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The Role of Housing and Mortgage Markets in the Financial Crisis

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Abstract

Ten years after the financial crisis of 2008, there is widespread agreement that the boom in mortgage lending and its subsequent reversal were at the core of the Great Recession. We survey the existing evidence, which suggests that inflated house-price expectations across the economy played a central role in driving both the demand for and the supply of mortgage credit before the crisis. The great misnomer of the 2008 crisis is that it was not a subprime crisis but rather a middle-class crisis. Inflated house-price expectations led households across all income groups, especially the middle class, to increase their demand for housing and mortgage leverage. Similarly, banks lent against increasing collateral values and underestimated the risk of defaults. We highlight how these emerging facts have essential implications for policy.

INTRODUCTION

Ten years after the financial crisis of 2008, some of the drivers and implications of the crisis are coming into better focus. Most observers agree that mortgage lending and housing markets were at the core of the Great Recession. US housing markets experienced an unparalleled boom in house prices and a steep expansion in mortgage credit to individual households before 2007. When house prices started to collapse, the drop in collateral values not only led to increased defaults but also affected the stability of the financial markets. The ensuing dislocations in the financial sector led to a drying up of credit flows and other financial functions in the economy and ultimately to a significant slowdown of economic activity, which culminated in the Great Recession.

In this article, we take stock of what has been learned about the origins of the crisis and, in particular, the role that house prices and house-price expectations played in the increase in mortgage debt and ultimately defaults. Accumulating evidence suggests that the housing market was subject to a classical asset bubble (for a discussion of price dynamics in housing markets, see, e.g., Cutler, Poterba & Summers 1991; Case & Shiller 2003). Inflated (or overoptimistic) house-price expectations appear to have led banks to lend against increasing collateral values and to underestimate the risk of defaults. Similarly, optimistic households, maybe enticed by the expectation of further house-price increases or by an underappreciation of a potential downturn, increased their demand for housing and mortgage debt. This increase in household debt was widespread among the US population and encompassed all income groups, especially middle-class borrowers. The great misnomer of the 2008 crisis is that it was not a subprime crisis but a middle-class crisis. The financial sector acted as an amplification mechanism for inflated expectations by lending into the bubble rather than guarding against overoptimistic collateral values by reducing its exposure or curtailing loan-to-value (LTV) ratios. Some studies suggest that the housing boom also led to broader allocative distortions, e.g., in structural labor market imbalances (Charles, Hurst & Notowidigdo 2016) and in students' educational outcomes (Charles, Hurst & Notowidigdo 2015).

Several theory papers provide microfoundations for how the impact of optimistic agents in housing markets can be time varying and, as a result, can generate boom and bust cycles. One set of theories suggests that the number of optimistic agents changes with the credit cycle. For example, if house-price expectations are extrapolative or adaptive, initial increases in house prices can feed on themselves (see, e.g., Lo 2005; Barberis et al. 2015; Glaeser & Nathanson 2015; DeFusco, Nathanson & Zwick 2017). Burnside, Eichenbaum & Rebelo (2016) provide a different microfoundation via social contagion, where optimistic agents with tighter priors can convince less optimistic agents to change their beliefs. Geanakoplos (2010) and Piazzesi & Schneider (2016) suggest that banks can amplify these expectations by providing higher combined loan-to-value (CLTV) ratios when house prices are expected to go up. This can allow more optimistic agents to hold a greater fraction of assets and, as a result, drive up house prices. Using a structural model, Kaplan, Mitman & Violante (2017) show that the main driver of movements in house prices was a shift in beliefs; they argue that changes in credit conditions did not move house prices, but that these are important for homeownership, leverage, and defaults. Consistently, Justiniano, Primiceri & Tambalotti (2015) develop a quantitative model that implies that the credit cycle of the Great Recession was likely due to credit factors working through higher house prices rather than a direct relaxation of borrowing constraints.[1]

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[1] Earlier work by Bernanke, Gertler & Gilchrist (1999) and Kiyotaki & Moore (1997) suggests that credit-constrained borrowers need collateral to borrow due to information asymmetries or limited contract enforcement (see also Gertler & Gilchrist 1994, Rampini & Viswanathan 2010). However, these models of the collateral lending channel assume rational homeowners

An alternative view of the mortgage crisis is that the financial sector was the causal driver of house-price increases, since it had misaligned incentives that led to unsustainable lending to poor and marginal borrowers, often associated with subprime lending. Popular narratives, such as the book *The Big Short* (Lewis 2010) and the 2010 film *Inside Job*, and theoretical papers (e.g., Parlour & Plantin 2008; Dang, Gorton & Holmström 2010; Chemla & Hennessey 2014) highlight the channels through which the misalignment of incentives can lead to the provision of credit to borrowers with low income or poor credit quality who would not otherwise receive credit (see, e.g., Mian & Sufi 2014). This channel often relies on short-term managerial incentives as an important source of distortions that led banks to knowingly lend to borrowers who were poor credit risks. It is important to differentiate this view from the general idea that banks fail to internalize the buildup of systemic risk in the economy since they have protection against negative states of the economy through implicit government bailout guarantees; this is known as the central bank put (for a discussion, see, e.g., Acharya et al. 2014).

The problem for empiricists is that both incentives and expectations are difficult to measure directly. This empirical challenge is exacerbated by the fact that the two channels are not mutually exclusive. If lenders believed that house prices were going to keep rising, they might rationally decide that it was less important to carefully screen borrowers, since the expected collateral value would protect lenders from potential defaults. Therefore, changes in expectations about house prices could lead to the loosening of credit standards. It is crucial to assess the relative importance of these two views, however, since the assessment not only affects the diagnosis of the Great Recession but also prescribes different policies to protect the economy from future crises.[2]

We review the main empirical findings about the housing market in the run-up to the crisis and during the crisis itself. We argue that these findings support the view that overoptimistic house-price expectations played a central role in the crisis. First, the recent literature has shown that the expansion of mortgage credit leading up to the crisis was widespread across the entire population and not concentrated on marginal or low-credit-score borrowers. Debt-to-income (DTI) ratios rose proportionally for all groups. Second, the distribution of LTV ratios for new home purchases did not change over the boom period. Banks seem to have taken house prices at face value and almost mechanically lent against these increased collateral values. These results suggest that financial institutions did not display major dislocations in their credit provision, either in whom they were lending to or in their use of collateral. These results also run counter to the view that relaxation of credit standards and misaligned incentives in the banking industry were causal drivers of the boom, since this argument rests on the idea that there were cross-sectional distortions in the allocation of credit, especially to marginal borrowers, such as borrowers with low income or poor credit quality (Mian & Sufi 2009). The systematic mistake in the banking market appears to have been not taking into account the fact that collateral values were highly inflated, instead lending into the bubble while not guarding against a possible downturn in prices.

Third, optimistic house-price expectations played an important role in explaining the behavior of households during the boom period. Several studies have documented that the speed with which houses were sold and bought (churn) increased significantly during the boom. Furthermore, the fraction of properties that were bought for speculative investment purposes or as second homes shot up during the boom period, especially in areas that experienced rapid house-price increases.

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and banks, and thus would not predict a crash. If agency problems vary over the business cycle, such variation could lead to a flight to quality and thus reduced collateral values in the bust.

[2]It is beyond the scope of this article to describe the drivers of house-price dynamics. Rajan (2010) argues that the cumulative effect of low interest rates over the decade leading up to the housing boom may have increased the demand for credit and subsequently increased house prices (see also Himmelberg, Mayer & Sinai 2005; Bernanke 2007).

Finally, after the onset of the crisis, middle- and high-income borrowers, as well as prime borrowers, made up a much larger fraction of defaults than in normal times. Mortgage holders with a credit score of about 720 went from a default rate close to zero before the crisis to a default rate of more than 5%. Since richer households have larger mortgages, the dollar value of mortgage defaults was most pronounced among middle- and high-income borrowers. Thus, the largest increase in defaults came from a group of mortgage holders who previously had never defaulted at high rates and constituted good credit scores at the time the mortgages were originated. These defaults were disproportionally high in areas where house prices first increased the most and then dropped the most at the onset of the crisis. This last result suggests that asset values played an important role in explaining defaults, independent of the identity of the borrowers.

Only a proper diagnosis of the origins of the financial crisis allows for meaningful responses that prevent similar events in the future. As discussed above, many early explanations of the crisis assumed that bank incentives for loan origination exogenously changed and led to distortions in lending standards, especially to the poor. Instead, our analysis shows that lending standards likely changed endogenously in response to increasing collateral values and optimistic expectations about future asset growth. Banks seem to have taken collateral values as given and mechanically lent against increased collateral values, holding LTV ratios constant. In aggregate, this led to a systemic buildup of leverage, in the sense of increasing DTI ratios. These results point to a need for macroprudential regulation to prevent systemic buildup of debt across the economy and to ensure that there is sufficient slack in the financial system to guard against systemic shocks to asset values. Macroprudential tools such as requiring higher (or time-varying) capital requirements and higher standards for asset quality have been proposed to prevent banks from taking on too much leverage and shrinking their balance sheets in response to negative macroeconomic shocks (see, e.g., Hanson, Kashyap & Stein 2011). The Basel III regulations that are currently being implemented incorporate some of these suggestions, although the capital requirements are lower than originally called for by academics and consumer groups. Similarly, the government-sponsored enterprises could impose countercyclical LTV requirements, which would tighten LTV ratios after periods of steep house-price appreciation.

WIDESPREAD INCREASES IN MORTGAGE LEVERAGE

The significant increase in mortgage and other household debt in the period leading up to the 2008 crisis has been widely documented. Brown et al. (2010) show that household mortgage debt almost doubled between 2000 and 2007, and contrary to earlier periods, increases in mortgage debt were not offset by reductions in other household debt. Remarkably, in the run-up to the crisis, this increase in leverage was prevalent across all income groups and was closely tied to house-price appreciation across neighborhoods. Adelino, Schoar & Severino (2016) document that the increase in household leverage, measured as DTI levels, went up across all income groups and all credit scores. **Figure 1** shows the increase in mortgage credit during the period 2001–2007 and demonstrates that the flow of new (purchase) mortgages across incomes was stable over this period. Adelino, Schoar & Severino (2016) also document similar patterns across the credit score distribution. In other words, the fraction of credit going to low-, middle- and high-income households did not change over the period 2001–2007. But since richer households with higher credit scores take out larger mortgages, the dollar value of mortgage credit held by middle-class and upper-middle-class borrowers increased significantly over this time period. Adelino, Schoar & Severino (2017) also show that the increase in DTI ratios was almost twice as high in states with high house-price appreciation compared to those with low appreciation.
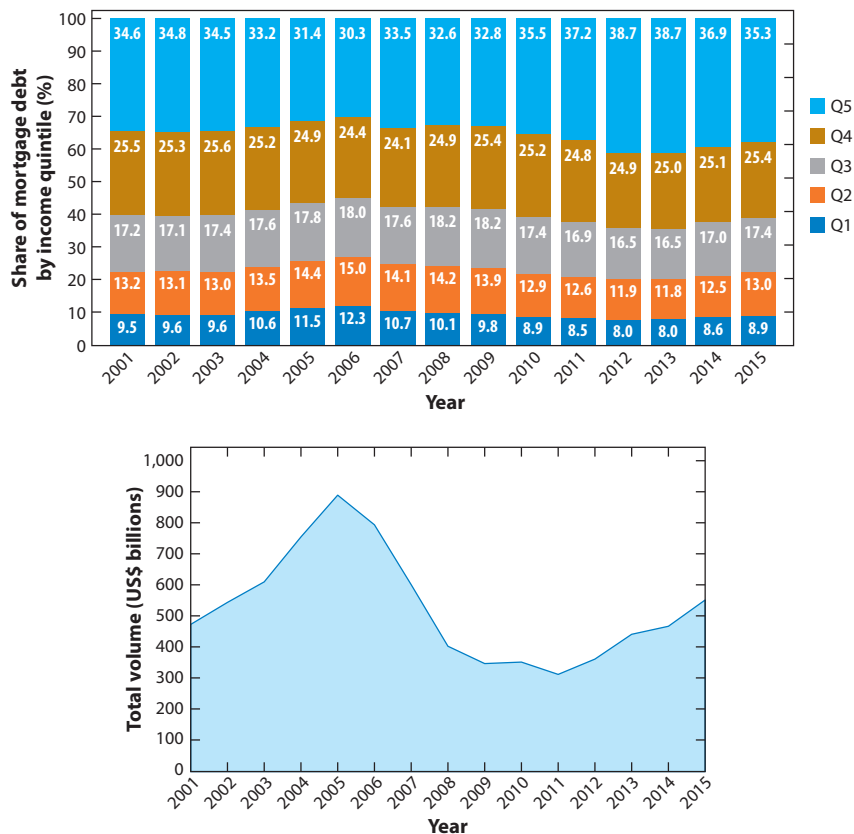
Figure 1

Distribution of mortgage debt by income quintile. (*a*) Evolution over time from 2001 to 2015 of the fraction of the total dollar volume of purchase mortgages by income quintile. (*b*) Total dollar volume on aggregate, shown in billions of dollars. We use household income from the IRS as of 2002 (i.e., the ZIP codes in each bin are fixed over time). The cutoff for the bottom quintile corresponds to an average household income in the ZIP code of $34,000; the second quintile corresponds to $40,000; the third quintile corresponds to $48,000; and the fourth quintile corresponds to $61,000. The sample includes 8,619 ZIP codes. Figure adapted from Adelino, Schoar & Severino (2017) with permission.

New credit flows, however, may not tell the whole story of how indebted the average household is, since the stock of household leverage is also affected by (*a*) the speed with which households retire or refinance existing debt, (*b*) the velocity of buying and selling houses (churn), and (*c*) the likelihood of entering into homeownership. To track the entire stock of mortgage debt, Adelino, Schoar & Severino (2016) use data from the Survey of Consumer Finances, which includes purchase mortgages, second liens, and other home equity lines, to show that that the stock of DTI at the household level increased proportionally across the income distribution. Foote, Lowenstein & Willen (2016) confirm this finding using the stock of debt from credit registry data. Similarly, Albanesi, De Giorgi & Nosal (2017), using the Consumer Credit Panel of the Federal Reserve Bank of New York, show that credit growth between 2001 and 2008 was concentrated in the prime segment and that debt to borrowers with low credit scores was constant across all debt categories. These results confirm the idea that the credit expansion was a phenomenon that affected all groups of the population.

One of the most important channels by which homeowners increased the leverage on their houses even without moving was cash-out refinancing. In this type of refinancing, if the price of a house has gone up and thus the homeowner has equity in the house, the homeowner takes out a new, higher mortgage on the house and receives cash equal to the increase in the mortgage value. Mortgage refinancing and equity extraction played an important role in the credit expansion. Bhutta & Keys (2016) show that home equity extraction peaked in 2003, when interest rates went down in the United States for the first time in more than a decade. The authors show that an interest-rate decline of 100 basis points led to a 25% rise in extraction. Using cross-sectional variation in house-price fluctuations, they estimate that this rate effect is half the magnitude of the house-price effect. Mian & Sufi (2011) provide evidence that equity extraction was closely tied to increasing house prices, since equity extraction was particularly concentrated in areas where prices had gone up. Similarly, Mian & Sufi (2011) and Brown, Stein & Zafar (2015) show that credit rose more in areas with high house-price appreciation, and previous research has shown that consumption is sensitive to housing wealth fluctuations, which is consistent with the equity extraction channel (Hurst & Stafford 2004; Lehnert 2004; Campbell & Cocco 2007; Bostic, Gabriel & Painter 2009).

HOW DID LENDING STANDARDS CHANGE IN THE BOOM?

In the previous section, we showed that DTI levels increased proportionally for all income groups. DTI levels are usually seen as an indicator of a household's ability to pay its mortgage. But since mortgage loans are collateralized by the value of the house, the key indicator of changing lending standards is CLTV ratios at origination. This is the amount of mortgage leverage including any second liens or home equity loans on the house. It is often argued that the way the financial sector can create a bubble in housing markets is by relaxing CLTV requirements (see, for example, Geanakoplos 2010).

Figure 2 shows that the distribution of CLTV ratios at origination for purchase mortgages remained stable between 2001 and 2007. The median home purchased between 2001 and 2007 had a CLTV of 90%, and mortgages in the 90th percentile of the leverage distribution had a CLTV just lower than 100%. Furthermore, Adelino, Schoar & Severino (2017) show that there is no difference in the stability of the CLTV distribution between areas with high and low house-price growth. Ferreira & Gyourko (2016) also show that CLTV ratios between 1997 and 2011 were stable and did not increase dramatically during the boom period. Somewhat contrary to popular belief, lenders did not significantly loosen CLTV requirements during the boom period. It is important to understand that even prior to the boom of the 2000s, the American mortgage system provided very high-LTV loans to a subset of the population primarily via Federal Housing Administration (FHA) loans. Therefore, subprime loans basically substituted for high-LTV loans from the FHA but did not change the distribution.

Furthermore, Ferreira & Gyourko (2018) provide evidence that the housing boom started at different times across different cities in the United States. For example, cities such as Boston and San Francisco already saw increasing house prices at the end of the 1990s, which kept rising at a steady level until 2007. In contrast, Phoenix and Las Vegas had a much shorter and more sudden boom and bust cycle starting only in the mid-2000s. But the authors show that mortgage financing at the beginning of each of these local booms did not show a change in LTV ratios. This means that the increase in local house prices was not correlated with any relaxation of LTV conditions at origination. Similarly, Glaeser, Gottlieb & Gyourko (2013) suggest that a reduced cost of lending alone cannot explain the increase in mortgage debt.

Of course, house prices were going up rapidly during the boom period. So even if lenders did not loosen CLTV standards, as the papers cited above confirm, by just mechanically lending
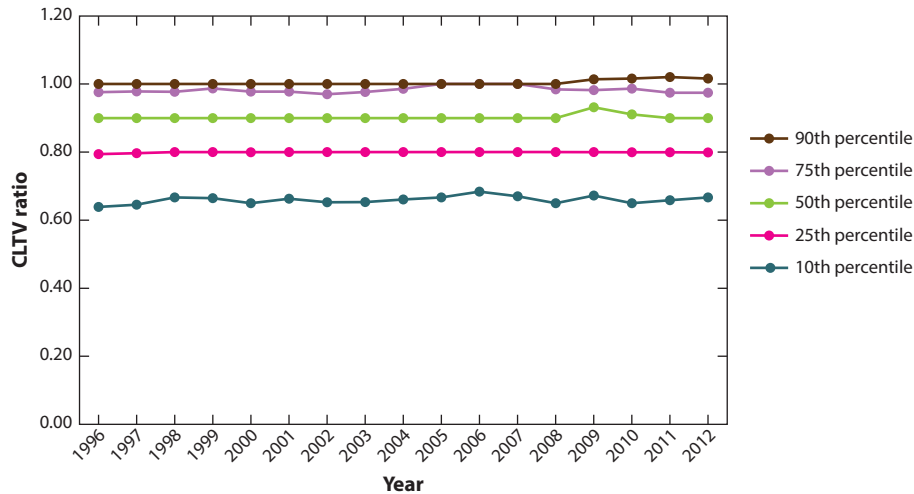
Figure 2

Combined loan-to-value (CLTV) ratios during boom and bust. Sample includes all transactions with positive CLTV ratios. CLTV ratios are computed using the sum of the first, second, and third liens taken up to 6 months after a home purchase transaction. Each time series represents the average CLTV ratio in a year for the given percentile. Data from CoreLogic (formerly DataQuick). Figure adapted from Adelino, Schoar & Severino (2017) with permission.

against higher house values, they were issuing larger loans relative to homeowners' incomes (for a discussion of the interaction between DTI and LTV constraints, see Greenwald 2016). A series of papers confirms this argument and shows that loan values became less correlated with households' personal characteristics (see, for example, Barlevy & Fisher 2010; Keys et al. 2010; Agarwal et al. 2014; Jiang, Nelson & Vytlacil 2014; Di Maggio & Kermani 2017). This supports the idea that lenders were putting more and more weight on collateral values. Keys et al. (2010) show that lenders might have reduced their screening of unobservable characteristics, since for nonagency loans that had easier access to private securitization, defaults increased by 10–25%. Gerardi, Sherlund & Willen (2008) document that, even in the subprime segment, the major change in underwriting standards was an increase of LTV levels. The authors provide evidence from contemporary sources that market participants understood that a drop in house prices would have dire consequences for mortgage repayments but that participants assigned a low likelihood to that state of the world.

Also, in line with the idea that lenders mechanically lent against increased house prices but otherwise did not significantly increase access to finance for marginal borrowers, Adelino, Schoar & Severino (2017) find that households in all income quintiles that purchased homes had similar (and small) drops in stability of employment over the boom. The cross-sectional differences across income groups did not change over the boom. However, at the onset of the mortgage crisis, there is a sudden spike in the share of households with full-time employment, which most likely reflects the tightening of credit during the Great Recession after prices plummeted.

Taken together, the evidence seems consistent with the view that lenders increased mortgage origination against increased home prices without adequately accounting for the risk that house prices could go down again. However, we do not observe a change in average CLTV ratios over this time period. These results are consistent with a financial market that did not anticipate the housing bust. This view is shared by Shiller (2007) and supported by Shiller (2014) and Cheng,

Raina & Xiong (2014), who use personal home transaction data to show that midlevel managers in securitized finance did not seem to anticipate the housing downturn.

NO EXPANSION OF HOMEOWNERSHIP

Several researchers have explicitly asked if an erosion of credit standards happened at the extensive margin. In other words, did distortions in credit origination allow households with low income and poor credit quality, who previously were rationed out of the market, to become homeowners (see Mian & Sufi 2015)? Goodman & Mayer (2018) present evidence that runs counter to this hypothesis. Using data from the American Housing Survey, they show that the overall US homeownership rate rose from 63.5% in 1985 to 68.8% in 2005. However, most of the increase was concentrated in the period before 2000, that is, before the onset of the mortgage expansion. It then dropped to 62.7% after the onset of the financial crisis.

But aggregate homeownership rates might mask important changes in the composition of borrowers if there was a significant expansion of credit to marginal households. Adelino, Schoar & Severino (2017) test this idea by comparing changes in homeownership rates for high- versus low-income households across regions. **Figure 3** shows that the housing boom made homeownership less accessible for the lowest-income households. In particular, starting in 2001, low-income households entered homeownership at lower rates than middle- and high-income households, and households above the twentieth percentile all saw similar increases in homeownership over the period. The results are broken out by areas with fast and slow house-price growth; a similar pattern emerges in both areas. However, the steep decline in homeownership rates for the lowest-income group already starts in 2001 for areas with low house-price appreciation. These results are consistent across three large-scale census surveys (the American Community Survey, the American Housing Survey, and the Consumer Population Survey). These patterns are inconsistent with a view in which marginal and low-income borrowers benefited disproportionally from the credit expansion during the housing boom.
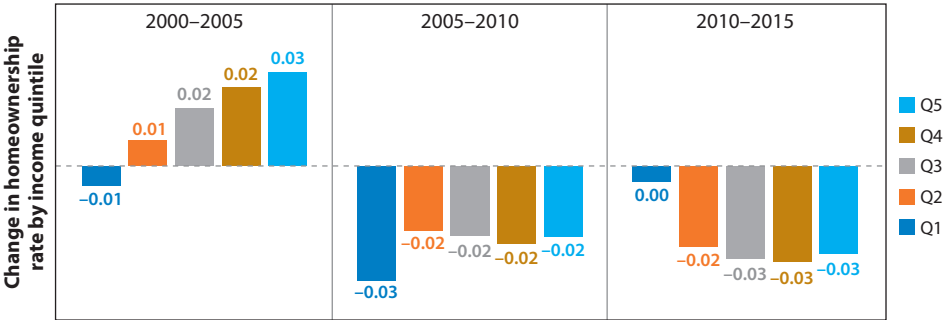
Figure 3

Change in homeownership rate by income level. The homeownership rate is calculated as the share of owner-occupied homes divided by the total number of occupied homes. The bars represent the change in homeownership rate within each income quintile and within each 5-year interval. The cutoff for the bottom quintile corresponds to an average household income of $18,000 in 2000 and $23,000 in 2015, the second quintile corresponds to $33,000 in 2000 and $43,000 in 2015, the third quintile corresponds to $51,000 in 2000 and $70,000 in 2015, and the fourth quintile corresponds to $80,000 in 2000 and $112,000 in 2015. Data from the decennial US Census for 2000 and from the American Community Survey 5-year public-use microdata sample for 2005–2015. Figure adapted from Adelino, Schoar & Severino (2017) with permission.

In a similar vein, Foote, Loewenstein & Willen (2016) find no increase in homeownership for low-income households; in particular, their evidence suggests that a transition into first-time mortgage borrowing became less frequent during the boom for persons with low credit scores. Acolin et al. (2017b) use a new measure of first-time homebuyers, based on the Federal Reserve Bank of New York's Consumer Credit Panel, to show that the decline in the share of first-time homebuyers is connected with the decline in homeownership in young households since the early 2000s, a trend also documented by Bhutta (2015). Furthermore, Acolin et al. (2017a) show consistent evidence by documenting that subprime lending was not associated with increases in homeownership rates.

Cross-sectional dynamics within geographical areas are also important when looking at home-ownership rates; for example, Landvoigt, Piazzesi & Schneider (2015) and Kuminoff & Pope (2013) show that regions with different house or land prices experience differential house apprecia-tion during a boom. In principle, gentrification matters for relatively impoverished neighborhoods that are geographically close to high-price areas within a city. Guerrieri, Hartley & Hurst (2013) highlight the role of house-price appreciation on endogenous gentrification driven by income spills across neighbors. Such a mechanism could help explain small changes in homeownership for middle-income neighborhoods.

The fact that homeownership rates increase with income is of course not unique to the boom and bust period; rather, it has been widely documented. Gyourko & Linneman (1997) use decennial US Census data from 1960 to 1990 to show that homeownership rates increase with income even after conditioning on age. Turner & Smith (2009) provide evidence that low-income and minority households are less able to sustain homeownership using data from the Panel Study of Income Dynamics from 1970 to 2005.

In sum, there is no evidence that the housing boom of the 2000s increased the entry of marginal borrowers into the housing market. If anything, there was a reduction in the transition to home-ownership among poor and marginal households. The results also suggest that, in the post-2000 period, the Community Reinvestment Act did not achieve its goal of increasing homeownership among low-income households.

CHURN AND SPECULATIVE BUYING

Another part of the literature has focused on whether increasing house prices and collateral values affected the demand side of the housing market, i.e., purchase behavior by households. Inflated house-price expectations might lead households to increase the speed at which they buy new and potentially larger homes to take advantage of growing house prices. Each time a household moves to a new home, it typically repays an older mortgage (that usually has lower LTV and DTI ratios) and gets a new mortgage, which resets the household's leverage to a new and higher level. Optimistic house-price expectations might also entice households to see housing as an investment vehicle and engage in speculation in the housing market. A similar mechanism is discussed in theoretical work related to stock-price bubbles; in the setup of Allen & Gorton (1993), trades are motivated not by changes in information or fundamentals but by the desire to profit from gains.

Stein (1995) also highlights the idea that optimistic homeowners exploited increasing house prices by flipping houses more quickly and using the capital gains in one property as a down payment for a larger home. For example, Piazzesi & Schneider (2009) show that the fraction of homeowners who were very optimistic about house prices doubled between 2004 and 2006 (from 10% to 20% of the population) even in the face of already highly increased house prices. Foote, Gerardi & Willen (2012) show that banks themselves expected and published favorable scenarios of house-price changes. Also, Bailey et al. (2018) provide evidence on the important role of heterogeneous beliefs about house prices to explain individuals' homebuying decisions.

Table 1   Percentage of houses sold that were also previously sold in the past 12 months

Year	Percentage of houses sold that were also previously sold in past 12 months, grouped by house-price growth quartile				Increase from first quartile to fourth quartile
	First quartile	Second quartile	Third quartile	Fourth quartile	
2000	5.2	4.9	5.2	5.9	0.7
2001	5.3	4.9	5.2	6.1	0.8
2002	5.7	5.3	5.6	6.6	0.9
2003	6.1	5.7	5.9	7.0	0.9
2004	6.7	6.6	6.9	8.0	1.3
2005	6.9	7.1	7.3	8.5	1.6
2006	6.6	6.7	6.7	7.8	1.2
2007	6.1	6.0	5.8	6.0	0.0
2008	5.1	4.9	4.6	4.7	−0.5
2009	4.3	4.0	3.7	4.5	0.2
2010	4.4	4.2	4.0	4.9	0.5
2011	4.1	4.0	3.7	4.9	0.8
2012	4.5	4.4	4.0	5.0	0.4
2013	5.2	5.0	4.6	5.4	0.2
2014	4.9	4.7	4.4	5.1	0.2

This table shows the percentage of houses sold that were also previously sold in the past 12 months (a measure of flipping). Data from Zillow; ZIP codes are broken down into quartiles by house-price growth between 2002 and 2006.

Adelino, Schoar & Severino (2016) show that the rate at which owners moved into new homes peaked in 2006, with approximately 8% of households moving in each year. During the boom, high-income households had higher levels of churn relative to low-income ones. **Table 1** shows yearly summary statistics for the percentage of houses sold in a month that were also previously sold within the past 12 months. These statistics indicate that this measure of flipping or churn increased during the boom and increased most in areas of rapid house-price appreciation.

Chinco & Mayer (2015) provide evidence on the role of out-of-town second-house buyers on the housing market. Demand from out-of-town second-house buyers during the mid-2000s predicted house-price appreciation rates. They argue that out-of-town investors behave as misinformed speculators, earning lower capital gains and consuming smaller dividends from housing.[3] Haughwout et al. (2011) document the importance of real-estate investors in the housing market crisis, arguing that real-estate speculators were responsible for a large increase in purchases during the boom and subsequently suffered significant delinquencies. Overall, the evidence suggests that house-price dynamics during the boom, exacerbated by speculative behavior that followed price increases, may have led to increases in mortgage debt of existing homeowners that were trading up their house stock, a behavior that is consistent with an overoptimistic view of homeowners concerning house-price increases.[4]

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[3] Nathanson & Zwick (2018) provide evidence linked to landowner supply speculation that helps explain why house-price booms in the United States between 2000 and 2006 occurred in areas with elastic housing supply. The mechanism that we focus on is different because it is related to the turnover rates of existing houses.

[4] Cheng, Raina & Xiong (2014) show that even managers of mortgage-backed securities were overoptimistic in their own homebuying decisions during the boom. Coleman, LaCour-Little & Vandell (2008) argue that subprime lending may have been a joint product rather than the cause of the increase in house prices.

DEFAULTS IN THE MIDDLE CLASS

Early in the crisis, most commentators focused on the high levels of subprime foreclosures experienced during the bust (using different definitions of subprime, as pointed out by Mayer & Pence 2009). This is not surprising, given that in some areas subprime foreclosure rates were as high as 20% during the crisis. Further, the cost to families and neighborhoods was very high (Campbell, Giglio & Pathak 2011). However, subprime default levels are high even in good economic times, with an average of almost 6%, and subprime mortgages are small compared to prime mortgages (Amromin & Paulson 2009).

Adelino, Schoar & Severino (2016) show that ex post defaults increased most sharply for middle-income and prime borrowers. Since these borrowers take on larger mortgages, the fraction of mortgage dollars in delinquency increased most steeply for this group. Mayer, Pence & Sherlund (2009) point out that, already at the beginning of the foreclosure crisis, the proportional increase in default rates for Alt-A, or near-prime, loans was larger than for subprime loans. Ferreira & Gyourko (2016) similarly estimate that, although defaults during the housing bust occurred on prime and subprime mortgages, almost twice as many prime as subprime borrowers lost their homes in 2009–2012. Adelino, Schoar & Severino (2016) show that this pattern of defaults by prime borrowers is concentrated in areas that experienced high house-price appreciation during the
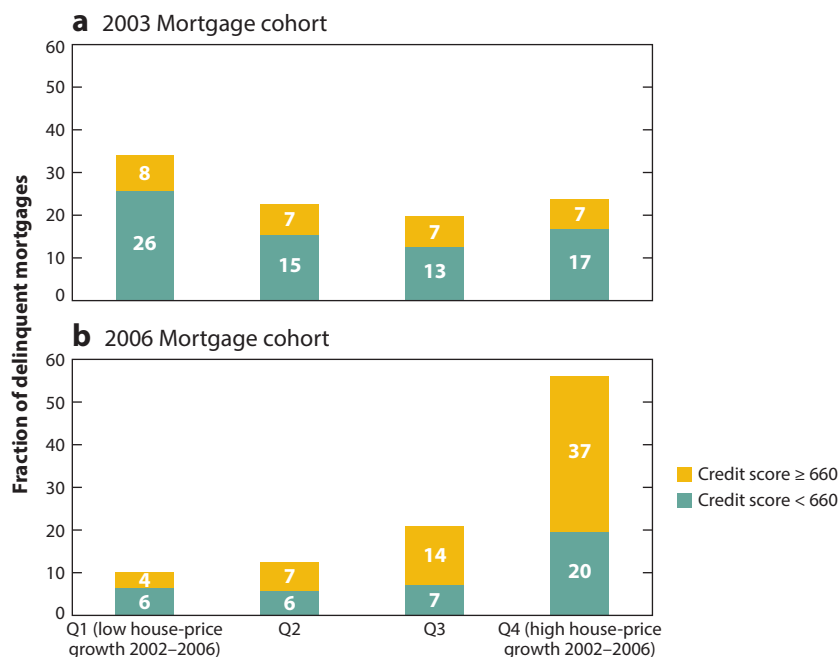
Figure 4

Delinquency by house-price growth and credit score. This figure shows the fraction of the dollar volume of purchase mortgages more than 90 days delinquent at any point during the 3 years after origination for the (*a*) 2003 and (*b*) 2006 origination cohorts. Data are divided into quartiles according to house-price appreciation by ZIP code from 2002 to 2006, as well as by whether the borrower is above or below a credit score of 660 (a common credit score cutoff for subprime borrowers). Numbers in bars are percentages and add up to 100% (the total amount of delinquent mortgages for each cohort) in each panel, up to rounding error. Data are from LPS Data & Analytics, and the sample includes ZIP codes with nonmissing Zillow house-price data. Figure adapted from Adelino, Schoar & Severino (2016) with permission.

boom. **Figure 4** shows that the increase in prime defaults is closely tied to house-price appreciation, which highlights the critical role that house prices played in the rise in defaults during the Great Recession. Albanesi, De Giorgi & Nosal (2017), using credit registry data, confirm that the rise in mortgage defaults during the crisis was concentrated in the middle of the credit score distribution and was mostly attributable to real-estate investors.

Foote, Gerardi & Willen (2008) and later Palmer (2015) explicitly look at the effects of house-price changes and changing contract characteristics on defaults and find that prices are the more important factor in explaining the increase in defaults. Palmer (2015) argues that price declines unrelated to the credit expansion causally explain the majority of the disparity in cohort perfor-mance. Using counterfactual simulations, Palmer (2015) shows that if 2006 borrowers had faced the price paths that the average 2003 borrower did, their annual default rate would have dropped from 12% to 5.6%.

Furthermore, Gerardi et al. (2017) find that individual unemployment is the most reliable predictor of default. They show that unemployment increases the probability of default. Regarding the importance of strategic motives, while approximately 38% of defaulters do have the ability to pay, the authors find that the estimated likelihood of default among low-equity borrowers with the ability to pay is relatively small. The double trigger effect of unemployment and negative equity is also a key friction in Hsu, Matsa & Melzer (2018).

Despite these documented effects, Bhutta, Dokko & Shan (2010) find that the role of strategic behavior during the crisis is small. They document that borrowers do not walk away from their house until they are deep underwater, which confirms the idea that the big declines in house prices during the bust played a crucial role in the subsequent defaults.[5] Consistent with the important role of house prices, Bhutta (2015) finds that the postcrisis decline in debt reflects collapsing inflows more than defaults. Inflow declines across counties are related to house-price declines, rising unemployment, and minority population shares.[6]

This set of facts is most consistent with the expectations view, where borrowers took out mortgages against inflated house-price values and defaulted when house prices dropped.

DETERIORATION OF ORIGINATION PRACTICES OVER THE HOUSING BOOM

Finally, various researchers have also shown that loan origination practices deteriorated over the boom period (Keys et al. 2010; Demyanyk & Van Hemert 2011; Dell'Ariccia, Igan & Laeven 2012). For example, originators misrepresented collateral quality or overstated borrower characteristics and incomes. In line with the idea that lending practices were affected by inflated house prices and overoptimistic expectations about further appreciation, most incidences of misstatements that have been reported occurred late in the boom period. Borrowers misrepresent to banks as well, and loans that show incidences of misrepresentation are equally likely to show up on banks' own books or securitized loan pools.

Consistent with this interpretation, Elul & Tilson (2015) use a matched credit bureau and mortgage data set to identify occupancy fraud in residential mortgage originations, that is, bor-rowers who misrepresented their occupancy status as owner occupants rather than residential

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[5] Mayer et al. (2014) provide evidence that underwater borrowers became delinquent in search of a mortgage modification, but this effect was the household response to a change in mortgage modification rules linked to a specific lender and not something systematic across lenders.

[6] There is a series of papers documenting the externalities of foreclosures and highlighting the potential spillovers and the importance of understanding the origins of defaults (see, for example, Campbell, Giglio & Pathak 2011; Gupta 2017).

real-estate investors. They find that misrepresentations appeared in the government-sponsored enterprise market as well as loans held on bank portfolios. Similarly, Griffin & Maturana (2016) analyze apparent fraud among securitized nonagency loans using three indicators: unreported second liens, owner-occupancy misreporting, and appraisal overstatements. They find that about 48% of loans exhibited at least one indicator of misrepresentation. Again, misreporting is similar in both low- and full-documentation loans.

Piskorski, Seru & Witkin (2015) document that contractual disclosures by intermediaries during the sale of mortgages contained false information about the borrower's housing equity in 7–14% of loans, which were also more likely to default ex post. In support of the idea that investors misestimated the future increase in house prices, they find that the misrepresentations exist among securities sold even by the most reputable intermediaries (for more evidence on collateral misrepresentations, see also Ben-David 2011, Garmaise 2015).

Finally, a few researchers have carefully documented the magnitudes of the overstatements that lenders engaged in. Jiang, Nelson & Vytlacil (2014), using information from a loan originator who went bankrupt, show that income was overstated by 20–25% for low-documentation and no-documentation loans, which themselves form a small fraction of loans originated in this period (about 30%). Ambrose, Conklin & Yoshida (2015) estimate an 11% mean overstatement in the sample of borrowers most likely to exaggerate income. While these papers show that overstatements happened, the magnitude of the distortions is relatively modest. Several papers have shown that the size of income shock needed to trigger mortgage defaults by households is a multiple of these numbers (Fuster & Willen 2017; see also the discussion above in the section Defaults in the Middle Class). Similarly, Adelino, Schoar & Severino (2015) show that the fraction of loans that could have been affected by overstatement was too small to have played a major role in the housing crisis.

CONCLUSIONS

In sum, a careful review of the significant trends in mortgage markets leading up to the 2008 crisis supports a view of the boom in which financial institutions and households alike bought into increasing house prices because of overly optimistic expectations. This broad-based increase in borrowing and house prices might have been triggered initially by low interest rates at the beginning of the 2000s. In turn, credit standards appear to have fallen as a result of higher house prices because lenders were too willing to rely on collateral values alone. Once house prices started falling, it was especially middle-class and higher-income households, as well as borrowers with high credit scores, who defaulted at unprecedented levels and created strain on the financial system. Therefore, calling the crisis a subprime crisis is a misnomer of this episode in US financial markets. At its heart, this crisis was driven by unprecedented leverage and defaults by the middle class.

These emerging facts also show why it is essential for policy evaluation to understand the drivers of the crisis. Many early responses to the crisis focused predominantly on microprudential regulations such as changing borrower screening processes and excluding certain borrower groups from credit altogether, in particular low-income borrowers. But in a classical asset bubble, there is a need for macroprudential regulation to prevent a systemic buildup of debt across households and to ensure that there is sufficient slack in the financial system to guard against systemic shocks that are not tied to individual borrower characteristics. A classical asset bubble also points to a central role of the financial sector: If the buildup of systemic risk can have widespread economic impact, macroprudential regulation ultimately has to trade off how much to restrict lending ex ante to minimize potential losses versus how to determine ex post who bears the losses in case of a crisis.

DISCLOSURE STATEMENT

ACKNOWLEDGMENTS

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