

Under House Arrest: The Effects of Underwater and Low-Equity Mortgages on Small Business Failures and Mobility

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1. Introduction

Recovery from the Great Recession has proceeded slowly over the past seven years. While the unemployment rate has dropped by half (from its peak of 10% in October 2009 to 5% in October 2015), wages and incomes continue to stagnate. Real wages for the US median worker has remained at around \$800 per week since the early 2000s. Household living standards also fell significantly during the past seven lean years. According to the US Census Bureau (2015a), US median household income in 2014 was \$53,657, well below its pre-recession peak.

Even worse, median household wealth dropped by 44% between 2007 and 2010 (Wolff 2012, 2014). The most important reason for this is the nearly 30% decline in housing prices between March 2006 (the peak of the housing bubble) and November 2011 (the when housing prices hit bottom) (Glick et al. 2015) and the fact that, except for the very wealthy (the top 10% or so of the wealth distribution), the majority household wealth is held in the form of home equity (Piketty 2014).

Recovery in the housing market has been slow, although some regional housing markets have recovered most or all of their losses from the 2000s. But millions of homeowners still remain underwater on their mortgages, and many homeowners are just barely above water, making it difficult

for them to downsize or move. They are one economic disaster (medical bills, a bout of unemployment, etc.) away from not being able to pay their regular and necessary bills.

This paper examines the economic consequences of underwater and near-underwater mortgages. In the first part of our analysis we focus on three groups—households underwater on their mortgages, households with between 0% and 10% equity in their homes, and households with between 10.01% and 20% equity in their homes. Unlike other studies that lump nearly underwater mortgages with above-water mortgages, we separate these two groups in order to examine the changes and differences between them. Both groups seem to suffer from similar problems. Besides locking homeowners into their current home, because they lack the cash required to sell their home and move, low levels of equity also come with significant costs, such as having to make steep insurance payments (private mortgage insurance or PMI) with their monthly mortgage payments. PMI typically runs around \$50 per month for each \$100,000 borrowed, but can run as high as \$75 or \$85 per month per \$100,000 borrowed. This is one reason we think these barely above water mortgages should be analyzed separately, or at least divided out from other above-water mortgages. Households with underwater and barely-above water mortgages will find it difficult (or impossible) to sell their homes because such a transaction involves large financial outlays that these homeowners are unlikely to be able to make. Some underwater households have an advantage because if they did not have much money in their homes they can walk away from the mortgage. Of course, there are still financial repercussions from walking away. They still have to move, find a new place to live and it could damage their credit history. But the financial costs are much greater for households that have to pay money to sell their houses. If they cannot sell their houses (due to lack of money) then they might forgo better paying job opportunities elsewhere due to house lock-in.

The second part of our study measures the effects the Great Recession has had on low-equity and underwater mortgage holders. Using the Federal Reserve's Survey of Consumer Finances panel data for 2007 and 2009 we are able to track the same households from before the housing market crashed and afterwards. Using this two-wave panel we show how low-equity households were negatively affected in two ways that typically require some positive net worth—small business failure and labor mobility.

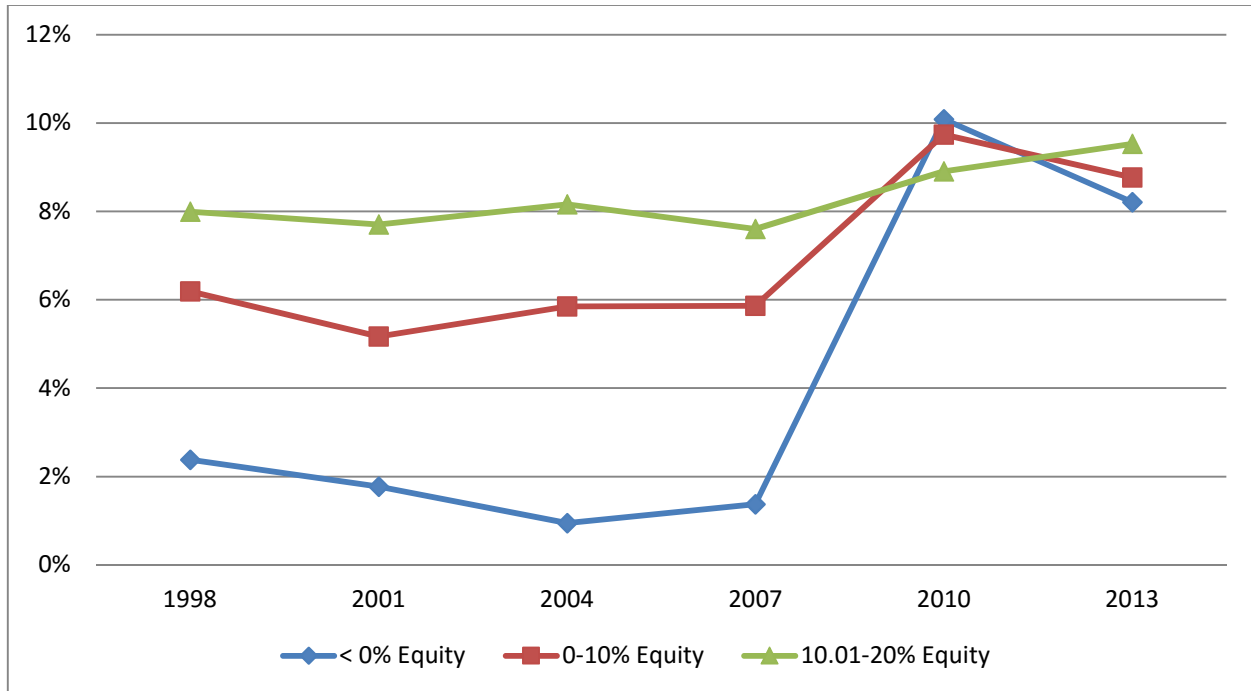
2. Measuring the Amount and the Cause of the Decline

Mortgages are deemed to be underwater when the value of the mortgage on the home exceeds the value of the home. The number of underwater mortgages, as well as negative equity rates (the percentage of underwater homes) started growing in the middle 2000s when home prices stopped their unsustainable increase. The problem became much greater as a result of the Great Recession, which resulted in a sharp drop in housing prices.

According to Core Logic (2014), negative equity rates fell from 25% in the first quarter of 2011 to 20.2% in the first quarter of 2013 and then to 12.7% in the first quarter of 2014. This decline is due to both the large number of home foreclosures and to rising home prices.

Besides being underwater, many mortgages are close to being underwater. The value of the mortgage is less than the value of the home, but only by a little. Roughly 20% of homeowners had between zero equity and 20% equity in their homes—a figure that has remained relatively constant over time. Even within this group there are differences between those with between 0% and 10% equity and those with between 10% and 20% equity in their homes.

Figure 1: Percentage of Mortgages that are underwater (< 0% equity), barely above water (1-10% equity) and above water (10.01-20% equity), 1998-2013.



Source: Federal Reserve (2015) Survey of Consumer Finances weighted data.

In Figure 1 we see that the percentage of mortgages in the three equity categories jumped significantly. The greatest jump occurred in underwater mortgages and the second largest jump was for mortgages that are barely above water. The only equity category to increase since 2010 were mortgages between 10.01% and 20% equity, which is likely a result of people buying homes at lower prices (due to the crash and low interest rates) that in turn led to a rise in prices.

Using the Federal Reserve's Survey of Consumer Finances panel data for 2007 and 2009 we could track how these groups fared from the first survey to the second. The surveys were taken around the middle of the survey years (2007 and 2009) and continued until the end of each survey year (a few cases carried over one month into the following year). For Table 1 below, households were identified in their equity category then we used the same variables to see how they changed into the next survey wave (no households were dropped between the two waves).

Table 1: Comparing Households with Mortgages that are Underwater, Barely Above-Water and Above-Water from 2007 to 2009.

	Underwater	Barely-Above-Water	Above-Water
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	(< 0% equity)		(0-10% equity)		(10.01-20% equity)	
	2007	2009	2007	2009	2007	2009
Median Income	\$80,938	\$55,787	\$67,094	\$63,757	\$69,223	\$72,723
Consumer Debt-to-Income	44.1%	53.2%	30.6%	32.4%	33%	30.5%
Net Worth (Median)	\$10,252	\$21,600	\$30,115	\$17,000	\$92,168	\$55,600
Median Home Equity	(\$11,392)	\$4,149	\$7,249	\$2,000	\$31,068	\$9,000
Value of Home (Median)	\$134,628	\$130,000	\$181,230	\$134,000	\$201,942	\$147,000
Moved	*	16.6%	*	18.4%	*	22.2%
Owned Home in 2009	*	89.7%	*	87.8%	*	90.6%
Foreclosed on Home	*	10.5%	*	8.5%	*	7.1%
Saved Money in Last Year	62.5%	56.3%	62.1%	44.3%	59.2%	52.6%
Payments > 60 Days Late	11.2%	20.3%	7.4%	23.7%	11.4%	10.6%
Total Consumer Debt	\$40,175	\$33,663	\$22,349	\$24,492	\$20,453	\$21,725
Credit Card Debt	\$8,486	\$7,006	\$6,535	\$8,565	\$8,212	\$6,293
Education Debt	\$9,933	\$7,829	\$8,644	\$8,633	\$10,092	\$12,856
Vehicle Debt	\$14,873	\$15,889	\$10,479	\$9,173	\$8,092	\$7,858
Other Debt	\$1,760	\$66	\$465	\$2,813	\$622	\$2,548
Home Equity Line	\$15,056	\$10,702	\$4,872	\$3,941	\$3,526	\$5,026
Married	77.9%	74.3%	68%	60.6%	74%	70.9%
Employed	100%	95.7%	96.7%	95.5%	98.4%	93.2%
At Least a College Degree	29.6%	29.6%	34.2%	34.2%	42.3%	42.3%
Number of Kids	0.59	0.57	0.56	0.59	0.59	0.62
Age	40.4	42.5	38.2	40.5	42	44.3
White	79.3%	*	75.1%	*	69.7%	*
Black	10.8%	*	14%	*	20%	*
Hispanic	6.3%	*	8.4%	*	7.6%	*
Other Race	3.6%	*	2.5%	*	3%	*
n	38	38	118	118	155	155

Source: Federal Reserve (2015) Survey of Consumer Finances 2007/2009 weighted panel data.

There are many differences between these groups. One key difference is the greater probability of foreclosure as home equity falls. In contrast to the 10.5% foreclosure rate for homeowners with underwater mortgages, according to the Federal Reserve's Survey of Consumer Finances 2013 data, only 3.4% of homes were foreclosed with more than 20% equity in 2007.

In Table 1 we can see some similarities between the three groups (total consumer debt, marital status, employment, average number of kids and age); but differences are also noticeable. The median house price is lowest for underwater mortgages as is their savings rate, median net worth

(assets minus debts) and education level. Households with underwater mortgages have higher consumer debt-to-income ratios and higher total debt-to-income. Over one-fifth of households with underwater mortgages were late more than 60 days on any of their debts, which is much higher than the other two groups. Black households are also more likely to be underwater compared to the other groups.

Underwater and barely above water mortgages can have many negative consequences for the US economy. When a mortgage goes underwater, homeowners have difficulty selling their home. Since selling a home involves considerable costs (realtor commissions, legal fees, moving expenses, etc.), even if homeowners are a bit above water on their homes, they still may not be able to sell the home and move elsewhere because they cannot sell their home and move without repaying their mortgage. So, unless the homeowner has considerable cash available, the homeowner cannot sell their home, they cannot move and they cannot downsize. More importantly, they cannot take advantage of better jobs that might be available in other locations, and certainly they cannot use the equity in their home to finance their education or their children's education, or to start up a new business.

This became a problem for the US economy in the 2000s. During the early part of the decade home prices rose considerably. Inflation-adjusted house prices (for homes sold) in the United States rose over 35% between 1999 and 2005 peaking at \$245,749 (in 2009 dollars) (US Department of Justice, 2015). But household incomes increased only 0.5% during this same period—thus failing to keep up with the increase in home prices (US Census Bureau, 2015b). This meant that people buying a new home had to finance a large amount and a larger percentage of the price of the home. Also, with home prices increasing rapidly, many homeowners took out home equity loans. Some of these loans went to increase the value of the home through renovating a kitchen or bathroom or through actually increasing the number of bedrooms or bathrooms in the house. Other home equity loans went to pay

for normal living expenses since, as noted above, wages and incomes have failed to keep up with the cost of living for median income homeowners.

During the latter part of the 2000s, as home prices fell nationwide, many homeowners found that they had negative equity in their homes. This was reversed to some extent during the early 2010s. There are a number of reasons mortgages can move from being underwater to being above water.

First, home values have recovered in many regions from the low values experienced around 2010. Median sales prices for homes in the US grew almost 18% between 2010 and 2014 (in real terms). In fact, after adjusting for inflation, median sale prices were only 3% lower in 2014 than at the market's peak in 2005. Second, foreclosures and distressed sales can reduce the number and percentage of underwater homes. According to Dreier & Sen (2015), this is where most of the progress has taken place over the past half dozen years. They note that 5.8 million families lost their homes to foreclosure between 2006 and 2011, and that this is the main reason for the decline in the number of underwater mortgages. Third, homeowners can pay down part of their mortgage, maybe as part of a refinancing package. The extra money to do this can come from some windfall going to the homeowner (an inheritance, a gift from relatives, lottery winnings) or even selling some other assets in order to pay down one's mortgage. This has not taken place to a large extent in the US, despite several government programs to encourage mortgage write-downs. Finally, there can be a write-down of the mortgage in order to increase the chances that the homeowner will stay in the home and continue to pay their mortgage.

3. The Consequences of Underwater and Low-Equity Mortgages

Because the majority of the decline in underwater mortgages has been the result of foreclosures, and the second largest cause is the uptick in home prices, the US economy remains fragile and poised for

further economic and financial problems. Underwater homeowners are 150% to 200% more likely to default on their mortgages than those with positive equity (Ocwen Financial 2011).

Still, there are a number of reasons why homeowners continue to pay mortgages, including aversion to default, the consequences of default for getting credit in the future if it is needed and the fact that people buy homes that they like and in neighborhoods that they want to live in (e.g., good school system). Households are thus reluctant to give these things up by defaulting on their mortgages. Foote et al. (2008) found that individuals with underwater mortgages tend to continue paying their mortgage unless they experience some adverse event such as job loss or high medical bills.

First, the fact that homes were foreclosed means that something had to happen with these homes. Homes do not disappear when they are foreclosed. They are typically put up for sale at auction. A large number and a large fraction of the foreclosed homes have been bought by hedge funds such as Blackstone. The properties are then rented out. In 2013, Blackstone and Deutsche Bank offered the first “single-family rental-back securities”. These securities rely on payments from renters, which get funneled through to investors. Their success depends on keeping renters in rental properties and renters continuing to make their payments. This is a problem due to the stagnation of wages in the US. If the US dips into recession, these payments cannot be forthcoming, and these securities can fall in value dramatically as the supply of securities (which may soon reach \$1 trillion) finds no buyers.

Second, labor mobility is reduced because many people are tied to homes that they are unable to sell. Because homeowners are locked into their existing home, they cannot move if a better job opportunity presents itself; if they are unemployed they cannot move if offered a job if it is not within commuting distance. In addition, workers who are laid off may reduce job search time, accepting lower wage offers, because they fear not being able to pay their mortgage and losing their home. Had they

some equity, they may have been willing to tap it in order to continue their job search and obtain higher wages.

There is some empirical evidence that declining home prices reduce labor mobility. Ferreira et al. (2010, 2011), using the American Household Survey and data from before the Great Recession, find that underwater mortgages affect labor mobility rather substantially. Mobility rates decline by up to 35% according to their estimates. These results are robust over a number of different empirical specifications and econometric techniques. And while (Coulson & Greico 2013) find that underwater homeowners are more likely to move, this may be due to the fact that homeowners who are underwater are more likely to default for strategic reasons and then find a new place to live, thereby increasing mobility. This interpretation is supported by their finding that extreme levels of debt tends to *increase* housing mobility. For example, Andersson & Mayock (2014) find that there is a U-shaped relationship between housing equity and mobility—negative equity tends to reduce mobility until it reaches very high levels, at which point default and moving to a new residence become reasonable solutions. More ambiguously, Nenov (2012) looks at underwater mortgages by state and finds that it tends to increase migration to another state; however, it does not increase migration within the state or moving to another domicile within the state.

All this is likely to reduce socio-economic mobility. Social scientists measure mobility in terms of the extent to which the income levels of parents and children are correlated. The general method involves comparing the income quintiles of adults (those between 30 and 40 years old) with the income of their parents when they were that age. The fact that workers are less mobile and less able to take higher paying jobs due to being underwater on their mortgages makes it harder to have a better standard of living than one's parents, who did not face such constraints. In addition, as Thomas Piketty (2014) has pointed out, income inequality and wealth inequality go together, and mutually reinforce

one another. So the rise in underwater mortgages, and the lost wealth due to the bursting of the housing bubble, may reduce future returns to wealth (Piketty's r) to middle-class households and leave today's adults worse off than their parents. This may also have large consequences when today's adults reach retirement age without sufficient wealth to support them in retirement.

Third, underwater and barely-above water mortgages mean that homeowners cannot draw on home equity for spending. Instead, they need to rely on bank loans or credit card loans, which are considerably more expensive than home equity loans backed by a home. In addition, unlike credit card and bank loans, the interest paid on home equity loans are tax deductible, further reducing the cost to homeowners. This lack of demand for borrowing (and similarly the corresponding reduced willingness of banks to lend) will reduce spending on items that typically required borrowed money, such as starting up a small business and spending for education. Small businesses are responsible for almost all net job growth in the United States over the past 20 years, and home equity is a popular source of startup business financing. This relationship may account for some of the significant reduction in business startups over the past several years.

Fourth, there is the possibility of a serious debt-deflation problem, something first raised by Irving Fisher (1933). The problem that developed in economies experienced during the Great Depression, as Fisher noted, is that difficult economic times can lead to falling prices, making the real value of the debt more difficult to repay. This counters the Pigou or real balance effect, and may even overwhelm it. This is especially true when the gains in real wealth go to people with substantial wealth who are unlikely to spend more money because its real value has increased. In contrast, the loss of real wealth has a large impact on middle-income groups, which are more likely to spend any increase in real wealth. The result is that paying off past debt puts such a large burden on households and businesses that it reduces new spending by both households and business firms as everyone tries to deleverage.

Fifth, we can encounter a vicious cycle or a problem of negative cumulative causation. Defaults at the local level can lead to falling home prices and sales, which in turn lead to more underwater homes and then more mortgages going into default (Leonard & Murdoch 2009; Rogers & Winter 2009; Schuetza et al. 2008; Wassmer 2011). This process can continue unless and until something is done to reverse the decline in prices and increase in defaults.

Finally, consumers have deleveraged some of their consumer debt since the Great Recession, but significant outstanding debt still remains (Scott & Pressman 2015). Debt such as student loans continues to rise and presents problems for young families. These high debt levels reduce spending, as more money needs to be put to paying interest on past debt and reducing the debt levels that are not sustainable. In addition, defaulting homeowners will have poor credit scores, reducing their ability to borrow. It may even make getting a job or renting an apartment more difficult, as more and more employers and landlords check credit scores before hiring and before renting. As a result, consumer spending is sluggish and more volatile. This will make starting a small business more risky and further reduce the number of small-business startups. Add this to the stagnant incomes and the pieces are in place for a reduction in consumption. Since consumers are responsible for more than two-thirds of all spending in the US economy, the US economy remains fragile and grows too slowly. And should the economy head into a recession in the next year or so, all the problems noted above will become much greater.

In most of these cases, being slightly above water on one's mortgage should have similar consequences to being underwater. For example, given the costs of buying and selling a house (including realtor fees and putting down money on a new home or rental property), and moving to a new location, some positive equity will be necessary in order for the household to be able to do this. Using the first four waves of the British Household Panel Survey, Henley (1998) finds a strong

correlation between negative equity and geographic mobility. Genesove & Mayer (2001) find some evidence of loss aversion in higher asking prices (relative to market prices) when homeowners are underwater. In addition, homeowners may face loss aversion, a phenomenon found repeatedly in behavioral economics (Kahneman 2011, pp. 314-9). Cunningham & Engelhardt (2008) find more direct evidence of loss aversion in housing markets.

One issue not addressed by prior studies is that being nearly underwater can be as bad as actually being underwater. Moreover, in almost all previous empirical studies of these issues, nearly underwater mortgages are counted with mortgages that are above water. Thus, these studies are biased to find little or no effect of mortgage debt on economic outcomes since they include problem mortgages along with unproblematic mortgages.

4. Empirical Models

Our analysis is a study of what has happened to underwater and low-equity homeowners from the peak of the housing market around 2007 to 2009. For our study we use the Federal Reserve's Survey of Consumer Finances (SCF) panel data (2007 to 2009) on United States households' finances. The SCF data is collected triennially on around 5,000 households in the United States. The 2007/2009 panel is a unique dataset because it tracks the same households surveyed in 2007 (really 2006) and gave them the same survey in 2009. Due to factors such as non-compliance and inability to find the original survey takers, the 2007/2009 panel includes 3,857 households.

4.1. Small Business Failure

First, we look at the impact of home equity on small business failures. The SCF is valuable because of its detailed financial data on households (which is not often available in small business owner surveys,

which tend to focus solely on the business). Between 2007 and 2009 among homeowners with a small business there were 64 small business failures (a failure rate of 6.7%). As discussed above, small businesses play an important role in the US labor market (see Birch, 1987; Haltiwanger, Jarmin and Miranda, 2010). Small businesses are responsible for significant net job growth in the US. There is evidence that correlates entrepreneurs' home equity values with small business creation and operation (see Corradin and Popov, 2013; Harding and Rosenthal, 2013). Kennickell, Kwast and Pogach (2015) study the effects of the financial crisis and Great Recession on small businesses. While their study is more comprehensive and looks at broader questions, they too find that small businesses rely heavily on home equity for financing.

Our model builds on the work of Kennickell, Kwast and Pogach (2015) by comparing small businesses owned by homeowners with mortgages that failed to those small businesses that survived from 2007 to 2009. Our main objective is to see if households with less home equity (or more) were less likely (or more likely) to see their small businesses fail (or survive). We use a Logit model with a binary dependent variable that measures whether between 2007 and 2009 a small business failed (0)—i.e. went out of business, or survived (1)—i.e., was still in operation, sold, went public or was gifted to a family member. Our main variable of investigation is home equity, which we measure as a vector of four binary variables (<0-25% equity; 25-50% equity; 50-75% equity and greater than 75% equity)—we removed greater than 75% equity to serve as the base variable. We used this breakdown so that there were enough small business-owning households in each group. With a sample size of only 599 households the breakdown needed to be wide enough to allow for robust explanatory power. Likewise, consumer debt is a vector of four variables (broken down as quartiles based on frequency: \$1-\$3,700; \$3,701-\$12,400; \$12,401-\$30,550; \$30,551-\$1,000,000)—each provides a comparison to households without consumer debt. Race is a vector of four variables (white, black, Hispanic and other races)—

whites are removed as the base variable. The dummy variable $\Delta Income$ accounts for whether a household experienced a negative change in income (0) or a positive change in income (1). Another dummy variable $Late60$ determines if the household was past due on any of its bills in the last sixty days (1 if yes; 0 if no) in the latest survey (2009). The last parameter (δ) accounts for the following control variables: education, marital status and if they had a new child(ren). Equation (1) is our primary specification:

$$Failed = \alpha_0 + \beta_1 \sum_{r=1}^4 Home\ Equity + \beta_2 \sum_{g=1}^5 Consumer\ Debt + \beta_3 \sum_{v=1}^4 Race + \beta_4 \Delta Income + \beta_5 Late60 + \delta_{xi} + \varepsilon_i \quad (1)$$

Where Failed is the log odds ratio: $ln \left[\frac{p(failure)}{1-p(failure)} \right]$

Table 2: Logit Regression Results for Equation 1

Parameters	Odds Ratios
Home Equity1	1.629*
Home Equity2	1.173*
Home Equity3	0.892*
Consumer Debt1	1.504*
Consumer Debt2	1.501*
Consumer Debt3	0.923*
Consumer Debt4	0.815*
$\Delta Income$	0.75*
Late60	2.081*
New Kid(s)	1.032*
College Degree (at least)	0.776*
Married	1.175*
Black	7.586*
Hispanic	0.997
Other Race	0.298*
n	599

*Significant at 1%.

Source: Federal Reserve (2015) Survey of Consumer Finances 2007/2009 weighted panel data.

We see in Table 2 that our model generated significant results. The main finding is that small business owning households with the lowest level of home equity (up to 25%) in 2007 were 62.9%

more likely to see their businesses fail by 2009 compared to households with greater than 75% home equity. Also, small business-owning households in the next level of home equity (50-75%) in 2007 were actually 10.8% less likely to see their businesses fail by 2009 compared to households with at least 75% home equity. Small business owning households with consumer debt up to the 2007 median value (\$12,400) were more likely (by 50%) to have experienced business failure between 2007 and 2009; however, households with greater than the median amount of consumer debt were less likely to see their small businesses fail (perhaps as a result of households with more consumer credit being more creditworthy and thus able to sustain greater levels of debt). Small business owning households that experienced a positive change in income ($\Delta Income = 1$) between 2007 and 2009 were almost 25% less likely to see their small businesses fail by 2009. Not surprisingly, small business owning-households that were at least 60 days past due on any of their debts in 2009 were twice as likely to see their businesses fail by 2009 compared to those who had no past-due debt bills. Black homeowners with small businesses were over seven times more likely to see their businesses fail by 2009 compared to white owners.

4.2. Mobility

Second, we look at labor mobility. Of people who moved between the 2007 and 2009 surveys and took on new mortgages, 41.6% had less than 20% equity; 16.4% had between 0% and 10% equity; and 14.8% had negative equity. So, it might be argued that the lessons of the housing crisis did not change home buying behavior in a significant way.

The following models are partially proportional ordered Logit regressions that study if households with varying levels of home equity were more likely or not to move; move within the same city or move to a new city. The partially proportional ordered Logit model estimates multiple

equations. The number of equations estimated equals the number of categories in the dependent variable minus one. Each equation models the odds of being in the set of categories previously tested to the categories remaining. The only variable that is not proportional is whether someone moved, moved within the same city, or moved to a new city. These variables include estimates for each category of the dependent variable (minus the lowest level that serves as the base variable). The dependent variable is the amount of home equity a household had in 2007 broken down by quintile (0-20% equity; 20-40% equity; 40-60% equity; 60-80% equity and greater than 80% equity). We use this breakdown because we assume that because home prices fell by around 25% to 30% between these periods, anyone with 20% or less of home equity would be, *ceteris paribus*, low-equity homeowners. Parameters of interest are whether someone moved (and whether it was within the same city or to a new city), whether the person is self-employed (1 if self-employed; 0 otherwise) or lost their job between 2007 and 2009 (1 if yes and 0 if no). We are also interested in knowing if the household bought a home by the time of the 2009 survey (*OwnHome09*) and whether they had any ownership in a business (*Business Share* = 1) or not (*Business Share* = 0). The variable *Late60* is now whether the household was late by at least 60 days on any of their debts in 2009. The variables Δ Income, Consumer Debt and the control variables are the same as in Equation (1) above. Equation (2) is our primary specification:

$$\begin{aligned}
 \text{Home Equity} = & \alpha_0 + \beta_1 \text{Moved} + \beta_2 \Delta \text{Income} + \beta_3 \text{Self Employed} + \beta_4 \text{Lost Job} + \beta_5 \text{Late60} + \\
 & \beta_6 \text{New Kids} + \beta_7 \text{Business Share} + \beta_8 \text{OwnHome09} + \beta_9 \sum_{y=0}^4 \text{Consumer Debt} + \delta_{xi} + \varepsilon_i
 \end{aligned}
 \tag{2}$$

Where Home Equity is $\ln \left[\frac{\sum_{i=1}^5 (p_1 + p_2 + \dots + P_x)}{1 - \sum_{i=1}^5 p_1 + p_2 + \dots + P_x} \right]$

The only difference between the three equations is that for the first model (*Moved*) the independent variable moved is a dummy variable (1 if moved; 0 if not) and is tested against the five

categories of the dependent variable (minus the lowest level, which is the base). The second model (*Moved Same City*) has a dummy variable if the household moved within the same city (1) or not (0); and the third model (*Moved New City*) includes a dummy variable measuring if the household moved to a new city (1) or not (0). Since this model is a partially proportional ordered Logit regression, the variables representing moving are treated as having unequal slopes to the dependent variables (confirmed by testing the assumption of parallel regression), which is why only the “moved” variables are broken down by the dependent variable’s categories separately (similar to a multinomial Logit (or polytomous Logit)).

Table 3: Partially Proportional Ordered Logit Regression Results for Homeowners of Five Different Equity Levels Depending on Whether and Where They Moved (by Quintile)

	Moved	Moved Same City	Moved New City
	Odds Ratios		
<i>Moved (>80% equity)</i>	0.926*	1.321*	0.798*
<i>Moved (60-80% equity)</i>	0.779*	1.047*	0.713*
<i>Moved (60-40% equity)</i>	0.626*	1.01*	0.522*
<i>Moved (20-40% equity)</i>	0.679*	1.103*	0.589*
Δ Income	0.888*	0.888*	0.887*
Self-Employed	1.295*	1.296*	1.309*
Lostjob	0.723*	0.723*	0.722*
Late60 in 2007	0.569*	0.561*	0.557*
New kid(s)	0.531*	0.531*	0.53*
Business Share	1.016*	1.012*	1.011*
OwnHome09	3.846*	5.686*	4.725*
Consumer Debt1	0.713*	0.707*	0.717*
Consumer Debt2	0.596*	0.597*	0.596*
Consumer Debt3	0.427*	0.428*	0.426*
Consumer Debt4	0.404*	0.4*	0.4*
College Degree (at least)	0.858*	0.842*	0.863*
Saved07	1.004*	0.994*	1.001
Married	0.883*	0.879*	0.882*
Black	0.565*	0.567*	0.563*
Hispanic	0.728*	0.724*	0.724*
Other Race	0.918*	0.931*	0.917*
N	1,968	1,968	1,968

* Significant at 1%.

Source: Federal Reserve (2015) Survey of Consumer Finances 2007/2009 weighted panel data.

In Table 3 the *Moved* model shows the less home equity a household has the less likely there are to move relative to households with $\leq 20\%$ home equity. For example, people with between $>20\%$ and 40% home equity were 32.1% less likely to move. However, homeowners with greater than 80% equity were only slightly less likely to move (by 7.4%) compared to people with $\leq 20\%$ home equity. In the model *Moved Same City* we see that all four equity groups were more likely to move within the same city compared to households with $\leq 20\%$ equity. Homeowners with more than 80% equity were 32.1% more likely to move within the same city compared to those with $\leq 20\%$ equity. In the model *Moved New City* the each lower level of home equity decreases the likelihood of moving to a new city—compared to the lowest equity category.

Since the remaining independent variables are proportional odds (i.e., parallel) they are interpreted as simultaneous equations. For example, all three models show households that experienced a positive change in income were all less likely to be in the next higher-order group (i.e., have more home equity). In all three models, households that experienced a job loss were less likely (by more than 27% in all three models) to be in the next higher-order group, which means the less home equity households have the more likely they experienced job loss. In all three models, the more consumer debt a household has the less likely they are to be in a higher-order home equity group.

The last regressions we run are Logits that compare homeowners in 2007 with a mortgage that have less than or equal to 10% home equity compared to all other homeowners in 2007 with a mortgage (those households with $>10\%$ home equity). All these regressions include the same independent variables as Equation (2) above, except that the home equity variables are replaced with dummy variables representing whether a household moved between 2007 and 2009 (I), moved within the same city (II) or moved to a new city (III).

Table 4: Logit Regressions with $\leq 10\%$ Home Equity Compared to All Other Homeowners with a Mortgage in 2007

	I	II	III
	Odds Ratios		
Moved	1.083*		
Moved Same City		1.301*	
Moved New City			0.783*
Δ Income	0.656*	0.835*	0.838*
Self-Employed	0.837*	0.645*	0.648*
Lostjob	0.833*	0.834*	0.84*
Late60 in 2007	1.277*	1.291*	1.314*
New kid(s)	1.046*	1.882*	1.885*
Business Share	1.878*	1.05*	1.055*
OwnHome09	0.261*	0.261*	0.211*
Consumer Debt1	2.155*	2.14*	2.141*
Consumer Debt2	2.049*	2.062*	2.055*
Consumer Debt3	3.209*	3.225*	3.209*
Consumer Debt4	3.152*	3.183*	3.2*
College Degree (at least)	0.881*	0.869*	0.882*
Saved07	1.158*	1.154*	1.158*
Married	0.849*	0.847*	0.849*
Black	1.283*	1.287*	1.28*
Hispanic	1.12*	1.123*	1.118*
Other Race	0.592*	0.596*	0.593*
Hosmer-Lemeshow	0.184	0.418	0.258
N	1,974	1,974	1,974

* Significant at 1%.

Source: Federal Reserve (2015) Survey of Consumer Finances 2007/2009 weighted panel data.

In Table 4 we see that all three Logit regressions pass the Hosmer-Lemeshow test for goodness-of-fit (null hypothesis is that the model fits well). First, we see that those who moved (I) were more likely (by 8.3%) to have $\leq 10\%$ home equity in 2007; and those who moved within the same city were much more likely (by 30.1%) to have $\leq 10\%$ home equity in 2007. Interestingly, those who moved to new cities (III) were less likely (by 21.7%) to have $\leq 10\%$ home equity in 2007. Those households that experienced a positive change in income (Δ Income) were less likely to be in the low home equity category in all three models. Also, those who experienced a job loss were also less likely

to fall in the lowest home equity category in all three models. Those households that had a new child(ren) between 2007 and 2009 were all more likely to have less than or equal to 10% home equity—but this is especially true for households that moved within the same city or to a new city. Households that owned a home in 2009 were all much less likely (by over 70%) to be in the lowest level of home equity.

5. Some Policy Solutions

Finally, some good news and some bad news. The good news is that there are several ways out of our current predicament. The bad news is that these policy solutions are unlikely to happen anytime soon given the political pressures and pressures from wealthy campaign contributors to maintain the status quo. This, in large part, is why these solutions were not enacted after the collapse in housing prices and the economy in 2008 or thereafter, during the ensuing Great Recession. If these changes did not take place in a time of crisis, when there was some impetus and a reason for enacting them, it is less likely that they will be put in place as the US economy approaches something close to full employment and as the percentage of underwater homes continues to fall (albeit slowly).

It is clear there has been a policy failure in Washington. The above analysis points to the need to do something to help underwater homeowners and homeowners barely above water.

A write-down of underwater mortgages and near underwater mortgages is the quickest and most direct means of doing this. As noted above, there are externalities to having a large number of underwater mortgages and benefits to individual communities and the entire economy if homeowners can be helped to stay in their houses and if homeowners can spend more money on consumption goods rather than on repaying their mortgages. However, there is a political problem. Any attempts to provide

large taxpayer subsidies to homeowners perceived as being irresponsible because they made bad decisions is unlikely to fly in Washington.

One easy way to do this is through bankruptcy reform. Currently, most homeowners underwater cannot reduce the value of their obligations through bankruptcy proceedings. As documented by Jennifer Taub (2014), the Supreme Court ruled in 1993 that homeowners could not reduce their mortgage debt via bankruptcy. At this point, financial institutions developed a false sense of security. They thought borrowers would be forced to repay mortgages no matter what, so they could lend without worrying about write-downs.

Mortgage reductions would let bankruptcy judges reduce the principal owed on underwater mortgages to the current value of the home under a Chapter 13 bankruptcy filing. This provides an alternative to default and would stop strategic foreclosures. It would also give underwater homeowners more leverage with loan service firms to have their mortgages renegotiated so that they could eliminate their negative equity.

The Obama administration proposed this in 2009, but Congress failed to act, mainly due to extensive lobbying by mortgage lenders. Another objection to write-downs is that would clog the bankruptcy courts, and that bankruptcy judges are not qualified to make judgements about mortgage write-downs. However, the number of bankruptcy filings has fallen from 1.2 million during most of the early 2010s to 875,635 in 2014 and looks to be even lower in 2015. As a result, the argument stemming from overcrowded and overburdened bankruptcy courts does not seem to hold water. And as for the claim that judges cannot make judgements, this is really no longer necessary since we have reasonably good estimates of home values and since the courts will only be able to lower mortgage debt to the estimated home value.

In February 2010 the Obama administration announced a plan called “HASP” (short for Homeowner Affordability and Stability Plan). It provides \$75 billion to support loan modifications and refinancing. However, eligibility for this program requires that the mortgage loan does not exceed 105% of the property’s appraised value. This disqualifies many underwater and low-equity homeowners from reaping the benefits of this program.

A second way to help homeowners would be to create a public agency modelled on the Home Owners’ Loan Corporation during the Great Depression. That agency would buy up outstanding mortgages, reduce interest rates on these mortgages, and then help homeowners to pay their mortgages and remain in their homes. Another possibility (Ocwen Financial 2011) would be for mortgages to be reduced but any appreciation in the value of the home be divided between the government, the lender and the homeowner.

The Home Owners’ Loan Corporation (HOLC) was established in 1933 to deal with the large number of mortgages in default during the Great Depression. It provided loans at 80% of appraised value for homes worth \$20,000 or less (\$336,000 today), and sought to keep people in their homes by providing assistance in collecting unemployment insurance, seeking paid work, and even finding tenants to help pay the mortgage (Harriss 1951, pp. 67f.). The government printed \$2 billion of bonds (\$33 billion in today’s dollars) to purchase mortgages and then refinanced them at low interest rates. Interest rates were 5%, around 1-2 percentage points below market rates at the time. Second liens could be refinanced as well as past due property taxes, but the total loan could not exceed 100% of assessed value. Investors who sold their mortgages to the government got paid in bonds. Unlike HAMP (which reduces interest rates for only 5 years), HOLC resets were permanent.

Around 20% of HOLC loans went into foreclosure; the government had to sell the property, just as banks do when they foreclose on home loans. The remaining 80% were repaid with interest. All

told, the government made a little money from HOLC (Harriss 1951). Even if this estimate is a bit on the high side, the gains from stabilizing the economy and from keeping people in their homes and making mortgage and property tax payments would surely have been worth the small expense.

Replicating this today would require the US Treasury to purchase mortgages that qualify. It could then modify loans any way they wanted. Since the 80% figure worked well in the 1930s, when there were similar problems, it should probably also work well today. Providing mortgages at 1-2 percentage points below market rates means refinancing at 2.3%, given mortgage rates in mid-2012 averaged 3.8%. The savings for a family with a \$250,000 mortgage would be \$200 per month. Given 10-year bond rates are less than 2% in mid-2012, the government can again come close to breaking even if 20% of loans go into foreclosure and the government loses half the value of a mortgage on each foreclosed property.

Finally, something can be done about the mortgage deduction and the property tax deduction. As a tax expenditure (see Surrey & McDaniel 1985; Noto 1980), these are essentially upside down subsidies-- that they don't help households most in need. People in top tax brackets get back large fractions of their mortgage interest while people in low tax brackets (who need the most help) get little or nothing back. Households get back little if they are in the lowest (10 percent tax bracket). Those who owe little or no taxes (before the deductions) effectively get back nothing from the government. This makes it harder for households struggling to make their monthly mortgage payments (which will include their property taxes). It would be relatively easy to convert the mortgage deduction into a refundable tax credit at no loss of revenue.

Part of the reason for this is that wealthy households are in higher tax brackets and so get back more money on each dollar of interest paid. To take a simple example, if you pay \$10,000 in mortgage interest during the year and are in the 10% tax bracket, you save just \$1,000 in taxes. If you are in the

top (35%) bracket, your tax savings is \$3,500. Third, higher income taxpayers are more likely to itemize their deductions, which is necessary to gain from this tax provision. In addition, the gain is only the excess deductions over the standard deduction. Some moderate income households may be able to deduct from their taxes a small portion of their mortgage payments and get back much less than \$1,000. Fourth, there is the cost. Estimates are that the mortgage interest deduction will cost the Treasury \$131 billion in 2012 and the property tax deduction another \$31 billion. Most of this money goes to the very wealthy, who are in the highest tax bracket. Very little goes to middle-class households. Virtually nothing goes to low-income households with little income tax liability (Toder et al. (2010); see also Drier & Atlas 1992).

The Congressional Budget Office (2013) suggested converting the mortgage interest deduction into a 15% tax credit. It noted that such a change would result in no revenue loss to the Federal government and even result in a small revenue gain. Toder et al. (2010) estimate that replacing the mortgage interest deduction with a 19.2% non-refundable credit would be revenue neutral for the government. It would result in small losses for those in the top income quintile, but gains for everyone else, including gains of a few hundred dollars (around .3% of income) for the middle and fourth income quintiles.

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