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WORKING PAPER

The Role of Mortgage Finance in Financial (In)Stability

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Empirical research on the causes of financial crises has grown in recent decades. Early work, such as that by Kaminsky and Reinhart, helped establish the link between asset prices and banking crises.[1] While this initial research focused on equity prices, subsequent research expanded the analysis to include residential property prices. This subsequent research is briefly reviewed here. After establishing the link between residential property prices and banking crises, I discuss the role of various credit policies, both for their impact on property prices and for the stability of the financial system in the face of declining property prices. The role of specific loan characteristics, such as loan-to-value (LTV), will be discussed first, followed by the role of institutional leverage. Policy recommendations conclude.

Costs of Financial Crises

Policy choices are ultimately about deciding which costs are worth bearing to achieve a particular set of benefits. Debates regarding homeownership—and by extension, mortgage finance—have a tendency to tout the benefits with little, if any, discussion of the costs. Numerous studies have documented a variety of benefits, both public and private, that are correlated with homeownership.[2] Other studies have found correlations that are not so beneficial, such as increased structural unemployment.[3] While correlation is obviously not causality, the positive benefits of homeownership appear to be robust, at least for the average, if not the marginal, homeowner. Those benefits, however, must be weighed against the costs that are associated with banking crises, to the extent that banking crises are either driven by or exasperated by mortgage policies. This paper will argue that U.S. mortgage finance policies were direct contributors to the recent financial crisis.

Housing busts are costly. Examining housing booms and busts across industrial economies between 1971 and 2001, Helbling finds that GDP levels are, on average, around

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[1] Kaminsky and Reinhart (1999).
[2] For a brief review of the literature on the benefits of homeownership see Coulson (2002).
[3] Blanchflower and Oswald (2013).

eight percent below trend three years after the beginning of a housing bust.[4] Of the twenty

housing busts defined by Helbling, only one was not associated with a recession. More recent

estimates from Reinhart and Rogoff support these findings, wherein financial crises are

associated with an average decline of GDP of nine percent and an average increase in

unemployment of seven percentage points (for the recent U.S. episode, unemployment

increased from 4.5 percent to 10 percent).[5] Financial crises, associated with housing busts, also

result in substantial increases in government debt.

A harder to quantify but no less real consequence of financial crises is the increased

state ownership of financial institutions that often follows. At the time of this writing, the

United States government, via the Troubled Asset Recovery Program, maintained an interest in

270 financial institutions,[6] most of which are small institutions. Of more consequence is the

federal rescue of Fannie Mae and Freddie Mac. For some, such as General Motors' former

financing arm Ally Bank, government ownership represents a majority (74 percent for Ally

Bank). The United States is not alone in this regard, for instance the Royal Bank of Scotland is

still majority owned by the U.K. government.

Beginning with the seminal contribution of La Porta, Lopez-de-Silanes, and Shleifer,

researchers have identified several negative aspects of increased state ownership of banks.[7]

Greater government ownership of financial institutions is correlated with lower economic

growth and in particular lower growth in labor productivity (the ultimate driver of wages).

More recent research by Chen and Lin suggest these negative effects arise from increased

political interference with bank lending and investment decisions.[8] To the extent that financial

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[4] Heibling (2005).
[5] Reinhart and Rogoff (2009).
[6] See Office of the Special Inspector General for the Troubled Asset Relief Program, Quarterly Report to Congress, July 2013 (www.sigtarp.gov/Quarterly%20Reports/July_24_2013_Report_to_Congress.pdf).
[7] La Porta, Lopez-de-Silanes, and Shleifer (2002).
[8] Shen and Lin (2012).

crises result from housing and mortgage finance policies, such policies appear to have long-run negative impacts on the economy due to an expanded state control of the financial system.[9]

House Prices and Financial Crises

Scholarship on financial crises had long been dominated by either verbal story-telling or stylized mathematical models.[10] Friedman and Schwartz's ground-breaking contribution introduced a more empirical analysis of both financial crises and business cycles.[11] Their work, however, focused exclusively on the United States and almost exclusively on monetary factors. Despite its empirical nature, much of the interpretation of Freidman and Schwartz remained verbal. Extensive panel studies of financial crises would not appear until the 1990s.

On one hand, American researchers are fortunate that financial crises are relatively uncommon in the United States. On the other hand, infrequent occurrences leave us with too few observations to ascertain significant statistical patterns. Even for the sake of science, few of us would wish for another Great Depression. Keeping in mind the institutional differences, however, country panel studies have greatly increased our degrees of freedom and knowledge. Beginning with Kaminsky and Reinhart, researchers utilized panel data spanning a number decades in several countries.[12]

Using a database spanning 76 currency crises and 26 banking crises between 1970 and 1995, Kaminsky and Reinhart identify booms in equity prices as significant predictors of banking crises.[13] Reinhart and Rogoff extend this analysis to include residential property prices, with similar findings, they find substantial real increases in housing prices characterize banking crises in advanced economies.[14]

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[9] On the relation between federal housing policy and the recent financial crisis, see Wallison (2010).
[10] Kindleberger (2005); MacKay (1841).
[11] Friedman and Schwartz (1963).
[12] Kaminsky and Reinhart (1999).
[13] Kaminsky and Reinhart (1999).
[14] Reinhart and Rogoff (2008).

Earlier theoretical work by Gorton and by Calomiris and Gorton placed the bursting of asset bubbles at the center of their analysis of banking crises.[15] Asset busts can lead to crises because depositors lack the ability to fully evaluate the net-worth of banks and according take observable declines in asset prices as a proxy for bank health. If the funding of said assets is highly leveraged, as is generally the case with real estate, then significant declines in asset values are likely to lead to some financial insolvency.

The association of housing price declines and financial fragility is not simply an artifact of modern economies. Calomiris and Gorton attributed 40 percent of national bank failures during the Panic of 1890 to real estate depreciation and about a third of such failures during the Panic of 1884 to similar causes.[16]

Empirical and theoretical research indicates an important role for asset price booms and busts in the frequency of financial crises. But is there anything special about housing? Or is residential real estate simply another asset class for regulators and bankers to monitor? The empirical evidence suggests yes, there is something special about housing. Bordo and Jeanne, when examining asset booms and busts in OECD countries between 1970 and 2001, find the probability of a property boom ending in a bust is 52.5 percent.[17] The corresponding probability of a stock market boom ending in a bust is only 12.5 percent in their sample. Put simply, stock market booms generally do not end in busts, whereas property booms do, suggesting housing markets demand particular attention in terms of financial stability.

More recent research has attempted to quantify the marginal impact of housing price appreciation on the probability of a financial crisis. Barrell and others estimate that a one percentage point increase in real house prices raises the probability of a financial crisis by 0.07 percent in the United States.[18] In order to off-set the impact of house price increases, Barrell

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[15] Gorton (1988); Calomiris and Gorton (1991).
[16] Calomiris and Gorton (1991).
[17] Bordo and Jeanne (2002).
[18] Barrell and others (2010).

and others estimate that for every three percent rise in real house prices, a bank's un-weighted capital adequacy ratio would have to rise by one point.

The unique role of housing prices in financial crises is the result of the high level of "dual leverage" in the U.S. mortgage finance system. The dual nature of this leverage arises from the elevated debt-to-equity ratios of both mortgagees and mortgagors. In the face of declining asset prices, equity on the part of both borrowers and financial institutions can cushion this decline, avoiding widespread household and financial insolvencies. One can envision the property owner as the first equity cushion. With sufficient declines in asset prices, property owners may default, often in the presence of an adverse income shock. The smaller the cushion of equity, the more likely defaults occur. In the event of a default, the holder of the mortgage becomes the owner of the underlying asset. At this point, the holder's equity cushion becomes the primary determinant of whether it is pushed into insolvency due to a decline in property values.

Housing is, of course, not the only asset acquired with debt. Financial institutions are required to hold capital against both housing and non-housing loans. The extremely high level of dual leverage in the U.S. residential mortgage market is, however, unmatched in other sectors of our economy. Examine, for instance, the U.S. rental market. Moody's Apartment Price Index displays a boom and bust even larger than that witnessed in the single-family home market. Yet there is little evidence that the U.S. apartment market contributed to the recent crisis, other than its impact on employment and residential investment. Defaults in the apartment sector contributed to the failure of small and regional banks, but the role of these institutions in contributing to any financial "panic" appear trivial.[19] As it relates to taxpayer provided assistance, direct taxpayer costs have largely been to cover losses in the single-family sector. Despite the very large losses associated with the failures of Fannie Mae and Freddie Mac, those are almost exclusively a result of their single-family activities.

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[19] See Felton and Nichols (2012); Bhaskar, Gopalan, and Kliesen (2010).

Comparing differences between the apartment and single-family market, let us start with the borrower. During the recent housing boom, purchases of single-family homes averaged a loan-to-value ratio of close to 80 percent, as reported by FHFA's Monthly Interest Rate Survey. The typical purchaser of an apartment complex, in contrast, purchased the property with a loan-to-value of around 60 percent.[20] This difference alone explains a considerable amount of the variation in default rates between single-family home-owners and apartment owners.

Recalling that the borrower is the first line of defense, let us now take a look at the lender's cushion. The most straightforward cushion is the risk-weighting of the apartment loan. Under the Basel capital standards, a bank would be required to hold 100 percent risk weight. An adequately-capitalized bank keeps 8 percent as cushion.[21] If the lender in question holds the single family mortgage, the risk-weighting equals 50 percent, or 4 percent capital. If, as was typical during the boom, the lender sold the mortgage along with other loans, and re-acquired a mortgage-backed security containing the loan, the risk weighting was 20 percent or 1.6 percent capital.

To make the comparison more concrete, assume there are two properties, both worth $1 million. One is a single-family residence; the other a small apartment complex. For the single-family, the borrower takes a mortgage for $800,000. If the lender holds this loan on its balance sheet, it reserves 4 percent or $32,000 against the loan. The apartment complex purchaser takes a mortgage for $500,000, which the lender holds and sets aside $40,000. Under this example, there is a combined $232,000 in cushion to absorb loss for the single-family loan, and $560,000 to absorb loss for the apartment loan. While a highly stylized example this comparison illustrates why a boom and bust in the apartment market does not result in a systemic crisis, whereas similar losses in the single-family housing market can.

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[20] See American Council of Life Insurers, Commercial Mortgage Commitments, various years.
[21] For regulatory definitions of bank capitalization, see 12 CFR 325.103.

In the following sections, this paper will examine the drivers of this dual leverage and offer policy proposals to minimize the risk arising from housing booms and busts.

Demographics and Loan-Level Characteristics

This section will argue that reduced downpayments on the part of borrowers have been a significant driver of mortgage defaults, particularly when coupled with low-credit borrowers. The connection between low downpayment lending and population demographics, particularly age profile, is then examined. I will argue that low downpayment lending dramatically increased home-ownership among households under the age of 30, arguably allowing such households to skip the process of saving for a downpayment. Low downpayment lending also played a critical role among older borrowers and among investors, which while contributing to increased defaults added little to short term gains in homeownership.

Given that economists still debate the causes of the Great Depression, it should be of little surprise that scholars are divided over the causes of the recent "Great Recession." Among the topics debated are the drivers of mortgage default. The arguments in this paper are built upon the relationship between borrower equity and mortgage default.[22] The theory is that in the face of an adverse income shock, such as job loss, households with less equity will be less likely to be able to maintain their mortgage, and will have fewer incentives to do so.

One element of public debate regarding mortgage default is the contribution of loan features deemed unfair or even predatory. The theory, to the extent there is one, behind the Dodd-Frank Act's Title XIV "Mortgage Reform and Anti-Predatory Lending Act" is that abusive loan features pushed borrowers into default, triggering the crisis. In order to abstract away from these loan features, the following table presents normalized claim rates for Federal Housing Administration single-family loans. Each cell is a multiple of the normalized "1.0" in the upper right cell, for instance a rate of "5.6" would represent a claim rates 5.6 times that observed under the cell "1.0". FHA loans are almost always fixed-rate 30 year mortgages with

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[22] For review of this literature, see Ayres and Mitts (2012); Foote, Gerardi, and Willen (2008); Vandell (1995).

no pre-payment penalty, no teaser rate, and various fees capped either by regulation or statute. FHA is essentially the benchmark for a "safe loan" under most definitions of abusive lending, such as that used under the risk-retention requirements of Section 941 of the Dodd-Frank Act.

Table 1

FHA Single Family Insured Loan Claim Rates
Relative Experience by Loan-to-Value and Credit Score Values-Ratios of each
Combination's Claim Rate to that of the Lowest Risk Cell

Loan-to-Value Ratio Ranges	Credit Score Ranges			
	500–579	580–619	620–679	680–850
Up to 90%	2.6	2.5	1.9	1.0
90.1–95%	5.9	4.7	3.8	1.7
Above 95%	8.2	5.6	3.5	1.5

Testimony of Carol Galante (2011).

As one reads right to left across the table, borrower credit quality declines, and as one descends down the rows, borrower downpayment declines. What is immediately obvious is the exponential nature of increasing loan loss as both loan-to-value increases and credit quality declines. Similar results have been documented outside of FHA[23] as well as being established within FHA, controlling for a variety of other variables,[24] and for earlier time periods.[25]

Research since the crisis has questioned whether "cheap credit," particularly as measured by loan-to-value, can explain the crisis. Glaeser, Gottlieb, and Gyourko suggest that
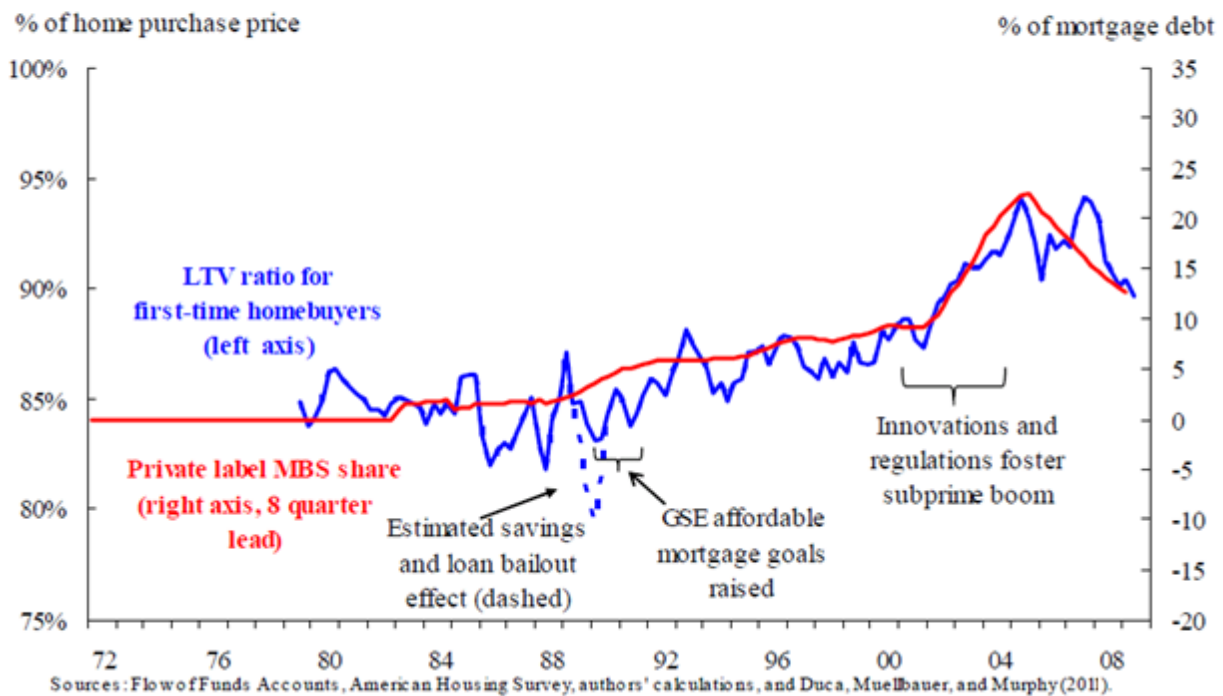
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[23] Anderson, Capozza, and Van Order (2008).
[24] Hendershott and Schultz (1993).
[25] Hendershott and Schultz (1993); Von Furstenberg (1969).

trends in average loan-to-value cannot explain the housing bubble.[26] Subsequent analysis by Duca, Muellbauer, and Murphy, however expands the analysis to examine trends in loan-to-value ratios for first-time homebuyers.[27] Estimates by Duca, Muellbauer, and Murphy, displayed in the following chart, suggest that about half the real appreciation in home prices between 2001 Q4 and 2005 Q4 can be attributed to an increase in loan-to-value ratios among first-time homebuyers.

Figure 1: LTV Ratios for First-Time Homebuyers Trend with Share of Mortgages Packaged into Private Label Mortgage Backed Securities

Sources: Flow of Funds Accounts, American Housing Survey, authors' calculations, and Duca, Muellbauer, and Murphy (2011).

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[26] Glaeser, Gottlieb, and Gyourko (2010).
[27] Duca, Muellbauer, and Murphy (2011).

While LTVs among first-time buyers have been trending upward since the early 1990s, the early 2000s witnessed a significant acceleration of that trend. The increase in first-time buyer LTVs also closely tracks the private label mortgage-backed securities share of the mortgage market, although one must bear in mind the large private label MBS purchases by the government sponsored enterprises, particularly from 2002 to 2005.[28] Even had there been no expansion of mortgages to borrowers with a weak credit history, the increase in LTVs among first-time buyers would have significantly increased delinquencies in the face of a housing bust.

Given the usual necessity of saving for a downpayment, and normal amortization of most mortgages, LTVs differ dramatically across homeowners. The highest ratios are among the youngest households. Among all homeowners (not just recent buyers) LTVs averaged just below 40 percent in 2010, up from around 30 percent during the boom. Households with heads under 40, on average, currently display LTVs just over 70 percent, up from around 60 percent during the boom. Younger households are also more likely to have a mortgage. Despite a dramatic increase in mortgage use by elderly households, partly driven by the expansion of FHA's HECM program, over half of elderly households still own their homes free and clear. Among families under age 40, less than 10 percent own their homes free and clear.[29]

The decade from 1994 to 2004, essentially moving from the trough to near the peaks of both the housing boom and trends in age-specific ownership rates, witnessed a five percentage point increase in homeownership, from 64 percent to 69 percent. This increase was not spread evenly across age groups. Amazingly, households under age 25 saw an almost doubling in their homeownership rate, an eleven percentage point increase from 15 percent to almost 26 percent. The increase among households 25 to 29 years of age was almost as impressive with

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[28] Calabria (2011).
[29] For age-related homeownership rates, see Emmons and Noeth (2013).

an eight percentage point increase from 34 percent to 42 percent. The following figure

illustrates this increase, by five year age increments, for families under 40 years of age.[30]

Figure 2

Cumulative Change in Homeownership Rate Since 1994 by Age Group:
All 5-Year Age Groups Younger than 40 Years
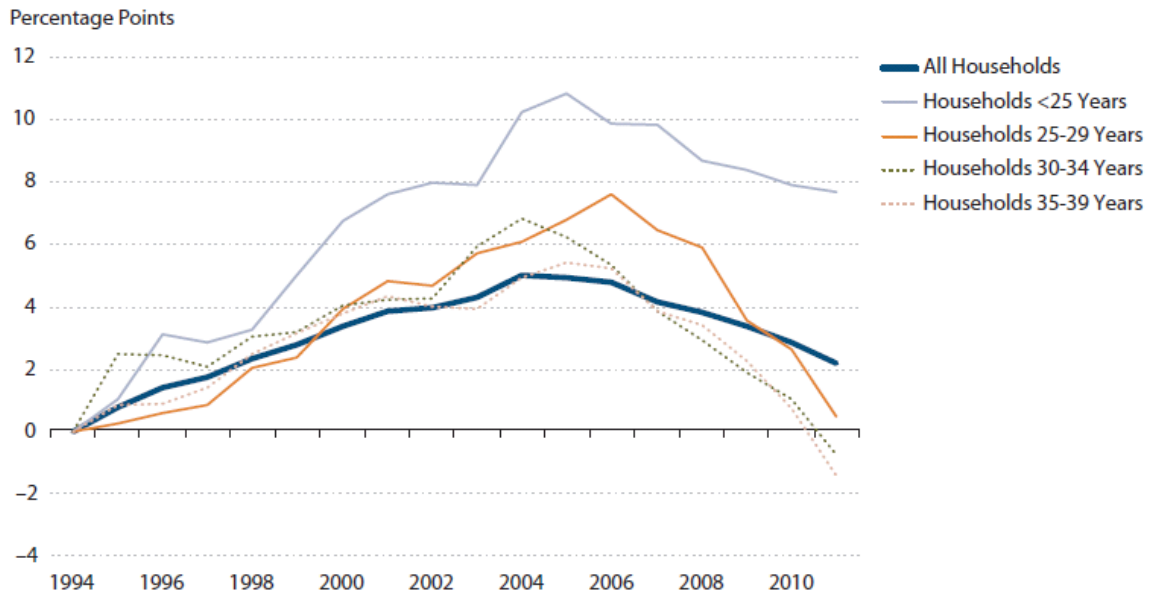
SOURCE: U.S. Census Bureau.

As the cliché goes: what must go up, must come down. The dramatic increase in

homeownership rates among younger households has been somewhat matched by an equally

dramatic reversal. The largest declines in homeownership, since the ending of the boom,

occurred among households under 40. By contrast, homeownership rates for households over

75 have actually increased since the onset of the bust.   To the extent that the increase in

homeownership among younger households was driven by increases in LTV, the decline in

homeownership among this group is also a result of the interaction of high LTVs with a bust in

home prices.

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[30] The figure is reproduced from Emmons and Noeth (2013).

One measure of distress is the degree to which households are underwater on their mortgage (that is, the value of their mortgage exceeds the value of their home).   Carter calculates the percent of households underwater by age, 1997 to 2009, from the American Housing Survey.[31]

A number of trends emerge. As it relates to age, younger households have consistently displayed a larger frequency of being underwater. The frequency in 2009 for households under 35 was almost three times that for households over 65. Even after the onset of the bust, the frequency of underwater households, over age 65, was less than that witnessed by households under age 35 at the peak of the boom in 2005.

To the extent that negative equity is a driver behind mortgage default,[32] and negative equity is also the result of younger household entering homeownership earlier due to a relaxation in downpayment requirements, we can connect the age structure of borrowers and mortgage defaults. This is not to imply that age itself is an independent driver of mortgage default, but rather that low/negative equity has been the result of expanding homeownership to younger households and that the resulting reduction in equity among those borrowers has driven mortgage delinquencies.

Because younger households started out with less equity, their percentage reductions in equity during the bust were greater as well, magnifying the impact of the recession on the balance sheet of younger households. Homeowners under 35 have witnessed an average decline in home equity of around 60 percent, whereas owners over age 75 experienced a decline of less than 10 percent.[33] Between these extremes, increasing age is associated with smaller percentage reductions in home equity. Wolff also finds mortgage delinquency rates to be loosely declining with age.

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[31] Carter (2012). Separately calculated figures from the Survey of Consumer Finance yield slightly smaller frequencies, but qualitatively similar results. See Wolff (2012).
[32] Bhutta, Dokko, and Shan (2010).
[33] Wolff (2012).

This section has suggested that a significant contributor to the rise in mortgage delinquencies has been the reduction in downpayments, particularly among first-time, generally younger, homebuyers. Such an outcome was not only foreseeable but, in at least one instance, predicted. Deng, Quigley, and Van Order simulate the outcome of a policy of extending low downpayment mortgages.[34] Their results indicate that if a zero downpayment option were offered, but priced as a conventional mortgage, the expected losses could exceed 10 percent of the funds loaned. The sensitivity of their results is highly dependent upon the rate of house price appreciation, unemployment, and household income relative to area median household income.   Their "extreme" case of zero price appreciation, zero downpayment, eight percent unemployment, and an income 60 percent of median yields a cumulative 15 year default rate of 35 percent. Obviously, events of the last several years make this "extreme" case look relatively mild. Even under the sunny situation of 10 percent price appreciation, four-percent unemployment, and 150 percent of area median income, Deng, Quigley, and Van Order still find zero downpayment loans to have a 15 year cumulative default rate of 4.4 percent.[35] If anything, history has shown the cost estimates of Deng, Quigley, and Van Order to be on the conservative side. Gerardi, Shapiro, and Willen also provide evidence that the primary drivers of default are combined loan-to-value and continued borrower equity.[36]

The arguments presented here are consistent with the theory of low-equity clustering proposed by Ayres and Mitts, who argue that it is not simply the average level of negative equity that matters but more importantly the distribution of negative equity.[37] Consider two populations, both have average loan-to-values of 90 percent and both suffer a fall in house prices of 15 percent. In population A, where all households have an LTV of 90, the entire population is underwater. In population B, where 50 percent have an LTV of 100 and 50 percent have an LTV of 80, the percent underwater is now half. Ayres and Mitts suggest

[34] Deng, Quigley, and Van Order (1996).
[35] Deng, Quigley, and Van Order (1996).
[36] Gerardi, Shapiro, and Willen (2009).
[37] Ayres and Mitts (2012).

clusters of low-equity borrowers by geography explains the observed pattern of mortgage defaults.[38] I suggest here that low-equity clustering also occurred by age, more specifically among younger households. Given the lower attachment of younger households to the labor market, low-equity clustering among the young also makes such households more vulnerable to "double-trigger" models of default that incorporate both job loss and negative equity. Johnson and Mommaerts estimate that younger households are significantly more likely to lose their jobs, particularly those under the age of 25.[39] The percent of workers whose jobs ended during the study period 29.1 percent for workers aged 18 to 24. By comparable figures for other age groups: 17.3 percent for ages 25 to 34; 13.0 percent for 35 to 49; 12.5 percent for ages 50 to 61; and 17.9 percent for ages 62 and older.

The focus on younger households also derives from the policy objective of increasing homeownership via the reduction of downpayment requirements. For many younger households, the need to save for a downpayment can delay the transition to homeownership. Older homeowners are also likely to take advantage of reduced equity requirements, but without a correspondingly gain in homeownership rates. The discussion here does not intend to imply that the recent boom was driven solely, or even mainly, by young households, but that the policy relevance of reduced downpayment requirements is largely an issue for younger households. Although the prevalence of negative equity is greater for younger households, the depth, for those households underwater, is often greater for older households, due largely to borrower extraction of equity via re-finance. This suggests different policy responses. For younger households downpayment requirements are likely more binding, whereas for older households restrictions on federal support of equity extraction is more important. To the extent that federal backing is provided, such backing can be limited to purchase loans and not to cash-out re-financings.

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[38] Ayres and Mitts (2012).
[39] Johnson and Mommaerts (2011).

The preceding has focused upon the increase in leverage during the recent boom by homeowners. Investors, those not intending to live in the home, also played an important role in driving both increased leverage and home prices. Researchers at the Federal Reserve Bank of New York have documented both the increasing percent of purchases made by investors as well as increasing leverage among these investors.[40] Calabria also documents the increasing investor share of Fannie Mae and Freddie Mac purchases.[41] Given the greater propensity for investors to default, federally-backed loans to investors should be subjected to a higher level of underwriting than comparable purchase loans. Haughwout and others focus on "self-reported" investor loans, whereas many investor loans were initially reported as owner-occupied.[42] Piskorski, Seru, and Witkin report that "more than 6% of mortgage loans reported for owner-occupied properties were given to borrowers with a different primary residence."[43] Their research suggests that increased fraud by both borrowers and originators was in part due to the increased use of securitization.

Mortgage defaults, of any level, need not result in widespread insolvencies among financial institutions. Nor does any level of mortgage delinquency guarantee a financial crisis. The level of mortgage default, along with the severity of loss, determines the losses that holders of mortgages incur. Whether holders become insolvent is also a function of the equity capital held to absorb losses. High losses can be off-set by high levels of equity. Such was not to be, however: as leverage increased on the part of borrowers, so did leverage increase on the part of mortgage investors and lenders. The following section examines this trend.

Securitization and Financial Stability

With the exception of information technology, there are probably few sectors of the economy that have changed as dramatically in the last few decades as the financial sector. Among the most significant change is how we fund our mortgage market. It is almost hard to

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[40] Haughwout and others (2011). See also Robinson (2012).
[41] Calabria (2011).
[42] Haughwout and others (2011).
[43] Piskorski, Seru, and Witkin (2013, p. 3).

imagine that as President Reagan took office in 1981, the government-sponsored enterprises owned or guaranteed only about 17 percent of the mortgage market. Around a third of that share was held directly on portfolio, with the remainder representing virtually all the securitized mortgage activity. The private issuance of mortgage-backed securities was trivial. Over two-thirds of residential mortgages were held directly on the balance sheet of depositories. By the end of 2006, at the height of the housing boom, 56 percent of residential mortgages were held either in agency pools or private label securities. Thirty-one percent were held as whole loans on the balance sheets of banks, thrifts, and credit unions.

Securitization had its benefits, though some more were more perceived than real. Certainly mortgage-backed securities were, in general, more liquid than the underlying mortgages. They were also priced more regularly in the market, offering institutions a more accurate measure of the value of assets on their balance sheets. Those values, of course, might be more representative of market opinion but they were also likely to be more volatile.

Figure 3

Percent Home Mortgages Securitized
GSE & PLS
Source: Federal Reserve, Z.1
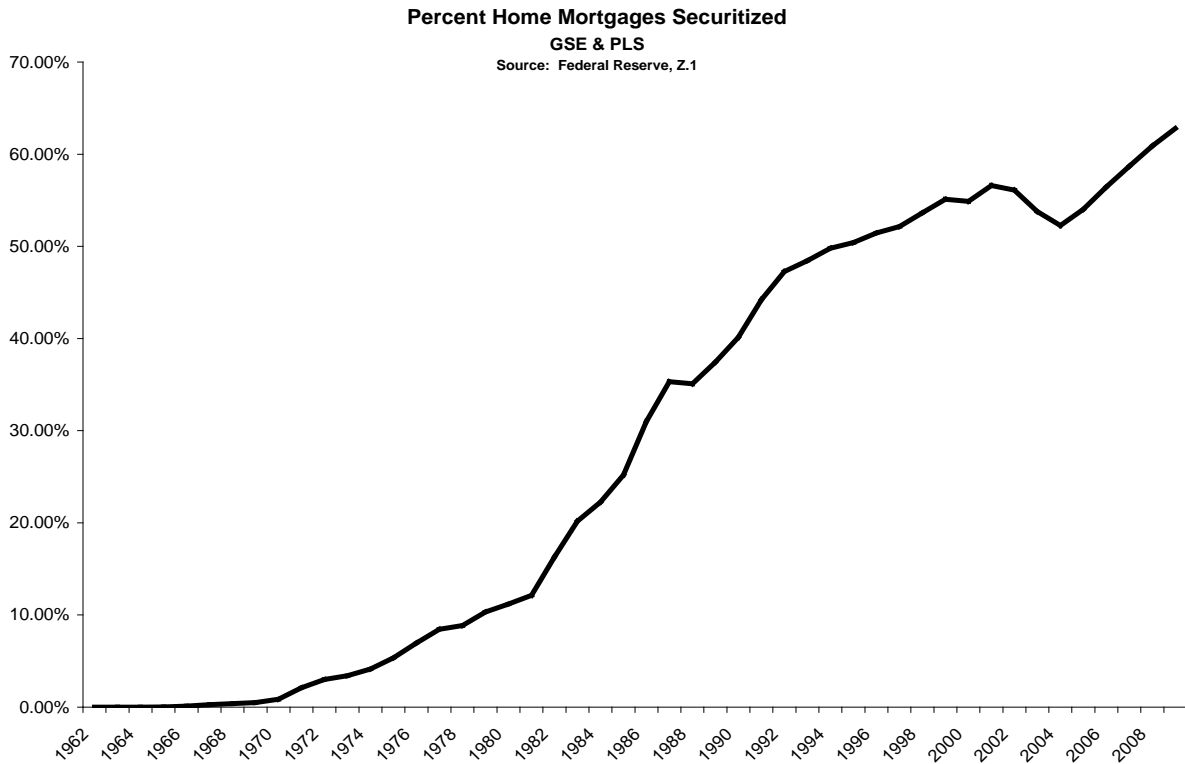
One of the benefits of securitization for financial institutions, was that it allowed for significant reductions in required capital, the flip-side of which is increased leverage. Under both the Basel I, published in 1988, and Basel II, published in 2004, securitized mortgages required far less capital than holding whole mortgages. The risk weight for whole mortgages, under Basel, is 50 percent, whereas the risk weight for mortgage-backed securities is 20 percent. Much of the recent banking problems in Europe are a direct result of capital standards placing a zero risk weighting on OECD government debt. Any system of banking regulation that treats Greek sovereign debt as "risk-free" is a system likely to fail.

Much of this impact was recognized before the crisis. Ambrose, Lacour-Little, and Sanders find evidence consistent with the notion that securitization is driven by an arbitrage of

capital standards.[44] They focus on the arbitrage within a bank's own portfolio. The International Monetary Fund also noted that during the expansion of the housing boom, the largest banks significantly expanded their total assets with only a relatively modest increase in total risk-weighted assets, allowing for a significant increase in leverage.[45] This was accomplished not by increasing loans-to-assets but by increasing the holds of securities.

Capital arbitrage also works across institutions. To some degree, the growth of Fannie Mae and Freddie Mac was likely the result of mortgage credit risk flowing to the most highly leveraged segments of the financial system.

Perhaps the most egregious element of the Basel capital standards was the allowance of a zero risk weighting on off-balance sheet short-term "liquidity" guarantees. Banks could originate (or purchase) mortgages and mortgage-backed securities, and place them in off-balance sheet special purpose entities (also known as special investment vehicles). Such entities were then funded in the short-term commercial paper market, with the investor usually being a money market mutual fund. Banks could choose to incorporate these entities as separate corporations, in which case the banks would retain no risk. Most banks, in order to increase the attractiveness (and credit rating) of these vehicles offered liquidity guarantees behind these entities. As long as these guarantees were under a year in duration, the Basel rules provided a zero risk weight for capital purposes.

The zero risk weight on short-term bank guarantees interacted in a perverse manner with the regulation of money market mutual funds (MMMF). By regulation, money market mutual funds are limited to holding only short term highly-rated securities. Such provided a ready source of demand for short term asset-backed commercial paper issued by banks, especially in a low interest rate environment where funds were pushed to reach for yield. Since neither the MMMFs, nor the short-term bank guarantees, required capital, the interaction of these two separate regulations resulted in a financing of mortgages that could be leveraged on

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[44] Ambrose, Lacour-Little, and Sanders (2005).
[45] IMF (2008).

a massive scale. Acharya, Schnabl, and Suarez estimated this combination of regulatory incentives reduced banking system capital by almost $70 billion, had such loans been held on the balance sheet of depositories.[46]

To give an indication of the impact of capital arbitrage, the following table represents alternative scenarios. Total U.S. home mortgages held in 2006 equaled $10.48 billion. Depository institutions, the government sponsored enterprises and private ABS pools held $9.3 trillion, which forms the basis of figures below.

Table 2: Comparison of Alternative Capital Holdings for Financial System Mortgage Holdings, 2006

	Mortgage Holdings	Minimum Capital Ratio	Minimum Capital	Min. 10% Cap Ratio	Minimum Capital	No Risk Weights	Minimum Capital
Depositories	2,932,733	4.00%	117,30	5.00%	146,637	8.00%	234,619
Agency - Whole Loans	457,587	2.50%	11,44	2.50%	11,440	2.50%	11,440
Agency - MBS Guarantees	3,749,120	0.45%	16,87	0.45%	16,871	0.45%	16,871
ABS Private Issuers	2,167,117	0.00%	0	0.00%	0	0.00%	0
Bank GSE debt holdings	786,654	1.60%	12,58	2.00%	15,733	8.00%	62,932
Total Capital			158,20		190,680		325,862
Alt Scenario (All Bank, Whole Loan)	9,306,557	4.00%	372,26	5.00%	465,328	8.00%	744,525
Additional Capital			214,05		274,647		418,663

Source: Author's calculations, Federal Reserve, Z.1

The final two lines present capital requirements, and additional system capital, if all $9.3 trillion mortgages in 2006 were held as whole loans on the balance sheet of depositories. As the FDIC requires a 10 percent risk weighted capital ratio for banks to be considered "well capitalized," the second set of columns reproduces the comparison with a 10 percent ratio, instead of the 8 percent used in the first set of columns. The third, and final, set of columns presents estimates for a flat 8 percent unweighted capital ratio. All of the alternatives make

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[46] Acharya, Schnabl, and Suarez (2012).

the assumption that neither the demand nor supply of mortgage credit is affected by changes in capital requirements. We will revisit that assumption.

A mortgage finance system characterized by the holding of whole mortgages on bank balance sheets would also be a system with over $200 billion more in equity, a cushion of equity that could have strengthened confidence as the crisis hit and a cushion that could have stood before any taxpayer losses. At a 10 percent risk-weighted capital ratio, that cushion increases to almost $300 billion. An elimination of risk-weighting would, all else equal, raise that cushion to over $400 billion.

Reducing the leverage of our mortgage finance system obviously raises the issue of whether there would be sufficient capital to support the size of our mortgage market. This paper discussed the role of household mortgage leverage earlier. Reducing the level of individual household mortgage leverage would allow for some reduction in overall system leverage. For instance in 2007, households held real estate valued at $20.8 trillion, backed by mortgage debt totaling $10.5 trillion, yielding a ratio of equity-to-value of 49.4 percent. Increasing that value to 57.5 percent would reduce total mortgage debt outstanding by a $1 trillion, allowing for a reduction in financial system leverage as well.

The preceding discussion has assumed that the levels of leverage observed in the mortgage market accurately reflected underlying "true" levels of leverage. During the peak of the boom, valuations in both the single and multi-family markets, were driven by comparables that reflected the boom. The possibility of using a more "trend" comparable for appraisals, rather than a snap-shot, could potentially reduce the pro-cyclical nature of the appraisal process. Booms can also lead to aggressive assumptions regarding income growth for income producing properties. Again using assumptions that dampen cyclical factors would provide more stable measures of leverage. To some extent the growth of government backed securitization has reduced the incentives for originators to gather more accurate and stable measures. Compared to our current mortgage finance system, moving towards a greater

reliance on bank balance sheet funding would not only increase the capital in the system but also better align the incentives for tracking and accurately measuring leverage at the loan level.

Another benefit of increased equity on both the part of borrowers and lenders is that it provides a greater cushion in the event that property valuations contain large errors. To some extent, neither regulators nor market participants can ever truly known the actual amount of leverage in the system. Valuations can change quickly, even when they are measured accurately. Such errors become more important as leverage increases. For simplicity, posit that the true price of a home observed by lenders or investors is +/- 10 percent of the observed price, with a 0.5 probability of either. With a 10 percent downpayment, half the time the actual borrower equity is zero. A similar analysis holds for the examination of bank solvency. Again a higher equity cushion on the part of borrowers and lenders will reduce the likelihood that measurement errors result in insolvencies.

Policy Recommendations

Incentives facing both the borrower and the lender greatly contributed to increased leverage in the mortgage finance system. Given the social harm from housing busts and any accompanying financial crisis, policies to reduce these costs appear badly needed.

On the part of borrowers, federally-backed mortgages should require modest downpayments. Hatchondo, Martinez, and Sánchez estimate that a minimum downpayment requirement of 15 percent would reduce mortgage defaults by 30 percent.[47] If house prices did not adjust (fall), homeownership rates would fall by an estimated 0.2 percent. A full downward adjustment in house prices of 0.7 percent would result in no decline in homeownership rates. In any event, it appears large reductions in mortgage defaults can be achieved with a relatively low impact on both homeownership and house prices.

Alternatively Hatchondo, Martinez, and Sánchez estimate that garnishing the income of defaulters, in excess of 43 percent of median consumption, would achieve similar declines in

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[47] Hatchondo, Martinez, and Sánchez (2011).

defaults, but with lower required downpayments and result in both an increase in homeownership rates and housing prices.[48] Despite the vast welfare improvements of such a proposal, I believe the time-inconsistency problem facing policymakers would render it ineffective.[49] Policies facing borrowers need to be robust to the political economy of housing busts. While Athreya, Tam, and Young find that "harsh" penalties for defaulting borrowers would improve social (and borrower) welfare, these policies again strike me as politically unsustainable, accepting that the development of a model of political behavior regarding borrowers is beyond the scope of this paper.[50]

In assessing the impact of downpayment requirements on homeownership, history suggests the bulk of the impact will be manifest more in home prices than in homeownership rates. The following chart displays the national homeownership rate and the average owner loan-to-value ratio. What is immediately obvious is that long-run homeownership gains since 1960 have been relatively modest, while average leverage has more than doubled.
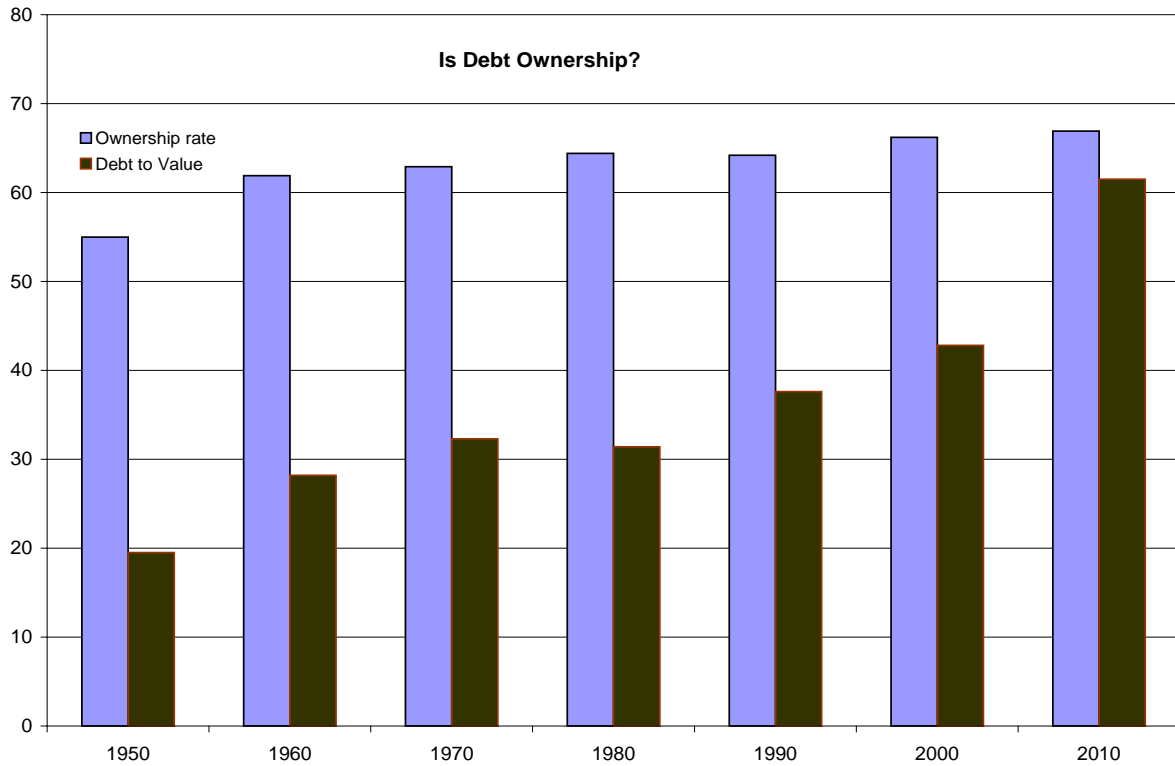
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[48] Hatchondo, Martinez, and Sánchez (2011).
[49] Kydland and Prescott (1977).
[50] Athreya, Tam, and Young (2009).

Figure 4

From 1960 to 1980, average loan-to-values remained relatively stable. Beginning in the 1990s, after the Tax Reform Act of 1986 eliminated the deductibility of all but mortgage debt, loan-to-values dramatically increased to the point LTV ratios in 2010 were double what they had been in 1980. Comparing this trend to Robert Shiller's time-series on real house prices, prices follow a similar trend: relatively stable until the 1990 and then a massive boom that corresponds to the increase in leverage.[51] Again the time-series suggest the most significant impact of the increased leverage was increasing prices, not homeownership. Setting aside the most recent boom, the Shiller series also raises a basic question about the value of homeownership as an investment, as between 1950 and 1997 the series fluctuated around an

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[51] See Robert Shiller's housing price series (www.econ.yale.edu/~shiller/data.htm).

index value of 107. It is simply hard to conclude from the last 120 years of data that housing in the United States has been a "good" investment. If one plots five-year rolling changes in real house prices (not shown), it also becomes readily apparent that housing is a risky investment.

A contributing factor to the increased leverage on the part of homeowners is the confusion between ownership and debt. At the extreme, if one has zero (or negative) equity in a property, it is hard in any real sense to label one an "owner." A contributor to the increase in household leverage has been the mortgage-interest deduction (MID). While others have offered more complex proposals to reform the MID,[52] a gradual elimination would likely be both the easiest to implement and the most effective at reducing household leverage.

As the paper emphasizes, it was the unique combination of high leverage on both the part of borrowers and lenders that contributed to the crisis. Financial reform efforts to reduce this leverage should include: an elimination of Basel's risk-weighting system to be replaced with a simple, flat leverage ratio of around 10 percent, with an equal treatment of on- and off-balance sheet funding. As importantly, any federally-chartered institution, whether depository or government sponsored enterprise, must be subject to equal capital treatment for the holding of mortgages. Raising bank capital requirements, while leaving those of even more highly-leveraged institutions unchanged would be to double-down on the mistakes of the past. Equal capital treatment should also apply across both whole loans and mortgage-backed securities. Regulators in the U.K. have proposed increasing capital standards required for mortgages in line with increases in housing prices. While such an idea has considerable merit and attractiveness, the political pressure during a housing boom would be to continue to the boom and not "leaning against the wind." Accordingly the policy proposals suggested here have intentionally not relied on the discretion of bank regulator or politicians, but have advantage of being "hard-wired" into statute.

A potential counter to the proposals raised here, especially those regarding increased downpayments, is that a modest increase in downpayments, say of 5 or even 10 percent, would

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[52] Ayres and Mitts (2012).

have made little difference in a market where prices are falling 20 or 30 percent. First, the depth of negative equity directly is related to default.[53] Even if households were still underwater, being *less* underwater would likely reduce mortgage delinquencies. Second increased downpayment requirements on federally backed-loans would also reduce the demand for housing, with the result that housing prices in the boom period would increase by less, suggesting that housing prices declines that followed the boom would be more modest. At a very basic level, the policies here are aimed less at cushioning the bust but at restraining the boom. Gerardi, Shapiro, and Willen also provide evidence that even in the face of large price declines, mortgages with initial combined loan-to-value ratios of under 90 percent performed reasonably well during the recent crisis.[54]

The housing bubble and financial crisis were the result of a multitude of policy choices. This paper does not attempt a comprehensive analysis of the crisis and nor are its proposals comprehensive. The focus has instead been on forces unique to the U.S. system of mortgage finance. Reform in other areas, including monetary policy, is also badly needed.

Conclusions

Banking crises, particularly those associated with housing busts, are quite costly. While a variety of policies, such as monetary policy, were likely contributors to the financial crisis of 2008, this paper argues that the uniquely high levels of "dual" leverage in our mortgage finance system were the primary drivers of the losses to both households and financial institutions. Other policy changes should be considered. Policies that directly reduce household and financial system leverage should, however, be at the heart of mortgage finance reform. Homeownership policies that leave households deeply underwater or in foreclosure are not sustainable policies. On the tax side, the mortgage interest deduction provides an incentive for households to become more leveraged, just as the expensing of interest encourages higher corporate leverage. An elimination of the mortgage interest deduction should be part of any

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[53] Bhutta, Dokko, and Shan (2010).
[54] Gerardi, Shapiro, and Willen (2009).

reform debate. Subsidies for low downpayment lending, such as those provided by FHA or the GSEs, should also be scaled back if not eliminated. To the extent that government chooses to subsidize homeownership, those subsidies should be targeted at home equity rather than home debt. On the bank regulatory side, a substitute of the Basel risk weights for a flat leverage ratio could reduce both the herding of banks into mortgage assets as well as decreasing overall bank leverage, if done correctly.   Additionally policies that continue to tap households, in their role of taxpayers, to re-capitalize financial institutions are also not sustainable.

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