the borrowers that make the decision on what price to offer for a home. Still, if a lender offers a lower interest rate or lower fees, a borrower may be willing to pay more for a home. A lender also chooses how much to lend as a function of a borrower's risk profile and the ratio of the mortgage to the home's value. More lenient lenders can lead to more potential borrowers for a given home, with higher demand leading to higher prices. In this section, I examine how the type of lenders in a market influences home prices.[4]

The available data and the desire to focus on factors that push home prices up limit the sample period to 1993-2005. The starting date is selected because key data is missing prior to then. The sample includes several years of moderate price increases before the first escalation in the late 1990s and the rapid increases in 2002-2005. So, the sample ends before the large price decreases.

I use the S&P/Case-Shiller Home Price Index (CSI) to measure home prices. The CSI tracks prices based on a repeat sales technique. The index is based on the sales of single-family homes of all types and prices ranges. This gives it an advantage over other indices such that the OFHEO constant-quality index, which excludes expensive homes and risky borrowers. The CSI is available at a quarterly frequency for twenty metropolitan areas.[5] I use the CSI to derive my main measure of home prices, $\%\Delta CS_{c,t}$,

[4] I make no attempt to determine whether prices were too high during the early 2000s. There is an extensive academic literature on the topic. Some studies find evidence that homes in selected local markets are overpriced (e.g., Case and Shiller, 2003; Haines and Rosen, 2007; Himmelberg, et al., 2005), but others claim that there is not significant overpricing (e.g., McCarthy and Peach, 2004; Smith and Smith, 2006). There is evidence that zoning restrictions are associated with high prices, and that prices may behave differently in "superstar" cities than in other areas (Glaeser, et al., 2005; Gyourko, et al., 2004). Most non-academic studies in 2006-2007 find significant overpricing (one recent analysis found that markets accounting for 40% of all single-family home value are overpriced by at least 34%, see National City, 2006).

[5] Data on Dallas starts in 2000, while all other metro areas start in 1993.

which is the change in the percent change in the CSI in metro area *c* from quarter t-1 to quarter t. Table 1 gives summary statistics for all the variables used in the analysis. On average, prices in a metro area increased by 1.8% per quarter. This is slightly faster than the national average, reflecting the fact that the areas covered by the CSI were concentrated in parts of the country (such as California) that grew especially fast.

The key goal of this paper is to determine how home prices are affected by the lenders in a market. I get information on lenders from the information they are required to report under the Home Mortgage Disclosure Act (HMDA). For each mortgage loan application, HMDA data reports the name of the lender, its type (by regulator), and loan information including the location of the borrower.[6] A loan is credited to the institution that provides the funding, thus a broker that finds a bank for a borrower is not credited with the loan, instead the lending bank is (even if that bank later sells the loan).

The competitive impact of a lender is a function of its size relative to its rivals and on how the lender competes. I capture the first point using the Herfindahl-Hirshmann Index (HHI), a traditional measure of market competition. The HHI, $Herfindahl_{c,t}$, is calculated by summing the squared market shares of the lenders in the metro area *c*, where a lender's market share is the ratio of the number of mortgages it issues to the total number of mortgages in the market.[7] The markets are large metro areas, and thus are reasonably competitive, with the average value of the index equal to 0.029 (see Table 1). In general, a market with a HHI of less than 0.110 is considered de facto competitive in antitrust analysis.

How a lender competes can depend on the lender's cost structure, the synergies between the loans and the rest of the lender's portfolio (including loans in other markets), and the nature of the rivals. This can depend on many idiosyncratic factors, but the corporate form of the lender is likely to be a factor. To see how corporate form might matter, consider two of the largest groups of lenders, commercial banks and mortgage brokers. Commercial banks are regulated for safety and soundness and also have capital requirements while mortgage brokers are largely unregulated. This may affect the relative cost of making loans. In addition, banks often have, or want to have, other relationships with borrowers. A bank may discount mortgage rates to borrowers who also have checking accounts with the bank. The ability to cross-sell can make banks pursue borrowers more aggressively. In addition, the brick-and-mortar locations of banks may give them an advantage with some borrowers. This suggests that banks may

[6] Loan applications classified for home improvement or for the purchase of multifamily dwellings are dropped from the sample. There is no reason to expect these to have an impact on home prices, but the results are qualitatively similar if they are included.

[7] Loan applications that are denied are not used to calculate the HHI.

compete differently than mortgage brokers. This motivates the use of the market share by lender type as a measure of competitive conditions.

The HMDA data is used to derive the market shares of different kinds of lenders, where the shares are based on the number of loans originated in a metro area during a quarter. I calculate the market shares for four groups: commercial banks (*CB share*$_{c,t}$), thrifts (*THR share*$_{c,t}$), credit unions (*CU share*$_{c,t}$), and mortgage bankers (*MB share*$_{c,t}$), where mortgage bankers are non-DI lenders such as mortgage brokers and finance companies.[8,9] Table 2 shows the shares of each category of lender for the period 1993-2005. The bank share drifted up through 2003, then fell sharply. The drop was caused by a decrease in refinancing at many banks at the same time as one mortgage banker was expanding rapidly.

The overall level of competition among lenders in a market can be reflected in the types of loans that are granted. The ratio of the amount of the loan to the borrower's income (as reported to HMDA) in a metro area controls for the overall looseness of lenders in the region. I use *%ΔAmount_to_income*$_{c,t}$, the change in this ratio from quarter t-1 to quarter t to control for aggregate easing of lending conditions in metro area *c*. On average, borrowers took out larger loans against their income as the sample period progressed.

Another measure likely to be correlated with competitiveness is the fraction of loan applications denied. A higher denial rate can result from a decline in borrower quality, but it also can occur because lenders tighten lending standards. Let %Δ*Denial_percentage*$_{c,t}$ be the percentage change in the share of loan applications that are denied from quarter t-1 to quarter t. Denied loans are excluded in the calculation of all other variables that measure loan market activity.

I also examine the effect on home prices of changes in the number of loans and the fraction of loans that are used to refinance properties already owned by borrowers. The percentage change in the number of new purchases, *%ΔPurchase*$_{c,t}$, can be used to see whether increased purchase activity leads to higher prices, as it might if it reflects increased demand for homes, and vice versa, if increasing prices draw in new purchasers (or higher prices keep potential buyers away). When home prices are rising, as they mostly are during 1993-2005, changes in refinancing are driven by changes in mortgage

[8] HMDA records the identity of the lender, which may not be the firm that arranged the loan. A loan where the borrower works with a mortgage broker to borrow from a bank is listed as a bank loan.

[9] Note that one important drawback of the HMDA data is that classifies lenders without regard for whether the lender is the subsidiary of a different kind of institution. So, a mortgage made by a mortgage banker that is the subsidiary of a commercial bank holding company is classified in the "other" category, even if in some respects the commercial bank category may be more appropriate. I use a data set provided by Robert Avery of the Federal Reserve Board to classify lenders by type of their parent organization. The commercial bank category includes bank and financial holding companies while the thrift category includes thrift holding companies.

interest rates. An increase in the share of refinancing can result in loans for new purchases being crowded out, putting downward pressure on home prices. Let $\%\Delta Refi\_percentage_{c,t}$ be the percentage change in the share of loans that are used for refinancing.

The remaining variables that can influence home prices have less to do with competition among lenders than with the overall supply of and demand for loans.

Mian and Sufi (2008) and others argue that the spread of securitization contributed to the rapid rise in home prices from the late 1990s through 2005. Most home loans that are securitized flow through the (at that time) government-sponsored entities (GSEs) Fannie Mae and Freddie Mac. The GSEs only securitize loans that are below the conforming loan limit ($357,650 in 2005) and are issued to borrowers meeting a minimum quality threshold. The loans typically require a large down payment. Financial intermediaries such as commercial and investment banks also securitize loans. These so-called private-label securitizations generally include loans generally do not qualify for GSE securitization, because either they are too risky (subprime loans) or the loan amount is too high (jumbo loans). It is these securitizations, especially of subprime loans, that expanded rapidly from 2000 through 2006 and were blamed by many for the meltdown in housing markets. To capture the two types of securitizations, I include $Govt\_securization_{c,t}$, the share of loans in a market that are included in GSE securitizations, and $Private\_securitization_{c,t}$, the share of loans included in private-label securitizations.[10] If Mian and Sufi are correct, the share of loans that are in private-label securitizations should be positively correlated with home price increases.

As noted in the introduction, a home provides two types of services to owner-occupants. The home is an investment and a residence. A number of studies examine whether housing is overvalued by deducting a normal return on investment (after factoring in costs and taxes) from home price increases and comparing the remainder, an imputed rent, to the value of the home's residential services as proxied for by rental rates on similar properties (see, e.g., Himmelberg, et al., 2005). Changes in the residential value of a home are unlikely to be affected by competition among mortgage lenders in a market. Changes in the consumer price index for the rental value of owner occupied homes, $CPI\text{-}OER_t$, is used control for changes in rents.[11] In addition, as a robustness check, I use the change in ratio of home prices to the CPI-OER as a measure of price changes. This ratio, $\%price\text{-}to\text{-}rent_{c,t}$, is essentially the change in a price-to-earnings ratio

[10] Loans guaranteed by Ginnie Mae are not included in either securitization category, as these tended to have lower down payments than GSE-securitized loans while Ginnie Mae-guaranteed mortgage-backed securities (MBS) have a stronger guarantee than private-label MBS.

[11] The CPI-OER for each metro area is selected to most closely match the Case-Shiller metropolitan areas. The same is true for all the other data except for mortgage rates, which are measured at the national level.

(Leamer, 2002). Movements in the ratio reflect changes in the investment value of homes.

Homes also become more affordable when mortgage rates fall. One way to measure this is with an affordability index (see, e.g., Haines and Rosen, 2007). Let $\%\Delta Afford_{c,t}$ be the percentage change in the ratio of the mortgage payment on the median home price to the median household income in metro area *c*. The mortgage is assumed to be a 20% down, fixed-rate mortgage using the national average mortgage rate for quarter t while the household income is for the metro area. More affordable mortgages should be associated with higher home prices.

Two other variables are used to control for the macroeconomic conditions in a metro area. The change in the unemployment rate, $\Delta Unemploy_{c,t}$, and the percentage change in median household income, $\%\Delta Income_{c,t}$, measure the ability of residents in a metro to pay for homes. When unemployment falls or income rises, demand for housing should increase, leading to higher home prices, all else equal (see, e.g., Case and Shiller, 2003).

There is evidence of persistence in home price increases (see, .e.g., Mayer and Sinai, 2007). To control for this, I add a lagged dependent variable as another control.

The baseline empirical model is:

$$\begin{aligned}\%\Delta CS_{c,t} = f(&Herfindahl_{c,t-1}, CB\ share_{c,t-1}, THR\ share_{c,t-1}, CU\ share_{c,t-1},\\ &\%\Delta Amount\_to\_income_{c,t-1}, \%\Delta Denial\_percentage_{c,t-1}, \%\Delta Purchase_{c,t-1},\\ &\%\Delta Refi\_percentage_{c,t-1}, Govt\_securization_{c,t-1}, Private\_securitization_{c,t-1},\\ &\%\Delta CPI\text{-}OER_{c,t-1}, \%\Delta Afford_{c,t-1}, \Delta Unemploy_{c,t-1}, \%\Delta Income_{c,t-1}, \%\Delta CS_{c,t-1}).\end{aligned} \quad (1)$$

To mitigate potential endogeneity problems, the right-hand side variables are all lagged one quarter. Also, to control for potential differences across metro areas that are not captured by the control variables, metro area dummies are included in all regressions. The regressions also use robust standard errors controlling for metro area clusters. This model is estimated using quarterly data over the period 1993-2005.

III. The effect of lender competition on home price changes

Table 3 presents the results of linear regressions of the percentage change in home prices against variables measuring competitive conditions and other controls. The first column includes reports coefficients for the full model as given (1). The coefficient on $Herfindahl_{c,t-1}$, the HHI variable, is positive and insignificant. If competition leads lenders to issue more mortgages, then this coefficient should be negative. To the extent that the coefficient on the HHI is significant in other regressions, it is weakly positive.

This suggests that traditional measures of competition do not capture the effect of lenders on home prices.

The coefficients reported in column 1 of Table 3 indicate that shifting market share from mortgage bankers (the excluded group) to DIs increases the rate at which home prices go up. If loans shift from lenders in the mortgage banker category to banks enough to increase the bank share by one standard deviation, the percentage increase in home prices rises by 42 basis points, which is 23% of the 1.8% mean quarterly rate of increase. Thus, shifting market share can have a significant economic impact on home price changes.

The coefficients on the other control variables are consistent with intuition. When purchases increase at a faster rate, this induces a rise in home prices. An increase in refinancing pushes cuts the rate at which home prices increase, consistent with refinancing demand crowding out purchases. More affordable homes and higher incomes, as expected, lead to faster home price increases.

The coefficient on the lagged dependent variable is significantly positive, indicating persistence in home price increases. To see how including the lagged dependent variable changes the coefficients on the other variables, the regression in the second column of Table 3 excludes the lagged dependent variables. The results are qualitatively similar to those in the first regression, although some of the coefficients are larger. This is true for the other tests in the paper as well.

To show that the results are robust to the home price index used, the final two columns of Table 3 gives results of regressions with, respectively, the price-to-rent (CSI-to-CPI-OER) ratio and the OFHEO index. The results are generally consistent with those when the CSI is used. The most interesting differences are when the OFHEO index is the dependent variable. Then, increases in affordability and the ratio of loan amount to income are associated slower home price increases. This may reflect that the OFHEO index only includes conforming loans. Since these are limited in loan size, it could be that when homes get more affordable or loans get larger, borrowers move from conforming loans to larger loans. This could cause negative coefficients on $\%\Delta Afford_{c,t-1}$ and $\%\Delta Income_{c,t-1}$.

The rate of home price increases changed over the sample period, as illustrated in Figure 1. This makes it natural to wonder whether the impact of lender competition also evolved over time. There seems to be three distinct periods of price evolution between 1993 and 2005. The first period, 1993-1996, saw mild price increases while the second period, 1997-2001, had faster increases, and the third period, 2002-2005, produced the largest rate of increase. To see whether the effect of competition or the other controls changed over these periods, I use three versions for most of the control variables, one for

each period. For example, I create three HHI variables. The first equals the HHI in metro area *c* in quarter t-1 for each quarter t during 1993-1996, and is zero otherwise. The second equals the HHI in metro area *c* in quarter t-1 for each quarter t during 1997-2001, and is zero otherwise. The third is defined likewise for 2002-2005. I do this to each control variable except the lagged dependent variable and the metro area dummies. This gives

$$\%\Delta CS_{c,t} = f(Herfindahl93\text{-}96_{c,t-1}, Herfindahl97\text{-}01_{c,t-1}, Herfindahl02\text{-}05_{c,t-1}, CB\ share93\text{-}96_{c,t-1}, CB\ share97\text{-}01_{c,t-1}, CB\ share02\text{-}05_{c,t-1}, \ldots, \%\Delta CS_{c,t-1}). \quad (2)$$

I report the results of a linear regression based on (2) in Table 4. Note that the table presents the coefficients for selected variables only.

The results in Table 4 show that the coefficients on the DI market share variables do not change much over time. This hides the impact of lender activity. If we run a similar regression based on the type of lender rather than the type of parent organization (not shown), the coefficient on the bank share falls in the last period while those for thrifts and credit unions rise. This suggests that banks might have bought or expanding risky lending, especially in their non-bank subsidiaries, near the end of the sample period. Consistent with this, I find that the average ratio of loan amount to borrower income at banks (and other DIs) increased substantially in 2002-2005 compared to earlier levels. There was also an increase at mortgage bankers, but it was much smaller. This suggests a major change of strategy at banks.

Finally, the coefficient on the percentage change in loan purchases increases significantly from the first time period to the last one. This is consistent with borrowers increasingly looking to past price increases to determine whether to make a home purchase. This would happen if a boom psychology gradually took hold over the sample period. I return to this shortly.

Overall, the results show that lender market shares affect home prices. Because all the regressions have metro area dummies, this section provides evidence that when the market share of DIs increases in a metro area, the rate at which home prices increase goes up. This could occur if DIs are more lenient lenders, but the evidence suggests this is not the case. The average ratio of mortgage loan amount to borrower income is lower at DIs than at mortgage banks. An alternative possibility is that DIs are more sensitive to the overall market conditions that lead to a strong housing market. Relative to mortgage bankers, they might thus move into areas before the pace of price increases start to rise. If banks are leading indicators of home price increases, this opens up the question of whether some types of lenders follow price increases into a market, which we turn to now.

IV. The impact of home price changes on market characteristics

The evidence in the last section suggested that depository institutions compete for mortgage borrowers differently than other lenders do. In this section, the reverse relationship is examined. I look at whether changes in the rate of home price increases draw in lenders of a particular type or home purchasers.

To see whether the rate of change in home prices affects lender market shares, I use the same set of control variables as in (1). The baseline regressions are:

$$\begin{aligned} MS\ share_{c,t} = f(&Herfindahl_{c,t-1}, MS\ share_{c,t-1}, \%\Delta Amount\_to\_income_{c,t-1}, \\ &\%\Delta Denial\_percentage_{c,t-1}, \%\Delta Purchase_{c,t-1}, \%\Delta Refi\_percentage_{c,t-1}, \\ &Govt\_securization_{c,t-1}, Private\_securitization_{c,t-1}, \%\Delta CS/CPI\text{-}OER_{c,t-1}, \\ &\%\Delta Afford_{c,t-1}, \Delta Unemploy_{c,t-1}, \%\Delta Income_{c,t-1}, \%\Delta CS_{c,t-1}) \end{aligned} \quad (3)$$

where $MS\ share \in \{CB\ share, THR\ share, CU\ share, MB\ share\}$. Note that the only lender share variable included on the right-hand side of (3) is the lagged dependent variable. Table 5 has results for linear regressions of (3). The regressions offer some insights into the market conditions that attract different kinds of lenders.

The regression results suggest that mortgage bankers are moving into "hot" housing markets at the expense of banks. A hot housing market from the point of view of a lender is one with lots of sales or one where prices are rising (which may lead to more sales, but will certainly reduce defaults if the trend continues). The results in Table 5 show that the coefficients on the percentage change in home purchases and the percentage change in home prices are negative for banks but positive for the mortgage banker category. This suggests that mortgage bankers replace banks in hot housing markets. However, both home prices and purchase levels are correlated across markets. It is possible that these results reflect nationwide trends. To examine this, define $\%\Delta CS\text{-}natl_{c,t}$ as the percentage change in the national CSI from quarter t-1 to quarter t and $\%\Delta Purchase\text{-}natl_{c,t}$ as the percentage change in the total home purchases in the 20 sample metro areas from quarter t-1 to quarter t.

Table 6 reports the results of regressions with the national price and purchase variables in addition to the local ones. What is immediately apparent is that national changes matter. Mortgage banks do not change hot local markets. Instead they expand when national markets are hot. They seem to do so mostly at the expense of banks. There are controls for securitization, so these changes are not likely to represent an expanded use of the originate-to-distribute (OTD) model. They may reflect the relatively low overhead necessary to operate a mortgage banker. Mortgage bankers can easily expand in good times (e.g., Ditech advertisements blanketing TV) and contract in bad

times. Banks, with their brick-and-mortar buildings and stability-oriented corporate cultures, are less nimble.

Table 6 also includes a regression examining whether market structure and home price changes affect home purchases. The results show that when mortgage bankers increase their market share relative to DIs, home purchases increase at a slower rate. This is consistent with DIs less aggressively pursuing marginal customers. In addition, purchases within a market increase when national prices increases, but not when local prices do. The larger impact of national prices is not surprising, since national price increases can stoke hope while local price increases stoke hope but also make homes more expensive.

To test whether mortgage bankers were attracted to hot markets once securitization became common, I create variables for each of the three time periods used earlier. As before, I interact each variable except the lagged dependent variable and metro area dummies with time period dummies giving:

$$MS_{c,t} = f(\%\Delta CS93\text{-}96_{c,t-1}, \%\Delta CS97\text{-}01_{c,t-1}, \%\Delta CS02\text{-}05_{c,t-1}, Herfindahl93\text{-}96_{c,t-1}, Herfindahl97\text{-}01_{c,t-1}, Herfindahl02\text{-}05_{c,t-1}, \ldots, MS_{c,t-1}). \quad (4)$$

In Table 7, I give selected coefficients for a linear regression of (4). One interesting result is that, over time, the impact of price changes on lender share declined while the impact of changes in the rate of home purchases increased.

One explanation consistent with the results so far is that mortgage bankers chased hot markets in ways that banks did not. To do this, mortgage bankers would have to get customers that they did not get when the markets were not as hot. If the brokers did this by offering comparable terms to banks but advertising more, my data would not capture this. But, if competition was through lenient terms on mortgages, it might be possible to pick up using the ratio of mortgage size to borrower income (the debt-to-income ratio). For each lender, I find the average debt-to-income ratio by metro area. I take the average ratio for banks

The analysis in this section points to mortgage bankers chasing hot markets at the expense of banks. In the early part of the sample, the brokers responded more to home prices, but later prices and home purchases were essentially equally attractive to brokers.

V. Robustness

This section reports the results of several robustness tests. One issue is that the sample period was selected knowing that home prices generally were rising until the very end of the sample and that, in certain markets, home prices did very well. In this section,

we provide evidence that the main qualitative results hold even if some changes are made to account for the sample period selection.

Home prices increased by at least 80% between 1993 and 2005 in every metro area in the sample. However, some areas did better than others. Studies have pointed out that prices in some "superstar" cities may increase more than prices in other areas (Glaeser, et al., 2005; Gyourko, et al., 2004). Others noted that the price increases during the sample period were concentrated in coastal cities (see, e.g., Haines and Rosen, 2007). Since many of the areas that did best are in California, as a robustness check, I rerun the main price change regression (column 1 of Table 3) dropping the three California metro areas (Los Angeles, San Diego, and San Francisco). The results are reported in the first column of Table 8. The results are qualitatively similar to when California is included. If we split the sample by either the median growth rate of home prices or of home purchases, the share of mortgages issued by banks is positive and significant for both the high- and low-growth subsamples (not shown).

There were several other trends during the sample period. One important one that has been alluded to is the growth of securitization. It is possible that differences in the ability (or practice) of banks to securitize in a particular market could have affected how and why home prices increased. In unreported regressions, I split the metro areas by the share of loans that are securitized. The key results hold for both subsamples.

The existence of trends suggests a more direct set of controls. I include a trend variable and a trend squared variable in the main regressions. The final three columns of Table 8 report regressions where the dependent variables are the growth in home prices, the bank share, and the mortgage bank share. The trend variables are all statistically significant. However, again, the main results still hold with little important change in the magnitudes of the coefficients. There are clearly trends in home prices and mortgage lending during the sample period. However, they do not change the key relationships in the paper between home price increases and lender market share.

VI. Conclusion

While fundamental factors such as mortgage rates and the health of the local economy certainly play a major role in explaining average home prices, these do not appear sufficient to explain boom in home prices in the early part of the 2000s. Previous studies have appealed to supply-side and behavioral reasons why prices may have deviated from fundamentals. In this paper, I offer new evidence that provides support for both these explanations, although for different reasons that in the prior studies.

This paper looks at how home prices are related to the types of mortgage lenders. Although the originate-to-distribute model means that lenders can issue mortgage loans without having to raise a lot of capital, organization structure can still affect costs and benefits of lending. Banks and other DIs have a very different structure and regulatory environment than mortgage bankers. Banks generally have higher overhead than brokers, but more ability to cross-sell. This can allow banks to get customers more easily than brokers and also to profit more from borrowers. These differences between banks and brokers may explain why lender market shares have an influence on home price increases and vice versa.

I show that when the share of banks in a market grows relative to the share of mortgage bankers, the rate of increase of home prices goes up. That is, banks are associated with higher future home prices. During the sample period, this was true when price growth was moderate and when it was fast. This is consistent with loan supply issues affecting home prices.

There is also an impact of home prices, and home purchases, on lender market shares. When prices and purchasers nationwide are increasing at a faster pace, market share shifts from bank to mortgage bankers. The nationwide changes have larger impacts than local changes. This is consistent with either brokers or their customers believing that rising prices and purchases indicate future strength in housing markets. Brokers, with low entry costs, may be chasing hot products, or chasing customers who have a boom psychology.

The evidence in this paper suggests that there is a relationship between home price changes and lender market shares. Some important questions going forward are whether this relationship played a role in starting the price boom and whether it played a role in damping the boom.

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Figure 1. Median home price and CPI_OER (rent) index, 1982-2008.

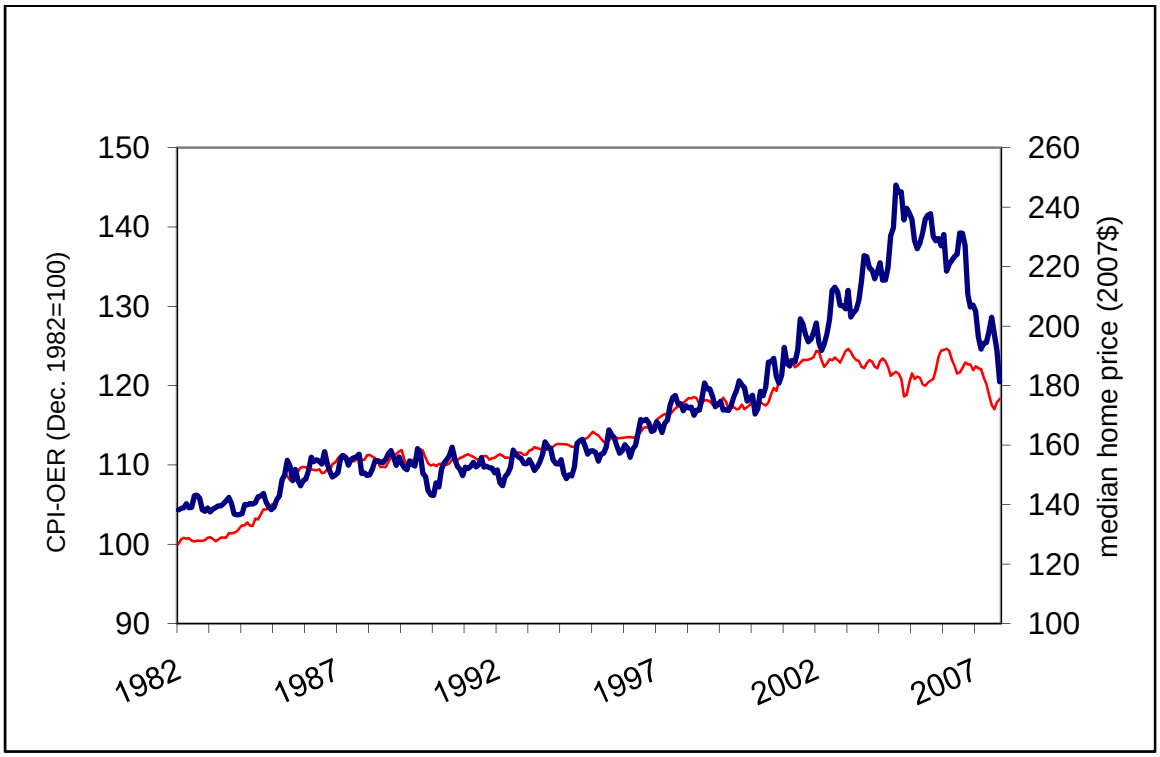

Table 1. Summary statistics.

	Mean	Median	Std. dev.
%ΔCS	0.018	0.015	0.019
%Δ(price-to-rent)	0.010	0.008	0.019
%ΔOFHEO	0.017	0.014	0.017
Herfindahl	0.023	0.022	0.009
CB(bank) share	0.442	0.448	0.100
THR (thrift) share	0.210	0.206	0.081
CU (credit union) share	0.021	0.019	0.012
MB (mort. bank) share	0.326	0.313	0.090
%ΔDenial_percentage	0.021	0.009	0.141
%ΔPurchase_change	0.022	0.020	0.063
%ΔRefi_percentage	0.016	0.003	0.190
Govt_securization	0.291	0.288	0.086
Private_securitization	0.022	0.018	0.017
%ΔCPI-OER	0.008	0.008	0.007
%ΔAmount_to_income	0.007	0.008	0.104
%ΔAfford	0.015	0.019	0.041
ΔUnemploy	4.938	4.800	1.421
%ΔIncome	0.010	0.011	0.006

The data include 972 observations from quarterly observations of 20 metro areas from 1993-2005.

Table 2. Mortgage market shares.

Year	Mortgages (millions)	Bank share	Thrift share	Credit union share	Mortgage banker share
1993	3.30	31.5%	24.6%	1.7%	42.1%
1994	1.99	34.2%	24.7%	1.7%	39.4%
1995	1.60	40.7%	21.7%	1.8%	35.8%
1996	2.08	41.7%	22.4%	1.9%	33.9%
1997	2.27	43.4%	21.0%	1.8%	33.9%
1998	4.03	46.4%	18.9%	1.9%	32.8%
1999	3.23	49.1%	18.7%	2.0%	30.2%
2000	2.62	49.5%	20.0%	1.8%	28.6%
2001	5.00	46.7%	23.4%	2.3%	27.1%
2002	6.18	50.7%	22.9%	2.5%	24.0%
2003	8.34	49.7%	21.8%	2.4%	26.1%
2004	5.53	43.9%	20.5%	2.1%	33.6%
2005	5.72	40.7%	19.8%	2.0%	37.6%

Data is for 20 metro areas. Market shares based on corporate parent of lender.

Table 3. Price change regressions.

Dependent variable:	*%ΔCS*	*%ΔCS*	*%Δprice-to-rent*	*%ΔOFHEO*
Herfindahl	0.054	0.165	0.111	0.116
	(0.575)	(0.357)	(0.350)	(0.072)*
CB(bank) share	0.042	0.074	0.050	0.028
	(0.001)***	(0.006)***	(0.002)***	(0.011)**
THR (thrift) share	0.031	0.056	0.020	0.019
	(0.034)**	(0.075)*	(0.218)	(0.107)
CU (credit union)	0.189	0.568	0.241	0.236
share	-0.108	(0.022)**	(0.037)**	(0.005)***
%ΔDenial_percentage	-0.004	-0.007	-0.005	-0.015
	(0.171)	(0.132)	(0.189)	(0.001)***
%ΔPurchase	0.063	0.056	0.061	0.021
	(0.000)***	(0.000)***	(0.000)***	(0.004)***
%ΔRefi_percentage	-0.014	-0.008	-0.019	-0.008
	(0.000)***	(0.008)***	(0.000)***	(0.000)***

(continued on next page)
All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Price change regressions (continued)

Dependent variable:	*%ΔCS*	*%ΔCS*	*%Δprice-to-rent*	*%ΔOFHEO*
Govt_securization	-0.009	-0.008	-0.006	-0.005
	(0.235)	(0.634)	(0.459)	(0.446)
Private_securitization	0.061	0.279	0.091	0.121
	(0.144)	(0.002)***	(0.092)*	(0.001)***
%ΔCPI-OER	-0.107	-0.013		-0.019
	(0.170)	(0.892)		(0.718)
%ΔAmount_to_income	0.000	0.014	0.004	-0.004
	(0.890)	(0.102)	(0.169)	(0.060)*
%ΔAfford	0.102	0.044	0.107	-0.018
	(0.000)***	(0.009)***	(0.000)***	(0.063)*
ΔUnemploy	-0.001	-0.002	0.000	-0.001
	(0.330)	(0.065)*	(0.449)	(0.009)***
%ΔIncome	0.196	0.743	0.316	0.236
	(0.012)**	(0.001)***	(0.002)***	(0.022)**
Lagged dependent variable	0.631		0.528	0.642
	(0.000)***		(0.000)***	(0.000)***
R-sqaured	0.578	0.318	0.485	0.629

All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Price change regressions by time period. The results reported are for a single regression where the control variables are interacted with dummies for the three time periods.

	%ΔCS		
	1993-1996	1997-2001	2002-2005
Herfindahl	0.083	0.128	-0.115
	(0.326)	(0.319)	(0.489)
CB(bank) share	0.038	0.047	0.050
	(0.024)**	(0.007)***	(0.039)**
THR (thrift) share	0.020	0.029	0.035
	(0.074)*	(0.180)	(0.053)*
CU (credit union) share	0.042	0.144	0.200
	(0.738)	(0.222)	(0.131)
%ΔPurchase	0.011	0.050	0.131
	(0.324)	(0.001)***	(0.000)***
Lagged dependent variable		0.578	
		(0.000)***	
R-squared		0.623	

Only selected coefficients are reported. The full regression is given in (2).
All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Effect of home price changes on securitization, purchases, and bank share of local markets

	Bank share	Thrift share	Credit union share	Mortgage banker share	*%ΔPurchase_change*
Herfindahl	-0.014	-0.027	0.059	0.059	0.080
	(0.922)	(0.830)	(0.028)**	(0.707)	(0.793)
CB share	0.870				-0.088
	(0.000)***				(0.026)**
THR share		0.833			-0.182
		(0.000)***			(0.023)**
CU share			0.695		0.110
			(0.000)***		(0.743)
MB share				0.855	
				(0.000)***	
%Δ*Denial_percentage*	-0.009	0.012	-0.006	0.004	-0.010
	(0.090)*	(0.004)***	(0.001)***	(0.444)	(0.553)
%ΔPurchase	-0.095	0.007	-0.003	0.089	-0.149
	(0.000)***	(0.469)	(0.429)	(0.000)***	(0.000)***
%ΔRefi_percentage	-0.015	-0.003	0.000	0.019	0.053
	(0.001)***	(0.428)	(0.772)	(0.001)***	(0.000)***

(continued on next page)

All control variables are lagged one quarter.

Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Effect of home price changes on securitization, purchases, and bank share of local markets (continued)

	Bank share	Thrift share	Credit union share	Mortgage banker share	*%ΔPurchase_change*
Govt_securization	-0.003	0.003	0.001	-0.005	0.148
	(0.847)	(0.824)	(0.577)	(0.703)	(0.001)***
Private_securitization	-0.001	-0.105	-0.003	0.105	0.086
	(0.977)	(0.009)***	(0.659)	(0.012)**	(0.500)
%ΔCPI-OER	0.130	0.162	-0.030	-0.214	-0.602
	(0.267)	(0.105)	(0.009)***	(0.026)**	(0.002)***
%ΔAmount_to_income Lag	0.011	0.015	0.001	-0.028	-0.042
	(0.112)	(0.065)*	(0.584)	(0.002)***	(0.034)**
%ΔAfford	0.113	-0.020	0.015	-0.113	0.461
	(0.001)***	(0.627)	(0.002)***	(0.000)***	(0.000)***
ΔUnemploy	-0.005	0.000	0.000	0.006	0.008
	(0.001)***	(0.973)	(0.489)	(0.000)***	(0.001)***
%ΔIncome	-0.447	-0.424	-0.046	0.942	1.830
	(0.018)**	(0.035)**	(0.169)	(0.000)***	(0.000)***
%ΔCS	-0.213	0.068	-0.006	0.156	-0.045
	(0.000)***	(0.059)*	(0.494)	(0.001)***	(0.717)
R-squared	0.943	0.930	0.890	0.931	0.304

All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Effect of home price changes on securitization, purchases, and bank share of local markets.

	Bank share	Thrift share	Credit union share	Mortgage banker share	*%ΔPurchase_change*
Herfindahl	-0.246	-0.043	0.053	0.404	0.236
	(0.158)	(0.742)	(0.057)*	(0.029)**	(0.481)
CB share	0.906				-0.132
	(0.000)***				(0.010)**
THR share		0.826			-0.189
		(0.000)***			(0.023)**
CU share			0.698		0.032
			(0.000)***		(0.927)
MB share				0.887	
				(0.000)***	
%ΔPurchase	-0.005	0.014	0.000	-0.009	-0.135
	(0.776)	(0.433)	(0.989)	(0.537)	(0.002)***
%ΔPurchase national	-0.235	-0.018	-0.007	0.250	-0.035
	(0.000)***	(0.542)	(0.209)	(0.000)***	(0.572)
%ΔCS	-0.101	0.106	-0.004	0.041	-0.192
	(0.053)*	(0.009)***	(0.717)	(0.372)	(0.124)
%ΔCS national	-0.251	-0.071	-0.006	0.258	0.334
	(0.002)***	(0.078)*	(0.499)	(0.000)***	(0.030)**

(continued on next page)

All control variables are lagged one quarter.

Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Effect of home price changes on securitization, purchases, and bank share of local markets (continued)

	Bank share	Thrift share	Credit union share	Mortgage banker share	*%ΔPurchase_change*
%Δ*Denial_percentage*	-0.006	0.011	-0.006	0.001	-0.006
	(0.253)	(0.004)***	(0.001)***	(0.874)	(0.719)
%ΔRefi_percentage	-0.001	-0.002	0.001	0.004	0.054
	(0.725)	(0.597)	(0.460)	(0.285)	(0.000)***
Govt_securization	0.021	0.005	0.002	-0.037	0.153
	(0.124)	(0.719)	(0.235)	(0.001)***	(0.002)***
Private_securitization	0.124	-0.086	0.000	-0.033	0.013
	(0.007)***	(0.024)**	(0.973)	(0.423)	(0.926)
%ΔCPI-OER	0.083	0.140	-0.032	-0.134	-0.522
	(0.434)	(0.153)	(0.009)***	(0.154)	(0.008)***
%ΔAmount_to_income	0.011	0.015	0.001	-0.030	-0.043
	(0.110)	(0.061)*	(0.557)	(0.000)***	(0.031)**
%ΔAfford	0.048	-0.028	0.013	-0.048	0.480
	(0.107)	(0.540)	(0.004)***	(0.069)*	(0.000)***
ΔUnemploy	-0.003	0.000	0.000	0.004	0.007
	(0.031)**	(0.893)	(0.606)	(0.000)***	(0.001)***
%ΔIncome	-0.065	-0.425	-0.037	0.522	1.832
	(0.719)	(0.031)**	(0.223)	(0.000)***	(0.000)***
R-squared	0.948	0.930	0.890	0.938	0.309

All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7. Effect of home price changes on securitization, purchases, and bank share of local markets.

	(1) Bank share	(2) Thrift share	(3) Credit union share	(4) Mortgage banker share
	(0.199)	(0.099)*	(0.161)	(0.377)
Lag %ΔCS (97-01)	-0.083	0.051	-0.017	0.071
	(0.408)	(0.478)	(0.349)	(0.366)
Lag %ΔCS (02-05)	-0.113	0.061	-0.003	0.069
	(0.039)**	(0.150)	(0.880)	(0.221)
Lag natl. %ΔCS (93-96)	-1.911	0.872	-0.044	1.082
	(0.000)***	(0.004)***	(0.247)	(0.001)***
Lag natl. %ΔCS (97-01)	-0.557	0.176	-0.010	0.390
	(0.000)***	(0.162)	(0.599)	(0.000)***
Lag natl. %ΔCS (02-05)	-0.306	-0.152	-0.056	0.476
	(0.004)***	(0.038)**	(0.008)***	(0.000)***
Lag %ΔPurch (93-96)	0.008	-0.005	0.001	-0.011
	(0.803)	(0.939)	(0.877)	(0.837)
Lag %ΔPurch (97-01)	-0.032	0.033	0.005	-0.003
	(0.222)	(0.267)	(0.555)	(0.889)
Lag %ΔPurch (02-05)	0.019	0.018	-0.002	-0.034
	-0.314	-0.320	-0.832	(0.045)**
Lag natl. %ΔPurch (93-96)	-0.122	0.098	0.009	0.020
	(0.088)*	-0.310	-0.426	-0.776
Lag natl. %ΔPurch (97-01)	-0.187	-0.024	-0.024	0.231
	(0.000)***	-0.516	(0.036)**	(0.000)***
Lag natl. %ΔPurch (02-05)	-0.452	-0.088	-0.010	0.533
	(0.000)***	(0.003)***	-0.252	(0.000)***
Lagged dependent variable	0.832	0.804	0.661	0.849
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
R-squared	0.962	0.937	0.898	0.951

Only selected coefficients are reported. The full regression is given in (4).
All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Robustness checks: Regressions where dependent variable is rate of change in home prices. Effect of dropping California metro areas and introducing trend variables.

	Dropping California	With trend variables		
	(1)	(2)	(3)	(4)
Herfindahl	-0.013	0.059	-0.331	0.293
	(0.851)	(0.472)	(0.045)**	(0.212)
CB share	0.030	0.038	0.840	
	(0.008)***	(0.020)**	(0.000)***	
THR share	0.027	0.035		
	(0.070)*	(0.017)**		
CU share	0.178	0.155		
	(0.176)	(0.176)		
MB share				0.820
				(0.000)***
%ΔPurchase	0.046	0.059	-0.002	-0.010
	(0.003)***	(0.000)***	(0.919)	(0.548)
%ΔPurchase national			-0.248	0.264
			(0.000)***	(0.000)***
%ΔCS	0.660	0.578	-0.100	0.002
	(0.000)***	(0.000)***	(0.040)**	(0.963)
%ΔCS national			-0.544	0.592
			(0.000)***	(0.000)***
Trend		-0.041	0.186	-0.209
		(0.058)*	(0.000)***	(0.000)***
Trend squared		0.100	-0.215	0.258
		(0.014)**	(0.010)**	(0.001)***

(continued on next page)

All control variables are lagged one quarter.

Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Robustness checks: contemporaneous purchases, dropping California, and national variables (continued)

	Dropping California	With trend variables		
	(1)	(2)	(3)	(4)
%ΔDenial_percentage	-0.007	-0.004	-0.008	0.003
	(0.003)***	(0.191)	(0.165)	(0.639)
%ΔRefi_percentage	-0.011	-0.013	0.005	-0.003
	(0.001)***	(0.000)***	(0.350)	(0.491)
Govt_securization	-0.008	-0.005	0.031	-0.035
	(0.261)	(0.486)	(0.044)**	(0.010)**
Private_securitization	0.053	-0.023	0.033	0.046
	(0.263)	(0.593)	(0.505)	(0.318)
%ΔCPI-OER	-0.107	-0.078	0.051	-0.137
	(0.186)	(0.313)	(0.662)	(0.142)
%ΔAmount_to_income	0.001	0.001	0.009	-0.026
	(0.761)	(0.847)	(0.197)	(0.003)***
%ΔAfford	0.081	0.097	0.001	0.006
	(0.001)***	(0.000)***	(0.976)	(0.829)
ΔUnemploy	0.000	-0.002	-0.001	0.001
	(0.713)	(0.012)**	(0.440)	(0.183)
%ΔIncome	0.156	0.196	0.313	0.190
	(0.049)**	(0.011)**	(0.218)	(0.132)
R-squared	0.553	0.585	0.951	0.942
Observations	822	972	972	972

All control variables are lagged one quarter.
Note: All regressions have metro-area fixed effects. P-values using robust standard errors clustered at the metro area are in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%

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