What Fuels the Boom Drives the Bust:

Regulation and the Mortgage Crisis

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Abstract We show that the lightly regulated non-bank mortgage originators contributed disproportionately to the recent boom-bust housing cycle. Using comprehensive data on mortgage originations, which we aggregate at the county level, we first establish that the market share of these independent non-bank lenders increased in virtually all US counties during the boom. We then exploit the heterogeneity in the market share of independent lenders across counties as of 2005 and show that higher market participation by these lenders is associated with increased foreclosure filing rates at the onset of the housing downturn. We carefully control for counties' economic, demographic, and housing market characteristics using both parametric and semi-nonparametric methods. We show that this relation between the pre-crisis market share of independents and the rise in foreclosure is more pronounced in less regulated states. The macroeconomic consequences of our findings are significant: we show that the market share of these lenders as of 2005 is also a strong predictor of the severity of the housing downturn and subsequent rise in unemployment. Overall our findings lend support to the view that more stringent regulation could have averted some of the volatility on the housing market during the recent boom-bust episode.

Key words: regulation, independent mortgage companies, foreclosures, county performance, credit supply, matching estimator.
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1 Introduction

The global financial crisis had its roots in the U.S. housing market. Following a period of unprecedented boom in mortgage lending, the U.S. housing market entered a downturn phase during 2006, a year that saw a sharp increase in mortgage delinquency. These problems later spilled into the financial sector by weakening the balance sheets of financial institutions. The far reaching consequences of this housing bust have prompted a growing body of research that seeks to gain a better understanding of the drivers of this housing cycle.

There is now substantial evidence that the unprecedented housing boom was fueled by deteriorating lending standards which led to a worsening in the risk profile of the marginal borrower (Dell'Ariccia et al, 2008; Mian and Sufi, 2009a; Purnanandam, 2010). This evident deterioration in lending standards has led to widespread calls for changes in the regulatory and supervisory systems under which mortgage lenders operate. That enhanced regulation and supervision could have averted bad lending remains, however, a theoretical premise with little empirical work to validate such link. Nevertheless, the Dodd-Frank Act which led to the most significant overhaul of the United States financial regulatory system since the Great Depression was at least partially motivated by that premise.

In this paper we show that the less regulated mortgage lenders contributed disproportionally to the boom in mortgage originations and that their lending was associated with a sharper increase in foreclosures.

Depending on their status, mortgage lenders in the U.S. operated, prior to the crisis, under different regulatory structures with differing degrees of oversight particularly between banks and non-bank mortgage originators. Banks were more regulated under federal banking laws and especially more tightly supervised by federal agencies (see e.g. Belsky and Richardson; 2010). They are subject to a range of federal examinations such as fair lending, the Community Reinvestment Act (CRA), and safety and soundness assessment. They must comply with CRA provisions such as reporting requirements and merger review. Depository institutions that are insured by the Federal Deposit Insurance Corporation (FDIC) must

also in addition meet a minimum risk-based capital and reserve requirements. Federal agencies were also required to regularly examine the compliance of the banks they regulate with applicable laws related to their mortgage lending such as the CRA, Truth In Lending Act (TILA), and fair lending laws (see e.g. Immergluck, 2009). Independent non-bank mortgage lenders (henceforth independents), on the other hand, escaped most of these federal regulations and were instead lightly regulated and supervised at the state level (see e.g. Belskey and Retsinas, 2008; Treasury Blueprint, 2008; Immergluck, 2009).[1] A major trade organization representing these independents lenders, the Mortgage Bankers Association, has also called for establishing a federal regulator to develop a uniform national mortgage standards and regulate independent mortgage lenders (see Belsky and Richardson, 2010).

Using comprehensive data on mortgage originations we distinguish between these two types of lenders and first show that the mortgage boom was to an important extent fueled by an expansion of independents. While independent lenders accounted for around one-third of mortgage lending in 2003, they contributed to more than 60% of the increase in mortgage lending between 2003 and 2005. We show that this expansion of independents was more pronounced in areas experiencing higher growth in house prices, a variable that we instrument for using housing supply elasticity (see e.g. Mian and Sufi, 2009b).

We then exploit the heterogeneity in the market share of independents across counties and show that their presence is a strong predictor of the rise in foreclosures.[2] This relation holds after controlling for economic and demographic differences between counties. We

[1] Treasury Blueprint (p81): "Treasury recommends subjecting participants in the mortgage origination process that are not employees of federally regulated depository institutions (or their subsidiaries) to uniform minimum licensing standards. [footnote: Federally regulated mortgage lenders and their employees are subject to an extensive scheme of federal supervision of their lending practices and compliance with applicable laws and regulation]". Immergluck (p66): "Banks and thrifts are subject to regular examination for compliance with not just CRA but also fair lending laws and the Truth in Lending Act. Mortgage companies have generally not been subject to routine examination for compliance with any of these laws on a regular basis. Federal regulatory have large cadres of well-trained examiners to conduct these regular examinations. Meanwhile, mortgage companies are typically regulated by state mortgage banking agencies in the states in which they conduct business. Suffice it to say that, in most states, the capacity of state mortgage regulators is generally not as great as that of the federal regulatory agencies".

[2] By "market presence" we refer to the extent of the market share of a lender, i.e., the percentage of loan volume originated by the lender, and not to its physical location or the location of its branches.

also control for measures of credit and house price growth during the boom and find that the market share of independents remains a significant predictor of foreclosures. The recent literature on the mortgage crisis underlined the role of the increased reliance on an originate-to-distribute model, or in other words, the rise in securitization rates, in the deterioration of lending standards (see, e.g., Keys et al, 2009; Purnanandam, 2010). While independents securitized a significantly larger share of their originations we find that the market share of independents explains to a great extent the relation between the securitization share and the rise in foreclosures, and not the other way around. These results suggest that the type of lender, alone, is an important determinant of mortgage defaults. We focus our empirical exercise on the early rise in foreclosures prior to the liquidity crunch and thus minimize the possibility that our results be contaminated by these factors (see e.g., Ivashina and Scharfstein, 2010). We ensure that the relation between the market share of independent and the rise in foreclosures is not captured by changes in the house prices by instrumenting for the latter. In fact, the early in rise in foreclosures preceded the fall in house prices. We interpret these findings as a strong indication that the expansion of independents came at the cost of fast deteriorating lending standards. This interpretation is compatible with the findings from the recent literature that suggest that the expansion in mortgage credit was to a large extent fueled by the willingness of lenders to extend credit to a riskier category of borrowers (see e.g. Dell'Ariccia et al, 2008; Mian and Sufi, 2009a).

The housing downturn was characterized by a significant contraction in mortgage credit and in house prices, and a subsequent increase in unemployment starting in 2008 which is one of the hallmarks of the Great Recession. We examine these variables as useful measures of the severity of the crisis on the regional level. We show that our key variable, the market share of independents as of 2005, is also a strong predictor of the contraction in credit and house prices, and the rise in unemployment.

A salient feature of our methodological approach is the use of matching techniques to supplement the traditional parametric regression analysis. We use these semi-nonparametric

methods to ensure better control for the covariates thus minimizing the impact of possible confounding factors. These methods also help us ensure that our results are not dependent on a linear specification. A standard approach in the matching literature is to compare the mean of the dependent variable between a treatment sample and a matched control sample. We follow this approach and use the Abadie-Imbens bias-adjusted matching estimator (see Abadie and Imbens, 2002). In addition to this step, we repeat our linear regressions on the subsample of matched counties, hence effectively using the matching as a nonparametric preprocessing of the data (see e.g. Ho et al, 2010). In the benchmark exercise, we match U.S. counties with no restriction on the state, but we also show results from intra-state matching which lead to similar findings.

Compared to banks, a conspicuous characteristic of independents is their lack of regulation and supervision. It is thus natural to attribute, with some confidence, differences between the outcomes of their lending to their heterogeneous regulation and supervisory structure, as in Keys et al (2009). We nevertheless pursue and test several alternative hypotheses. More specifically, we test whether our findings could be captured by either differences in mortgage lender competition across counties, or by the geographical diversification of lenders, and we find that none of these factors can capture the effect of independents on foreclosures. In the benchmark regressions we only control for one measure of securitization, specifically the share of private securitization defined as in Mian and Sufi (2009a). As robustness, we also use more comprehensive measures by including other forms of securitization and find that this does not affect our results. One might argue that an important difference between independents and banks is that the latter are depository institutions. We therefore exploit the heterogeneity in the ratio of core deposits to assets across banks by merging HMDA data with data on banks and thrifts' balance sheets to construct and control for a weighted measure of the core deposit ratio of lenders in a county, and show that our results remain robust.

To further explore the regulation argument, we examine whether the relation between the

share of independents and foreclosures is more severe in less regulated states. The premise is that any state regulation that constrains risky lending is likely to have a more important impact on the lending standards of the otherwise less constrained lenders, i.e. independents, as banks are more tightly regulated and supervised by federal regulators. To this end, we exploit two different datasets on state regulation, one pertaining to anti-predatory laws and the other to broker laws. We find evidence that the impact of independents on foreclosures was smaller in states that tightened their regulation prior to and during the boom.

A growing number of papers examine the boom-bust episode in the US housing market (Demyanyk and Van Hemert 2009; Doms, Furlong, and Krainer 2007; Gabriel and Rosenthal 2007; Gerardi, Shapiro, and Willen 2007; Dell'Ariccia et al., 2008; Mayer and Pence 2008; Keys et al. 2010, Mian and Sufi 2009a, 2009b, 2010; Purnanandam 2010). Our paper differs from this literature in that we distinguish between banks and independent lenders to understand the role of regulation, an issue that has received less attention from the literature so far. In that respect, our paper is most related to Keys et al (2009) that compare the performance of subprime securitized loans originated by banks and independents around a FICO threshold that induces an exogenous increase in securitization. They find that the moral hazard problem associated with securitization is more severe for banks. Our focus is instead on the aggregate effect which could be driven by loan performance over all FICO scores for both securitized and non-securitized loans. Few studies have looked at mortgage credit at the county level, Mian and Sufi (2010) and Favara and Imbs (2010) are important exceptions. Our paper is related to Mian and Sufi (2010) in that they study the impact of the increase in leverage on county performance during the crisis; we also show results with a similar flavor as we control for the growth in mortgage credit during the boom.

The rest of the paper is organized as follows. Section 2 describes the data used in this paper and presents summary statistics. Section 3 explores the expansion of independents during the boom. Section 4 presents our key finding on the relation between the market share of independents and county outcomes during the downturn using both parametric

and semi-non-parametric methods. Section 5 addresses alternative hypotheses and further explores the role of regulation using data on state regulation. Section 6 concludes.

2 Data and Summary Statistics

2.1 Data

We construct our dataset by merging data from several sources. The data appendix provides comprehensive information on the data used, and a detailed description of the steps involved in the construction of the dataset. In what follows we summarize the main steps.

Our mortgage related data come from a comprehensive sample of mortgage applications and originations between 2003 and 2008 that were collected by the Federal Reserve under the provision of the Home Mortgage Disclosure Act (HMDA). Under this provision, the vast majority of mortgage lenders are required to report.[3] The HMDA data include information on the year of the application (the data is available on an annual basis), the amount of the loan, the lender's decision, and the income of the applicant. The data also provide useful information on the lender such as the name of the institution, its type, and its regulating agency. We thus can distinguish between depository institutions and their affiliates (banks, thrifts, credit unions and mortgage companies affiliated to them) and independent non-bank mortgage originators. We restrict our attention to mortgage applications that are considered as: home purchase, conventional, one-to-four-family, and owner-occupied. We also limit our study to mortgage originations in counties situated in a Metropolitan Statistical Area (MSA) for which data is available on house price growth and on the housing supply elasticity. This leaves us with 773 counties, which account for around 80% of total HMDA mortgage originations in 2005.[4] After imposing these restrictions, our 2003-2008 sample period consists

[3] See Data Appendix for more information about these requirements and the coverage of HMDA.

[4] Restricting our sample to these counties allows us to control for variables that are otherwise not available for other counties such as measures of house price growth and of the housing supply elasticity. Focusing on

of around 28 million applications which we aggregate at county level. We do so to construct variables that capture the volume of mortgage originations in each county during a given year as well as the share of mortgage origination by lender type. We also use these data to create various measures of the share of securitization witihin a county, Herfindhal index measures, and measures of geographical diversification of lenders (for the diversification measure see Loutskina and Strahan, 2011). HMDA data also provide the median income of the census tract of the property, which we take advantage of to compute the shares of census tracts in a county that fall within a given income bracket, for six income brackets.

To further control for demographic information and local economic conditions we also supplement our dataset with county characteristics from an extensive county level database consolidated by the Inter-University Consortium for Political and Social Research (ICPSE). We also make use of the Federal Housing Finance Agency (FHFA) data on house prices which are available at the MSA level. We also make use of TransUnion Trend Data to control for the average consumer credit score and the percentage of low consumer credit score in a county.

To control for geographical characteristics that could affect house price growth in a region we supplement our dataset with a land topology-based measure of housing supply elasticity constructed by Saiz (2010). Glaeser, Gyourkou, and Saiz (2008) show that areas with very high elasticity of housing supply are unlikely to experience large house price growth.

Our foreclosure data come from Realty Trac Foreclosure Market Trend Reports data.[5] Realty Trac provides comprehensive county coverage of foreclosure filings within a quarter. The reports are available starting from the second quarter of 2005. We thus use the second quarter of the years 2005, 2006 and 2007. By using data on the second quarter for each year, we are able to get a measure of the increase in quarterly foreclosure filings prior to the liquidity crisis and the official start of the recession in the U.S., thus ensuring our results are

the larger counties also helps minimize any noise in the data that could be brought by the inclusion of areas with a small population.

[5]A recent paper by Mian et al. (2011) also makes use of the same source to compute a measure of foreclosure rates.

not driven by these factors.

We make use of data on state regulation of mortgage brokers available from Pahl (2007), and a dataset on state level anti-predatory lending laws constructed by Bostic et al. (2008). We use these data to further explore the regulation aspect. We also supplement our data with information on the ratio of core deposit to total assets of all depository institutions which we obtain from the Reports of Condition and Income (Call Report) and from the Statistics on Depository Institutions (SDI), both available from the FDIC.

2.2 Summary statistics

We provide summary statistics from both the disaggregated loan level data and the aggregated county level data.

Table 1 provides summary statistics for the loans originated by banks and independents. The table shows statistics on originated loans in 2003, 2005, and 2007, on the loan amount, the applicant's income, and the loan to income ratio. In the upper table we show statistics from the full sample. Looking at the column titled N, the number of loans, we find that the number of originated loans has increased between 2003 and 2005, and then decreased between 2005 and 2007 for both banks and independents.[6] Note that 2005 was the peak year in loan originations as shown in Figure 6. However, the extent of the boom and bust was substantially larger for independents. Notably, while in 2003 independents made around 31% of loans, they contributed to more than 60% of the increase in mortgage originations between 2003 and 2005 and the decrease between 2005 and 2007. The upper table from the full sample shows that on average banks made loans to higher income applicants. The last column shows the p-value from a t-test of the difference in means. Much of this difference however is due to the fact that banks were significantly more active on the jumbo loan market.[7] Figure 1 shows

[6] We focus on the N values for the loan amount as there are around 4% of loans in our sample without information on applicant income. HMDA requires lenders to report income when this information was relied upon in making the credit decision.

[7] A jumbo mortgage is a mortgage loan in an amount above conventional conforming loan limits. This standard is set by the two government-sponsored enterprises Fannie Mae and Freddie Mac, and sets the limit

histograms of the applicant income of originated loans for both banks and independents. We see that the distribution is in fact similar across both subsamples with some exceptions, the most notable of which is a fatter right tail for banks. In the lower table we exclude jumbo loans and find that the differences in loan income and applicant amount narrows between banks and independents, although it remains significant except for the difference in the applicant income in 2005. As for the loan to income ratio, we find both in the full sample as well as in the non-jumbo loan sample that independents gave higher LTI loans in 2003 and 2007 but lower LTI loans in 2005.

Our analysis is carried at the county level and Table 2 summarizes the main variables. We rely on HMDA to construct our variables on mortgage volume and mortgage growth rates. In the first line of Table 2, we see that in the average county, mortgage credit grew by around 30% between 2003 and 2005. It then contracted by more than 80% between 2005 and 2007. The share of loans originated by independents varies substantially across countries as we can see in Figure 2. This distribution is relatively symmetric and the mean and median market share were around 23% in 2003. This market share has increased by 4% in 2005, due to the faster expansion of independents. The share of private securitization was, in mean and median, around 0.13. We also include broader measures of securitization in our empirical exercise (See Data Appendix). The foreclosure rate measures the percentage of properties with new filings during the quarter. On average, new foreclosures were filed for 0.1% of properties, during 2005Q2. The measure shows significant variation however with a standard deviation around 0.11. New foreclosure filings doubled between 2005Q2 and 2006Q2 and nearly tripled between 2005Q2 and 2007Q2. House prices were increasing rapidly between 2003 and 2005 with an average growth rate of 27% and a median of 19%. The growth rate substantially declined between 2005 and 2007. House prices entered their downturn trend only later in 2007 and early 2008 as can be seen in Figure 6.

on the maximum value of any individual mortgage they will purchase from a lender. The loan amount cutoff for 2005 is $\$359,650$.

3 Mortgage credit expansion: 2003-2005

In this section we show that independent lenders contributed disproportionally to the mortgage boom. We first start with some motivating facts before presenting a simple empirical exercise to quantify differences between the expansion of banks and that of independents.

The year 2005 constituted the peak of a mortgage boom that started in early 2000s and substantially accelerated to register unprecedented levels of mortgage growth between 2003 and 2005. Figure 6 plots the log of total new mortgage originations in the U.S. illustrating the rise and fall of the mortgage market between 2003 and 2008. We focus on the differences between the contribution of independents and that of banks to the boom between 2003 and 2005. The number of originated loans in Table 1 strongly indicates that independents had a disproportional contribution as we discussed. Figure 3 plots a scatter of the market share of independents in 2005 against their market share in 2003 across counties. This figure is very telling as it shows that this expansion in the market share of independents took place in the vast majority of U.S. counties.

We quantify this difference between independents and banks by running simple regressions of the change in mortgage volume on a constant. Table 3 shows the outcome of these regressions. In the first column, we regress the change in total mortgage volume, by both banks and independents, on a constant. This constant is a measure of the average credit growth between 2003 and 2005, which is estimated at around 33%. In the second and third columns we show similar regressions where the endogenous variable is the change in mortgage credit by banks and independents respectively. They suggest that, on average, credit growth by independents was around 23% higher than that of banks. In the fourth column, the endogenous variable is the change in the county market share of independents. The result indicates that on average, the market share of independents grew by around 4%. We also look at whether the expansion of independents can be characterized as being inward or outward expansion. We thus regress, in the fifth column, the change in the market share of independents on a constant and on the lagged market share in 2003. The results suggest

that independents gained market shares in new areas where they had lower presence in the past.

We next pursue the question of whether independents expanded more into areas that experienced higher house price growth. The premise is that an environment of high returns on housing is conducive to increased willingness by independents, due to lighter regulation, to lend to a segment of high risk applicants. Indeed, a major empirical challenger is to circumvent endogeneity. The expansion of independents, through its effect on the supply of mortgage credit, is likely to have contibuted to the rise in house prices. We address this issue by instrumenting for house price growth by the regions's housing supply elasticity. This instrument which is taken from a dataset constructed by Saiz (2010), is based on geographical characteristics of a Metropolitan Statistical Area (MSA) and thus exogenous to changes in mortgage credit. One would expect this variable to be negatively correlated with house prices growth between 2003 and 2005 since house prices are more likelyt o be more responsive to changes in the demand for housing (and the supply of mortgage credit) in areas where the supply of housing is low, i.e., the supply of housing more constrained due to geographical features of the area such as the proximity to water. This makes the housing supply elasticity a potentially good instrument for house price growth between 2003 and 2005.[8] In the sixth column, we show that a simple regression of the change in the market share of independents on housing supply elasticity, controlling for the market share in 2003, yileds a negative and significant coefficient suggesting that independents expanded mroe in areas that have on average a lower elasticity in housing supply.

We explore the association betwen house price growth and the change in the market share of independents in Table 4. In the first two columns we regress the growth rate of lending by banks and independents, respectively, between 2003 and 2005, on the growth rate of the housing price in the previous year, 2002. We find that on average, following an increase in house prices independents increased their lending by more. Ideally, however, we want to test

[8]This variable is also used as an instrument for house price growth between 2002 and 2006 in Mian and Sufi (2009).

whether independents expand more aggressively to areas that are experiencing a housing boom. To circumvent the previsouly mentionned endogeneity problem, we instrument for house price growth between 2003 and 2004 using the housing supply elatsicity measure. In column three we show results for the first stage regression of the house price growth between 2003 and 2005 on the housing supply elasticity. We find that the instrument is strongly correlated with the endogenous regressor. In colums four and five we show the second stage regressions where the dependent variable is banks' and independents' credit growth between 2003 and 2005, respectively. While there is a positive relation between house price growth and bank lending growth, the coefficient is small and far from significant. When the dependent variable is the growth in independents' lending, on the other hand, the coefficient becomes larger in magnitude and significant at the 10% level. Therefore, these results do suggest that independents expanded relatively faster in areas that are experiencing a house price boom.

4 The Rise in Foreclosures and the Role of Independents

In this section we exploit the geographical heterogeneity of lenders and show that, controlling for county characteristics, the market share of independents is a strong predictor of the early rise in foreclosures. We also show that it predicts the subsequent contraction in credit and house prices, as well as the rise in unemployment. We begin with some motivating facts before describing our empirical methodology. We leave the interpretation and the discussion of the results to the end.

4.1 Motivating Facts

It is now well established that the housing boom was fueled by a shift in mortgage supply as a result of deteriorating lending standards that led to a worsening in the risk profile of the marginal borrower, and to the subsequent rise in foreclosures (e.g. Mian and Sufi,

2009a). In light of these findings from the literature, the patterns documented in Section 3, alone, are suggestive of a faster deterioration in the lending standards of independents. It is indeed possible that due to their lack of regulation and supervision, independents were able to expand rapidly and rip the benefits from a booming housing sector while minimizing their perceived risk through the heavy reliance on an originate-to-distribute (OTD) model. This interpretation resonate well with some of the calls that were raised during the crisis for tighter regulation on the "shadow banking" sector, including independent mortgage lenders. Nevertheless, this remains an interpretation without direct evidence that lending by independents was associated with worse outcomes. We thus look at whether counties where independents channeled a larger share of mortgage loans fared worse during the crisis. We focus in particular on the rise in foreclosure as it is a direct result of the deterioration in lending standards, and since mortgage defaults were the first sign of mortgage trouble and were at the root of the subsequent housing downturn.[9] Figure 4 shows the spike in foreclosures which started as early as in 2006.

Figure 5 shows a scatter of the increase in foreclosure filings in a county between 2005Q2 and 2007Q2 against the market share of independents in 2005. The graph from the full sample (left) is suggestive of a strong positive relationship between these two variables. A further inspection shows that this relation is robust to the exclusion of counties with the very highest shares of independents (right). Indeed, this relation could be also driven in part by confounding county characteristics that are correlated with the presence of independents. This calls for an empirical model to control for these factors. We note, however, that the pre-crisis market share of independents is far from being fully explained by economic and demographic characteristics of the counties alone, nor by factors directly related to the housing boom. Independent lenders grew in prominence during the 80s and 90s, when they gained significant market shares in some regions in the U.S., mainly in some areas in the Southwest and some pockets in the South, Midwest, and on the East Coast. In some of

[9] See e.g. Demyanyk (2010) and Mayer et al. (2009).

these regions they became the main lenders or one of the largest in market share. While their expansion during the boom has increased their market share in several regions, both new regions and regions in which they are well established, the increase in market share during that period was only around 4%, and a large share of their market share as of 2005 is explained by their historical presence or by proximity to areas of strong presence.[10] While some of these areas can be characterized as having a lower average income and lower housing supply elasticity, the sample of counties with high market share of independents is a heterogeneous one, as is the sample of counties with low presence of independents. In the matching exercise, we are in fact able to match counties of similar economic and demographic similarities but with heterogeneous market shares of lenders. This heterogeneity allows us to control for factors that could be correlated with both the presence of independents and the rise in foreclosure. We also note that one of the interesting features of the rise in foreclosures between 2006 and 2008 is that it took place in areas with historically low foreclosures, thus it was not explained by a region's per-capita income or credit risk.[11]

We also look at three useful indicators of the severity of the crisis at the regional level: the contraction in credit and in house prices, and the rise in unemployment. Figure 7 shows scatters of the growth rates of credit and house prices, and the change in unemployment, between 2005 and 2008 against the share of independents in of 2005. The figure suggests that counties with higher market shares also tended to have worse outcomes during the crisis, and as explained in the footnotes of Figure 7, the fitted lined show a statistically significant relation. We show the change between 2005 and 2008 for ease of comparison, however, and as can be seen in Figure 6, aggregate credit contracted prior to the decline in house prices, and unemployment only started increasing in 2008. While it is impossible to avoid the effects of the recession and the credit crunch when studying the relation between the market share

[10] We are able to supplement our Appendix with some maps and further analysis on this issue if the referee finds that a substantiation on this issue would be useful.

[11] A notable example is the Southwest and particularly some areas in California that saw skyrocketing foreclosures despite a historically low average foreclosure rate. The Southern states are important examples of historically high foreclosure rate areas, and low average income, that many of which did not experience as sharp of an increase in foreclosures as other states did.

of independents and unemployment, due to its late rise in 2008, we will focus our empirical analysis on the 2005-2007 period when studying the impact on credit and house prices to minimize these effects.

4.2 Empirical methodology

We exploit the heterogeneity in the market share of independents across counties to study the impact of their market participation on foreclosure outcomes during the housing downturn. We study the change in foreclosure using quarterly foreclosure data from the second quarter of 2005, 2006, and 2007. The advantage of using quarterly data is that it allows us to track changes in foreclosure prior to the liquidity crunch and the official start of the recession in Q3 and Q4 of 2007, respectively. The challenge in studying this question is that the market share of independents could be correlated with county characteristics that affect our outcome variables. We carefully address this concern by controlling for a host of economic and demographic county characteristics. We seek to disentangle the impact of lender type from that of the county to understand whether two hypothetical identical counties would have experienced different economic outcomes due to a difference in the type of lenders that dominated their mortgage markets. One might also be concerned that a relation between our key variable, the market share of independents, and the rise in foreclosures could be affected by housing shocks that are correlated with both the market share of independents and the rise in foreclosures. While this is unlikely partly because house prices only started to decline in late 2007 and early 2008, we also aim to address this concern by instrumenting for house prices.

We also study the impact of our key variable, the market share of independents, on mortgage credit, house prices and unemployment during the downturn. Our aim from such exercise is to examine whether the market share of independents is also a strong predictor of severity of the housing downturn.

4.2.1 Parametric approach

Our first methodology consists of using standard regression analysis to study the determinants of the rise in foreclosures between 2005 and 2007, focusing in particular on the impact of the market participation of independents. Our benchmark regression is a simple ordinary least squares of the following form:

$$\Delta_{05Q2-07Q2}Forc_i = \beta_0 + \beta_1 Independent_{i,05} + \beta_1 X_{i,05} + \beta_2 \Delta_{03-05} Z_i + \beta_3 Securitization_{i,05} + \epsilon_i \quad (1)$$

where $\Delta_{05-07}Forc_i$ is change in *new* foreclosure filing rates between 2005Q2 and 2007Q2, in county$i$. $Independent_{i,05}$ is a measure of the market share of independent lenders in the base year 2005, the peak year in mortgage lending, and $X_{i,05}$ summarizes county-specific controls from or prior to 2005. In these county specific controls we include various information on economic and demographic variables in each county. To control for economic characteristics we include measures of per-capita income and unemployment in 2005, per-capita income growth during the boom between 2003 and 2005, categorical variables capturing the average consumer credit score and percentage of low credit score consumers, as well as six variables capturing the share of census tract in a county with a median income that falls in one of the six deciles of income brackets below 60K. To control for demographic characteristics we include variables capturing the share of Black population, the share of Hispanic population, and the average immigration rate between 2000 and 2005. We also control for the housing supply elasticity given that it captures the propensity of house prices to experiences boom-bust cycles. We also control for the extent of the mortgage boom between 2003 and 2005, $\Delta_{03-05}Z_i$, captured by the growth in house prices and mortgage credit during that period. This is because a higher $Independent_{i,05}$ might be associated with a faster expansion in credit and house prices. We thus explore whether lending by independents had a significant effect on foreclosure beyond its association with certain county characteristics or with the extent of

the housing boom in these counties. We finally also control for the share of originated loans in a county that were sold for private securitization. There is now substantial evidence that securitization has led to worse lending standards. Since independents securitized a higher share of loans we control for securitization to differentiate between the effect of securitization and that of the type of the originator.

4.2.2 Matching methods

A salient feature of our empirical exercise is that, in addition to standard regressions, we also address the problems that could arise from using a linear regression with a poor distributional overlap of control variables and the risk of placing undue weight on a linear model by using matching methods. A linear representation might be inappropriate if the underlying relations between variables are highly non-linear. Also, a regression alone does not fully address the possibility that county characteristics are unbalanced between counties with varying market share of independents. Therefore, we supplement the standard parametric approach with a matching exercise. The objective of this approach is to reduce our sample to a subsample of counties that are similar on a set of covariates that we find likely candidates to be correlated with both, the main explanatory variable and the outcome variable. This approach also allows us to address the concern that the market share of independents might be highly correlated with county characteristics, as it involves testing whether the selected subsamples of high and low market share of independents are indeed similar on a set of county characteristics. Matching alone is not a method of estimation. It requires a technique to compute estimates. The literature usually makes use of some matching estimator to test the differences in means between the treated and control samples. We use the Abadie-imbens bias corrected estimator for this specific purpose. However, an important aspect of our exercise is that in addition to such estimates we re-run the earlier linear regressions using the matched sample of treated and control counties. Therefore the matching exercise is serving in essence as a nonparametric pre-processing of the data. Pre-processing the

data the way we do reduces the correlation between our key variable and the controls and therefore makes estimates based on the subsequent parametric analysis far less dependent on modeling choices and specifications.[12] Ho et al (2010), show that after preprocessing the data estimates are less sensitive to changes in the parametric modeling assumptions. Furthermore, the exercise serves as a stringent robustness test for our earlier results by restricting our sample to characteristically similar counties.

4.3 Parametric Results

We first run a set of regressions following the linear model in (1) where the dependent variable is the change in new foreclosure filing rates between the second quarter of 2005 and the second quarter of 2007. The results are shown in Table 5. In the first column we run the regression with all controls included except for our key variable, the market share of independents (some regressors not shown in table due to space limit) . We also include state dummies and cluster error at the state level. We find that securitization was associated with an increase in foreclosure filings. This result is not surprising as there is now evidence showing that the OTD model has led to deterioration in lending standards (see e.g. Keys et al. 2010; Purnanandam, 2010). The estimate of the coefficient on securitization implies that an increase in one standard deviation of the securitization rate leads to an increase of 0.04 in the foreclosure filing rate. That means that 4 properties in every 10000 properties per quarter or 1/5th in the increase in average filings between 2005Q2 and 2007Q2. The estimate of the coefficient on per-capita income is not significant, but that is likely due to the inclusion of the census income level variables. The results also imply that counties that experience faster economic growth during the boom experienced less rise in foreclosures and that counties with a higher share of low credit score consumers and a higher share of Black population also display a more important rise in foreclosures. In the second column of Table 5 we include the market share of independent as a regressor. The estimate of the coefficient on

[12] See e.g. Rosenbaum and Rubin (1984), Rubin and Thomas (2000) and Imai and van Dyk (2004).

this variable is positive and significant at the 1%. It implies that an increase in one standard deviation in the market share of independents is associated with an increase in 0.08 in the rate of foreclosure filings, which is of important magnitude as it stands around 40% of the increase in average filings between 2005Q2 and 2007Q2. Interestingly, we find that the estimate of the coefficient on securitization loses its significance and becomes significantly smaller. This suggests that the coefficient in column (1) was capturing the effect of independents via their higher securitization rate. But as we control for the market share of independents we find that the type of lender is a more significant explanatory variable than securitization per se.[13] In the third column we control, in addition, for the house price growth between 2003 and 2005, and the growth rate in mortgage credit over that same period. We find that these factors do not significantly affect the coefficient on independents, and the estimates of their coefficient are not significant. This is likely due to the fact that we are studying the early rise in foreclosures, at which time the boom, particularly in house prices, was still ongoing.

In the fifth column, we show the result from a second stage regression of the change in foreclosure on the benchmark regressors (see column 2) and the house price growth between 2005 and 2007 instrumented by the housing supply elasticity and the lagged house price growth.[14] We find that even when we control for house prices the relation between independents and the rise in foreclosure remains strong despite a slightly smaller coefficient. The estimate of the coefficient on the instrumented house price growth is negative, in line with expectations, but not significant. These results minimize the concern that the relation between the market share of independents and the change in foreclosure rate could be driven by unobserved factors that affected house prices during that period.

In columns (5), (6), and (7) we repeat the above steps but replace the endogenous variable

[13]This finding is very robust and we later show that it also holds when controlling for different measures of securitization. In a regression of the change in foreclosure rates on the market share of independents and the share of securitization, *alone*, the estimates of both coefficients are positive and significant at the 1%. However, as we control for geographical and county characteristics, the share of securitization loses its significant, but the estimate of the coefficient on independents always remains signficant.

[14]The first stage F-statistic=14.1 and gives a partial $R^2 = 0.05$. The Sargan and Bassmann overidentificaton test yield a p-value of 0.96 and 0.97, respectively.

with the change in foreclosures between 2006 and 2007. This fully places the endogenous variable in the downturn period and allows us to address concerns related to our choice of studying the early rise in foreclosures and the possibility that some of our results might be reflecting correlations that are present during the boom but not during the bust episode. When the endogenous variable is the increase in foreclosure filings over one period only, the estimated coefficient on independents decreases in magnitude but remains significant, as shown in column (5). When we also control for the house price growth and the growth in mortgage credit in column (6) we find a positive and significant coefficient on mortgage credit growth, which also captures some of the effect of independents. The interpretation of this finding is relatively straightforward. Between 2006 and 2007 more U.S. counties have entered the downturn phase, in which case it is expected that the contraction to be at least partly explained by the extent of boom, as in most boom-bust episodes. As for the impact this has on the estimated coefficient on independents, it is expected that due to the fast expansion of independents, their market share in 2005 will be correlated with the growth rate of credit at county level. In the last column we also instrument for the house price growth in 2007 and find a negative and significant coefficient.[15] This also has an effect of decreasing the magnitude of the coefficient on independents; as we will see shortly, the market share of independents also predict a contraction in house prices, and therefore this explains the impact on its coefficient in column (7).

Figure 6 shows that the contraction in mortgage credit started in 2005, albeit to a mild degree as mortgage credit was still higher than that of 2003 and 2004 levels. In 2007, credit contracted substantially further bringing total credit to a significantly lower level than in the boom years. One might be concerned about how these movements in credit supply could affect the documented relation between independents and foreclosures. Arguably, however, movements in credit are only likely to affect foreclosures through their effect on house prices, and we do control for this variable. Nevertheless we also run regressions where

[15]The F-statistic from first stage is equal to 31.2 and the partial $R^2 = 0.11$. The Sargan and Bassman overidentification tests yield a p-value of 0.52 and 0.55, respectively.

the dependent variable is the change in total mortgage credit between 2005 and 2006 and find similar results. We also study the relation between independents and foreclosures in subsamples of counties based on their mortgage growth in 2005 and 2006. We find that the relation is more important in magnitude in the subsample of counties that were still experiencing a mortgage boom in 2005 and in 2006. These results are shown in Table 6. In the first column we run a simple regression on the full sample, of the change in foreclosures between 2005Q2 and 2006Q2 on a constant. In Column 2, we re-run the regression selecting only the subsample of counties that recorded higher than median growth in 2005 and in 2006. We find the constants in both regressions comparable which suggests that counties with fast growing mortgage market as of 2005 and 2006 also experienced a similar early rise in foreclosure. In column (3) we include the benchmark regressors in Table 5 using the full sample and find a positive and significant coefficient on independents. In column (4) we restrict the regression to the same sample of fast growing counties, while in column (5) we restrict it to the subsample of slow growing counties (below median growth in credit in 2005 and 2006) and find that the estimated coefficient on independents in column (4) is larger in magnitude. In summary, the aggregate patterns, together with the IV regressions from Table 5 and the results in Table 6 severely minimize the concern that the relation between independents and foreclosure is driven by factors related to house price and credit movements at the start of the downturn.

Credit, house prices, and unemployment We next explore whether counties with a higher market share of independents also experienced a more severe housing downturn and whether their regional economies were more impacted by the downturn. The rise in foreclosures alone can have important consequences on the regional economy through its effect on house prices (see e.g. Rogers and Winter, 2009; Mian et al., 2011). Lenders might also shy away from these counties due to an increase in the perceived riskiness of borrowers in these counties. These several hard-to-dissociate factors amplify the impact of foreclosures

and might lead to a when-it-rains-it-pours effect. Disentangling the amplification mechanism is beyond the scope of this paper, however, and our objective in this subsection is to examine whether the presence of independents was also associated with worse outcomes in terms of credit, house prices, and unemployment. We focus on the early credit and house price contraction between 2005 and 2007 in order to minimize, to the best extent possible, the impact of the liquidity crunch.[16] As for unemployment, which is one of the hallmarks of the Great Recession, it started its rise only in 2008. Therefore we also include 2008 in our analysis while keeping in mind that some of this relation could be affected by the event of the liquidity crunch. The results are shown in Table 7. The first column shows the results from a linear regression similar to the one in equation (1) except that the endogenous variable is now the change in total mortgage credit in the county between 2005 and 2007. We first find that the market share of independents as of 2005 has a strong and significant negative impact on mortgage credit growth during the downturn. An increase in one standard deviation is associated with a contraction of around 5% in mortgage credit between 2005 and 2007 (0.1*-0.498). This sharper decline of credit in areas with higher pre-crisis market share of independents could be due to a combination of both demand and supply effects, as discussed earlier, both of which are likely related to the more important rise in foreclosures in these areas. We also find that the higher market share of securitization is associated with a sharper contraction in credit. However, this effect loses its significance when we control in the second column for the expansion in credit and house prices during the boom. Column (2) also suggests that the increase in house prices during the boom was also significantly negatively associated with credit growth during the downturn. This is expected as the extent of the boom is likely to be an important factor in explaining the severity of the bust. Controlling for the mortgage boom, however, only slightly decreases the magnitude of the coefficient on the market share of independents, which remains significant at the 1%. In the third and fourth columns, the dependent variable is the change in house prices between 2005 and

[16]The impact of the liquidity crunch on lenders could widely vary based on lenders' size and liability structure, and its impact on credit supply could be in part unrelated to lending standards during the boom.

2007. We find that there is a negative relation between the market share of independents and house price growth, but that this relation is only significant when we control for credit and house price growth during the boom. Note that unlike credit growth between 2005 and 2007, a more substantial housing boom predicts an increase in house prices between 2005 and 2007. This finding is likely due to the fact that there is a significant persistence in house prices as they only started to decline substantially in late 2007 and during 2008. In the fifth column the dependent variable is the change in unemployment between 2005 and 2007. The coefficient on independents is positive but not significant. As mentioned earlier, however, unemployment only started to increase during 2008.[17] We thus regress, in column (6), the change in unemployment between 2005 and 2008 on the benchmark regressors. We find that the market share of independents is a significant predictor of the rise in unemployment, and that a one standard deviation increase in the market share is associated with an increase of 0.16 points in unemployment rate.

4.4 Matching results

We use the Abadie-Imbens matching estimator which allows us to match counties with respect to both categorical and continuous variables. Since continuous observations cannot be exactly matched, the procedure allows for bias-correction for that purpose. Our matching procedure and the post-matching balancing tests are carried in a way similar to a recent literature that uses these methods. The matching strategy consists first of isolating a subsample of counties that share similar characteristics based on our key explanatory variable, the percentage of independent loans in 2005. The procedure is often used when the explanatory variable is categorical so that there is a clear cutoff between what is treated and what is not. In our case, our explanatory variable is continuous and therefore we choose an ad-hoc cutoff of the independent variable and we vary this cutoff for robustness. Such practice is standard when the variable is continuous (see e.g. Almeida et al., 2010). Our benchmark

[17] U.S. unemployment rate in 2007 was in fact only slightly higher than that in 2005, 5% in comparison to 4.9% respectively. Source: BEA.

cutoff is the upper 15% of counties in terms of their market share of independents as of 2005.[18] The smaller our sample is, the better our matches are, but decreasing our sample too much might jeopardize our statistical tests. We denote this subsample as the sample of "treated" counties. We end up with a sample of 107 treated counties. The objective is to match this subsample to another subsample of counties that are similar in characteristics.

We choose our covariates with the main endogenous variable in mind, the change in the rate of foreclosures.[19] The covariates that we have to control for should be variables that are likely to be correlated with both the market share of independents and the rise in foreclosures. It is absolutely important, however, to avoid using a covariate for which we suspect a direct causality from the market share of independents, such as, for example, the change in house prices during the boom. Such variables will be included in the linear regression that we run on the sample of treated and control counties, but cannot be included in the matching process (see e.g. Ho et al, 2010). Our choice of covariates is self explanatory: we choose to match on the county's per capita income, average credit score, housing supply elasticity, and unemployment rate. These are variables for which a causality from the treatment variable is highly unlikely, yet they are likely to be correlated with both the market share of independents and the rise in foreclosures. In the benchmark exercise we match counties in the U.S. without geographical restrictions. We also show the results from an exercise where we impose the matching to be restricted within a state, i.e., intrastate matching. We do so to address concerns that state foreclosure laws could play an important role, although we do control for state dummies in the post-matching regression stage.

4.4.1 Balancing tests

Upon completion of the matching estimation we conduct balancing tests. The objective of these tests is to ensure that the distribution of the conditioning variables, the covariates, does

[18] This cutoff corresponds to a market share of independents of 0.3854; choosing a cutoff corresponding to the higher 10% or higher 20% gives similar results.

[19] The fact that the outcome variable reflects a change in a flow variable addresses issues with unobservable time-non varying county characteristics.

not significantly differ across the treatment and the control groups. We use the Kolmogorov-Smirnov (KS) test of *distributional* differences as well as t-test to compare the means. The first row of Table 8 shows the change in foreclosures between treated and the control groups of counties. A visual comparison of the means and medians across the two groups suggest that the treated group experienced distinctly worse outcomes during the downturn. The KS and t-tests suggest these differences are significant. The next four rows compare the distribution of covariates between the treated and control subsamples. We find a strong similarity and the KS test cannot reject that they are generated by the same distribution, while the p-values from t-tests show that we cannot reject the equality of the mean. Table 10 shows similar results from the exercise in which, in addition to matching counties on the four covariates, we also impose on the counties to be from the same state. This constraint, indeed, makes it harder to find counties that are characteristically similar, nevertheless we find that the KS and t-test suggest that the differences in the distribution of the covariates and their means, respectively, are not significantly different between the treated and control subsamples. Note that the p-value from the KS test on income is relatively small (0.12), however, we find that on average it is the treated counties, i.e., counties with a higher market share of independents, that have a slightly higher per-capita income; this is a lesser reason for concern. The first row in Table 10 shows that, just like in the benchmark interstate matching, foreclosure outcomes are significantly worse in the treated sample.

4.4.2 The Abadie-Imbens Estimator

We next show the results from the Abadie-Imbens matching estimator. We show results from three different estimators: the sample average treatment effect (SATE), the sample average treatment effect on the treated (SATT), and the population average treatment effect on the treated (PATT). The results for the benchmark matching exercise are shown in Table 9 which reports the differential change in foreclosure filings rate, mortgage credit growth, and the change in unemployment rate between the treated and control samples.

The results confirm that treated counties had experienced a significantly sharper increase in foreclosures, as can be seen from all estimators which yield results of a similar magnitude. The treatment effect, i.e., having a high market share of independents, is estimated to be associated with an increase in foreclosure filings rate by around 0.26, which is higher than the average increase in foreclosure filings rate over that period. The results on mortgage credit and unemployment also confirm earlier findings, although we note that the impact on unemployment varies substantially depending on the estimator used. Table 11 shows the results from the intrastate match. The SATE estimator yields substantially lower difference but results from all estimators are again significant for the three variables. Interestingly we find that the SATT and PATT yield very similar results on the main outcome variable, foreclosures, in the benchmark and the intrastate matching exercises.

4.4.3 OLS on the matched subsample

The third step of our matching exercise consists of running the benchmark linear regression on the subsample of matched counties. The results are shown in Table 12. Note that we control, but do not show, for all previously used economic and demographic controls as well as for state dummies (see Table 5), and we cluster errors at the state level. The first three columns are regressions on the full sample for the three endogenous variables, change in foreclosures, credit growth and unemployment. The next three are from the benchmark matched subsample, while the last three are from the intrastate matched subsample. Looking at the coefficients on foreclosure first, we find that the estimated coefficients on the matched subsample are significantly larger in magnitude. In fact, the estimated coefficient in column (4) is twice the size of that in column (1). The estimated coefficient from the intrastate match, as shown in column (7), is even higher. These results are very encouraging as they show that as we focus our study on characteristically similar counties our key finding becomes sharper. As for the coefficients on mortgage credit and unemployment we find that they are similar in magnitude in the interstate match, although the coefficient on mortgage

credit growth becomes only significant at the 10%.

4.5 Discussion

In the earlier section we have shown that independents contributed disproportionally to the lending boom and that, during the boom, the expansion in their market share was more pronounced in areas with a higher percentage of low credit score consumers, and areas experiencing higher house price growth. These findings alone hint to more severe deterioration in the lending standards of independents when compared to banks, particularly in light of the findings from the earlier literature that shows that the mortgage boom was to a great extent caused by an outward shift in the supply of mortgage which was fueled by greater moral hazard due to securitization (Mian and Sufi, 2009a). In this section, we examine the outcome of this mortgage boom and focus particularly on foreclosures, a variable that is more directly related to lending standards. We show that, even after controlling for county characteristics, counties where a higher share of mortgage lending was channeled by independents experienced a sharper rise in foreclosures. Indeed, it is the heterogeneity in the market share of independents that allows us to carry this exercise. Despite the correlation between the presence of independents and some of the county characteristics, it is far from a perfect correlation. A large share of the market share of independents as of 2005 is explained by their market share prior to the mortgage boom, as these lenders were concentrated in several geographical pockets. Many counties which did experience high price growth during the boom, and that had relatively lower average income and credit score were prior to the boom, and also as of 2005, largely dominated by banks. We control for county characteristics not only with standard parametric methods, but also by matching counties. These matching methods allowed us to verify the claim that the type of lender is not perfectly correlated with county characteristics.

These findings strongly indicate that the expansion of independents came at the expense of a significant deterioration in lending standards, one which led them to either lend to a

riskier category of lenders, expend less effort in collecting soft information from the average borrower, design riskier contracts (but possibly more attractive for the less risk-averse borrowers), or all of the above. Such differential between the lending standards of banks and independents alone can explain the above results. Exploring the risks associated with independents' lending is, however, beyond the scope of this paper, but would be an important avenue for future research, possibly using disaggregated data. Our findings from the county level data establish correlations that are quantitatively important at the aggregate level and thus shed light on the aggregate contribution of independent lenders.

5 Exploring the Role of Regulation and Alternative Hypotheses

Compared to banks, a conspicuous characteristic of independents is their weak regulation and supervision. This difference offers a very plausible explanation to the patterns documented in this paper.[20] Less tightly regulated and supervised lenders, by definition, face fewer constraints when it comes to their lending policy. They are thus able to, under favorable circumstances such as the housing boom and the availability of the OTD technology, gain market shares by originating increasingly risky loans. We nevertheless check the robustness of this argument by (a) testing alternative hypotheses and (b) exploiting variation in mortgage related regulation across states.

5.1 Alternative Hypotheses

A long standing finance literature that examines the relation between competition and lending standards offers ambiguous results (see e.g. Jarayatne and Strahan, 1996; Black and Strahan, 2002; Campbell, 2006; Gabaix and Laibson, 2006; Dick and Lehnert, 2010).

[20] Keys et al. (2009) use this distinction between independents and banks to test for the impact of regulation.

Nevertheless, it suggests that competition can have a substantial effect on lending policy. One might ask, therefore, whether the market share of independents, our key variable in the analysis, is correlated with the degree of competition on the local market. To control for the regional competition effect we control for a Herfindahl index constructed for the top, 15, 30 and 50 lenders in the county (see e.g. Barth et al., 2009). We sequentially add these indexes on the right hand side of our benchmark regression of foreclosures on county characteristics. The results are shown in Table 13. In the first column we show the outcome of the benchmark regression for comparison. We then in columns (2), (3), and (4) control for our measures of market competition and find that the estimated coefficient on each of the Herfindahl measures are far from significant. Note that when we control for the Herfindahl indexes constructed for the top 30 and 50 lenders, in columns(2) and (3) respectively, our sample of counties becomes smaller, as there are counties with fewer than 30 and 50 lenders. Nevertheless, we find that the coefficient on independents remains positive and significant in all three, and becomes larger in magnitude as the sample size shrinks in (3) and (4).

Another concern is related to the geographical diversification of lenders. Recently, Loutskina and Strahan (2011) showed evidence that geographically concentrated lenders act like informed investors and tend to collect more information on the applicants, while geographical diversification has the opposite effect. One might argue that our results could be driven by a difference in the degree of geographical diversification of lenders, which could have an impact on the outcome of their lending. This is unlikely to explain our results, however, as the bulk of bank lending was originated by geographically diversified lenders. Nevertheless we control for this factor by computing the same index of lender diversification as in Loutskina and Strahan (2011) from which we compute a weighted measure of diversification at the county level.[21] We control for this measure in column (5) of Table 13 and find that it has virtually no impact on the coefficient of independents and that the estimated coefficient on the index is small and not significant.

[21] See Data Appendix.

One might also argue that differences in lending standards between banks and independents could be due to differences in their liability structure. In particular, banks typically rely on core deposits (in varying degrees across banks) while independent lenders are essentially wholesale lenders. There are two opposing predictions of the impact of deposit-taking on lending standards. On one hand, the presence of subsidized deposit insurance might lead to imprudent lending from banks. On the other hand, retail-lenders are more involved in relationship lending (see e.g. Song and Thakor, 2007) and thus might be better placed to efficiently screen applicants on soft information (see e.g. Purnanandam, 2010).[22] We address the question of whether the relations that we see in the data are driven by differences in deposit-taking activity rather than by differences in the regulatory framework by exploiting the heterogeneity in the extent of deposit-taking within banks. The increasing reliance on wholesale funding by banks during recent decades (see e.g. Feldman and Schmidt, 2001) makes our sample of banks a very heterogeneous one in terms of the ratio of core deposits to assets. To exploit this heterogeneity we obtain data on the ratio of core deposits to assets from the Reports of Income and Condition and from Statistics on Depository Institutions.[23] The median core deposits to assets ratio in our sample banks, as of 2005, is 0.51. A significant share of banks rely on deposits as a secondary source of funding as several large banks have ratios lower than 0.2. We therefore compute the share of loans originated in each county by banks with an above the median core deposits ratio, and also by banks above the upper quartile cutoff. The non-bank lending is, by definition, done by independents which can be characterized by a core deposits ratio equal to zero. We compete these measures with our measure of the market share of independents in columns (6) and (7). The results strongly suggest that the relation that we document is unlikely to be driven by the differences in deposit taking. We also control for other cutoffs as well as a weighted average measure of

[22] Another argument that would lead to a similar prediction is one related to the fragility induced by demand deposits as in Calomiris and Kahn (1991). However, wholesale funding or market borrowing are also subject to a sudden stop and recent literature suggests that wholesale lenders could be more vulnerable to withdrawal in episodes of liquidity shocks (see e.g. Gatev and Strahan, 2006; and Huang and Ratnovski, 2008).

[23] See Data Appendix.

core deposits in a given county (by imposing a ratio of core deposits to assets equal to zero for independents) and find similar results.

Several studies have recently established a negative relation between securitization and lending standards (see e.g. Keys et al., 2010; Purnanandam, 2010). This finding can be explained, as earlier studies argued, by a moral hazard argument by which an originate-to-distribute model diminishes banks' screening and monitoring incentives (see e.g. Petersen and Rajan, 1994; and Parlour and Plantin, 2008). In light of this finding, one might ask whether the heterogeneity in the rate of securitization between banks and independents can explain the relation between independents and the rise in foreclosures. We address this question in our benchmark regressions by controlling for the share of securitized loans at the county level. To compute this share we follow closely Mian and Sufi (2009a)'s definition of private securitization. The results suggested that securitization explains at best a small fraction of the effect of independents. We further address this question using other proxies for securitization. Specifically, in addition to private securitization we control in columns (8) and (9) for measures of the share of loans sold to GSEs and the share of loans that were kept on the balance sheet of the originator, respectively. We see that in column (8) the estimated coefficient on *Percent sold to GSE* to be negative but not significant. It slightly reduces the estimated coefficient on independents which however remains very significant. The result suggests that securitization to GSEs, unlike private securitization, is negatively correlated with the rise in foreclosures. Indeed, GSEs required minimum standards on the loans their purchased which could explain this correlation. The decline in the estimated coefficient on independents could thus be explained by the fact that they sold a relatively smaller share of their loans to GSEs. Nevertheless, this relation is weak and has only a small impact on the benchmark regression. Finally, in column (9) we control for the share of all non-securitized loans and find that the estimated coefficient to be positive and not significant.

5.2 State regulation

We next explore whether the strong association between lending by independents and the rise in foreclosures varied with the extent of mortgage market regulations across states. If this association can be explained by the lack of sufficient regulation of independents, then one might expect to find that this association is less (more) pronounced in more (less) regulated states. The premise is the following: *if* state mortgage-related regulations are effective in limiting risky loans, they are likely to have a more important effect on the lending of the otherwise less regulated lenders, i.e., independent lenders. The challenge in identifying such relation is the difficulty in measuring *effective* state regulation and supervision. State laws that regulate the mortgage market vary widely across states, however, market observers have pointed to a lack of enforcement problem (see e.g. Belskey and Retsinas, 2008; Treasury Blueprint, 2008; Immergluck, 2009). With these caveats in mind, we explore two datasets on state regulation. One dataset is constructed by Bostic et al. (2008) and reflects the extent of state restrictions on predatory lending laws. The second dataset is on state regulation of mortgage brokers and comes from Pahl (2007).[24] Note that in most states, brokers and lenders were supervised by the same state agency (see e.g. Immergluck, 2009), making this index a good candidate for a proxy of mortgage regulation and supervision of both mortgage brokers and lenders. These datasets thus focus on distinctive aspects of the mortgage market. Arguably, however, more regulation and supervision of mortgage brokers and more restrictive predatory lending laws should both act as constraints on risky lending. We thus run regressions where we interact the share of independents as of 2005 with one of these indexes on new state mortgage-related regulations. We focus on new regulations for several reasons. First, Bostic et al.(2008) make the distinction between pre- and post-1999 state regulations on anti-predatory lending, as the modern laws were patterned differently, akin the Home Ownership and Equity Protect Act (HOPEA) that congress enacted in 1994. They find that these new laws with broader coverage had an effect above and beyond the old laws. Second,

[24] See Data Appendix

since our dependent variable measures the change in new foreclosure filings, one would expect that examining new laws would also be more appropriate in our context. Third, since many of the state regulations were not effectively implemented during the mortgage boom (see e.g. Immergluck, 2009) a concern about effectiveness leads us to place more weight on new regulations which are a better proxy of a state's regulatory reaction to the mortgage boom. For these reasons, and for comparability with the data from Bostic et al. (2008), we examine the new state regulation on broker regulations which are available from Pahl (2007) between 1996 and 2005.[25] For each regulation measure, the anti-predatory lending laws and the broker regulations, we rank states and assign a dummy for the upper quartile of most regulated states. We do so to minimize the effect of the judgmental nature in which these indexes were constructed by sometimes a linear sum of subcomponents. Finally, since we are examining laws at the state level one cannot control simultaneously for state dummies. Instead we also control, in addition to the county characteristics, for state characteristics that could affect foreclosures such as the state GDP, and three dummies capturing foreclosure related laws (see Pence, 2006).

The results from these regressions are shown in Table 14. In the first column we show the results from the benchmark regression of the rise in foreclosure on the county and state controls, to which we add the dummy for states with high broker regulation. We find that the estimated coefficient on the dummy is negative, meaning that these states experienced on average a smaller increase in foreclosures during the downturn. In the second column we interact the broker dummy with the market share of independents (third row) and find a negative and significant coefficient. This result supports the premise that more regulation lessened the impact of independents on foreclosures. Note that the coefficient on the regulation dummy turns positive. This is surprising but could be due to a host of factors that we cannot control for, such as state specific effects. In the third column we cluster errors at the

[25]The data are also available for 2006 but we exclude this year out of a concern for possible endogeneity with the outcome variable. Nevertheless we include it in a robustness exercise and find that it does not affect our results (not shown).

state level and find that the coefficient remains significant at the 5%. In columns (4), (5) and (6) we re-do the exercise in the first three columns this time replacing the dummy for broker regulation with the dummy on the anti-predatory lending laws. Column (4) shows that there is a negative correlation between the dummy and the increase in foreclosure, yet it is far from significant. Interestingly however, when we interact this dummy variable with the market share of independents we find that the results mirror our earlier finding from the broker dummy, with however a smaller magnitude on the interaction variable which is also only significant at the 10% in the last column where errors are clusters at the state level. While the regulation variables we use are far from ideal, as they are not direct measures of effective state regulation of mortgage lenders, the results do suggest that the effect of independents on foreclosure is weaker in states that implemented stricter mortgage related regulations during the boom. Taken together with our robustness analysis, the findings suggest that regulation could be key in explaining the lender effect on foreclosures.

6 Conclusion

The evidence in this paper suggests that the lightly regulated independent lenders contributed disproportionately to the recent boom-bust housing cycle. We show that, to a large extent, the mortgage boom was fueled by a fast expansion of credit from independent lenders. We then show that the market share of these independents as of 2005 is a strong predictor of the increase in foreclosure between 2005 and 2007. We carefully control for county characteristics using both parametric and semi-nonparametric methods and show that these patterns are unlikely to be driven by factors unrelated to the lending standards of independents. We show robustness tests that suggest that this strong association between independents and the rise in foreclosures is most likely be due to the weak regulatory structure. We illustrate the macroeconomic consequences of these relations by showing that the presence of independents also predicts the contraction in credit and house prices and the subsequent rise

in unemployment between in 2007 and 2008. Overall our findings lend support to the view that more stringent regulation could have averted some the volatility in the housing market during the recent boom-bust episode. Our study sheds light on the aggregate contribution of the least regulated lenders. An interesting avenue for future research is to identify, using disaggregated data, the characteristics that made lending by independents riskier than that by banks.

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7 Data Appendix

HMDA Data

We use a comprehensive sample of mortgage applications and originations that have been collected by the Federal Reserve under the provision of the Home Mortgage Disclosure Act (HMDA). Under this provision, the vast majority of mortgage lenders are required to report data about their house-related lending activity.[26] HMDA data covered around 95% of all mortgage originations in 2005 (see e.g. Dell'Ariccia et al., 2008), and has a better coverage within MSAs due to stricter reporting requirements in these areas.

The HMDA data provide information on the year of the application (the data is available on an annual basis), the amount of the loan, the lender's decision, and the income of the applicant. The data also provide information on the gender and race of the applicant, as well as other information on the census tract of the property such as the median income and share of minority households.

The raw HMDA data in our sample covering the sample period 2003 to 2008 period contain around 190 million applications. Of these, we keep only loans that are either approved or denied (Action code 1,2, and 3). We further restrict our loans types to be conventional (we exclude Federal Housing Agency, Veterans Administration, Farm Service Agency or Rural Housing Service), the property types to be one to four-family, the loan purpose to be

[26]Lenders are required to report if they meet certain criteria related to size, geographical location, the extent of housing-related lending activity, and regulatory status. Regarding size, a depository institution is subject to HMDA reporting requirements if it has assets of $34 million or more, as of December 31, 2004. In 2010, the Board raised this threshold to $40 million. For a non depository institution, total assets must exceed $10 million, as of December 31 of the preceding year, taking into account the assets of any parent corporation. Regarding the geographical location, lenders must report if they have offices in a Metropolitan Statistical Area (MSA) or if they are non-depository institutions with lending activities on properties located in an MSA. Lenders must also report if they are depository institutions with at least one home purchase loan or if they are non-depository institutions and they originate 100 or more home-purchase and refinancing loans. As for the regulatory status, lenders must report if they are non-depository institutions or if they are depository institutions that are federally insured or regulated.

home purchase only (excluding home improvement, refinancing purposes), and the occupancy status to be owner-occupied as principal dwelling. This leaves us with 34 million applications.

We distinguish between the type of lenders based on information available from HMDA on their regulatory agencies. Depository institutions and their affiliates (which we refer to as banks) are listed under the following agencies: Federal Deposit Insurance Corporation, Federal Reserve System, Office of the Comptroller of the Currency, Office of Thrift and Supervision, and National Credit Union Administration. Non-bank mortgage originators (independents) are listed under the Department of Housing and Urban Development.

We restrict our study to mortgage originations in counties situated in an Metropolitan Statistical Area (MSA) for which HMDA has better coverage and data on house prices and on house supply elasticity are available. This leaves us with 773 counties. These counties cover around 80% of total mortgage originations in HMDA in 2005.

We aggregate our data on mortgage originations at the county level which gives us the volume of loans originated in a county during a year. We can also distinguish between the originators. We calculate, in a county, the percentage of loans originated by independent mortgage companies and by banks.

HMDA provides information on the securitization process. Lenders are asked to report whether the originated mortgage was sold to a third party during the same calendar year in which it was originated. HMDA defines 8 types of purchasers. In the benchmark exercise we follow the approach of Mian and Sufi (2009a) and define securitization as being "private securitization", i.e., loans sold to private securitization pools, or sold to life insurance companies, credit unions, mortgage banks, and finance companies. We also supplement this measure with several other measures of securitization such as the share of of GSE securitization, as well as the share of non-securitized loans.

With the originated loan volume information, HMDA data allows us to construct measures on credit growth, bank competition (Herfindahl index) and geographic diversification. More specifically, for Herfindahl index we sum for each county the square of the percentage

share of originated loans of the top 15 , 30, and 50 mortgage originators to create three respective competition indicators. The Herfindahl index ranges from near 0 for a county that has much bank competition to 1 for a county that has only bank, i.e. no competition.

For lender geographic diversification, we follow closely the method used in Loutskina and Strahan (2011). The variable measures the extent to which a lender concentrates its lending within a Metropolitan Statistical Area (MSA). The measure equals the sum of squared shares of loans made by a lender in each of the MSAs in which it operates, where the shares are based on originated loans. The geographic diversification measure ranges from near 0 for lenders operating cross most U.S. MSAs to 1 for lenders operating in a single MSA. We construct our county level index by taking weighted average of the indexes of geographical diversification for each lender in the region, weighted by their share of originated loans.

Inter-University Consortium for Political and Social Research

Inter-University Consortium for Political and Social Research (ICPSR), an affiliated institute of the University of Michigan, maintains a database on demographic and economic characteristics of U.S. counties. The sources of the database include the Bureau of the Census, the Bureau of Economic Analysis, the Bureau of Labor Statistics, as well as other sources (website: http://www.icpsr.umich.edu/icpsrweb/ICPSR/). For our county level analysis, we include the following economic and demographic characteristics: per capita personal income in 2005 ($CA0N0030\_05$), Percent of Black resident population in 2005 (PctBlack05), percent of Hispanic resident population in 2005 (PctH05), and average net international migration from 2001 to 2005 (IntlMig01,02,03,04,05). We also compute the per capita income growth between 2003 and 2005 using annual growth measures from the U.S. Bureau of Economic Analysis (BEA).

RealtyTrac Foreclosure Market Trend Data

The RealtyTrac U.S. Foreclosure Market Trend Report provides comprehensive data on foreclosures at the county level. Data is taken from more than 2,200 counties in the U.S. that account for more than 90 percent of the population. RealtyTrac's report provides

foreclosure rates at the county level based on five types of documents filed in all three phases of foreclosure. Two filings, the Notice of Default and the *lis pendens* correspond to the first stage of foreclosure, prior to a foreclosure auction. Two filings are associated with the foreclosure auction, which are the Notice of Trustee Sale and the Notice of Foreclosure Sale. When a foreclosure auction is unsuccessful, the lender will legally repossess the property which is then filed as a REO, or Real Estate Owned. Our measure of foreclosure filings reflects all three stages of foreclosure and is a sum of all filings on properties in the county divided by the number of households in the county which is also provided by RealtyTrac. To avoid double counting, RealtyTrac only reports the most recent filing on a property. The report also checks if the same type of document was filed against a property in a previous month or quarter. When this is the case, the report does not count the property if a previous filing occurred within the estimated foreclosure time frame for the state the property is in. The reports are available from April 2005. We took the second quarter of 2005, 2006, and 2007 and use them to compute year on year changes as a measure of the increase in foreclosure filing rates.

Federal Housing Finance Agency

House Price Index (HPI) is a quarterly data published by the U.S. Federal Housing Finance Agency, an entity created in 2008 from the merging of the U.S. Office of Federal Housing Enterprise Oversight and the U.S. Federal Housing Board. As a weighted, repeated sales index, the HPI measures average price changes in repeat sales or refinancing on single family properties with mortgages that have been purchased or securitized by Fannie Mae or Freddie Mac. The HPI includes indexes for all nine Census Divisions, the 50 states and the District of Columbia, and every Metropolitan Statistical Area (MSA) in the U.S., excluding Puerto Rico. Compared to S&P/Case-Shiller indexes, the HPI offers a more comprehensive coverage of housing price trends in the U.S. metropolitan areas. We use the HPI data at MSA level (most disaggregated level that is available for this variable) and compute the year on year changes as a measure of house price growth in a given MSA.

TransUnion Trend Data

TransUnion is a leading consumer credit information company is the U.S., which offers credit-related information to potential creditors. It compiles the Trend Data, an aggregated consumer credit database that offers quarterly snapshots of randomly selected consumers, which enables the evaluation of actual consumer credit data over time. Data aggregations are available at national, state, metropolitan statistical area (MSA) and county levels. We use two categorical measures on credit scores in a county: Average Consumer Credit Score (ACCS) in 2004 and the Proportion of Low Consumer Credit Scores (PLCCS) as in Fellowes (2006).

Housing Supply Elasticity

Saiz (2010) provides a measure of housing supply elasticity at the MSA level computed based on topological factors. These factors are exogenous to house market conditions and population growth and are computed using both water and land slope constraint information obtained using Geographic Information System (GIS), United State Geographic Service (USGS), and USGS Digital Elevation Model (DEM). The data covers 269 Metropolitan areas using the 1999 county-based MSA or NECMA definitions. The geographic data is calculated using the principal city in the MSA, i.e., the first one on the list of a MSA name.

Call Report data

All regulated depository institutions in the United States are required to file their financial information periodically with their respective regulators. Reports of Condition and Income data are a widely used source of timely and accurate financial data regarding banks' balance sheets and the results of their operations. Specifically, every national bank, state member bank and insured non-member Bank is required by the Federal Financial Institutions Examination Council (FFIEC) to file a Call Report as of the close of business on the last day of each calendar quarter. The specific reporting requirements depend upon the size of the bank and whether or not it has any foreign offices. The availability of agency specific bank IDs in HMDA (Federal Reserve RSSD-ID, FDIC Certificate Number, and OCC Char-

ter Number) allows us to match HMDA lenders that are depository institutions with their financials from the Call report. For savings institutions, i.e. depository institutions regulated by the OTS, we use the balance sheet information from Statistics on Depository Institutions (SDI), available from the FDIC, and match them with HMDA using OTS docket number.[27] We use the financial information to compute a core deposit ratio as total deposit minus time deposit over $100,000 divided by total asset (see e.g. Berlin and Mester, 1999). Naturally, for non-depository institutions we assign a zero for this ratio. We then rank lenders based on their core deposit (CD) and pick two thresholds for CD, 0.51 and 0.61, which correspond to the lower quartile and median values. We then compute the percentage share of banks in a county that is above these thresholds.

State Broker Regulation

We use Pahl's (2007) compilation of mortgage broker regulation in fifty states and the District of Columbia. These regulations pertain to requirements on the financial entity's controlling individual and managing principal (such as age, state of residency, pre-licensing education, examination results as well as net worth), requirements on the entity to maintain a minimum net worth or a surety bond, as well as physical office requirements such as maintaining a physical office in the state, obtaining a license or certificate and paying various fees. Pahl assigns a value for the intensity of each of twenty-four regulatory components. We focus on new regulations that were put in place by the various states between 1996 and 2005.

State Anti-predatory Law Index

In 1994, Congress enacted the first modern, comprehensive anti-predatory lending statute, the Home Ownership and Equity Protection Act (HOEPA). Starting in 1999, many states began adopting anti-predatory lending laws akin to HOPEA; these were labeled mini-HOPEA laws. These mini-HOEPA laws display considerable variation across states. Bostic et al. (2008) constructed a legal dataset of these laws in 50 states and the District of Columbia.

[27] http://www2.fdic.gov/sdi/

They also computed a state level index which scores the degree of restrictiveness on anti-predatory lending. The subcomponent of this index are indexes that measure the extent of: 1) Restrictions (limits on prepayment penalties, restrictions on balloon payments, requirements for credit counseling, and limits on judicial relief), 2) Coverage (number of loan types, APR trigger for first lien/subordinate mortgages, points and fees trigger) and 3) Enforcement mechanisms (assignee liability, enforcement against originators). We use their additive state level index of new mini-HOPEA laws which is available in Table 2 in their paper.

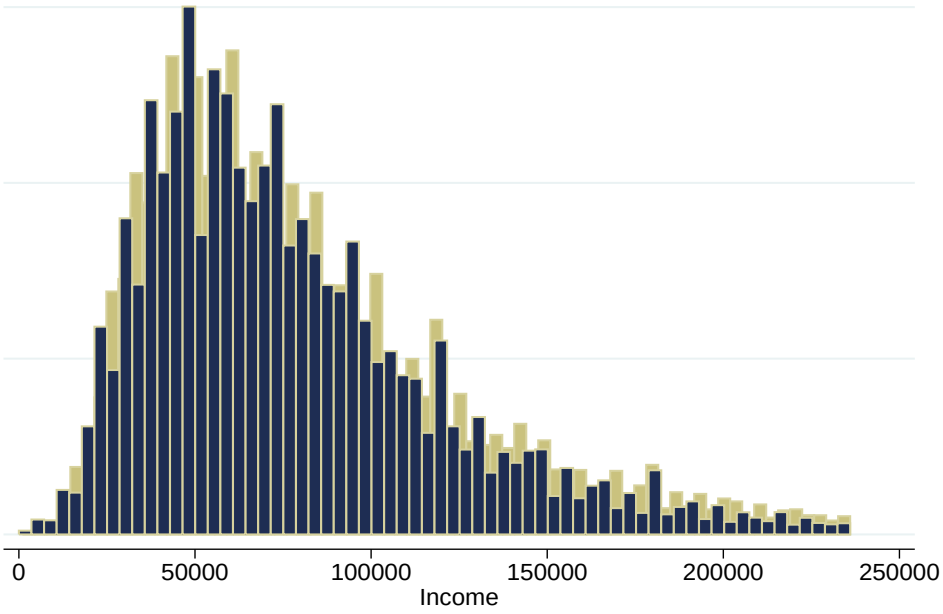

Figure 1: Income distribution.

Notes: This figure compares the income distribution of originated loans for each type of lender. The histogram of applicants' income for loans originated by independents is in black (dark blue in color).

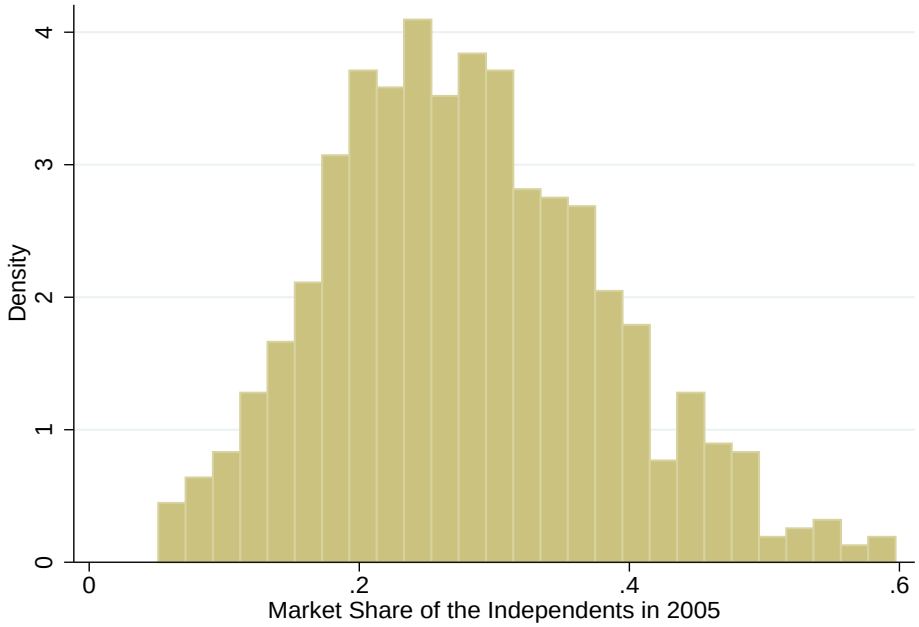

Figure 2: Market share of independents.

Notes: This figure shows a histogram of the market share of independents in our sample of 773 counties.

Figure 3: The expansion of independent lenders.

Notes: This figure shows the shift in Independents' share of the mortgage market between 2003 and 2005. For comparison we plot the 45 degree line to underline the upward shift.

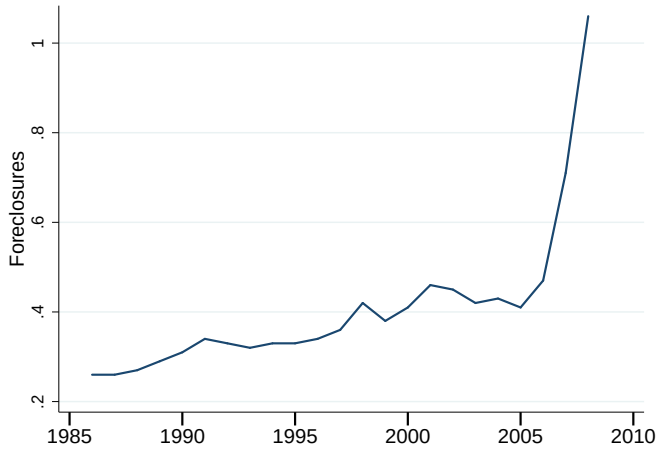

Figure 4: Foreclosures

Notes: This figure shows the evolution over time of foreclosure filings in percentage of originated mortgages. Source: HUD.

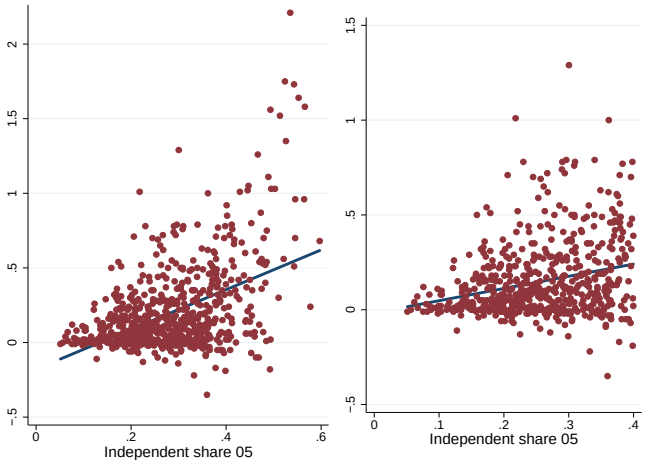

Figure 5: Foreclosures

Notes: This figure shows a scatter of the change in foreclosure filing rate (05Q2-07Q2) on the market share of independents as of 2005. In the left diagram we show the full sample. In the right doagram we show the close-up of the scatter eliminating counties with a market share of independents that is higher than 0.4. In both scatters we also fit a line from the regression of foreclosures on independents alone, in both samples we find a positive and significant coefficient.

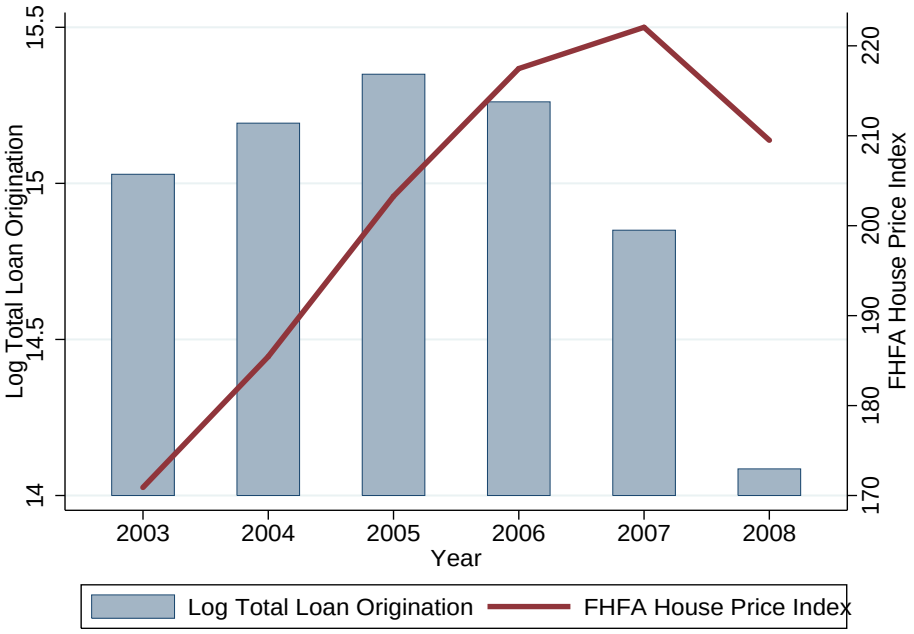

Figure 6: Mortgage credit boom and bust.

Notes: This figure plots the logarithm of total mortgage credit in our sample (bars) and an index of house prices in the U.S. (line, yearly average of quarterly data). Source: HMDA data (our sample, see Data Appendix) and FHFA.

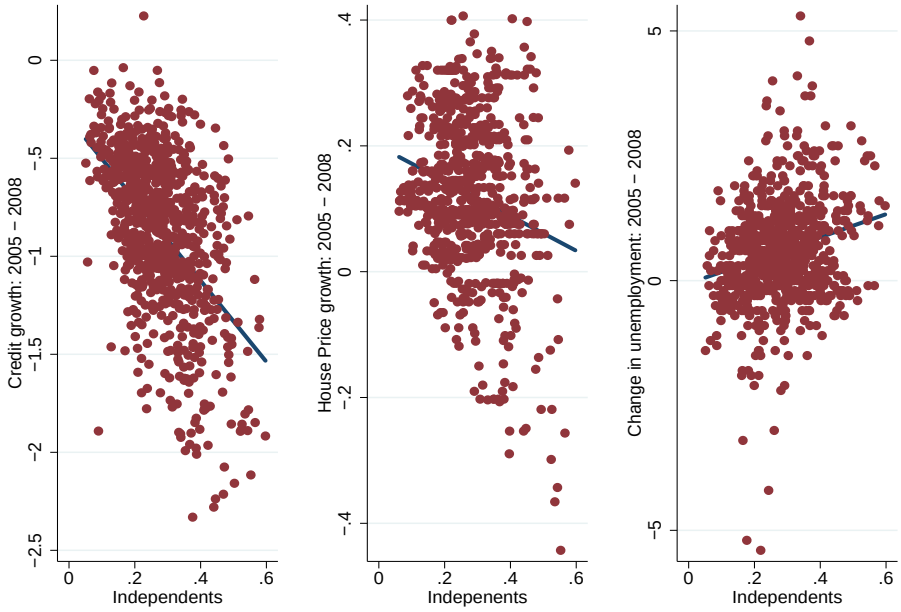

Figure 7: Credit, house prices, and unemployment.

Notes: This figure shows a scatter of mortgage credit growth between 2005 and 2008 (left) house price growth between 2005 and 2008 (middle) and change in unemployment rate between 2005 and 2008 (right), against the market share of independents as of 2005.

Table 1: Summary statistics: loan originations

This table presents summary statistics for the originated loans by both Independents and Banks for three years in our HMDA sample. Jumbo loan cutoffs are selected using information on loan limits from Fannie Mae and Freddie Mac for the corresponding year. We use the following limits for one family house mortgage loans: $\$322,700$ for 2003, $\$359,650$ for 2005, and $\$417,000$ for 2007. See Data Appendix for detailed information on the selection of our sample.

Full Sample

		Banks			**Independents**			
	Year	N	Mean	Median	N	Mean	Median	p-value
Loan amount (000's)	2003	2,309,677	181,229	146,000	1,056,122	164,044	142,000	0.00
	2005	2,770,440	203818	154000	1,867,061	174,472	136,000	0.00
	2007	2,155,242	220008	165000	658,369	208,325	176,000	0.00
Applicant Income	2003	2,227,064	89,468	69,000	1,013,923	79,904	66,000	0.00
	2005	2,665,797	98,122	75,000	1,769,365	89,749	74,000	0.00
	2007	2,100,790	109,093	80,000	629,392	98,470	78,000	0.00
Loan to income	2003	2,227,064	2.32	2.26	1,013,911	2.58	2.28	0.00
	2005	2,665,797	2.31	2.29	1,769,365	2.12	2.11	0.00
	2007	2,100,790	2.35	2.32	629,392	2.56	2.47	0.00

Non-Jumbo Loans

		Banks			**Independents**			
	Year	N	Mean	Median	N	Mean	Median	p-value
Loan amount (000's)	2003	2,051,601	141,935	133,000	973,496	140,219	133,000	0.00
	2005	2,400,392	147,281	135,000	1,679,344	137,970	122,000	0.00
	2007	1,922,485	165,175	150,000	607,013	177,034	165,000	0.00
Applicant Income	2003	1,979,014	74671	64,000	935,856	72,310	63,000	0.00
	2005	2,309,230	79619	68,000	1,593,676	80,226	70,000	0.00
	2007	1,876,602	88270	73,000	581,551	88,171	74,000	0.39
Loan to income	2003	1,979,014	2.23	2.18	935,847	2.49	2.21	0.00
	2005	2,309,230	2.16	2.14	1,593,676	1.98	1.95	0.00
	2007	1,876,602	2.26	2.23	581,551	2.47	2.42	0.00

Table 2: Statistical summary of the county level variables

This table show summary statistics for main the county level variables in our dataset. See Data Appendix for detailed description of the sources and construction of these variables.

Source	Variable	N	Mean	Median	Min	Max	S.D.
HMDA data							
	Mortgage credit growth, 2003-2005	773	0.32	0.30	-0.30	1.61	0.22
	Mortgage credit growth, 2005-2008	773	-0.87	-0.81	-2.33	0.22	0.41
	Market share of independents, 2003	773	0.23	0.22	0.02	0.55	0.09
	Market share of independents, 2005	773	0.27	0.27	0.05	0.59	0.10
	Share of private securitization, 2005	773	0.13	0.13	0.02	0.59	0.05
	Herfindhal index 1, 2005	765	0.10	0.09	0.04	0.64	0.04
	Herfindhal index 2, 2005	743	0.09	0.09	0.04	0.35	0.03
	Herfindhal index 3, 2005	660	0.09	0.09	0.04	0.24	0.036
	Lender geographical diversification, 2005	773	0.19	0.16	0.03	0.67	0.12
Realty Trac							
	Foreclosure rate, 2005Q2	697	0.10	0.06	0.01	0.66	0.11
	Foreclosure rate, 2006Q2	684	0.19	0.11	0.01	1.94	0.24
	Foreclosure rate, 2007Q2	730	0.29	0.19	0.01	2.33	0.33
ICPSR							
	Per capita income, 2005	746	10.34	10.32	8.54	11.44	0.22
	Unemployment, 2005	766	5.03	4.9	2.3	15.9	1.38
	Share of Black population, 2005	773	11.02	6.1	0.06	78.57	13.04
	Share of Hispanic population, 2005	773	7.81	3.48	0.37	89.36	11.27
	International Immigration, 2000-05	773	0.010	0.006	-0.0007	0.087	0.013
BEA							
	Per capita income growth, 2003-2005	746	.13	.13	.03	.30	.06
FHFA							
	House price growth, 2003-2005	721	0.27	0.19	0.041	0.98	0.20
	House price growth, 2006	721	0.04	0.04	-0.05	0.19	0.04
	House price growth, 2006-2007	721	0.05	0.05	-0.21	0.30	0.07
Trans Union							
	Average consumer credit score	722	2.99	3	1	5	1.25
	Percentage of low consumer credit score	718	2.95	3	1	5	1.26
Saiz (2010)							
	Housing supply elasitcity	773	2.37	2.23	0.59	12.14	1.24

Table 3: Expansion of the Independents.

This table compares the mortgage expansion of banks with that of independents between 2003 and 2005. The first column regresses the change in total mortgage credit on a constant and state dummies. In columns (2) and (3) the same is repeated for banks and independents respectively. Column (4) simply regresses the difference between the growth rate of each type of lender. In columns (5) and (6) we show regressions in which the endogenous variable is the change in the market share of independents between 2003 and 2005. We cluster errors at the state levbels in the regressions corresponding to columns (5) and (6).

	(1) Mortgage Credit 03-05	(2) Bank Credit 03-05	(3) Independent Credit 03-05	(4) Δ Indep. share %03-05	(5) Δ Indep. share 03-05	(6) Δ Indep. share 03-05
Constant	0.329***	0.265***	0.500***	0.041***	0.059***	0.093***
	(40.4)	(33.2)	(41.51)	(21.06)	(8.17)	(8.35)
Independents					-0.076***	-0.116***
					(-2.31)	(-3.57)
Housing supply elasticity						-0.010***
						(-4.13)
N	773	773	773	773	773	773
adj. R^2	0	0	0	0	0.717	0.731

t statistics in parentheses

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

Table 4: Expansion and house prices.

This table shows regressions of mortgage volume growth on house price growth. The first column shows the results from regressing mortgage growth for banks between 2003 and 2005 on house price growth in 2002, a set of economic and demographic variables, and state dummies. In the second column we show the same for independents. In the third column we show the result from the first stage of a IV regression where the dependent is the change in volume between 2003 and 2005, the instrumented endogenous variable is the change in house prices over the same period, and the instrument is the house price change over that same period. In the fourth and fifth column we show the results for the second stage where the dependent variables are bank credit growth and independents' credit growth, respectively. Erros are clustered at state level.

	(1) Bank 03-05	(2) Indep. 03-05	(3) House price growth 05	(4) Bank 05 IV	(5) Indep. 03-05 IV
House price growth, 2002	1.656***	3.317***			
	(4.00)	(3.69)			
Housing supply elasticity			-0.018***		
			(-2.75)		
House price growth, 2003-05				0.0242	1.112*
				(0.05)	(1.92)
Contstant	0.271***	0.396***	0.217***	0.170**	0.0229
	(20.44)	(13.81)	(4.23)	(2.35)	(0.20)
N	721	721	670	670	670
adj. R^2	0.382	0.246	0.813	0.447	0.330

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: An OLS of the rise in foreclosures on county characteristics.

This table shows results from the linear regression in equation (1). The dependent variable is the change in new foreclosures rates between 2005Q2 and 2007Q2 in columns 1 to 4, and between 2006Q2 and 2007Q2 in columns 5 to 7. See Table 2 and Data Appendix for details on the regressors. We also control for, but do not show, six income variables that capture the percentage of census tracts with a median income that falls into on of six income brackets, for the average immigration rate 2000-05, housing supply elasticity, and for state dummies. Errors are clustered at the state level.

	(1) 05-07	(2) 05-07	(3) 05-07	(4) 05-07 IV	(5) 06-07	(6) 06-07	(7) 06-07 IV
Market share of independent, 2005		0.831***	0.810***	0.648***	0.647**	0.544**	0.489***
		(2.94)	(2.85)	(2.80)	(2.41)	(2.05)	(3.14)
Private securitization, 2005	0.846**	0.315	0.149	-0.195	0.0138	-0.188	-0.385
	(2.64)	(0.94)	(0.41)	(-0.44)	(0.05)	(-0.57)	(-1.40)
Per-capita income, 2005	-0.00304	0.0325	0.0357	-0.0325	-0.0481	-0.00927	-0.0574
	(-0.03)	(0.30)	(0.34)	(-0.34)	(-0.44)	(-0.09)	(-0.82)
Income growth, 2003-05	-1.200***	-1.096***	-1.109***	-0.936***	-0.318	-0.395	-0.368
	(-3.78)	(-3.83)	(-3.50)	(-3.07)	(-1.44)	(-1.67)	(-1.49)
Unemployment,, 2005	0.00405	-0.00222	-0.00200	-0.0227	-0.00105	-0.000697	-0.0188
	(0.40)	(-0.22)	(-0.18)	(-1.13)	(-0.08)	(-0.05)	(-1.57)
Percentage of low credit score, 2004	0.0528*	0.0399	0.0423	0.0509***	0.0300	0.0296	0.0386***
	(1.89)	(1.65)	(1.67)	(2.91)	(1.54)	(1.48)	(2.76)
Foreclosure rate,, 2005Q2	0.0553	-0.0876	0.00687	0.0233	-0.485**	-0.409*	-0.388***
	(0.37)	(-0.49)	(0.04)	(0.20)	(-2.22)	(-1.80)	(-3.94)
Percent Black, 2005	0.00319**	0.00325**	0.00317**	0.00386**	0.0000652	0.0000815	0.000610
	(2.26)	(2.27)	(2.04)	(2.55)	(0.05)	(0.05)	(0.50)
Percent Hispanic 2005	0.00311	0.00214	0.00230	0.00392*	0.000795	0.00101	0.00168
	(0.88)	(0.73)	(0.78)	(1.96)	(0.29)	(0.36)	(1.15)
House price growth, 2003-05			0.122			0.165	
			(0.72)			(1.24)	
Mortgage credit growth, 2003-05			0.0338			0.134**	
			(0.50)			(2.69)	
House price growth, 2005-07				-2.531			
				(-1.23)			
House price growth, 2007							-2.599***
							(-2.58)
Constant	0.0814	-0.484	-0.533	0.551	0.405	-0.0235	0.667
	(0.07)	(-0.44)	(-0.51)	(0.46)	(0.36)	(-0.02)	(0.89)
N	624	624	583	583	594	557	557
adj. R^2	0.472	0.495	0.506	0.465	0.436	0.444	0.468

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Early rise in foreclosures in subsamples of counties selected based on mortgage growth.

This table shows the output of simple linear regressions where the endogenous variables is the change in new foreclosure rates between 2005Q2 and 2006Q2. In the first two columns we regress the dependent variable on a constant, first in the full sample (Full) and second in a susbsample of counties with mortgage growth above median both in 2005 and 2006 (High). In columns 3,4 and 5 we regress the dependent variable on our benchmark controls from Table 3 (second column) for the full sample, the subsample of counties with mortgage growth above median both in 2005 and 2006 and the subsample of counties with mortgage growth below median both in 2005 and 2006 (Low). The table only shows the coefficients on our key explanatory variable, the market share of independents. Errors are clustered at the state level.

	(1) Full	(2) High	(3) Full	(4) High	(5) Low
Market share of independents, 2005			0.344***	0.564**	0.337**
			(2.73)	(2.17)	(2.44)
Constant	0.0975***	0.105***	-0.611	0.369	-0.488
	(5.86)	(2.98)	(-0.85)	(0.29)	(-0.40)
N	632	176	593	161	188
adj. R^2	0.000	0.000	0.402	0.344	0.530

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Measures of the severity of the crisis and pre-crisis county characteristics.

This table shows results from linear regerssion of mortgage credit, house price and unemployment growth on the benchmark regressors. The dependent variable is the growth rate between 2005 and 2007, except for the last column which is the growth rate of unemployment between 2005 and 2008. See Table 5 and Data Appendix for details on the regressors. We also control for, but do not show, six income variables that capture the percentage of census tracts with a median income that falls into on of six income brackets, for the average immigration rate 2000-05, housing supply elasticity, percentage Black, percentage Hispanic, and for state dummies. Errors are clustered at state level.

	(1) Credit 05-07	(2) Credit 05-07	(3) House price 05-07	(4) House price 05-07	(5) Unemployment 05-07	(6) Unemployment 05-08
Market share of independents, 2005	-0.498***	-0.454***	-0.0939	-0.168***	0.687	1.639**
	(-3.21)	(-3.76)	(-1.47)	(-3.10)	(1.36)	(2.61)
Private Securitization, 2005	-0.550**	-0.235	-0.00794	-0.0932	0.644	0.631
	(-2.25)	(-1.49)	(-0.08)	(-1.18)	(1.07)	(0.45)
Per capita income, 2005	0.0368	0.0292	-0.0337	-0.0171	-0.265	-0.356
	(0.52)	(0.51)	(-1.23)	(-0.66)	(-1.53)	(-1.42)
Income growth 2003-05	0.702***	0.738***	0.178**	0.126*	-0.0990	0.251
	(3.38)	(3.89)	(2.11)	(1.72)	(-0.17)	(0.26)
Unemployment , 2005	-0.0107	-0.0135	-0.00965	-0.00803	-0.245***	-0.125
	(-0.85)	(-1.32)	(-1.32)	(-1.23)	(-3.07)	(-1.15)
Percentage of low credit score, 2005	0.0110	0.0118	0.00501	0.00361	-0.0648*	-0.0256
	(0.90)	(1.28)	(0.87)	(0.63)	(-1.70)	(-0.52)
Foreclosure rate, 2005Q2	0.150*	0.0619	-0.0225	0.0185	0.202	0.520*
	(1.84)	(0.94)	(-0.73)	(0.77)	(1.09)	(1.80)
House price growth, 2003-05		-0.471***		0.227*		0.862
		(-4.01)		(2.00)		(1.61)
Mortgage credit growth, 2003-05		-0.0650		0.0696**		0.201
		(-1.08)		(2.06)		(0.99)
Constant	-0.423	-0.238	0.571*	0.365	2.793	4.350
	(-0.58)	(-0.39)	(1.91)	(1.31)	(1.46)	(1.55)
N	644	599	599	599	644	599
adj. R^2	0.719	0.755	0.696	0.743	0.713	0.711

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Comparison between treated and control, interstate matching.

This table compares our outcome variables and covariates (*) between the treated and control samples. The KS test compares the distribution across both samples while the t-test is test of the difference in means.

		Mean	25%	Median	75%	KS Test	T Test
Foreclosure 05-07	Treated	0.432	0.130	0.360	0.610	0.000	0.000
	Control	0.154	0.000	0.090	0.230		
Credit Risk*	Treated	3.174	2.0	3.0	4.0	1.000	0.965
	Control	3.168	2.0	3.0	4.0		
Elasticity*	Treated	1.651	1.067	1.529	2.241	0.207	0.286
	Control	1.735	1.196	1.629	2.302		
Unemployment*	Treated	5.2	4.3	5.0	5.6	1.000	0.716
	Control	5.2	4.2	4.9	5.8		
Income*	Treated	10.385	10.207	10.385	10.567	0.697	0.817
	Control	10.379	10.205	10.387	10.536		

Table 9: Matching estimators, interstate.

This table shows the Abadie-Imbens matching estimators from the benchmark interstate matching exercise. We compare the change in mortgage volume, foreclosure, and unemployment between the matched samples. The matching estimators shown in columns are the average treatment effect, the average treatment effect on the treated and the average treatment effect on the treated where standards error are adjusted for the population.

	SATE	SATT	PATT
Foreclosure 05-07	0.2556***	0.2606***	0.2606***
	(0.0398)	(0.0371)	(0.0418)
Volume 05-07	-0.1624***	-0.1652***	-0.1652***
	(0.0226)	(0.0225)	(0.0284)
Unemployment 08	0.2670***	0.3190***	0.5175**
	(0.0990)	(0.0896)	(0.1604)

Table 10: Comparison between treated and control, intrastate matching.

This table compares our outcome variable and covariates (*) between the treated and control samples. The KS test compares the distribution across both samples while the t-test is test of the difference in means.

		Mean	25%	Median	75%	KS Test	T Test
Foreclosure 05-07	Treated	0.416	0.135	0.385	0.605	0.000	0.000
	control	0.170	0.05	0.19	0.27		
Credit Risk*	Treated	3.2333	2	3.5	4	0.928	0.594
	Control	3.122	2	3	4		
Elasticity*	Treated	1.717	1.100	1.550	2.553	0.704	0.721
	Control	1.758	1.068	1.605	2.175		
Unemployment*	Treated	5.222	4.1	5.1	5.7	0.179	0.240
	Control	4.99	3.9	4.9	5.8		
Income*	Treated	10.375	10.171	10.353	10.582	0.126	0.712
	Control	10.362	10.168	10.253	10.547		

Table 11: Matching estimators, instrastate

This table shows the Abadie-Imbens matching estimators from the state matching exercise. We compare the change in mortgage volume, foreclosure, and unemployment between the matched samples. The matching estimators shown in columns are the average treatment effect, the average treatment effect on the treated and the average treatment effect on the treated where standards error are adjusted for the population.

	SATE	SATT	PATT
Foreclosure 05-07	0.1964**	0.2600***	0.2600***
	(0.0991)	(0.0392)	(0.0428)
Volume 05-07	-0.0873***	-0.1302***	-0.1302***
	(0.0352)	(0.0238)	(0.0242)
Unemployment 05-08	0.1969**	0.2310***	0.2310***
	(0.0767)	(0.0688)	(0.0747)

Table 12: Comparison of OLS on full, interstate matched, and intrastate matched samples.

The endogenous variables are the change in foreclosure (05-07), denoted by For, mortgage credit growth (05-07), denoted by Vol., and the change in unemployment rate (05-08). The first three columns show regressions of these dependents variables on the market share of independents controlling for county economic, demographic characteristics, and for the growth in mortgage and house prices during the boom. The next three columns (4)-(6), run the same regressions on the subsample of matched counties from the benchmark *interstate* matching exercise. The last three columns (7)-(9), run the same regressions on the subsample of matched counties from *intrastate* matching exercise. As in the benchmark regressions, we control for county characteristics and state dummies (but do not show) and cluster errors at the state level.

	All sample			Interstate matching			Intrastate matching		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	For.	Vol.	Un.	For.	Vol.	Un.	For.	Vol.	Un.
Market share of	0.840***	-0.499***	1.900***	1.685***	-0.423*	2.078**	1.982***	-0.536**	1.177*
independents, 2005	(3.37)	(-3.83)	(2.90)	(3.97)	(-1.76)	(2.45)	(5.54)	(-2.14)	(1.75)
House price	0.124	-0.488***	0.859	0.309*	-0.301	0.757	0.242	-0.511***	1.582**
growth, 2003-05	(0.80)	(-4.36)	(1.54)	(1.71)	(-1.37)	(1.14)	(1.09)	(-7.64)	(2.84)
Mortgage credit	0.0339	-0.0517	0.211	-0.0683	-0.158	0.531**	-0.0779	-0.145	0.807
growth, 2003-05	(0.47)	(-0.84)	(1.07)	(-0.58)	(-1.37)	(2.04)	(-0.40)	(-1.36)	(1.18)
Constant	-0.205	-0.596	5.125*	-0.385	-0.342	-5.549	-1.853	2.289	-15.64**
	(-0.21)	(-0.98)	(1.94)	(-0.25)	(-0.27)	(-1.04)	(-0.72)	(1.63)	(-2.13)
N	583	599	599	278	280	280	162	162	162
adj. R^2	0.504	0.752	0.714	0.572	0.790	0.796	0.414	0.796	0.849

t statistics in parentheses

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

Table 13: Robustness analysis.

This table shows variation on the benchmark regression in the second column of Table 5. The first column shows the benchmark regression. Columns (2), (3) and (4) add measures of local market lender competition to the regressors: a Herfindahl index for the top 15, 30 and 50 lenders, respectively. Note that only 376 counties have more than 50 lenders. Column (5) controls for a measure of the geographical diversification of lenders in the county (see Strahan and Louskina, 2011; and the Data Appendix). Columns (6) and (7) control for the share of loans originated by banks with core deposits ratio (CD) above 0.51 and 0.61, respectively (see text and Data Appendix). Columns (8) control for the share of loans that are sold to GSEs. Column (9) controls for the share of originated loans that are not sold. As in the benchmark regression, we control for county characteristics (see Table 5), state dummies, and we cluster errors at state level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market share of independents	0.831***	0.835***	1.003***	1.353***	0.833**	0.866***	0.892***	0.790***	0.922***
	(2.94)	(2.92)	(3.27)	(3.36)	(2.66)	(2.70)	(2.92)	(2.88)	(3.36)
Private securitization	0.315	0.312	0.247	0.202	0.316	0.325	0.336	0.235	
	(0.94)	(0.92)	(0.58)	(0.40)	(0.94)	(0.96)	(1.00)	(0.73)	
Herfindahl index top 15		0.0716							
		(0.27)							
Herfindahl index top 30			-0.0289						
			(-0.07)						
Herfindahl index top 50				0.258					
				(0.36)					
Geographic diversification of lenders					0.00526				
					(0.04)				
Percent originated by CD > 0.5 banks						0.0624			
						(0.42)			
Percent originated by CD > 0.6 banks							0.150		
							(0.88)		
Percent sold to GSEs								-0.199	
								(-1.37)	
Percent not sold									0.106
									(0.54)
Constant	-0.484	-0.477	-0.241	-0.331	-0.490	-0.530	-0.540	-0.279	-0.404
	(-0.44)	(-0.43)	(-0.20)	(-0.27)	(-0.45)	(-0.48)	(-0.48)	(-0.24)	(-0.36)
N	624	622	558	376	624	624	624	624	624
adj. R^2	0.495	0.494	0.500	0.582	0.494	0.494	0.495	0.495	0.494

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Foreclosures and state regulations

This table shows results from regressions of the change in foreclosures filings rates on the benchmark controls (see Table 5, column 2), state controls, and dummies for state mortgage-related regulations. We do not control for state dummies since the regulation variables are at the state level. The dummy variable "States with high broker regulation" indicates that the state is in the top quartile on the broker regulation index constructed based on Pahl's (2007) index of new mortgage broker regulations between 1996 and 2005 (see text and Data Appendix). The dummy variable "States with high anti-predatory laws" indicates that the state is in the top quartile on the anti-predatory lending laws index constructed by by Bolstic et al. (2008) based on various indicators of new state regulations between 1999 and 2005 (see column 5, Table 2, p. 55 in their paper). In the third and fifth rows we control for the interaction of these dummies with the market share of independents. We also control for property laws that affect foreclosures which are taken from Pence (2006).

	(1)	(2)	(3)	(4)	(5)	(6)
Market share of independents, 2005	0.871***	1.086***	1.086***	0.859***	1.054***	1.054***
	(6.40)	(7.61)	(3.14)	(6.27)	(7.04)	(2.99)
States with high broker regulation	-0.0596***	0.213***	0.213*			
	(-2.72)	(3.23)	(1.91)			
Independents#broker		-0.956***	-0.956**			
		(-4.37)	(-2.10)			
States with high anti-predatory lending laws				-0.00623	0.180***	0.180*
				(-0.29)	(2.83)	(1.92)
Independents#anti-predatory					-0.660***	-0.660*
					(-3.11)	(-1.77)
Judicial foreclosure	0.0601***	0.0481**	0.0481	0.0577***	0.0546***	0.0546
	(2.93)	(2.36)	(1.06)	(2.80)	(2.67)	(1.08)
Statutory right of redemption required	-0.0194	-0.0258	-0.0258	-0.0140	-0.0129	-0.0129
	(-0.71)	(-0.95)	(-0.69)	(-0.51)	(-0.47)	(-0.31)
Deficiency judgment prohibited	0.0704**	0.0601*	0.0601	0.0711**	0.0662**	0.0662
	(2.17)	(1.88)	(0.84)	(2.18)	(2.04)	(0.81)
State per capita GDP, 2002	0.0382***	0.0352***	0.0352	0.0404***	0.0382***	0.0382
	(2.81)	(2.63)	(1.17)	(2.96)	(2.81)	(1.05)
Benchmark controls	YES	YES	YES	YES	YES	YES
Cluster errors at state level	NO	NO	YES	NO	NO	YES
Constant	-1.455*	-1.537*	-1.537	-1.355	-1.078	-1.078
	(-1.72)	(-1.84)	(-1.19)	(-1.59)	(-1.27)	(-0.77)
N	594	594	594	594	594	594
adj. R^2	0.183	0.208	0.208	0.173	0.185	0.185

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$