Competition in mortgage markets: The effect of lender type on loan characteristics

Richard J. Rosen

Introduction and summary

The years 1995 through 2007 saw a boom and bust in home prices and purchase activity in the United States. There has been a lot of attention paid to the causes of the boom–bust cycle and who, or what, is to blame.[1] Some have blamed the cycle on subprime lending and the securitization of home mortgages (see, for example, Mian and Sufi, 2009; Keys et al., 2010; and Demyanyk and Van Hemert, 2009).[2] During the latter years of the boom, both subprime lending and securitization expanded significantly. By 2005, subprime lending was over six times as large as its pre-2000 peak, and overall securitization was more than twice its pre-2000 peak.[3] But these changes, and the housing cycle in general, were not uniform across the country. The expansion of lending and the subsequent problems in housing markets were more extreme in some markets than in others (Mian and Sufi, 2009), in part possibly because of changes in home prices. Home prices rose much more rapidly in some markets than in others, both in percentage terms and relative to fundamentals (see, for example, Haines and Rosen, 2007). Differences across markets may occur because of market conditions and the core attractiveness of a market (see, for example, Gyourko, Mayer, and Sinai, 2006). However, they may also reflect differences in the composition of lenders in particular markets. This article explores how the characteristics of mortgages varied over time and across markets and how these differences relate to the composition of lenders in the markets.[4] The characteristics I focus on are measures of loan risk and borrower quality. I examine how these differ across mortgages issued by different types of lenders and how shifts in mortgage shares among lender types in local markets affected standards of lenders in those markets.[5]

I focus on the lender that originates, or originally funds, a mortgage. The primary division of lenders is into banks (that is, depository institutions) and independent mortgage banks (IMBs). Banks and IMBs differ in corporate strategy and regulation, both of which may affect their approach to participating in mortgage lending, including the characteristics of the mortgages they issue and the borrowers they issue them to. Mortgage lending generally plays a much larger role at IMBs than at banks; unlike IMBs, many banks tend to view mortgages as just one part of a broader strategy. Banks typically have branch networks to attract deposit customers, and mortgages may form only a part of their asset portfolios. In part because the presence of branches can affect the way banks compete for mortgage borrowers, I subdivide banks by whether or not they have branches in the local market being considered (local banks versus nonlocal banks). Local banks may be able to use their branches' presence to help them capture potential borrowers. Over the past 15 years, the market shares of the three types of lenders (local banks, nonlocal banks, and IMBs) have shifted by as much as 15 percentage points. From 1995 through mid-2006, the share of mortgages made by local banks trended down. Initially, local banks lost market share to IMBs, but starting in 2001, mortgages issued by nonlocal banks began to make up a large share of total mortgages in many markets. Finally, there was a massive readjustment away from mortgages made by IMBs starting in mid-2006, slightly after the housing market bust had begun.[6]

The way I divide lenders in this article reflects important differences across lenders in the mortgage delivery process. How borrowers are matched with lenders and how mortgages are ultimately financed

Richard J. Rosen is a senior economist and economic advisor in the Economic Research Department at the Federal Reserve Bank of Chicago. *He thanks Gene Amromin and Anna Paulson for their comments and Robert McMenamin and Edward Zhong for their assistance with the research.*

(two key elements) typically differ across the three types of lenders I focus on. A potential borrower wanting a mortgage has the option of contacting a bank or IMB directly. For example, a borrower who wants to find out about lending terms and conditions could visit local bank branches and talk with a loan officer. Alternatively, the borrower could use the services of a mortgage broker. A mortgage broker is an independent agent who serves as a contact between borrowers and lenders, arranging loans but not actually lending money. The broker can offer borrowers a menu of loan products from different lenders.[7] According to one study, mortgage brokers helped arrange 68 percent of all residential mortgages in 2004.[8] Brokers make it easier and less expensive for lenders with no physical presence in a market to lend in the market. This can potentially help both banks and IMBs expand. Often, the use of brokers is referred to as wholesale lending (as opposed to retail lending, where originators connect directly with borrowers, often when customers visit a bank branch or have a pre-existing relationship with the lender).[9] The expectation is that most IMBs and nonlocal banks operate in the wholesale lending market, while local banks rely on a mix of retail and wholesale lending (although, clearly, there are variations in strategy across banks of the same type).

As noted previously, many loans are securitized. Traditionally, the primary option for a potential home purchaser who needed a loan was to go to a local bank. Typically, the bank would hold the loan in its asset portfolio, financing it using its own deposits. This put a natural limit on the ability of the bank to issue mortgages. In the securitization process, the bank or other lender that initially funds the loan quickly sells it to a third party. The third party then uses a pool of mortgages as the collateral backing a bond issue. The bonds, known as mortgage-backed securities, are sold to investors (see Rosen, 2007b). The ability to easily sell mortgages means that the originating lender can finance a larger volume of loans with its capital. The costs and risks of originating mortgages for lenders that plan to securitize them are different than for lenders that plan to keep the loans in their portfolios. This difference may affect how the lenders compete for borrowers. While securitization made it easier for all lenders to expand, it is likely to be more important for those lenders without a strong deposit base, especially IMBs.

The ties between mortgage brokerage and securitization, on the one hand, and lender competition and lending market standards, on the other hand, are both direct and indirect. The presence of mortgage brokers, at least those who act in the interests of the home buyers (see note 7), should increase the competitiveness of lenders. This could mean lower mortgage rates, but it also could mean that other mortgage terms are relaxed, such as allowing applicants to take out larger mortgages than their incomes might readily support or mortgages that are significantly higher than the value of the homes they are buying. It is plausible that increased competition among lenders contributed to such developments as the 125 percent loan-to-value mortgages offered during the housing boom. Securitization also can increase the competition for mortgages. The expansion of securitization in the 1990s and the early part of the 2000s meant that the risk that a lender would not be able to sell a loan was reduced; also, the time a lender was forced to hold the loan before selling it as part of the securitization process likely fell. This made it less risky, and therefore less expensive, for lenders to enter new markets and expand. However, securitization also benefits from economies of scale. This led to industry consolidation. In 1995, the ten largest mortgage originators made 25.3 percent of all mortgages; by 2005, it was 32.7 percent.[10] Thus, the net impact of securitization on lender competitiveness is unclear.

It is likely that the mortgage delivery system, including the use of brokers on the front end and securitization on the back end, affects how lenders compete, including how lending market standards are set. However, the lack of data makes it difficult to directly tie brokerages and the rest of the mortgage delivery system to market conditions. The primary data on mortgages come from the information lenders are required to report to the Federal Financial Institutions Examination Council under the Home Mortgage Disclosure Act (HMDA). The HMDA data identify lenders and give some information on the disposition of a mortgage, but they do not include information on how a mortgage applicant connects with a lender, including whether a broker was involved in the lending process. The supplementary data on mortgages that I use in this article—from Lender Processing Services (LPS) Applied Analytics (formerly known as McDash Analytics)—also do not have information on the front end of the mortgage process. The best option I have is to use information on lenders as a proxy for the mortgage origination processes they use—and thus the lenders' effect on lending market competition and conditions.

I use HMDA and LPS data to examine both how mortgage characteristics differ by lender type and how the distribution of lender types within a market affects mortgage characteristics in the market. I find that, on average, banks make ex ante safer loans than IMBs do, both on an absolute scale and relative to IMBs in the counties where they lend. Also, mortgages issued by banks have lower loan-to-income ratios and lower

loan-to-value ratios, and banks' borrowers have higher FICO (Fair Isaac Corporation) scores.[11] Among banks, I find that local banks make safer loans than nonlocal banks do, with nonlocal banks falling between local banks and IMBs.

I examine how the shift in lending in a market from one type of lender to another affects all the lenders in a market. This gives an indication of whether lender type affects how a firm competes. If lender type does not matter, then the shift in lending should have no impact. I find that a shift in lending toward a particular type of lender is associated with a larger change in lending standards at that type of lender than at other types of lenders. The interesting thing is that when a particular category of lender increases its share in a local mortgage market, that category of lender makes mortgages with higher loan risk, but to borrowers who are, on average, of higher quality. For example, when the mortgage share of local banks in a market increases, those banks issue mortgages with higher loan-to-income and loan-to-value ratios (higher loan risk), but to borrowers with higher FICO scores (lower borrower risk). The impact of a change in the share of mortgages issued by a particular type of lender on other types of lenders is much weaker. So, for example, a shift in the share of mortgages issued from local banks to IMBs has a generally insignificant impact on loan standards at nonlocal banks.

I also examine whether large metropolitan areas are different from less densely populated areas. Separating counties (markets) into those in large metropolitan statistical areas (MSAs) and those in small MSAs,[12] I find that the impact of an increase in the share of a particular category of lender on that category's lending standards is weaker in the large-MSA counties than in the small-MSA counties.

Data

The primary source of mortgage data that I use comes from information that lenders are required to report under the Home Mortgage Disclosure Act. HMDA mandates that lenders report data for the vast majority of mortgage applications.[13] For each application, the HMDA data provide the name of the lender, its type, and loan information, including the location of the borrower. Lenders are required to report information on all types of residential mortgages, including loans used for purchases of single-family homes, loans used for purchases of multifamily dwellings, loans to refinance existing mortgages, and loans for home improvement. To make the comparisons in this article as revealing as possible, I restrict the sample to loans used for purchases of single-family homes and, within single-family loans, drop both second mortgages and home equity lines.[14] For most of the analysis, I separate lenders by whether or not they also take deposits. Institutions that both make loans and take deposits are regulated and chartered differently from those that only make loans. The deposit-taking institutions, which I generically refer to as banks, comprise commercial banks, thrift banks, and credit unions.[15] I refer to the non-deposit-taking lenders as independent mortgage banks, and this category includes specialized mortgage lenders and independent finance companies.

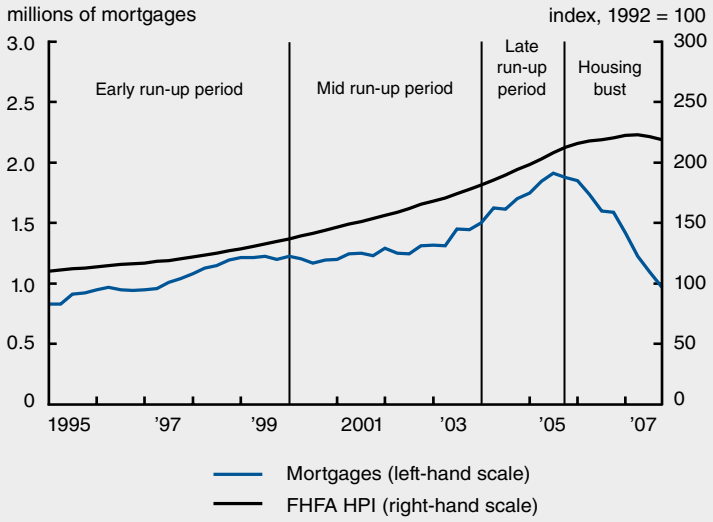
One important drawback of the HMDA data is that a lender is classified without regard for whether the lender is the subsidiary of a different kind of institution. So, a mortgage made by a mortgage bank that is the subsidiary of a commercial bank holding company is classified by HMDA in the IMB category. Instead, I classify lenders by the type of lender that their parent organization is. This assumes that major strategic choices are made at the parent organization level. This also assumes that where a lender books a mortgage is a matter of lender policy, meaning, for example, that some parent organizations book these loans at a bank subsidiary, while others book them at a mortgage bank subsidiary.[16]

In this article, I use quarterly HMDA data from 1995 through 2007. During this period, total mortgages issued increased from 1995 through the third quarter of 2005 (see figure 1). However, the rate of increase was not constant. From 1995 through 1999 (the early run-up period), home purchases increase at a rate of 8.4 percent. This falls to a rate of 3.8 percent from 2000 through 2003 (the mid run-up period), before rocketing up at a rate of 11.9 percent from 2004 through the third quarter of 2005 (the late run-up period). From the fourth quarter of 2005 through 2007 (the housing bust), there is a sharp decline in home purchases. The pattern is superficially similar to the pattern in home prices, as indicated by the Federal Housing Finance Agency's (FHFA) House Price Index (HPI), also reported in figure 1.[17] But home prices increased faster during the 2000–03 period than during the 1995–99 period (see, for example, Haines and Rosen, 2007, for a discussion of home price changes).

There is likely to be a difference in how banks connect with potential borrowers, depending on their presence in a market. Potential borrowers connect with a bank because of a pre-existing relationship, such as a checking or savings account. They may also walk into (or phone) one of the bank's branches. These two approaches are likely to be correlated with the bank having a physical presence (that is, a branch) in the borrower's local market. I define a mortgage as coming from a *local bank* if the lending bank has a branch

FIGURE 1

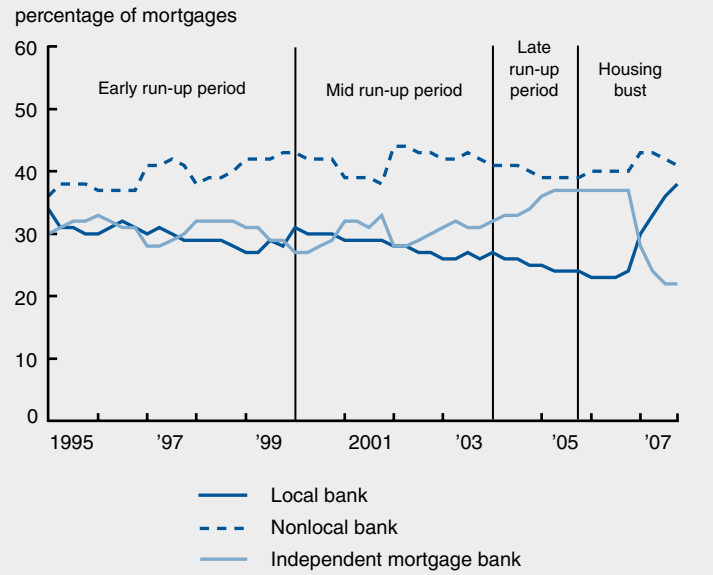
Total number of mortgages and home prices



Note: See the text for details on the four periods.
Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Federal Deposit Insurance Corporation, Summary of Deposits; and Federal Housing Finance Agency (FHFA), seasonally adjusted purchase-only House Price Index (HPI), from Haver Analytics.

FIGURE 2

Mortgage shares, by lender type



Note: See the text for details on the four periods.
Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Robert Avery, Board of Governors of the Federal Reserve System; and Federal Deposit Insurance Corporation, Summary of Deposits.

in the county where the home purchased with the mortgage is located. Alternatively, a borrower may use a mortgage broker (or an Internet equivalent) to help choose a lender. Brokers allow a bank to make mortgages without having a physical presence to attract customers. I define a mortgage as coming from a *nonlocal bank* if the lending bank has no branches in the county where the home purchased with the mortgage is located. While I do not know whether a borrower has a pre-existing relationship with a bank, walks into a branch, or uses a broker, I assume that it is more likely that a loan from a local bank is made through a branch or pre-existing relationship (that is, the retail channel). The vast majority of loans made by nonlocal banks (and IMBs) come through brokers (that is, the wholesale channel). In the entire sample, 28.46 percent of mortgages are made by local banks and 40.45 percent are made by nonlocal banks (of course, a bank can be a local bank in some markets and a nonlocal bank in other markets).[18]

Figure 2 shows the share of mortgages made by local banks, nonlocal banks, and IMBs over the sample period. The share of mortgages made by local banks declined steadily from 1995 through the third quarter of 2006, that is, during the period when housing prices rose and into the start of the housing bust. In the first quarter of 1995, local banks had a share of 34.26 percent of the mortgages made, but by mid-2006, this share had decreased to 23.84 percent. In 1995–99 (the early run-up period), the drop in the number of mortgages made by local banks was balanced by the rise in the number of mortgages made by nonlocal banks. But as home prices began to increase at a faster pace, the share of mortgages made by IMBs began to rise. At the start of 2000, IMBs had a share of 26.68 percent

of the mortgages made, but this quickly increased to 37.10 percent in the first quarter of 2005. Starting in late 2005, as home prices began to fall and private securitization markets shut down, these patterns reversed. By the end of 2007, the share of mortgages made by local banks increased to 37.90 percent, while the share of mortgages made by IMBs fell to 21.59 percent. Note that the decline in IMB share in 2006–07 is at least partially due to the failure of American Home Mortgage and several other IMBs.

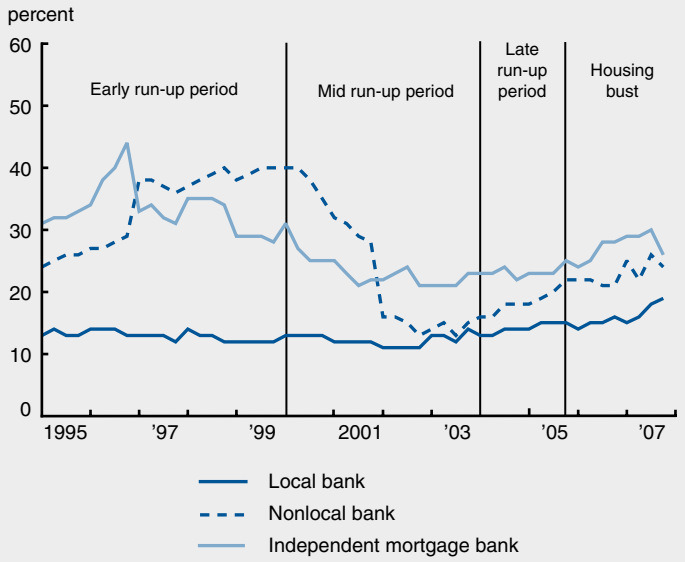
Up to now, I have been examining mortgages issued by lenders. But HMDA data also include records for mortgage applications that are denied. One focus of this article is to examine how lender competition affects the characteristics of loans that are made. For the most part, I treat the denial rate as if it is a loan characteristic, viewing it as a signal of the aggregate riskiness of loans that are granted. A lower denial rate may mean higher loan or borrower risk. To the extent that we do not perfectly observe loan and borrower risks, the denial rate can serve as a proxy for them. Figure 3 reports the percentage of mortgage applications that are denied by lender type.[19] The mortgage denial rate of local banks was flat for most of the sample period, only showing the beginning of an increase when home prices fell toward the end of the sample. The mortgage denial rate of nonlocal banks dropped sharply as home prices began to rise more quickly in 2000: The denial rate fell from 40.22 percent in the second quarter of 2000 to 13.44 percent in the second quarter of 2002. The denial rate of nonlocal banks then drifted up to about 25 percent by the end of the sample, in 2007. IMBs followed a similar pattern to that of nonlocal banks, perhaps because both groups are wholesale lenders, getting most of their loans from mortgage brokers. As I noted before, while local banks may get some applicants through brokers, they can also appeal to people with whom they have a pre-existing relationship or to people who visit a local branch.

The differences in mortgage denial rates across lenders, and possibly across time, likely reflect in part differences in applicant quality. They may also result from variation in the types of mortgages that applicants want. To examine whether these differences affect the mortgages that are granted, I need additional data. The HMDA data include information on the amount of each loan and the income of the borrower that I use to get the ratio of loan amount to income. However, to go further, I incorporate data from another source.

As I mentioned before, to supplement the HMDA data, I get information on loan details and borrower quality from LPS Applied Analytics, which collects data from a number of large loan servicers. These data include detailed information on mortgage characteristics and payments, as well as on the borrower. The LPS data contain information on the mortgage at origination and a monthly record of its status. I match the LPS data to the HMDA data. Because of data limitations, it is not possible to match an LPS observation with each HMDA record. The final merged data set matches 38.6 percent of the LPS records and 18.4 percent of the HMDA records. The matched records are broadly representative of the LPS sample. The proportion of different lender types is similar, as is the mean loan-to-income ratio. However, the merged data underrepresent certain loans in the HMDA data. Because LPS Applied Analytics only gets data from a limited number of large servicers, it misses many loans kept in portfolio by smaller banks or serviced by smaller servicers. The LPS data also underrepresent subprime loans

FIGURE 3

Mortgage application denial rates, by lender type



Note: See the text for details on the four periods.
Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Robert Avery, Board of Governors of the Federal Reserve System; and Federal Deposit Insurance Corporation, Summary of Deposits.

(see the discussion later on this). Finally, the share of loans in HMDA data that are matched to LPS data increases over the sample period, paralleling the increased servicer coverage by LPS.

Differences across lender types

In this section, I present information on how various loan and borrower characteristics differ across lender types. Again, I focus on three lender types: local banks, nonlocal banks, and IMBs. Banks include all depository institutions (commercial banks, thrift banks, and credit unions); when appropriate, I discuss the different depository institutions.

The differences in mortgage characteristics across lender types are presented in three different ways in table 1. Panel A of table 1 presents full sample means. For each variable, I take the mean for each quarter of the sample period. The mean and standard deviation of the quarterly means are reported in panel A. I take the mean of quarterly means rather than the mean of the entire sample because the number of loans increases over time, and I do not want the means to overweight the latter part of the sample. One issue with using these means to compare lender types is that lender types are not uniformly distributed across markets. As a control for this, I take the average of each variable for each local market in each quarter, using counties as local markets. Panel B of table 1 reports the average difference between the local market average for a lender type and that market's average for all lenders. This is informative about how loans differ across lender types. For example, the proportion of fixed-rate mortgages (FRMs)[20] at local banks is 77.17 percent, which is 0.29 percentage points lower than the average proportion of fixed-rate mortgages at all lenders (seventh row in panel A). Does this mean that local banks give too few fixed-rate mortgages? Not necessarily. As shown in panel B (sixth row), local banks give 2.45 percentage points more fixed-rate mortgages than the average of lenders in the markets they are in. This suggests that lenders in markets with many local banks issued a smaller percentage of fixed-rate mortgages than did lenders in other markets. Finally, as figure 1 (p. 5) shows, the sample period includes a period of increasing sales and prices followed by a period of declining sales and prices. Rather than chart every variable, I report the sample averages for three interesting quarters in panel C of table 1. I show the values in the first period a variable is in the sample; the fourth quarter of 2004, to reflect the peak of sales and prices; and the fourth quarter of 2007, to observe the effects of the declining sales and prices. In general, the three different ways of looking at the data indicate the same patterns, but I discuss them in more detail when they do not.

I use the data in table 1 to examine how mortgage characteristics differ by lender type. In doing this, it is useful to divide mortgage characteristics roughly into three groups. The first is loan risk. These are the features that have to do with risk introduced by the size of the mortgage. The second is borrower quality. These characteristics measure the risk of the borrower more than the mortgage itself. There will be some overlap in the first two groups. Finally, I include some variables that are likely to be more weakly correlated to loan or borrower risk.

The first characteristic is the ratio of the loan amount to the borrower's income. Borrowers with a larger loan relative to income, all else being equal, are more likely to have trouble paying their mortgages. To measure the loan-to-income ratio, I divide the amount of the loan by the borrower's reported income from the HMDA data.[21] Figure 4 (p. 10) charts this ratio for the three types of lenders over the sample period. Several things are apparent from the data. On average, IMBs lend more per dollar of income than banks do (see also table 1, panel A, second row). While not shown in the figure, mortgages issued by thrift banks have a higher average loan-to-income ratio than do mortgages issued by commercial banks, and the mortgages made by credit unions have the lowest ratio of all lender types. The raw averages across the types of banks (table 1, panel A, second row) indicate that local and nonlocal banks lend the same amount as a fraction of borrower income—that is, 2.31. But, mortgages issued by local banks have a loan-to-income ratio (table 1, panel B, first row) that is 0.07 (7 percentage points) lower than the average of lenders in the markets they are in, while mortgages from nonlocal banks have a ratio that is only 0.02 lower, with the difference between 0.07 and 0.02 being statistically significant. This would arise if local banks had made a lot of mortgages in markets where the loan-to-income ratio was higher than in those markets where nonlocal banks made a lot of mortgages, so that the 2.31 loan-to-income ratio for local banks is 0.07 below the average of lenders in their markets, while the 2.31 ratio for nonlocal banks is only 0.02 below the average of lenders in their markets. The loan-to-income ratio for all lenders rose significantly over the sample period, from 2.08 in the first quarter of 1995 to 2.61 in the last quarter of 2007 (table 1, panel C, second row). The rate of increase of the loan-to-income ratio was fastest from 2000 through 2004, precisely when home prices were rising most quickly (see figure 4, p. 10).

A second measure of loan risk is the loan-to-value ratio (table 1, panel A, third row), available from the LPS data. This is the ratio of the mortgage amount to the appraised value of the home.[22] The

TABLE 1

Summary statistics, by lender type

A. Means

	All lenders		Local banks		Nonlocal banks		Independent mortgage banks	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Lender share	—	—	28.46	3.12	40.45	2.06	31.10	3.56
Loan-to-income ratio	2.35	0.18	2.31	0.22	2.31	0.16	2.42	0.20
Loan-to-value ratio	83.07	2.38	81.03	2.32	83.21	2.44	84.72	2.14
FICO score	707.6	5.09	715.7	5.14	706.0	6.11	699.2	10.18
Loan denial rate	24.23	0.060	13.47	0.018	26.97	0.096	28.06	0.062
Subprime share	2.61	2.84	2.36	2.81	2.99	3.22	2.29	2.66
Fixed-rate mortgage share	77.46	11.61	77.17	10.90	76.44	12.77	79.32	11.13
Jumbo share	8.20	2.79	10.22	3.94	8.47	2.46	5.87	2.29
Portfolio share	8.22	2.76	14.09	5.75	7.23	2.73	3.81	2.34
Private share	23.20	7.00	20.10	6.65	19.66	7.69	28.91	9.88
Government share	68.58	6.75	65.81	8.36	73.11	8.05	67.29	10.08
Unemployment rate	4.72	0.37						
Income per capita	35,329	1,450						

B. Within-county differences

	Local banks		Nonlocal banks		Independent mortgage banks	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Loan-to-income ratio	−0.07	0.03	−0.02	0.03	0.07	0.05
Loan-to-value ratio	−2.44	0.47	−0.05	0.32	1.39	0.77
FICO score	8.45	3.61	−1.12	2.16	−7.55	7.01
Loan denial rate	−5.41	0.96	0.16	1.66	7.04	1.41
Subprime share	−0.81	1.07	0.76	0.99	−0.22	1.20
Fixed-rate mortgage share	2.45	2.68	−1.50	1.86	0.10	1.50
Jumbo share	0.53	0.005	0.32	0.002	−0.82	0.004
Portfolio share	4.49	3.47	−0.27	1.54	−3.36	2.50
Private share	−1.95	2.89	−2.98	4.63	8.03	7.00
Government share	−3.33	3.91	3.37	4.67	−4.12	7.60

TABLE 1 (CONTINUED)

Summary statistics, by lender type

C. Values for selected quarters

	All lenders			Local banks			Nonlocal banks			Independent mortgage banks		
	1995:Q1[a]	2004:Q4	2007:Q4	1995:Q1[a]	2004:Q4	2007:Q4	1995:Q1[a]	2004:Q4	2007:Q4	1995:Q1[a]	2004:Q4	2007:Q4
Lender share	—	—	—	34.25	26.22	37.90	36.21	40.99	40.52	29.54	32.79	21.59
Loan-to-income ratio	2.08	2.60	2.61	1.99	2.61	2.59	2.10	2.51	2.55	2.11	2.74	2.75
Loan-to-value ratio	87.22	79.46	81.96	85.36	77.33	79.34	87.42	79.49	82.79	87.97	81.71	84.89
FICO score	698.46	709.63	715.40	712.57	717.13	723.62	703.72	709.76	712.78	666.83	700.39	705.23
Loan denial rate	27.58	18.36	22.55	15.33	13.31	18.55	28.31	17.90	23.57	37.29	21.98	26.64
Subprime share	0.09	8.30	0.66	0.11	7.55	0.25	0.04	8.55	0.98	0.11	8.71	0.74
Fixed-rate mortgage share	61.50	56.59	89.19	59.22	55.14	87.07	59.66	55.31	88.60	63.81	60.13	94.00
Jumbo share	4.87	14.21	5.61	6.18	18.26	8.70	6.05	13.27	4.97	3.49	11.31	1.52
Portfolio share	9.61	9.37	7.75	18.68	16.25	15.21	9.69	7.55	4.43	5.77	4.76	1.37
Private share	30.03	33.17	8.24	23.40	33.05	6.11	22.69	33.95	7.74	37.35	32.12	12.92
Government share	60.36	57.46	84.00	57.92	50.70	78.68	67.62	58.50	87.83	56.89	63.12	85.71

[a]FICO score is for 1997:Q1.

Notes: All values are in percent except those for loan-to-income ratio; FICO score, which indicates the Fair Isaac Corporation credit score; and income per capita, which is in dollars. Full definitions for the variables are in the text. Where possible, the statistics in the "all lenders" columns are for all Home Mortgage Disclosure Act (HMDA) observations, while all other statistics are for observations in the Federal Reserve Bank of Chicago data set that merges the HMDA data and the Lender Processing Services (LPS) Applied Analytics data. The means and standard deviations are derived from the average of quarterly means in local markets for the period 1995–2007 (except for FICO score, which starts in 1997). Panel B reports the average difference between the local market average for a lender type and that market's average for all lenders. In panels A and C, certain shares may not total because of rounding.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography; U.S. Bureau of Economic Analysis from Haver Analytics; and U.S. Bureau of Labor Statistics from Haver Analytics.

average loan-to-value ratio for all lenders is 83.07 percent (table 1, panel A, third row), and it decreases significantly over the sample period (table 1, panel C, third row). As with many of the other indicators, the loan-to-value ratio suggests that IMBs are making the riskiest loans and local banks are making the safest ones. Panel B of table 1 (second row) shows that mortgages issued by local banks have a loan-to-value ratio 2.44 percentage points below the average of lenders in their markets, while mortgages issued by IMBs have a loan-to-value ratio 1.39 percentage points above the average of lenders in their markets.

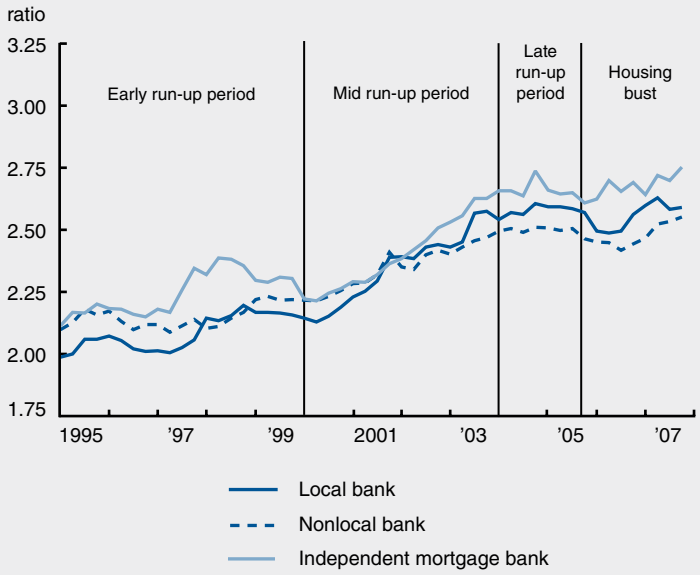
The FICO score (table 1, panel A, fourth row) is intended to provide a broad-based measure of borrower quality. It includes information from the borrower's other loans, credit history, and other relevant factors. The FICO score is commonly used to evaluate whether to grant mortgages and other forms of consumer credit. It ranges from 300 through 850, with a higher score representing a safer borrower. I use the FICO score at loan origination as another measure of borrower quality. The LPS data report the FICO score starting in 1997. As with the loan-to-income ratio, these scores indicate that borrowers with mortgages from IMBs are riskiest, since they have the lowest average FICO scores, and borrowers with mortgages from local banks are the safest, since they have the highest average FICO scores (table 1, panel A, fourth row, and panel B, third row). In contrast to the loan-to-income ratio, however, FICO scores indicate that borrowers got safer over time. The average FICO score rose from 698.5 at the start of 1997 to 715.4 at the end of 2007 (table 1, panel C, fourth row); this trend is also noted by Bhardwaj and Sengupta (2010) for subprime mortgages. The differences between

the trends for the loan-to-income ratio and FICO score could reflect the difference between the risk of the *mortgage* and the risk of the *borrower* prior to getting the mortgage.

The LPS data also contain an indicator of whether a loan is considered subprime (that is, loans graded "B" or "C," as opposed to loans graded "A," which are of prime quality). As noted previously, the LPS sample underrepresents subprime loans. LPS data cover about 58 percent of all loans at the end of the sample period, in 2007, but they only cover 33 percent of subprime loans. Thus, the shares of subprime lending in the data I use should be roughly doubled to get the share of subprime lending overall. However, the number of subprime loans in the LPS data with respect to the number of subprime loans in mortgage-backed securities is relatively constant over time. Thus, while there are too few subprime loans in the LPS sample, there is no reason to believe that percentage changes in subprime loans in the LPS data do not reflect the overall changes in subprime lending.

FIGURE 4

Loan-to-income ratio for mortgages, by lender type



Note: See the text for details on the four periods.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; and Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography.

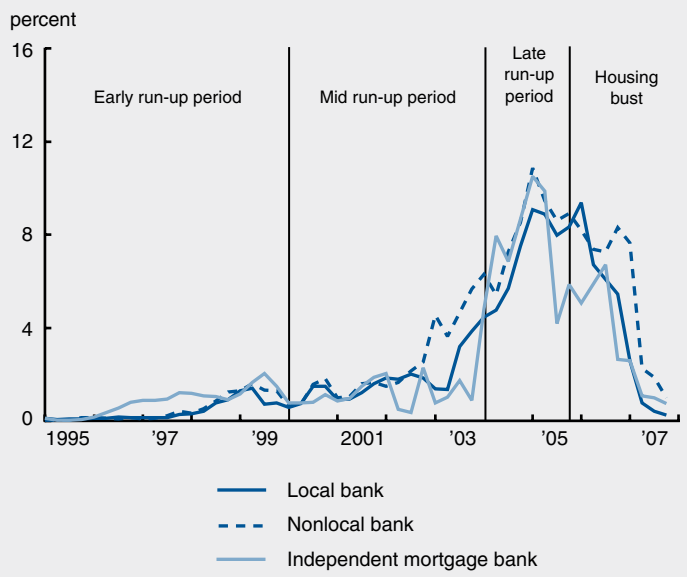
A mortgage is often classified as subprime because of the low credit quality of the borrower (it also could reflect the size of a mortgage relative to the borrower's ability to repay). Over the entire sample period, IMBs issued fewer subprime mortgages than banks did (table 1, panel A, sixth row, p. 8). Examining subprime lending over time, I notice some interesting patterns. As illustrated in figure 5, from 1995 through 2001 there was little subprime lending at any type of lender. Nonlocal banks started making a significant number of subprime mortgages in 2002. IMBs did not start making a significant number of these loans until 2004, but when they did, subprime mortgages went from 1 percent of their business to 8 percent in just six months. IMBs seemed to use subprime loans to expand, while nonlocal banks added subprime lending at a time when their share of lending was declining (see figure 2, p. 5). Thus, subprime lending may have played a different role at the two types of lenders. When the housing market started to have troubles in 2005, IMBs were the fastest to withdraw from the subprime mortgage market. This is consistent with IMBs being more flexible than other types of lenders.

The measures of loan risk and borrower quality generally indicate that borrowers with mortgages from IMBs are riskier than those with mortgages from banks; in addition, borrowers with mortgages from local banks generally seem safer than those with mortgages from nonlocal banks. There is evidence that the riskiness of borrowers rose during the sample period, with the largest increases during 2000–04, when home prices were also increasing at their fastest rate (see, for example, figures 4 and 5).

I next turn to examining other mortgage features. Mortgages come in many types, but I separate them in two ways. First, I split fixed-rate mortgages from adjustable-rate mortgages (ARMs).[23] On average, over three-quarters of all mortgages had fixed rates, but this share moved around as mortgage rates and market conditions changed over the sample period. More borrowers chose fixed-rate mortgages when the yield curve was shallow or inverted relative to when it was steep.[24] The proportion of fixed-rate mortgages rose from 61.50 percent in the first quarter of 1995 to 95.28 percent in the third quarter of 1998; it edged down to 95.06 percent in the first quarter of 2001, before falling to 56.52 percent in the second quarter of 2005. At that point, mortgage

FIGURE 5

Share of subprime mortgages, by lender type



Note: See the text for details on the four periods.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; and Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography.

market conditions made it more difficult for borrowers to qualify for adjustable-rate mortgages, and the proportion of fixed-rate mortgages increased to 89.19 percent by the end of 2007 (table 1, panel C, seventh row, p. 9).

I also examine the share of so-called jumbo loans. Fannie Mae and Freddie Mac were government-sponsored enterprises (GSEs) that purchased loans from lenders prior to securitizing them.[25] Fannie and Freddie could only buy loans equal to or less than a given size, known as the conforming loan limit; this limit ranged from $203,150 at the start of the sample, in 1995, to $417,000 at the end of the sample, in 2007.[26] Loans that otherwise are of prime quality but are larger than the conforming loan limit are known as jumbo loans. For much, if not all, of the sample period, jumbo loans were more difficult to securitize than conforming loans. Thus, they were more likely to be kept in a lender's portfolio. This may make it unsurprising that local banks made the largest share of jumbo mortgages (table 1, panel A, eighth row, p. 8).

As indicated in the prior paragraph, lenders were able to sell certain mortgages to Fannie Mae and Freddie Mac. In general, a lender had three options when it issued a mortgage. It could hold the mortgage in its portfolio. It could sell the mortgage to a GSE or have the mortgage guaranteed by a government agency (such as Ginnie Mae[27]) prior to selling the mortgage into securitization. Or it could sell the loan to a private financial intermediary, often as a prelude to securitization. Since the selling process can take time, I use the status of the mortgage 24 months after origination as my measure of whether it is held in portfolio, securitized with a GSE or government guarantee, or sold to a private firm.[28] My measure may introduce a bias because a mortgage is more likely to end up at one of the large servicers in the LPS data if it is securitized. The evidence on loan sales and securitization is likely to be indicative of differences across the types of lenders, but not of the true levels of where mortgages are held. Not surprisingly, local banks hold a greater percentage of their mortgages in portfolio and, in total, sell a lower percentage of their mortgages than nonlocal banks and IMBs (table 1, panel A, ninth, tenth, and eleventh rows, p. 8). The government share, which comprises mortgages securitized with a GSE or government guarantee, is highest at nonlocal banks (table 1, panel A, eleventh row, p. 8).

The loan characteristic variables are consistent with local banks making safer loans than other types of lenders. This may be because they have a different business model for mortgages, as evidenced by the fact that they keep a larger share of these loans in their portfolios. The data on borrower quality and loan characteristics suggest systematic differences across lender types.

Impact of lender types on local market lending standards

In this section, I extend the examination of whether mortgage lending and mortgage terms in a local market are related to the types of lenders in that market. In the previous section, I showed that mortgage lending standards are correlated with the market shares of different types of lenders. But the simple statistics do not allow us to determine whether the presence of one type of lender affects the mortgages offered by other types of lenders. Here, I use a regression model to tease this out.

The baseline model allows lending standards to be a function of lender types and market conditions:

1) $Lending\ standards_{i,c,t} = f(Lender\ shares_{i,c,t-1}, Lending\ market\ conditions_{c,t-1}, Economic\ conditions_{c,t-1})$,

where i is the type of lender (local bank, nonlocal bank, or IMB), c refers to the local market (county), and t is the time period. The right-hand side variables are all lagged one quarter to mitigate potential endogeneity problems.[29]

The characteristics I examine are those that focus on lending standards. The loan-to-income ratio and the loan-to-value ratio are direct measures of loan risk, while the FICO score and the share of subprime loans are measures of borrower quality (of course, a high-quality borrower with a high FICO score can nonetheless take a risky loan—for example, one with a very high loan-to-income ratio). Classifying the loan denial rate along these lines is more difficult. Loans can be denied either because a borrower has a weak profile or because the loan is too risky given the quality of the borrower. Thus, it mixes loan risk and borrower risk. Each of these characteristics can be affected by competitive conditions in a market, which include the different incentives of each type of lender.

I use each lending standard as both a dependent variable and a control because each can pick up aspects of market conditions other than differences across lenders. A high average loan-to-income ratio can reflect borrowers needing to commit a larger share of income in order to purchase a home in markets where homes are relatively expensive. Similarly, expensive homes may reduce the percentage down payment that borrowers can make, leading to a higher loan-to-value ratio. Additionally, in the recent crisis, some borrowers with loan-to-value ratios above 100 percent have walked away from their mortgages because they have negative equity in their homes. The risk of this happening is obviously higher when a mortgage has a larger initial loan-to-value ratio. More lender competition can reduce average FICO scores or lead to fewer loans being denied.[30] Similar to the loan-to-income ratio, the share of subprime loans in a market may be correlated with home prices in the market. Of course, it can also be affected by competition among lenders and changes in securitization markets.

Some aspects of loan quality that have a weaker correlation with loan risk are included as controls but not as dependent variables. The share of loans kept in portfolio is likely to be related to the types of lenders in a market. There may be a weak correlation with risk because it is more difficult to securitize unusual loans. The proportion of fixed-rate mortgages may reflect borrower strength, especially in later years when borrowers often qualified for mortgages based on their ability to meet the initial loan payments. The ability of borrowers of a given income and risk to qualify for larger adjustable-rate mortgages than fixed-rate mortgages means that, all else being equal, fixed-rate mortgages were safer to fund.

A number of the lending market standard variables are affected by the ability of potential borrowers to purchase a home. I control for prices in two ways. First, I include the percentage change in home prices over the past quarter in the local market (so the change in period $t-1$ is the percentage difference from period $t-2$ to period $t-1$). I measure prices using the FHFA HPI. There is an extensive debate in the housing literature about what the best price index is (see Rosen, 2008; and Case and Shiller, 2003). I choose the FHFA HPI because it is available for a wider number of markets than other constant-quality indexes, such as the Standard and Poor's/Case–Shiller Home Price Index. The second control I use is the price-to-rent ratio in the local market. I measure rents using the owners' equivalent rent component of the Consumer Price Index (CPI-OER), which is put out by the U.S. Bureau of Labor Statistics. The price-to-rent ratio is, thus, the ratio of the FHFA HPI to the CPI-OER. A high value indicates that owning a home is expensive relative to renting. For both controls, I use the data for the MSA that a market is in if available. Otherwise, statewide data are used.

I also add additional controls for local economic conditions. These include measures of the unemployment rate and income per capita.[31] For both variables, I use the mean value for the MSA a county is in if that is available. Otherwise, I use the mean value for the state. To pick up any systematic local differences not captured by the other controls, I include county-level dummies in the main regression.

There were secular trends in many of the lending market standards; for example, the rise of securitization and the increased use of the "originate-to-distribute" model for mortgages during the run-up in home purchases (see figure 1, p. 5) affected the mortgages lenders issued (see, for instance, Keys et al., 2010). Such trends may have given lenders an incentive to issue high loan-to-income, high loan-to-value, or low FICO-score mortgages. To control for the common effects of the rise and fall of securitization, I include time dummies in the regressions. The time dummies also pick up other changes in lending technology, economic conditions, and interest rates that

TABLE 2

Effect of mortgage and market characteristics on loan-to-income ratio in local markets, by lender type

	Loan-to-income ratio at:		
	Local banks	Nonlocal banks	Independent mortgage banks
Local bank share	0.223*	0.073	−0.250***
	(0.057)	(0.382)	(0.002)
Nonlocal bank share	−0.259**	0.175**	−0.320***
	(0.012)	(0.014)	(0.000)
Loan-to-value ratio	−0.077	0.138	0.212
	(0.685)	(0.527)	(0.284)
FICO score	−0.001**	−0.000	−0.000
	(0.048)	(0.146)	(0.415)
Loan denial rate	−0.002	−0.047	0.097
	(0.986)	(0.377)	(0.201)
Subprime share	0.292	0.003	−0.319**
	(0.103)	(0.980)	(0.029)
Portfolio share	−0.026	−0.058	0.005
	(0.775)	(0.531)	(0.958)
Fixed-rate mortgage share	−0.027	−0.029	−0.044
	(0.657)	(0.542)	(0.609)
Unemployment rate	0.131	−0.070	0.653**
	(0.823)	(0.821)	(0.047)
Income per capita	−0.000*	0.000*	−0.000**
	(0.096)	(0.078)	(0.017)
Change in home price	−0.353	−0.580	0.050
	(0.166)	(0.312)	(0.827)
Price-to-rent ratio	0.892***	0.831***	0.814***
	(0.000)	(0.000)	(0.000)
Adjusted R-squared	0.513	0.391	0.373
p value for test of local bank share = nonlocal bank share	0.000	0.021	0.389

*$p < 0.10$
**$p < 0.05$
***$p < 0.01$

Notes: FICO score indicates the Fair Isaac Corporation credit score. Full definitions for the variables are in the text. The regression in the first column has the loan-to-income ratio at local banks as a dependent variable. The regression in the second column has the loan-to-income ratio at nonlocal banks as a dependent variable. The regression in the third column has the loan-to-income ratio at independent mortgage banks as a dependent variable. Results in parentheses directly below the regression coefficients are *p* values (of statistical difference from zero). The test values reported in the final row are *p* values for a test that the local bank share coefficient is equal to the nonlocal bank share coefficient. Each regression has 31,010 observations.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography; U.S. Bureau of Economic Analysis from Haver Analytics; U.S. Bureau of Labor Statistics from Haver Analytics; and Federal Housing Finance Agency, seasonally adjusted purchase-only House Price Index, from Haver Analytics.

are common across markets. Including time dummies helps me focus on how the loan shares of different lender types affect lending market standards.

Finally, since one objective is to examine how the distribution of lender types affects loan characteristics, I exclude some small markets. To be included, a county must average 50 loans per quarter, with an average of at least five by each type of lender (local banks, nonlocal banks, and IMBs). The final data set includes observations for all county-quarters with mortgage market and local economic data. There are 31,010 observations, covering 800 counties during 52 quarters.[32] This is an unbalanced panel, since newly created counties are added when they appear in the data.

One issue with using aggregate lending market standards is that it is not possible to determine whether the resultant correlations reflect the effect of competition among lenders as opposed to just a change in the mix of lenders. To focus on the relationship between the mortgage shares of different lender types and the characteristics of mortgages, I separately consider mortgages by each type of lender in a market. That is, for each lending characteristic, I run separate regressions for the average characteristics of local banks, nonlocal banks, and IMBs.

Table 2 presents the coefficient estimates for regressions of equation 1, using the loan-to-income ratio for the mortgages that each type of bank has made as the dependent variable. The first column reports the results for local banks. The positive sign on the coefficient for the local bank share of the market (first row) implies that as the proportion of mortgages in a market issued by local banks increases, the average loan-to-income ratio on all mortgages issued by local banks in that market increases. Shifting the mortgage share from IMBs (the omitted variable) to local banks is associated with an increase in the loan-to-income ratio, with a one standard deviation increase in the local bank share (3.12 percent, as given in table 1, panel A, first row, p. 8) implying a 0.70 percent increase (3.12 × 0.223), or about 2.4 percent of its mean (0.70/28.46). The coefficient on the nonlocal bank share is negative (second row of table 2). This means that shifting loan share from IMBs to nonlocal banks reduces the average

loan-to-income ratio at local banks in the market. Also, the coefficients on the local bank share and the nonlocal bank share (first and second rows of table 2) are significantly different from one another (as shown in the final row of the table, which gives the *p* value for a test that the two coefficients are equal). So, a movement in lending from nonlocal banks to local banks is associated with significant increases in the loan-to-income ratio at local banks.

The results for the loan-to-income ratio at nonlocal banks and IMBs are presented in the second and third columns of table 2. One common element in all three regressions is that when the loan market share of a particular type of lender is increasing, the average loan-to-income ratio of mortgages from that type of lender increases. This is indicated by the positive coefficients on local bank share in the local bank regression (first row, first column) and on nonlocal bank share in the nonlocal bank regression (second row, second column). It is also indicated by the negative coefficients on both bank shares in the IMB regression (first and second rows, third column); both local and nonlocal bank shares decreasing means that the IMB share is increasing. When one type of lender increases its market share in period $t - 1$, mortgages from that type of lender are riskier, all else being equal, in period t. As described previously, the loan-to-income ratio for mortgages issued by local banks changes when there is a shift in market share between nonlocal banks and IMBs (second row, first column). This ratio, however, does not change for mortgages issued by nonlocal banks when there is a shift in market share between local banks and IMBs (first row, second column). Similarly, mortgages issued by IMBs do not change their loan-to-income ratio when market share shifts between local and nonlocal banks (final row, third column).

I now briefly discuss the coefficients on the other control variables in table 2. These are representative of the coefficients on later regressions. There is generally only a weak correlation among the measures of borrower quality. For example, in table 2, the coefficients on FICO score (fourth row) and the subprime share (sixth row) are each significant in only one regression, while the coefficients on the loan-to-value ratio (third row) and the loan denial rate (fifth row) are not significant for any of the regressions.

Changes in some of the macroeconomic factors featured in table 2 can affect the loan-to-income ratio at the different lender types. Higher income (tenth row) is associated with an increase in the loan-to-income ratio in the mortgages made by nonlocal banks, but a reduction in the loan-to-income ratio in the mortgages made by local banks and IMBs. This may indicate that changes in local income are associated with shifts among lender types. When the price-to-rent ratio (twelfth row) increases, buying a home is relatively more expensive than renting one. This makes it likely that when people do buy a home, they are not able to afford a large down payment, and thus they have a large loan-to-income ratio.

Table 3 presents the coefficients on the lender share variables for regressions of equation 1, using the averages of the loan characteristics by lender type as the dependent variables. This repeats the regressions in table 2 and also includes regressions where the dependent variables are the loan-to-value ratio, FICO score, loan denial rate, and subprime mortgage share. The other controls, although not shown, are the same as those for the regressions in table 2.

Two patterns are apparent from table 3. First, changes in lender shares have a different impact on loan risk characteristics than on borrower quality characteristics (here, the loan denial rate looks more similar to a loan risk characteristic than a borrower quality characteristic). While changes in lender shares are associated with riskier mortgages as measured by the loan risk indicators, such changes are associated with less risky mortgages as measured by borrower quality indicators. For example, an increase in the local bank share is associated with smaller loan-to-income and loan-to-value ratios and a larger loan denial rate at IMBs (third column), all indicating less risky mortgages. However, this increase is also associated with lower FICO scores and more subprime lending, which indicate lower-quality borrowers. One possible explanation is that high-quality borrowers were taking out risky loans; that is, borrowers with higher FICO scores took out loans that were risky enough to be classified subprime. Consistent with this interpretation, others have documented that FICO scores of subprime loans have increased since 2000 (Demyanyk and Van Hemert, 2009; and Bhardwaj and Sengupta, 2010). However, an analysis of why direct measures of loan risk seem to move in the opposite direction as measures of borrower quality is beyond the scope of this article.

A second pattern in table 3 is that, as a particular type of lender increases market share, the loans made by that type of lender tend to get riskier. As noted previously, the loan-to-income ratio for mortgages made by a lender type is larger as the own-type lender share increases.[33] The loan-to-value ratio increases and the share of loans denied decreases in these circumstances. The picture for subprime shares is mixed, with local banks (first column) having a larger share of subprime lending when local bank share increases, but nonlocal banks and IMBs (second and third columns) having the opposite reaction to own-type lender share increases

TABLE 3

Effect of mortgage and market characteristics on loan risk and borrower quality in local markets, by lender type

Dependent variable	Independent variable	Local banks	Nonlocal banks	Independent mortgage banks
Loan-to-income ratio	Local	0.223*	0.073	−0.250***
	Nonlocal	−0.259**	0.175**	−0.320***
Test: Local = Nonlocal		*0.000*	*0.021*	*0.389*
Loan-to-value ratio	Local	0.078*	0.007	−0.075***
	Nonlocal	−0.077**	0.066***	−0.052***
Test: Local = Nonlocal		*0.000*	*0.000*	*0.035*
FICO score	Local	104.930**	11.686	−144.131***
	Nonlocal	10.050	15.958	−81.212***
Test: Local = Nonlocal		*0.013*	*0.726*	*0.023*
Loan denial rate	Local	−0.076***	−0.071***	0.255***
	Nonlocal	−0.016	−0.176***	0.308***
Test: Local = Nonlocal		*0.000*	*0.000*	*0.021*
Subprime share	Local	0.026**	0.000	0.026***
	Nonlocal	−0.017*	−0.016**	0.023***
Test: Local = Nonlocal		*0.000*	*0.018*	*0.522*

*$p < 0.10$
**$p < 0.05$
***$p < 0.01$

Notes: FICO score indicates the Fair Isaac Corporation credit score. Full definitions for the variables are in the text. Coefficients on lender share variables are reported. Local is the coefficient on the local bank share, and nonlocal is the coefficient on the nonlocal bank share (independent mortgage bank share is the omitted variable). The regressions on which these are based include all the control variables for the regressions reported in table 2. The dependent variables for these regressions in the local banks column are the local bank average for the variable given in the leftmost column. Other dependent variables are similarly defined. The test values reported are *p* values for a test that the local bank share coefficient is equal to the nonlocal bank share coefficient. All regressions except those with FICO score as the dependent variable have 31,010 observations. The regressions with FICO score as the dependent variable have 26,445 observations.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography; U.S. Bureau of Economic Analysis from Haver Analytics; U.S. Bureau of Labor Statistics from Haver Analytics; and Federal Housing Finance Agency, seasonally adjusted purchase-only House Price Index, from Haver Analytics.

(see note 33). Consistent with the differences between own-type share changes and other-type share changes, there is generally a statistically significant difference between the coefficients on the local bank share and the nonlocal bank share (*p* values for these tests are reported in the table).

Lending standards at local banks seem to shift more after there are changes in nonlocal bank share, compared with the lending standards at nonlocal banks following changes in local bank share. To see this, compare the coefficients on nonlocal bank share in the first column with the coefficients on local bank share in second column of table 3. This shows that a shift in mortgage shares from IMBs to nonlocal banks is associated with a decrease in the risk of mortgages issued by local banks, while a shift from IMBs to local banks has little impact on the risk of mortgages issued by nonlocal banks. For instance, when the nonlocal bank share increases, the loan-to-income and loan-to-value ratios for mortgages issued by local banks decrease, indicating safer loans (table 3, second and fifth rows, first column). However, an increase in the local bank share has no significant impact on these ratios for mortgages made by nonlocal banks (table 3, first and fourth rows, second column).

It is instructive to compare the results in table 3 with those in panel A of table 1 (p. 8). As shown in panel A of table 1, mortgages issued by local banks have the lowest loan-to-income and loan-to-value ratios. Yet, as the coefficients on local bank share in the first column of table 3 show, when local bank lender share increases in a market, loans issued by local banks tend to have higher risk (that is, higher loan-to-income ratios, higher loan-to-value ratios, a greater likelihood to be subprime, and lower loan denial rates). In addition, as market share shifts from IMBs to nonlocal banks, mortgages issued by nonlocal banks generally increase in risk, as indicated by the coefficients on nonlocal bank share in the second column of table 3. Specifically, the loan-to-income

and loan-to-value ratios increase and the loan denial rate decreases, consistent with riskier lending practices (although the share of subprime loans decreases, pointing in the other direction). One interpretation consistent with this is that lenders compete more with lenders of the same type than lenders of other types, and competition manifests itself in allowing borrowers to take larger loans relative to both borrower income and home values. Of course, this does not necessarily mean that lenders are providing mortgages to riskier borrowers. Borrowers with mortgages from local banks have the highest FICO scores, but competition among local banks does not seem to lower the average FICO score of borrowers who get their mortgages from local banks.

Since the proportion of local bank lending fell during most of the sample period, until the housing crisis started in late 2005 (recall figure 2, p. 5), we can think about how this might have changed lending standards. As local banks made fewer loans in a market, loan risk decreased at local banks and increased at IMBs. To the extent that lender share by local banks was lost to nonlocal banks and IMBs, the net effect on loan risk at nonlocal banks was small. It is important to remember that there are time dummies in these regressions, so any changes are above and beyond secular trends across lender types.

TABLE 4

Summary statistics for counties in large and small metropolitan statistical areas (MSAs)

	Top 50 (large) MSAs		Non-top-50 (small) MSAs	
	Mean	Standard deviation	Mean	Standard deviation
Local bank share	22.3	16.8	26.4	22.5
Nonlocal bank share	44.9	17.9	45.2	22.1
Independent mortgage bank share	32.7	13.9	28.5	17.2
Loan-to-income ratio	2.36	0.40	2.13	0.50
Loan-to-value ratio	83.1	5.5	84.6	5.0
FICO score	705.17	19.75	702.61	20.85
Loan denial rate	17.8	8.5	22.3	11.1
Subprime share	2.6	3.7	2.8	4.6
Fixed-rate mortgage share	78.9	16.6	84.7	13.4
Jumbo share	7.3	12.0	2.5	6.2
Portfolio share	7.7	6.6	6.7	7.1
Private share	22.0	12.3	18.9	12.9
Government share	70.4	14.8	74.4	14.3
Unemployment rate	4.6	1.2	4.9	2.0
Income per capita	33,932	7,146	27,660	6,049
Share of market	59.67		40.33	

Notes: All values are in percent except those for loan-to-income ratio; FICO score, which indicates the Fair Isaac Corporation credit score; and income per capita, which is in dollars. Full definitions for the variables are in the text. A county is considered a large-MSA county if it is in one of the 50 largest metropolitan divisions/MSAs, according to the 2000 U.S. Census. Otherwise, it is considered a small-MSA county. See the text for further details. Certain shares may not total because of rounding.

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography; U.S. Bureau of Economic Analysis from Haver Analytics; and U.S. Bureau of Labor Statistics from Haver Analytics.

Lending standards and market size

The markets in the sample range from small counties with populations of less than 50,000 all the way up to the New York City area with over 10 million residents. To see whether lenders compete the same way in the large metropolitan areas as elsewhere, I divide the sample of counties (markets) into two categories. I place counties in MSAs. For very large MSAs, I further divide them into metropolitan divisions. Metropolitan divisions are groups of closely tied contiguous counties that serve as distinct employment districts. They are part of MSAs with populations of at least 2.5 million. I define a county as a large-MSA county if it is in one of the top 50 metropolitan divisions/MSAs; otherwise, I define a county as a small-MSA county. The MSAs are ranked by population according to the 2000 U.S. Census. The largest metro area is the New York–Wayne–White Plains, NY–NJ metropolitan division and the fiftieth largest is the Memphis, TN–MS–AR MSA. Table 4 presents a comparison of large-MSA and small-MSA counties. There are some significant differences between mortgage market conditions across large-MSA and small-MSA counties. However, it is not clear that one type of county has riskier conditions than the other type.

To see whether the differences between markets in large and small MSAs affect competition among lenders, I split the lender share variables by whether a market is a large-MSA or small-MSA county. Table 5 presents results for regressions including these variables. The regressions include the same nonlender control variables as the regressions in tables 2 and 3, but only the coefficients on the lender share variables are reported.

TABLE 5

Effect of mortgage and market characteristics on loan risk and borrower quality in local markets, by lender type and metropolitan statistical area (MSA) size

		Local banks			Nonlocal banks			Independent mortgage banks		
Dependent variable	**Independent variable**	**Large**	**Small**	***Test: L = S***	**Large**	**Small**	***Test: L = S***	**Large**	**Small**	***Test: L = S***
Loan-to-income ratio	Local	0.056	0.315**	*0.151*	0.001	0.126	*0.449*	−0.285***	−0.239**	*0.756*
	Nonlocal	−0.572***	−0.097	*0.011*	−0.112	0.321**	*0.020*	−0.296***	−0.331***	*0.780*
Test: Local = Nonlocal		*0.000*	*0.000*		*0.085*	*0.000*		*0.880*	*0.364*	
Loan-to-value ratio	Local	0.009	0.115**	*0.109*	0.012	0.013	*0.955*	−0.042**	−0.086***	*0.084*
	Nonlocal	−0.182***	−0.023	*0.016*	−0.022	0.110***	*0.000*	−0.063***	−0.045***	*0.527*
Test: Local = Nonlocal		*0.003*	*0.000*		*0.023*	*0.000*		*0.142*	*0.005*	
FICO score	Local	168.303***	86.511*	*0.240*	16.403	12.522	*0.871*	−32.116	−185.701***	*0.002*
	Nonlocal	−37.756	34.080	*0.419*	−7.369	28.427	*0.080*	−84.943**	−82.374**	*0.954*
Test: Local = Nonlocal		*0.003*	*0.202*		*0.269*	*0.268*		*0.148*	*0.003*	
Loan denial rate	Local	−0.060***	−0.084***	*0.241*	−0.097***	−0.067**	*0.453*	0.133***	0.304***	*0.000*
	Nonlocal	0.009	−0.029**	*0.088*	−0.110***	−0.209***	*0.026*	0.284***	0.324***	*0.362*
Test: Local = Nonlocal		*0.000*	*0.000*		*0.707*	*0.000*		*0.000*	*0.477*	
Subprime share	Local	−0.018	0.045***	*0.003*	0.004	−0.003	*0.664*	0.005	0.034***	*0.022*
	Nonlocal	−0.044**	−0.003	*0.048*	0.008	−0.027***	*0.010*	0.023***	0.023***	*0.985*
Test: Local = Nonlocal		*0.018*	*0.000*		*0.786*	*0.003*		*0.040*	*0.087*	

* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$

Notes: FICO score indicates the Fair Isaac Corporation credit score. Full definitions for the variables are in the text. Local is the coefficient on the local bank share, and nonlocal is the coefficient on the nonlocal bank share (independent mortgage bank share is the omitted variable). The regressions on which these are based include all the control variables for the regressions reported in table 2. The dependent variables for these regressions in the local banks columns are the local bank averages for the variable given in the leftmost column. Other dependent variables are similarly defined. The values reported for "*Test: Local = Nonlocal*" are *p* values for a test that the local bank share coefficient is equal to the nonlocal bank share coefficient. The values reported for "*Test: L = S*" are *p* values for a test that the bank share coefficient for large-MSA counties is equal to the bank share coefficient for small-MSA counties (see the text and table 4 for definitions of the large-MSA and small-MSA counties).

Sources: Author's calculations based on data from the Home Mortgage Disclosure Act; Lender Processing Services (LPS) Applied Analytics; Robert Avery, Board of Governors of the Federal Reserve System; Federal Deposit Insurance Corporation, Summary of Deposits; Missouri Census Data Center, MABLE/Geocorr2K: Geographic Correspondence Engine with Census 2000 Geography; U.S. Bureau of Economic Analysis from Haver Analytics; U.S. Bureau of Labor Statistics from Haver Analytics; and Federal Housing Finance Agency, seasonally adjusted purchase-only House Price Index, from Haver Analytics.

The pattern of responses to mortgage share changes in both groups of markets is similar to that of the full sample—with one exception. In large-MSA markets, lenders, especially local and nonlocal banks, seem to react *less* to changes in market share of lenders of the same type. For example, a change in local bank share is not associated with a significant change in the loan-to-income ratio or the loan-to-value ratio of mortgages issued by local banks (the coefficients 0.056 and 0.009, as given in the first column of table 5, are not significantly different from zero); also, a change in local bank share is not associated with a significant change in the share of subprime lending at the local banks (the coefficient –0.018 in the first column of table 5 is not significantly different from zero). All these coefficients are statistically significant in the similar regression for the sample as a whole (table 3, p. 15). This suggests that competition may be more complex in counties that are part of large MSAs.

Table 5 also presents tests of differences in the regression coefficients across large-MSA and small-MSA markets. The *p* values reported in the columns labeled "*Test: L = S*" are for tests of the differences between the coefficients in the large-MSA regressions and those in the small-MSA regressions. These results show little difference in how banks react to changes in local bank market share based on MSA size. However, in large-MSA markets relative to small-MSA markets, changes in nonlocal bank lender share are generally associated with larger changes in local bank mortgage characteristics but smaller changes in nonlocal bank mortgage characteristics. Again, this is consistent with differences in how lenders compete across MSAs that differ in size.

The results presented in tables 3 and 5 show that the distribution of lender types affects lending standards and loan characteristics. During the housing boom, the share of lending by local banks decreased, since both nonlocal banks and IMBs increased their market share. All else being equal, this means that loan risk and borrower quality fell for mortgages made by local banks, even more so in small-MSA markets than in large-MSA markets. To the extent that lending migrated to nonlocal banks from IMBs, loan risk and borrower quality increased for mortgages made by nonlocal banks, again more so in small-MSA markets than in large-MSA markets. As the share of loans made by IMBs increased, loan risk and borrower quality increased at IMBs, in both large-MSA and small-MSA markets.

Conclusion

I examine mortgage lending during the period 1995–2007. This was a period of extensive change in the mortgage market. There was a boom and bust in home purchases and home prices. What caused the boom and bust is a big question that is still being debated. One possible contributing factor is the shift in the mortgage delivery process. During the housing boom, fewer and fewer borrowers got their mortgages from local banks; both nonlocal banks and IMBs gained market share. This could have affected mortgage markets because each type of lender approaches mortgage lending differently. Local banks have a more intensive retail focus and are most likely to keep loans in portfolio. Banks that make loans outside their local markets (nonlocal banks) are likely to use the wholesale lending channel for these loans, but being banks, they sometimes will keep loans in portfolio. In contrast, IMBs are wholesale lenders that sell essentially all the loans they originate.

The changes in market shares of lender types could be important because the characteristics of mortgages are a function of the lender type. Local banks tend to make loans that appear ex ante safer—for example, they have lower loan-to-income and loan-to-value ratios. Thus, the market shift away from mortgages issued by local banks could lead to riskier mortgages being made.

The shift in lenders can also have an indirect effect. In part, loan characteristics for mortgages made by a particular type of lender may depend not only on that type of lender's cost–benefit trade-off, but also on the competitors it faces. I show that an increase in the mortgage market share of a particular type of lender is associated with other lenders of the same type increasing the average loan risk of their mortgages; at the same time, this increase in the mortgage market share of a particular type of lender is associated with an increase in the average quality of their borrowers. This impact is larger in counties that are in small MSAs.

My analysis suggests that the efforts to get (private) mortgage securitization markets going again might affect the types of mortgages that are issued because of their effects on lender composition. The securitization market facilitates the wholesale lending channel, and is likely to increase the share of loans made by nonlocal banks and IMBs. These loans tend to be riskier on average than loans made by local banks. In addition, the indirect effect of changing the market structure may be to increase loan risk even further at nonlocal banks and IMBs, although not at local banks. Hence, both the direct and indirect effects may add to aggregate loan risk.

NOTES

[1]For example, see Steverman and Bogoslaw (2008).

[2]Subprime lending is the issuing of loans to borrowers with poor or no credit histories; mortgage securitization is the packaging and sale of bonds that have mortgages as the underlying collateral. In addition, see U.S. Congress, Joint Economic Committee (2007)—a report on the housing crisis that centers around subprime lending.

[3]Inside Mortgage Finance Publications (2008).

[4]Previous work has examined how the structure of the mortgage industry has affected discrimination in lending (see Apgar, Bendimerad, and Essene, 2007).

[5]This is similar to the approach in the literature examining how the size and organizational structure of competitors in banking markets can affect deposit rates and small market lending (Rosen, 2007a; Berger, Rosen, and Udell, 2007; and Park and Pennacchi, 2009).

[6]The values cited here are from my calculations based on data from the Home Mortgage Disclosure Act; Robert Avery, Board of Governors of the Federal Reserve System; and Federal Deposit Insurance Corporation, Summary of Deposits.

[7]One would expect that brokers would lead borrowers to the lender offering the best deal. However, there are allegations that some brokers steered borrowers toward loans that maximized the brokers' commissions rather than minimized the borrowers' costs (see, for example, the comments of Senator Christopher J. Dodd, D-CT, in 2007 at http://dodd.senate.gov/index.php?q=node/4167).

[8]See Wholesale Access Mortgage Research and Consulting Inc. (2005).

[9]There is an intermediate case, where a small lender originates a loan and then quickly sells it to a large wholesale lender under prearranged terms. See Apgar, Bendimerad, and Essene (2007) for a more detailed discussion of the different origination channels.

[10]This is derived from the Home Mortgage Disclosure Act (HMDA) data described later in the article.

[11]An important feature of the FICO score is that it is intended to measure a borrower's creditworthiness prior to taking out a mortgage. FICO scores range between 300 and 850. Typically, a FICO score above 800 is considered very good, while a score below 620 is considered poor. As reported on the Fair Isaac Corporation website (www.myfico.com), in June 2009 borrowers with FICO scores above 760 were able to take out 30-year fixed-rate mortgages, or FRMs (see note 20), at interest rates that were 160 basis points lower, on average, than those available for borrowers with scores in the 620–639 range.

[12]Later in the article, I explain exactly how I divide the sample into large-MSA counties and small-MSA counties.

[13]For details, see Federal Financial Institutions Examination Council (2008). In general, very small lenders are exempt from filing, as are lenders that do not make loans in metropolitan statistical areas.

[14]The major excluded group is loans to refinance existing mortgages. The share of loans that are for refinancing varies over time, influenced in large part by the pattern of mortgage interest rates. I exclude these loans for two main reasons. First, the exclusion makes it easier to determine the role played by the lender, since I do not have to control for changes in the mix of loans. Second, borrowers' current lenders may have an advantage in capturing refinancing loans, and this means that the history of lender activity may be more important for refinancings than for purchase loans. Also excluded are home equity lines, which are revolving lines of credit with a home serving as collateral. Since these loans are not generally completely drawn at initiation, their pricing and characteristics may vary from those of basic mortgages.

[15]The different types of depository institutions reflect differences in their charters and regulators, as well as historical differences in the types of loans they issue. A commercial bank's primary federal regulator is the Office of the Comptroller of the Currency, the Federal Reserve, or the Federal Deposit Insurance Corporation. Thrift banks are regulated by the Office of Thrift Supervision; and credit unions are regulated by the National Credit Union Administration.

[16]The classification is based on a data set provided by Robert Avery, Board of Governors of the Federal Reserve System.

[17]The HPI is an index based on repeat sales information. It comes from the FHFA, which was established in 2008 by the Federal Housing Finance Regulatory Reform Act of 2008, a part of the Housing and Economic Recovery Act of 2008. The FHFA was formed by a merger of the Office of Federal Housing Enterprise Oversight (OFHEO), the Federal Housing Finance Board, and the U.S. Department of Housing and Urban Development's government-sponsored enterprise mission team (see www.fhfa.gov for additional details). The HPI was formerly published by OFHEO.

[18]I have no information on branch locations for credit unions, so I assume all mortgages made by credit unions are in markets where they have branches (that is, I assume all mortgages issued by credit unions are local bank mortgages).

[19]A small number of loan applications that are approved but not taken are dropped from this calculation.

[20]A fixed-rate mortgage is one whose interest rate is fixed from its origin for its entire term.

[21]The LPS data include the ratio of the initial mortgage payment to the borrower's monthly income from 2005 on. The cross-sectional pattern of the data is similar to that for the loan-to-income ratio in the HMDA data.

[22]I drop all observations where the loan-to-value ratio is above 250 percent, as these likely represent data errors.

[23]Unlike an FRM, whose interest rate is fixed from its origin for its entire term, an ARM's interest rate can adjust periodically based on terms set in the mortgage contract. When an ARM resets after an initial defined period (which may be as short as one year or as long as seven), the interest rate and, consequently, the monthly mortgage payment may change substantially.

[24]A yield curve shows the relationship between yields and maturity dates for a set of similar bonds, usually Treasuries, at a given point in time. A steep yield curve means that ARMs tend to have much lower initial interest rates than do FRMs; the interest differential is small when the yield curve is relatively flat.

[25]The full official name for Fannie Mae is the Federal National Mortgage Association. The full official name for Freddie Mac is the Federal Home Loan Mortgage Corporation. The two government-sponsored enterprises were put into conservatorship in 2008.

[26]This is the limit for a single-family home, which was set by the OFHEO and is now set by the FHFA. There were higher limits for multifamily homes.

[27]The full official name of Ginnie Mae is the Government National Mortgage Association.

[28]For mortgages that leave the data prior to 24 months (which often reflects repayment or default), I use the status in the last month the mortgage is in the data to measure its disposition.

[29]Including additional lags does not qualitatively change the results.

[30]FICO scores are only available from 1997 onward. For earlier years, the FICO score variable is set to zero when it is used as a control. In these years, the average FICO score for the nation is captured by time dummies.

[31]Income per capita is only available at an annual frequency. I linearly interpolate across quarters. The data come from the U.S. Department of Commerce and are based on population estimates by the U.S. Census Bureau. The unemployment data are from the U.S. Bureau of Labor Statistics.

[32]Our restrictions on the number of loans eliminate 115 smaller counties from the sample.

[33]To find what happens when the own-type lender share for IMBs increases, one would have to take the negative of the reaction to an increase in the lender shares of local and nonlocal banks.

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