The Effect of Underwater Mortgages on Unemployment

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Abstract

It has been frequently claimed that the high unemployment rates during the 2007-2009 U.S. recession and the slow decline in unemployment rates during the subsequent economic recovery are partially due to an increase in structural unemployment driven by reduced mobility caused by house lock. The claim is that underwater homeowners—those that owe more on their mortgages than their homes are worth—are more likely to choose to stay in their home rather than move to cities where they would have been more likely to find employment. Using restricted-access data from the Panel Study of Income Dynamics, we compare the mobility and employment of homeowners with mortgages that go underwater to similar homeowners that do not find themselves underwater during the housing bust. We find that underwater homeowners are twice as likely to move and are no more likely to experience a period of unemployment. We find no evidence to support the claim that the house lock from underwater mortgages caused an increase in structural unemployment.

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1. Introduction

The prevalence of underwater mortgages is frequently cited as a factor that contributed to the high unemployment rates during and following the 2007-2009 U.S. recession. The hypothesized mechanism is that some homeowners who experience a large decline in the value of their home end up underwater, implying that the value of their home is less than the remaining balance on their mortgage. It is more difficult to sell an underwater home because the homeowner would either need to bring money to the closing or negotiate a short sale where the lien holder agrees to accept less than the remaining balance on the home mortgage. This additional constraint to selling a home may reduce the homeowner's ability to move and is known as house lock. Individuals may also experience loss aversion in selling a house at below its purchase value and be effectively locked in through this channel (Chan 2001). The reduction in mobility from house lock may prevent some unemployed underwater homeowners from moving to where they would have found employment had they not been underwater.

Several studies have found supporting evidence. Chan (2001), Englehardt (2003), Ferreira, Gyourko, and Tracy (2010, 2011), and Modestino and Dennett (2013) all find evidence that underwater homeowners have reduced mobility. Linking house lock to unemployment, Estevao and Tsounta (2011) find that the level of skill mismatch in a state has a stronger impact on the unemployment rate in states with more underwater homes.

However, homeowners with an underwater mortgage may be more likely to move as a way to escape their mortgage payments. Because home mortgages in the U.S. are nonrecourse loans in which the debt is secured only by the home itself, the lender can only seize the home but cannot seize other assets or garnish wages if the homeowner defaults on the mortgage. A large drop in housing prices may provide a strong incentive to default on the home mortgage even

though there are credit score and social costs to doing so. This cost of default (in terms of stigma and restricted future borrowing ability) may be less than normal during a deep nationwide recession.

The claim that house lock restricted the mobility of underwater homeowners and thus prevented them from finding jobs is criticized by Molloy, Smith, and Wozniak (2011) who use Census, CPS, and IRS data to show that the migration rates did not decline in areas that were hardest hit by the housing bust, relative to the national trend. Schulhofer-Wohl (2012) find that underwater homeowners are more likely to move, using the same recent American Housing Survey data as Ferreira, Gyourko, and Tracy (2010), but a different definition of moving. Donovan and Schnurre (2011) use county-level data from the American Community Survey (ACS) and find higher out-of-state mobility but lower within-county mobility in counties that experienced greater declines in house prices.

Both the Molloy, Smith, and Wozniak (2011) finding that out-migration rates did not decline in areas with the largest fraction of underwater mortgages and the Donovan and Schnurre (2011) finding that out-of-state mobility actually increased in counties that experienced greater declines in house prices are not surprising given that individuals in those areas faced poor economic conditions and thus had a strong incentive to move. The real question is if an underwater homeowner faced a higher risk of unemployment relative to an observationally equivalent homeowner with slightly more home equity. Most of the recent literature cannot answer this question because it compares migration rates of areas with a high percentage of mortgages that are underwater to areas with a low percentage rather than using data on individual homeowners. One exception are the Schulhofer-Wohl (2012) and Ferreira, Gyourko, and Tracy (2010, 2011) studies which use American Housing Survey (AHS) data. However the AHS

follows homes, not individuals, and therefore is well suited to studying moving, but not unemployment as anyone who moves would be dropped from the data.

In contrast to these prior studies, we use restricted-access individual-level data from the Panel Study of Income Dynamics (PSID) that allows us to identify specific homeowners with underwater mortgages. We compare both the mobility (in terms of short- and long-distance moves) and the incidence of unemployment for these underwater homeowners to those of a similar group of homeowners who are not underwater. Using individual data also allows us to investigate whether individuals with underwater mortgages were more likely to change jobs. Our approach is similar to Valletta (2013) who uses CPS data to compare unemployment duration for homeowners and renters across geographic areas with different fractions of underwater mortgages. However, Valletta (2013) does not observe if a particular homeowner is underwater and thus has to rely on the same geographic variation in the prevalence of underwater mortgages that most of the recent literature uses for identification. To deal with the obvious selection problem, Valletta (2013) uses renters in the same geographic area as a control group. We view our control group of similar non-underwater homeowners in the same geographic area as better. Renters are quite different than homeowners, particularly in their mobility and employment expectations. While we believe our identification strategy is superior, ultimately our results are quite similar. We find that underwater homeowners during the recent U.S. housing bust are twice as likely to move and no more likely to become unemployed than similar non-underwater homeowners. We find weak evidence that suggests that underwater homeowners may be more likely to experience a job change, but this would be consistent with our finding that underwater homeowners are four times more likely to move to a different MSA.

2. Data

We use data from the Panel Study of Income Dynamics (PSID), a longitudinal household survey that began in 1968. Our data is a nationally representative sample of households in the U.S. from 2005 to 2009. Households are surveyed every two years and we only include those households with at least two consecutive survey responses (either 2005 and 2007, 2007 and 2009, or both) over this time period. The sample is restricted to homeowners with a mortgage in the first response period. Approximately 8 percent of the homeowners are already underwater in period 1 (either 2005 or 2007).

As is common in the literature, we define a homeowner as being underwater if the loan to value (LTV) ratio exceeds 0.94. The reason for selecting 0.94 rather than a LTV of 1.00 as the underwater cutoff is that homeowners incur closing costs in selling their homes and 0.94 represents an average breakeven point.[1] For individuals who have a second mortgage (26% of the sample) the underwater classification simply depends on whether the sum of these loans is greater than 94% of the house value.

Underwater status in period 2 is imputed rather than measured directly. There are two main reasons for this approach. First, individuals may have difficulty accurately evaluating changes in house values during this period of large declines in home values. Secondly, when an individual moves, we do not observe the self-reported change in the value of the home.

To avoid these problems we impute home value in period 2 for all homeowners using the Lovenheim and Mumford (2013) imputation method. We multiply the self-reported house value in the first period by one plus the change in the local house price index (HPI) provided by the

[1] Chan (2001) also notes the importance of closing costs in selling and uses LTV's less than 100% to represent lock-in.

Federal Housing Finance Agency to obtain an imputed home value in period 2.[2] The HPI varies at the level of the Core Based Statistical Area, which includes Metropolitan and Micropolitan Statistical Areas.[3] For houses located outside these CBSAs, we use the State Nonmetropolitan HPI to impute housing values.[4] The variation in the imputed home values in period 2 comes from the CBSA-level house price shocks and removes any homeowner-specific bias and neighborhood effects.

Our variable of interest is an indicator for being underwater in period 2 only. These are homeowners with a mortgage who were not underwater in period 1, but found themselves underwater in period 2. Similar homeowners who experience the same decline in home value, may differ in their underwater status in period 2 because of differences in their mortgage payment behavior, mortgage loan terms, and the mortgage balance in period 1. To remove any homeowner behavior, we impute loan values in period 2 using the interest rate and other loan characteristics from the first period to impute the remaining mortgage balance in period 2 under the assumption that the homeowner continues to make mortgage payments as scheduled.[5] This imputation removes homeowner mortgage payment behavior from our treatment variable

[2] We use the Federal Housing Finance Agency's All Transactions Index, which constructs house price indices using sales prices and appraisal data. We construct the percentage price change over the two response periods, using the 2nd quarter HPI index in each response year. Lovenheim (2011) shows that the self-reported house values in the PSID contain little systematic bias.

[3] As of February 2013, the Office of Management and Budget has defined 917 CBSAs in the U.S. Of these, 381 are Metropolitan Statistical Areas, and 536 are Micropolitan Statistical Areas.

[4] The Federal Housing Finance Agency's All Transactions Index does not report State Nonmetropolitan HPI for Rhode Island, D.C., and New Jersey. Therefore, in these cases, we assume houses located outside CBSAs change value according to the largest CBSA in the state (Providence-New Bedford-Fall River for R.I., Washington-Arlington-Alexandria for D.C., and Newark-Union for N.J.).

[5] The following formula is used to impute the loan balance at time$t$: $B = L[(1+c)^n - (1+c)^p]/[(1+c)^n - 1]$ where B is the loan balance after p months, L is the original loan balance, c is the interest rate divided by 12, and n is the number of months left on the mortgage. If our imputed loan balance B is negative, we set it equal to 0. Likewise, if individuals report the years left on the mortgage to be 2 or less, we set the imputed loan balance equal to 0 as it will be paid off by the next period. Interest rates are top coded at 10.

(underwater in period 2 only) leaving only the CBSA-level house price shock and the mortgage balance and other characteristics as the sources of variation in the treatment variable.

The outcomes of interest are an indicator for being unemployed in period 2, an indicator for changing jobs between periods 1 and 2, and an indicator for moving between periods 1 and 2. If the homeowner moves, we observe whether the move was a long-distance move to a new CBSA or a short-distance move (within the same CBSA). The results from regressions of each of these five outcome variables on an indicator for being underwater in period 2 only as well as other control variables are reported in Table 1. The results are not what we expected. They indicate that homeowners who go underwater are less likely to experience unemployment and more likely to move than similar homeowners who do not go underwater.

Perhaps the issue is that there is a very large number of homeowners in the data with high levels of housing equity in period 1 and who have little chance of finding themselves underwater in period 2. This group of high-equity home owners are a poor control group for the treated group of underwater homeowners. While we control for many factors, including the level of home equity in period 1, we may be asking too much of the regression model when these high-home-equity individuals are included.

Follwing Dehejia and Wahba (1999), we trim the sample based on the propensity score for becoming underwater. We estimate a probit model where the dependent variable is an indicator for having an underwater mortgage in the second period and the independent variables include all the observed variables from the first period including the house value, home equity, income, and financial wealth. Consider Figure 1, which graphs the propensity scores for being underwater in period 2 for two groups: those who actually were underwater in the second period

(the treated group) and those who were not underwater in the second period (the untreated group). Note that there is very little common support and that the majority of the untreated sample has a propensity score of approximately zero.

We therefore restrict our sample to obtain a group with a similar number of treated and untreated individuals, where the untreated individuals in the control group have propensity scores more similar to the treated group. To this end, we keep untreated individuals with the highest 10% of propensity scores for becoming underwater. In order to obtain common support, we also exclude treated individuals with propensity scores below this cutoff.[6] Figure 2 illustrates that this restricted group of untreated individuals is a much better match in terms of the probability of becoming underwater.

This subsample consists of 968 individuals.[7] Of these, 403 are treated (underwater in period 2) and 565 are not. Summary statistics are provided in Table 2. Columns 1 through 5 provide summary statistics for the relevant subsamples: those underwater only in the first period, those underwater only in the second period, those underwater in both periods, those who were never underwater, and the full subsample of 968 individuals.

As our empirical strategy relies on the fact that many individuals become underwater in the second period as a result of falling house prices, it is useful to compare columns 2 and 4. Column 2 displays results for those who are only underwater in period 2, while column 4 displays results for individuals who were never underwater in either period. These two groups have very similar levels of income, house values, and interest rates and are also similar in terms of age and education.

[6] This excludes very few treated individuals, 39 in total.
[7] There are 619 unique households in this sample.

3. Empirical Specification

We use a probit model to estimate the impact of an underwater mortgage on an individual's probability of being unemployed. Equation (1) is our primary specification:

$$Y_{ist} = \beta_0 + \beta_1 UW2_{ist} + \delta X_{ist} + \lambda_s \, x \, \gamma_t + \varepsilon_{ist} \qquad (1)$$

The primary variable of interest is an indicator for being underwater in period 2 only ($UW2$). Those homeowners who are never underwater are the control group so that we compare the homeowners who were never underwater to those who were initially "above water" and then experienced a large home value decline which pushed them underwater in period 2.

Our identification strategy depends on the comparability of those who were never underwater and those who became underwater in period 2. If the severity of the housing market decline is essentially random from the point of view of the homeowner, this supports our identification strategy. The control variables (X) include age, gender, race, ethnicity, marital status, education level, income, household size, real estate holdings, previous employment status, and indicators for whether a homeowner was underwater in period 1 only or underwater in both periods. We also include a refinanced measure, and two additional measures of wealth. The refinanced variable indicates whether the individual has refinanced any mortgage and captures the type of individual that is forward looking and well informed about their own mortgage status and the economy. Financial wealth is the sum of the value of any stocks or bonds, as well as any IRAs and annuities held by a household. Non–liquid wealth is the sum of the value of real estate and vehicles owned by a household minus the value of any debt.[8]

[8] Wealth and income variables, as well as house values, are reported in tens of thousands of dollars.

With one exception, control variables are measured in the first response period. Outcome variables are measured as occurring between the first and second periods, i.e. becoming unemployed, changing jobs, or moving at any time between response periods. We include state-by-year fixed effects to account for unobserved characteristics and include the county-level unemployment rate in period 2 to control for county-specific economic conditions. While the unemployment rate is measured in period 2, it corresponds to the county in which the individual lived in the first response period in order to avoid any potential reverse causality with using unemployment status and mobility as dependent variables.

While the PSID sample weights were used to calculate the summary statistics, we estimate the causal effects of an underwater mortgage without using sample weights. If the model is correctly specified and the error term in equation (1) is not related to the sample weights, then weighting is unnecessary (Solon, Haider, Wooldridge, 2013). However, we also report results from estimation using the sample weights alongside the un-weighted estimates as a robustness check. In addition, we also report results using the full unrestricted sample of homeowners with a mortgage, rather than our restricted sample of only treated and similar untreated homeowners.

All reported results are average marginal effects from a probit model specification of equation 1. For robustness, we estimate the corresponding linear probability model for every reported specification and in each case the results are similar. While we do not report the linear probability model results, they may be obtained from the authors on request.

4. Results

We first discuss results with respect to estimating equation (1) and consider how becoming underwater affects unemployment. Next, we consider another measure related to unemployment, job switching. Further, because mobility is a major mechanism affecting unemployment, we also investigate the effects of becoming underwater on mobility.

Unemployment

In the period 2 survey, each individual is asked if they experienced an unemployment spell since the previous survey. We use this as the binary dependent variable. Results from estimating equation (1) are shown in Table 3, where each column introduces additional controls. For every specification, we report the average marginal effect with robust standard errors clustered at the state level. The wide set of controls discussed in section 3, as well as the county-specific unemployment rate and state-by-year fixed effects are added across columns 2 through 4. Our preferred specification is column 4. As robustness checks, column 5 presents results from the full specification using sampling weights and column 6 displays results using the full unrestricted sample.

While those who start in period 1 with an underwater mortgage are more likely to become unemployed (though this result is not statistically significant), there is no evidence that a housing price drop that pushes mortgages underwater in the second period increases the likelihood of experiencing an unemployment spell. In fact, the point estimates for β_1 are negative in each specification in which we include controls. Note that this result is robust to using sampling weights and to using the full unrestricted sample.

Therefore, while much of the literature describes how negative equity creates house-lock effects that could constrain mobility and thus lead to greater unemployment, we find no evidence supporting this claim for the recent housing bust.[9] This is consistent with Valletta (2013), who finds no evidence of increased unemployment duration due to a decline in housing prices.

We do not investigate if there are any lagged unemployment effects. This analysis is not possible with our data, so while we cannot rule out lagged effects, we are confident that there were no short-term unemployment effects during the recent housing bust from a mortgage going underwater. There may be heterogeneous effects depending on how far underwater the home goes, so we explore this later in the paper.

Job Change

We also investigate if going underwater affects a homeowner's ability to change jobs or find new employment. We construct a simple measure of job change that indicates whether an individual switched employers at any time since the previous response period, or switched from unemployed to employed. These are "good" changes for workers who switch employers to take advantage of better employment opportunities. Even for those workers who are switching to a worse job, these are still good moves if the alternative was unemployment. This variable is 0 if an individual remained employed but never switched employers, moved from employed to unemployed, remained unemployed, or moved from employed to not in the labor force. If house lock constrains homeowners ability to switch jobs we would expect β_1 to be negative.

[9] Henley (1998), using data from the U.K. from 1991-1994, and Chan (2001), using data from the U.S. in 1989-1994, find evidence of lock-in. Ferreira et al. (2010), using U.S. data from 1985 to 2007, also find evidence of lock-in effects using American Housing Survey (AHS) data.

Table 4 shows that there is no evidence that individuals are constrained from switching jobs as a result of going underwater during the recent housing bust. The estimates of β_1 are positive implying that those whose mortgage goes underwater are more likely to switch jobs, though the estimates are not significantly different from zero. This result is consistent with our prior result that having one's mortgage go underwater does not increase the likelihood of unemployment.

These results are surprising when we consider the prior evidence that underwater homeowners are locked in to a particular geographic labor market. Though perhaps in this recent housing bust, the house-lock effect was weak as suggested by Schulhofer-Wohl (2012) and Molloy, Smith, and Wozniak (2011). To explain our finding of no increase in unemployment or decrease in ability to change jobs in response to having one's mortgage go underwater, we investigate the mobility of these underwater homeowners.

Mobility

The PSID tracks individuals over time which is an advantage over the other data sets previously used to study the effects of negative equity on mobility, such as the American Housing Survey (AHS) where houses are tracked over time rather than individuals.[10] Valletta (2013) is unable to analyze mobility because he uses CPS monthly survey data which does not track individuals if they move. Additionally, much of the literature investigates labor migration and uses state-level or other aggregate data and as such cannot track individual mobility (Molloy, Smith, and Wozniak 2011).

[10] Ferreira et al. (2010, 2011) and Schulhofer-Wohl (2012) both use AHS data where an individual is classified as having moved if new occupants reside in the house in a subsequent survey period.

The PSID Geocode data provides information on several levels of mobility including the state, MSA, CBSA, county, and census-tract levels. Therefore, we can analyze whether being underwater affects local mobility compared to long-distance mobility and search for evidence of house-lock at either level of mobility.

We start with the broadest definition of a move in the PSID Geocode data. If the individuals has moved to a new state, MSA, CBSA, county, or census tract then we code this individual as having moved. This means that individuals who move to a new home within the same census tract are not observed as having moved. However, census tracts are small areas that generally have a population of only 1,500 to 8,000. A city with a population of 50,000 will commonly have more than 10 census tracts implying that we are able to observe many within-city moves.

Using this broad definition of moving as the binary dependent variable, we again estimate equation (1) and report the results in Table 5. We find that having one's mortgage go underwater increases the probability of moving about 7 or 8 percentage points, nearly doubling the likelihood of moving. It is true that younger homeowners are both more likely to have their home go underwater and are more likely to move, but the estimation both controls for age groups and uses a selected control sample that has a similar likelihood of having an underwater home in the second period.

We view the results in Table 5 as strong evidence against a house-lock effect during the recent housing bust, consistent with Schulhofer-Wohl (2012). Note that the size and significance of this effect remain fairly constant even with the inclusion of individual controls, county unemployment rates, and state-by-year fixed effects. As shown in columns 5 and 6, the estimates

are similar when estimated with sample weights and when estimated using the full unrestricted sample. This increased mobility likely explains why we do not see an increase in unemployment in Table 3 or a decrease in job changes in Table 4 when the individual's mortgage goes underwater. While it is clear that individuals who become underwater are more mobile, there are various types of mobility that may have different labor market implications.

We define a long-distance move as a move to a new MSA and define short-distance moves as moves within the same MSA to a new census tract. As Donovan and Schnurre (2011) point out, short-distance moves likely represent moves for purposes other than finding new employment opportunities, as a local move leaves an individual within the same geographic job market. Conversely, long-distance moves are more likely to coincide with a job change than short-distance moves within the same MSA. We investigate if a home going underwater has a larger effect on long-distance or short-distance moves.

First, we consider the long-distance moves. Table 6 displays the results where the dependent variable is an indicator for moving to a new MSA. The estimated effect of one's mortgage going underwater in the second period is positive, statistically significant, and similar across all specifications. The size of these estimates suggests that much of the mobility effect is an increase in long-distance moves. This is unsurprising because most homes that went underwater were located in MSAs with very poor labor markets. Moves to a new MSA likely coincided with a change in employment.

Table 7 presents the results for the short-distance moves. The estimates here are also positive, though smaller and less statistically significant than those for the long-distance moves. Still, the results indicate that there is a statistically significant increase in short-distance moves in

response to one's mortgage going underwater. These moves are more likely to be moves into a rental property or a smaller/lower-quality home and are less likely to coincide with a job change. This includes instances where the individual defaults on the underwater mortgage but stays in the same city.

Our finding of a strong positive mobility response is consistent with individuals moving to a new location to take advantage of employment opportunities and, to a lesser extent, defaulting on their mortgage and downgrading locally. This result runs opposite to the findings in Chan (2001) and Henley (1998), though they are using data from an earlier time period. The apparent discrepancy could be explained by a reduction in the cost (financial and stigma) of a short sale or a default during the recent housing bust as compared to previous periods. This would cause the mobility and employment effects to be different for this housing bust as compared to previous busts, though an investigation of this is beyond the scope of the paper.

Evidence of a Nonlinear Effect

As suggested earlier, there may be heterogeneity in the response to one's mortgage going underwater depending on how far underwater the mortgage goes. If the mortgage dips just a bit underwater, the homeowner would likely be less willing to take the credit score hit and bear the stigma that accompany default than a homeowner whose mortgage is tens of thousands of dollars underwater. To investigate this we take the simple approach of interacting the indicator for having an underwater mortgage in only period 2 with a measure of the amount of negative equity as in equation (2):

$$Y_{ist} = \beta_0 + \beta_1 UW2_{ist} + \alpha_1(HNE_{ist} * UW2_{ist}) + \alpha_2(LNE_{ist} * UW2_{ist}) + \delta X_{ist} + \lambda_s \, x \, \gamma_t + \varepsilon_{ist} \quad (2)$$

Here, HNE and LNE (low negative equity) are indicator variables for whether an individual who is only underwater in period 2 is above or below the median equity level in period 2, within this group. The variable LNE indicates that the homeowner is just a little underwater while HNE indicates that the homeowner is far underwater.

The average marginal effects from the probit estimation of equation (2) are reported in Table 8. Rather than report various specifications to show the robustness of the results, we simply report results from a specification that includes all the control variables as well as the state-by-year fixed effects, similar to column 4 in Tables 3 through 7. Each column of Table 8 presents results for the 5 binary dependent variables considered in Tables 3 through 7: unemployment spell, job change, any move, long-distance MSA move, and short-distance census tract move.

The results in column 1 indicate that among homeowners whose mortgage went underwater in the second period, those who are far underwater (high negative equity) are more likely to become unemployed than those who are just a little underwater (low negative equity). The results in column 2 indicate that those with low negative equity are more likely to switch jobs than those with high negative equity. This suggests that those who go farther underwater are worse off, though neither of these results is significant.

There are significant differences in mobility for those with low and high negative equity. Those with high negative equity, who are underwater in period 2 only, are more likely to move overall and are more likely to have a short-distance move. Those with low negative equity are less likely to move than those with high negative equity, but those with low negative equity are much more likely to move to a new MSA as a result of becoming underwater.

The finding that those with high negative equity are most mobile overall is consistent with Schulhofer-Wohl (2012). However, because our data allows us to distinguish short-distance and long-distance moves, we observe that those with high negative equity are more likely to have a short-distance move while those with low negative equity are more likely to have a long-distance move. This is an important distinction because moving only a short distance is less likely to be associated with a change in employment and is more likely to be a housing downgrade or a switch to renting. Those with low negative equity are more likely to move to a new geographic labor market and have access to new employment opportunities, which is consistent with this group being less likely to become unemployed and more likely to switch jobs.

Heterogeneity in the Effect by Income and Education

High-income homeowners may respond differently than low-income homeowners to a housing price drop that leaves their mortgage underwater. Those with less income may have less financial flexibility to reduce expenditures and allow them to sell their underwater house. This may affect their ability to find employment. Similarly, those with some college experience (anywhere from 1 year of college to a graduate degree) may respond differently than those with no college experience to an underwater mortgage. A college-educated homeowner may have a better understanding of the options available to those with an underwater mortgage and this could have employment effects.

We split the group of homeowners with a mortgage that was not underwater in period 1 but is imputed to be underwater in period 2 into those with above median income for the group and those with below median income for the group. Similarly we split the same group of homeowners who were only underwater in period 2 by education into those with at least some

college experience and those with no college experience. In the same format as Table 8, we report the income results in Table 9 and the education results in Table 10.

Table 9 shows that those with a higher income are more likely to respond to having their mortgage go underwater by a long-distance move to a new MSA. The point estimates suggest that they may be more likely to have an unemployment spell, though this difference is not statistically significant. Those with lower income are more likely to have a short-distance move. While those with lower income are less likely to have a long-distance move than those with higher income, they are not less likely to move to a new MSA than those homeowners whose mortgage was never underwater. There is no statistically significant evidence of heterogeneity by income in the effect of an underwater mortgage on employment.

Table 10 shows that those with no college experience are much less likely to move in response to their mortgage going underwater than those with college experience. These results make it clear that most of the positive effect on mobility is being driven by those with college experience, even for the short-distance moves. However, as compared to those whose mortgage was never underwater, those with no college experience whose mortgage was only underwater in the second period are not less mobile. There is no statistically significant evidence for a heterogeneous effect by education on experiencing an unemployment spell, but there is a statistically significant difference in the probability of experiencing a job change. For homeowners whose mortgage goes underwater, those with college experience are more likely to change jobs than those with no college experience. This is consistent with our finding that those with college experience are more mobile, even controlling for income and wealth in period 1.

5. Conclusion

This paper uses data from the Panel Study of Income Dynamics to estimate the effect of an underwater mortgage on employment and mobility. Rather than relying on aggregate mobility data, we are able to use individual level data to compare underwater homeowners to similar homeowners who are not underwater. The identification is based on the assumption that going underwater is conditionally independent from the homeowner's employment and mobility outcomes. We motivate this assumption by using a sample of similar homeowners who faced a similar probability of their mortgage going underwater and then relying on geographic differences in the strength and the timing of the housing bust.

The results imply that underwater homeowners are not more likely to become unemployed and are more likely to move. We view this as evidence against house lock and the claim that the prevalence of underwater mortgages contributed to an increase in structural unemployment. Our data covers the period 2005 to 2009, so we only make this claim with respect to the recent housing bust. It is possible that house lock was an important cause of unemployment in prior housing busts but that the reduction in the stigma and other costs associated with a short sale or defaulting on a mortgage today reduced the effect of house lock.

We find evidence that how far a house goes underwater matters. Those whose home goes only a little underwater are much more likely to move to a new MSA than those whose mortgage never entered underwater status. These same homeowners whose mortgage goes a little underwater are no more or less likely to move a short-distance within the same MSA than those whose mortgage never went underwater. However, those whose mortgage went far underwater are much more likely to move, especially short-distance moves within the same MSA. There is also evidence of heterogeneity in the response to going underwater by income and education.

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Tables and Figures

Figure 1: Propensity Scores for Untreated and Treated, Full Unrestricted Sample

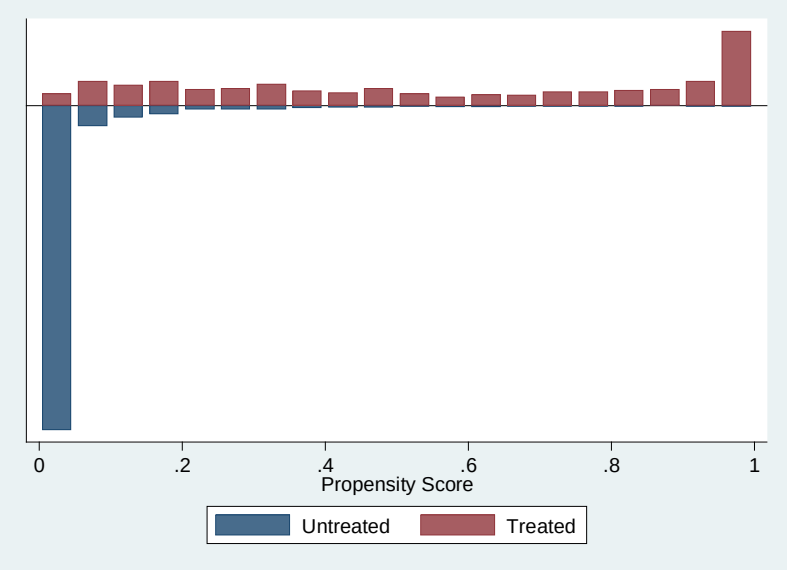

Figure 2: Propensity Scores for Treated and Untreated, Restricted Sample

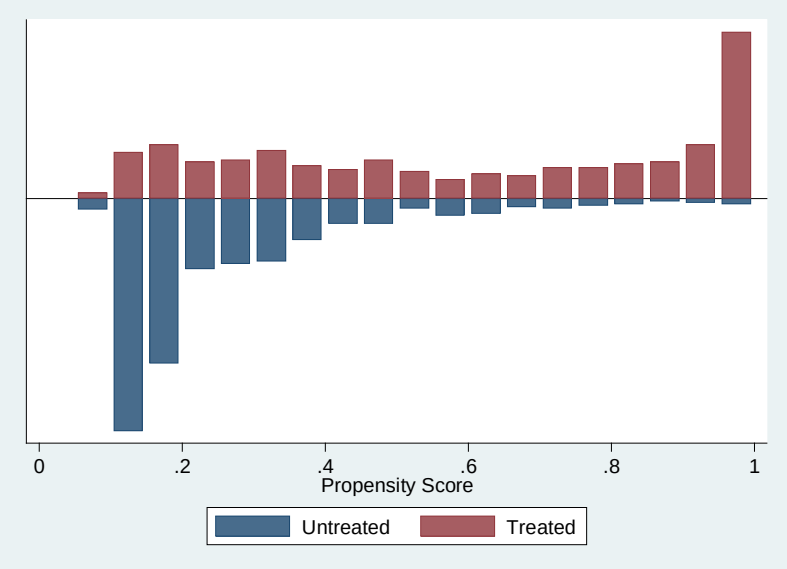

Table 1: The Effect of an Underwater Mortgage on Outcomes

	Unemployment (1)	Job Change (2)	Any Move (3)	Long-Distance (4)	Short-Distance (5)
Underwater in Period 2 Only	**-0.0033**	**0.0010**	**0.0673***	**0.0425***	**0.0420***
	(0.0203)	**(0.0164)**	**(0.0350)**	**(0.0240)**	**(0.0229)**
Income	-0.0022***	-0.0004	-0.0001	-0.0004	0.0002
	(0.0006)	(0.0003)	(0.0004)	(0.0004)	(0.0002)
Financial Wealth	0.0002**	-0.0002	0.0002	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
Non Liquid Wealth	-0.0001	-0.0006	0.0001	0.0001	0.0001
	(0.0002)	(0.0004)	(0.0002)	(0.0001)	(0.0001)
Ever Unemployed 1	0.0947***	0.1346***	0.0128	0.0114	0.0039
	(0.0072)	(0.0115)	(0.0120)	(0.0107)	(0.0102)
Out of the Labor Force	0.0205**	-0.0000	0.0142	0.0152*	-0.0006
	(0.0086)	(0.0183)	(0.0117)	(0.0080)	(0.0090)
House Value	0.0001	0.0001	-0.0001	-0.0001	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0002)
Refinanced Mortgage	-0.0081	0.0104	-0.0109	-0.0093	-0.0004
	(0.0059)	(0.0086)	(0.0104)	(0.0064)	(0.0095)
Interest Rate	0.0062***	0.0005	0.0123***	0.0006	0.0109***
	(0.0024)	(0.0024)	(0.0036)	(0.0029)	(0.0036)
Unemployment Rate 2	0.0007	-0.0021	-0.0006	-0.0034	0.0028
	(0.0026)	(0.0034)	(0.0032)	(0.0027)	(0.0024)
Additional Control Variables	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sample Weights	No	No	No	No	No
Observations	7409	6331	7422	6904	7312

Notes: Each column reports the average marginal effect from a probit regression of the outcome variable indicated on the variables indicated. All columns include additional controls for age, gender, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. The columns present results for the five dependent variables considered in Tables 2 through 6: unemployment, job change, any move, long-distance (MSA) move, and short-distance (census tract) move. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Variable Means for the Restricted Sample

	Underwater : Period 1 Only	Underwater : Period 2 Only	Underwater: Both Periods	Never Underwater	Restricted Sample
Variable	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Underwater: Period 1 Only	1.00	0.00	0.00	0.00	0.16
Underwater: Period 2 Only	0.00	1.00	0.00	0.00	0.14
Underwater: Both Periods	0.00	0.00	1.00	0.00	0.24
Unemployed in Period 2	0.11	0.13	0.10	0.12	0.11
Move to new MSA	0.11	0.09	0.07	0.01	0.05
Move within MSA to new Census Tract	0.11	0.08	0.09	0.05	0.08
Any Move	0.22	0.16	0.17	0.08	0.13
Equity in Period 1 ($10,000)	0.18	7.15	-0.62	21.64	10.78
Equity in Period 2 ($10,000)	2.48	-2.08	-1.94	13.25	5.73
Home Value ($10,000)	14.28	37.05	19.58	39.24	30.12
Interest Rate	6.38	6.23	6.72	6.12	6.32
Financial Wealth ($10,000)	1.58	17.06	2.87	7.22	6.59
Non Liquid Wealth ($10,000)	0.05	8.39	1.64	4.93	3.81
Income ($10,000)	6.52	9.92	8.50	9.62	8.88
Household Size	2.92	3.42	2.99	3.12	3.10
Refinanced	0.29	0.46	0.31	0.59	0.46
Age	37.07	40.99	39.34	43.67	41.18
Out of Labor Force	0.21	0.19	0.12	0.17	0.17
Education	13.52	13.53	13.54	13.65	13.59
Unemployment Rate in Period 2	6.69	11.40	9.09	11.09	9.93
Housing Price Index (HPI) Change	0.05	-0.27	-0.06	-0.24	-0.15
Second Mortgage	0.27	0.25	0.35	0.22	0.26
Remaining Principal Period 1 ($10,000)	12.96	28.35	18.08	16.67	18.00
Remaining Principal Period 2 ($10,000)	11.44	27.45	17.46	15.62	17.00
Remaining Principal 1 (2nd Mortgage)	1.14	1.55	2.11	0.93	1.33
Number of Observations	180	128	275	385	968

Notes: The means are computed using the PSID sample weights. The restricted sample consists of those observations with a similar estimated probability of having an underwater mortgage in the second period. This propensity score estimation is described in Section 2 of the paper and is based on all the observed variables in the first period which should leave us with similar control and treatment groups.

Table 3: The Effect of an Underwater Mortgage on Unemployment

	(1)	(2)	(3)	(4)	(5)	(6)
Underwater: Period 2 Only	**0.0003**	**-0.0045**	**-0.0120**	**-0.0116**	**-0.0124**	**-0.0033**
	(0.0399)	**(0.0370)**	**(0.0391)**	**(0.0385)**	**(0.0347)**	**(0.0203)**
Income		-0.0063***	-0.0074***	-0.0073***	-0.0089***	-0.0022***
		(0.0019)	(0.0017)	(0.0016)	(0.0014)	(0.0006)
Financial Wealth		0.0014***	0.0015***	0.0015***	0.0018***	0.0002**
		(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0001)
Non Liquid Wealth		-0.0001	0.0001	0.0001	0.0001	-0.0001
		(0.0008)	(0.0009)	(0.0009)	(0.0008)	(0.0002)
Ever Unemployed 1		0.2048***	0.2145***	0.2211***	0.1949***	0.0947***
		(0.0263)	(0.0227)	(0.0237)	(0.0249)	(0.0072)
Out of the Labor Force		0.0041	0.0112	0.0101	0.0168	0.0205**
		(0.0259)	(0.0272)	(0.0279)	(0.0383)	(0.0086)
House Value		-0.0012**	-0.0003	-0.0001	-0.0001	0.0001
		(0.0006)	(0.0006)	(0.0007)	(0.0004)	(0.0002)
Refinanced Mortgage		-0.0134	-0.0127	-0.0134	0.0193	-0.0081
		(0.0237)	(0.0248)	(0.0262)	(0.0264)	(0.0059)
Interest Rate		0.0171**	0.0186*	0.0189**	0.0064	0.0062***
		(0.0069)	(0.0099)	(0.0091)	(0.0097)	(0.0024)
Unemployment Rate 2		0.0051	0.0087	0.0099*	0.0075	0.0007
		(0.0058)	(0.0058)	(0.0053)	(0.0076)	(0.0026)
Additional Control Variables	No	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	No	Yes	Yes	Yes
Sample Weights	No	No	No	No	Yes	No
Observations	802	802	802	802	802	7409

Notes: Each column reports the average marginal effect from the estimation of a probit model where the dependent variable is an indicator for having an unemployment spell in the 2nd period. The models in columns 2 through 6 include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. Column 6 displays results using the entire unrestricted sample. Columns 1 through 5 use the restricted sample with observations in some state-years dropped because no individuals in that state-year experienced an unemployment spell. This typically occurs for less populated states where there are few observations. While this is only a problem for specifications which include state-by-year fixed effects, we fix the sample size in columns 1 through 3 to include the same observations as in columns 4 and 5. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: The Effect of an Underwater Mortgage on Changing Jobs

	(1)	(2)	(3)	(4)	(5)	(6)
Underwater: Period 2 Only	**0.0302**	**0.0275**	**0.0137**	**0.0103**	**0.0059**	**0.0010**
	(0.0372)	**(0.0314)**	**(0.0313)**	**(0.0319)**	**(0.0287)**	**(0.0164)**
Income		-0.0007	0.0003	-0.0005	-0.0005	-0.0004
		(0.0021)	(0.0019)	(0.0021)	(0.0019)	(0.0003)
Financial Wealth		0.0008*	0.0004	0.0005	0.0007	-0.0002
		(0.0005)	(0.0008)	(0.0007)	(0.0005)	(0.0001)
Non Liquid Wealth		-0.0035**	-0.0032*	-0.0034*	-0.0029**	-0.0006
		(0.0017)	(0.0018)	(0.0018)	(0.0014)	(0.0004)
Ever Unemployed 1		0.1187***	0.1216***	0.1247***	0.0992**	0.1346***
		(0.0401)	(0.0408)	(0.0422)	(0.0402)	(0.0115)
Out of the Labor Force		-0.1412*	-0.1724*	-0.1822**	-0.3553***	-0.0000
		(0.0743)	(0.0932)	(0.0901)	(0.0688)	(0.0183)
House Value		-0.0004	-0.0008	-0.0007	-0.0003	0.0001
		(0.0005)	(0.0006)	(0.0006)	(0.0005)	(0.0002)
Refinanced Mortgage		0.0292*	0.0323	0.0364*	0.0210	0.0104
		(0.0168)	(0.0211)	(0.0194)	(0.0215)	(0.0086)
Interest Rate		0.0014	0.0028	0.0063	0.0132	0.0005
		(0.0088)	(0.0090)	(0.0099)	(0.0106)	(0.0024)
Unemployment Rate 2		-0.0046	-0.0028	0.0010	0.0063	-0.0021
		(0.0041)	(0.0068)	(0.0074)	(0.0067)	(0.0034)
Additional Control Variables	No	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	No	Yes	Yes	Yes
Sample Weights	No	No	No	No	Yes	No
Observations	699	699	699	699	699	6331

Notes: Each column reports the average marginal effect from the estimation of a probit model where the dependent variable is an indicator for the individual remaining employed but switching employers at any time between the first and second response periods, or switching from unemployed to employed. This indicator variable is zero if an individual was continuously employed with the same employer, was continuously unemployed, became unemployed, or who left the labor force. The models in columns 2 through 6 include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. Column 6 displays results using the entire unrestricted sample. Columns 1 through 5 use the restricted sample with observations in some state-years dropped because no individuals in that state-year experienced a job change. We fix the sample size in columns 1 through 3 to include the same observations as in columns 4 and 5. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The Effect of an Underwater Mortgage on Moving

	(1)	(2)	(3)	(4)	(5)	(6)
Underwater: Period 2 Only	**0.1094****	**0.0912***	**0.0848***	**0.0819***	**0.0677***	**0.0673***
	(0.0495)	**(0.0469)**	**(0.0500)**	**(0.0488)**	**(0.0383)**	**(0.0350)**
Income		0.0058**	0.0062**	0.0062**	0.0073***	-0.0001
		(0.0024)	(0.0026)	(0.0029)	(0.0022)	(0.0004)
Financial Wealth		0.0003	0.0004	0.0004	0.0003	0.0002
		(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0002)
Non Liquid Wealth		-0.0004	-0.0006	-0.0005	0.0001	0.0001
		(0.0019)	(0.0020)	(0.0019)	(0.0016)	(0.0002)
Ever Unemployed 1		0.0834***	0.0929***	0.1005***	0.0833**	0.0128
		(0.0242)	(0.0263)	(0.0295)	(0.0343)	(0.0120)
Out of the Labor Force		0.0472	0.0553*	0.0444	0.0442	0.0142
		(0.0327)	(0.0333)	(0.0370)	(0.0344)	(0.0117)
House Value		-0.0001	0.0002	0.0001	-0.0001	-0.0001
		(0.0008)	(0.0008)	(0.0009)	(0.0006)	(0.0002)
Refinanced Mortgage		-0.0133	-0.0126	-0.0066	-0.0152	-0.0109
		(0.0395)	(0.0417)	(0.0434)	(0.0367)	(0.0104)
Interest Rate		0.0404***	0.0495***	0.0504***	0.0511***	0.0123***
		(0.0102)	(0.0105)	(0.0107)	(0.0092)	(0.0036)
Unemployment Rate 2		-0.0073	-0.0067	-0.0076	-0.0074	-0.0006
		(0.0046)	(0.0071)	(0.0081)	(0.0080)	(0.0032)
Additional Control Variables	No	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	No	Yes	Yes	Yes
Sample Weights	No	No	No	No	Yes	No
Observations	874	874	874	874	874	7422

Notes: Each column reports the average marginal effect from the estimation of a probit model where the dependent variable is an indicator for whether an individual has moved at the state, MSA, CBSA, county, or Census Tract level between response periods. Measures of mobility are constructed using PSID Geocode data and observing whether an individual's location code changes across response periods. The models in columns 2 through 6 include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. Column 6 displays results using the entire unrestricted sample. Columns 1 through 5 use the restricted sample with observations in some state-years dropped because no individuals in that state-year moved. While this is only a problem for specifications which include state-by-year fixed effects, we fix the sample size in columns 1 through 3 to include the same observations as in columns 4 and 5. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 6: The Effect of an Underwater Mortgage on Long-Distance Moves

	(1)	(2)	(3)	(4)	(5)	(6)
Underwater: Period 2 Only	**0.0823*** **	**0.0706** **	**0.0654* **	**0.0662** **	**0.0736*** **	**0.0425* **
	(0.0238)	**(0.0331)**	**(0.0340)**	**(0.0335)**	**(0.0239)**	**(0.0240)**
Income		0.0006	-0.0018	-0.0018	-0.0006	-0.0004
		(0.0019)	(0.0024)	(0.0025)	(0.0014)	(0.0004)
Financial Wealth		0.0004	0.0004*	0.0004*	0.0004**	0.0000
		(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0001)
Non Liquid Wealth		0.0009	0.0010	0.0010	0.0004	0.0001
		(0.0008)	(0.0006)	(0.0006)	(0.0007)	(0.0001)
Ever Unemployed 1		0.0328	0.0555**	0.0551**	0.0237	0.0114
		(0.0260)	(0.0229)	(0.0231)	(0.0233)	(0.0107)
Out of the Labor Force		0.0298*	0.0143	0.0147	0.0141	0.0152*
		(0.0153)	(0.0210)	(0.0214)	(0.0116)	(0.0080)
House Value		-0.0007	0.0004	0.0005	0.0005	-0.0001
		(0.0007)	(0.0011)	(0.0011)	(0.0008)	(0.0001)
Refinanced Mortgage		-0.0079	0.0124	0.0099	-0.0238	-0.0093
		(0.0349)	(0.0403)	(0.0410)	(0.0327)	(0.0064)
Interest Rate		0.0021	0.0007	0.0007	-0.0039	0.0006
		(0.0072)	(0.0091)	(0.0094)	(0.0067)	(0.0029)
Unemployment Rate 2		-0.0143***	-0.0006	0.0001	0.0045	-0.0034
		(0.0035)	(0.0067)	(0.0069)	(0.0065)	(0.0027)
Additional Control Variables	No	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	No	Yes	Yes	Yes
Sample Weights	No	No	No	No	Yes	No
Observations	640	640	640	640	640	6904

Notes: Each column reports the average marginal effect from the estimation of a probit model where the dependent variable is an indicator for whether an individual has moved to a new MSA between response periods. The models in columns 2 through 6 include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. Column 6 displays results using the entire unrestricted sample. Columns 1 through 5 use the restricted sample with observations in some state-years dropped because no individuals in that state-year experienced a long-distance move. While this is only a problem for specifications which include state-by-year fixed effects, we fix the sample size in columns 1 through 3 to include the same observations as in columns 4 and 5. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 7: The Effect of an Underwater Mortgage on Short-Distance Moves

	(1)	(2)	(3)	(4)	(5)	(6)
Underwater: Period 2 Only	**0.0634***	**0.0682****	**0.0559****	**0.0553****	**0.0242**	**0.0420***
	(0.0350)	**(0.0274)**	**(0.0273)**	**(0.0269)**	**(0.0215)**	**(0.0229)**
Income		0.0074***	0.0075***	0.0075***	0.0080***	0.0002
		(0.0020)	(0.0019)	(0.0019)	(0.0014)	(0.0002)
Financial Wealth		-0.0023	-0.0019	-0.0018	-0.0025**	0.0001
		(0.0015)	(0.0013)	(0.0014)	(0.0012)	(0.0001)
Non Liquid Wealth		-0.0014	-0.0014	-0.0014	-0.0001	0.0001
		(0.0019)	(0.0019)	(0.0019)	(0.0014)	(0.0001)
Ever Unemployed 1		0.0493*	0.0623**	0.0630**	0.0843***	0.0039
		(0.0254)	(0.0293)	(0.0302)	(0.0241)	(0.0102)
Out of the Labor Force		0.0402	0.0375	0.0367	0.0250	-0.0006
		(0.0280)	(0.0298)	(0.0305)	(0.0273)	(0.0090)
House Value		0.0002	0.0002	0.0002	-0.0001	-0.0001
		(0.0007)	(0.0006)	(0.0007)	(0.0006)	(0.0002)
Refinanced Mortgage		-0.0058	-0.0068	-0.0042	-0.0027	-0.0004
		(0.0341)	(0.0381)	(0.0383)	(0.0260)	(0.0095)
Interest Rate		0.0432***	0.0470***	0.0480***	0.0487***	0.0109***
		(0.0074)	(0.0069)	(0.0075)	(0.0048)	(0.0036)
Unemployment Rate 2		-0.0040	-0.0033	-0.0027	-0.0012	0.0028
		(0.0039)	(0.0049)	(0.0053)	(0.0038)	(0.0024)
Additional Control Variables	No	Yes	Yes	Yes	Yes	Yes
State and Year Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	No	Yes	Yes	Yes
Sample Weights	No	No	No	No	Yes	No
Observations	800	800	800	800	800	7312

Notes: Each column reports the average marginal effect from the estimation of a probit model where the dependent variable is an indicator for whether an individual has moved to a different census tract but stayed within the same MSA between response periods. The models in columns 2 through 6 include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. Column 6 displays results using the entire unrestricted sample. Columns 1 through 5 use the restricted sample with observations in some state-years dropped because no individuals in that state-year experienced a short-distance move. While this is only a problem for specifications which include state-by-year fixed effects, we fix the sample size in columns 1 through 3 to include the same observations as in columns 4 and 5. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: The Effect of an Underwater Mortgage by Level of Negative Equity

VARIABLES	(1) Unemployed	(2) Job Change	(3) Any Move	(4) Move MSA	(5) Move Tract
Low Negative Equity	**-0.0409**	**0.0152**	**0.0486**	**0.0911****	**0.0017**
	(0.0386)	**(0.0501)**	**(0.0515)**	**(0.0356)**	**(0.0416)**
High Negative Equity	**0.0111**	**0.0044**	**0.1109***	**0.0443**	**0.0981*****
	(0.0471)	**(0.0207)**	**(0.0573)**	**(0.0479)**	**(0.0324)**
Income	-0.0072***	-0.0005	0.0063**	-0.0022	0.0077***
	(0.0017)	(0.0021)	(0.0029)	(0.0024)	(0.0019)
Financial Wealth	0.0015***	0.0005	0.0004	0.0005*	-0.0020
	(0.0003)	(0.0007)	(0.0004)	(0.0002)	(0.0014)
Non Liquid Wealth	0.0000	-0.0034*	-0.0005	0.0009	-0.0016
	(0.0009)	(0.0018)	(0.0019)	(0.0007)	(0.0020)
Ever Unemployed 1	0.2229***	0.1244***	0.1023***	0.0528**	0.0668**
	(0.0245)	(0.0424)	(0.0295)	(0.0230)	(0.0302)
Out of the Labor Force	0.0098	-0.1828**	0.0437	0.0143	0.0352
	(0.0280)	(0.0903)	(0.0362)	(0.0214)	(0.0303)
House Value	-0.0001	-0.0007	0.0001	0.0005	0.0002
	(0.0007)	(0.0006)	(0.0009)	(0.0011)	(0.0006)
Refinanced Mortgage	-0.0113	0.0363*	-0.0038	0.0060	-0.0017
	(0.0258)	(0.0194)	(0.0429)	(0.0417)	(0.0370)
Interest Rate	0.0185**	0.0063	0.0504***	0.0007	0.0475***
	(0.0089)	(0.0098)	(0.0107)	(0.0094)	(0.0078)
Unemployment Rate 2	0.0095*	0.0012	-0.0083	0.0010	-0.0035
	(0.0053)	(0.0075)	(0.0080)	(0.0060)	(0.0053)
Additional Control Variables	Yes	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	802	699	874	640	800

Notes: Each column reports the average marginal effect from the estimation of equation (2). All columns include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. The columns present results for the five dependent variables considered in Tables 2 through 6: unemployment, job change, any move, long-distance (MSA) move, and short-distance (census tract) move. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 9: The Effect of an Underwater Mortgage by Income Group

VARIABLES	(1) Unemployed	(2) Job Change	(3) Any Move	(4) Move MSA	(5) Move Tract
Above Median Income	**0.0167**	**-0.0039**	**0.0768**	**0.1117*** **	**0.0173**
	(0.0507)	**(0.0323)**	**(0.0711)**	**(0.0422)**	**(0.0408)**
Below Median Income	**-0.0377**	**0.0265**	**0.0869***	**0.0011**	**0.0830** **
	(0.0343)	**(0.0567)**	**(0.0469)**	**(0.0519)**	**(0.0358)**
Income	-0.0079***	-0.0004	0.0063**	-0.0031	0.0079***
	(0.0016)	(0.0021)	(0.0028)	(0.0029)	(0.0019)
Financial Wealth	0.0015***	0.0005	0.0004	0.0004*	-0.0020
	(0.0003)	(0.0008)	(0.0004)	(0.0003)	(0.0013)
Non Liquid Wealth	0.0000	-0.0035*	-0.0005	0.0011*	-0.0011
	(0.0009)	(0.0019)	(0.0018)	(0.0006)	(0.0019)
Ever Unemployed 1	0.2202***	0.1242***	0.1006***	0.0556**	0.0648**
	(0.0241)	(0.0430)	(0.0294)	(0.0222)	(0.0298)
Out of the Labor Force	0.0098	-0.1816**	0.0441	0.0144	0.0350
	(0.0276)	(0.0896)	(0.0375)	(0.0222)	(0.0305)
House Value	-0.0000	-0.0007	0.0001	0.0006	0.0002
	(0.0006)	(0.0006)	(0.0009)	(0.0011)	(0.0007)
Refinanced Mortgage	-0.0143	0.0363*	-0.0066	0.0108	-0.0042
	(0.0262)	(0.0193)	(0.0434)	(0.0407)	(0.0388)
Interest Rate	0.0187**	0.0063	0.0504***	0.0013	0.0472***
	(0.0088)	(0.0098)	(0.0108)	(0.0094)	(0.0076)
Unemployment Rate 2	0.0093*	0.0014	-0.0075	-0.0026	-0.0019
	(0.0051)	(0.0068)	(0.0078)	(0.0059)	(0.0052)
Additional Control Variables	Yes	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	802	699	874	640	800

Notes: Each column reports the average marginal effect from the estimation of a model similar to equation (2) in which income group rather than negative equity group is interacted with the indicator for having an underwater mortgage only in the second period. All columns include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. The columns present results for the five dependent variables considered in Tables 2 through 6: unemployment, job change, any move, long-distance (MSA) move, and short-distance (census tract) move. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 10: The Effect of an Underwater Mortgage by Education Group

VARIABLES	(1) Unemployed	(2) Job Change	(3) Any Move	(4) Move MSA	(5) Move Tract
Some College	**-0.0069**	**0.0442**	**0.1115***	**0.0892****	**0.0651***
	(0.0392)	**(0.0402)**	**(0.0576)**	**(0.0421)**	**(0.0374)**
No College	**-0.0188**	**-0.0716**	**0.0192**	**0.0068**	**0.0365**
	(0.0649)	**(0.0480)**	**(0.0504)**	**(0.0475)**	**(0.0369)**
Income	-0.0073***	-0.0004	0.0061**	-0.0023	0.0074***
	(0.0016)	(0.0020)	(0.0029)	(0.0026)	(0.0019)
Financial Wealth	0.0015***	0.0005	0.0004	0.0004	-0.0017
	(0.0003)	(0.0007)	(0.0004)	(0.0003)	(0.0014)
Non Liquid Wealth	0.0001	-0.0036**	-0.0005	0.0010	-0.0014
	(0.0009)	(0.0016)	(0.0019)	(0.0007)	(0.0019)
Ever Unemployed 1	0.2215***	0.1226***	0.1024***	0.0581**	0.0641**
	(0.0244)	(0.0414)	(0.0291)	(0.0235)	(0.0304)
Out of the Labor Force	0.0099	-0.1767*	0.0433	0.0145	0.0365
	(0.0279)	(0.0910)	(0.0371)	(0.0221)	(0.0306)
House Value	-0.0001	-0.0006	0.0001	0.0006	0.0002
	(0.0007)	(0.0006)	(0.0009)	(0.0011)	(0.0007)
Refinanced Mortgage	-0.0131	0.0395**	-0.0048	0.0129	-0.0042
	(0.0259)	(0.0199)	(0.0435)	(0.0405)	(0.0383)
Interest Rate	0.0189**	0.0070	0.0500***	0.0001	0.0477***
	(0.0091)	(0.0097)	(0.0105)	(0.0097)	(0.0074)
Unemployment Rate 2	0.0098*	0.0007	-0.0081	0.0001	-0.0029
	(0.0052)	(0.0075)	(0.0081)	(0.0068)	(0.0053)
Additional Control Variables	Yes	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	802	699	874	640	800

Notes: Each column reports the average marginal effect from the estimation of a model similar to equation (2) in which college experience rather than negative equity group is interacted with the indicator for having an underwater mortgage only in the second period. All columns include controls for gender, age, race, ethnicity, marital status, education level, household size, type of housing, other real estate holdings, an indicator for being underwater in period 1, and an indicator for being underwater in both periods. The columns present results for the five dependent variables considered in Tables 2 through 6: unemployment, job change, any move, long-distance (MSA) move, and short-distance (census tract) move. Robust standard errors are reported in parentheses below the estimates and are clustered at the state level. Statistical significance is indicated as follows: *** p<0.01, ** p<0.05, * p<0.1.